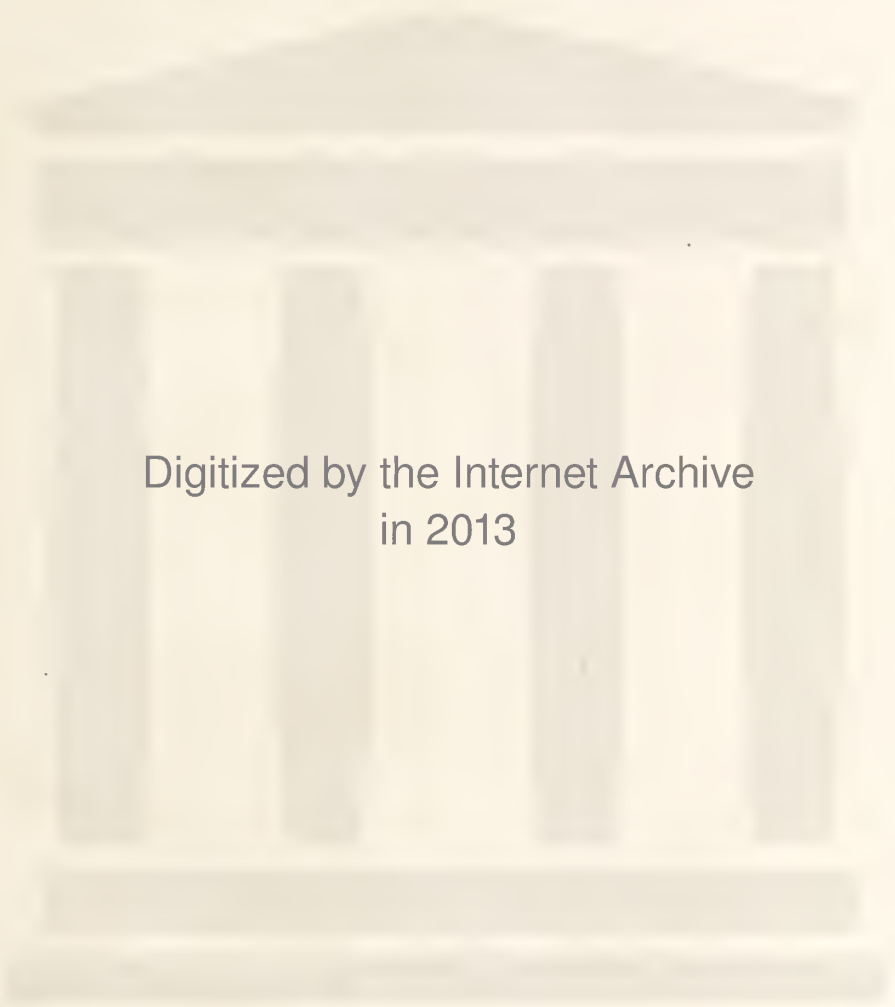
Our Western Empire.



AN EMIGRANT CAMP

OUR WESTERN EMPIRE:

OR THE

NEW WEST

BEYOND THE MISSISSIPPI:

THE LATEST AND MOST COMPREHENSIVE WORK ON THE

States and Territories West of the Mississippi.

CONTAINING

THE FULLEST AND MOST COMPLETE DESCRIPTION, FROM OFFICIAL AND OTHER AUTHENTIC SOURCES, OF THE GEOGRAPHY, GEOLOGY, AND NATURAL HISTORY, (WITH ABUNDANT INCIDENTS AND ADVENTURES,) THE CLIMATE, SOIL, AGRICULTURE, THE MINERAL AND MINING PRODUCTS, THE CROPS, AND HERDS AND FLOCKS, THE SOCIAL CONDITION, EDUCATIONAL AND RELIGIOUS PROGRESS, AND FUTURE PROSPECTS OF THE WHOLE REGION LYING BETWEEN THE MISSISSIPPI AND THE PACIFIC OCEAN.

TO WHICH IS ADDED

THE VARIOUS ROUTES, AND PRICES OF PASSAGE AND TRANSPORTATION FOR EMIGRANTS THITHER; THE LAWS, REGULATIONS AND PROVISIONS FOR OBTAINING LANDS FROM THE NATIONAL OR STATE GOVERNMENTS OR RAILROADS; COUNSEL AS TO LOCATIONS AND PROCURING LANDS, CROPS MOST PROFITABLE FOR CULTURE, MINING OPERATIONS, AND THE LATEST PROCESSES FOR THE REDUCTION OF GOLD AND SILVER, THE EXERCISE OF TRADES OR PROFESSIONS; AND DETAILED DESCRIPTIONS OF EACH STATE AND TERRITORY;

WITH FULL INFORMATION CONCERNING MANITOBA, BRITISH COLUMBIA, AND THOSE REGIONS IN THE ATLANTIC STATES ADAPTED TO SETTLEMENT, BY THOSE WHO DO NOT WISH TO GO WEST; AND STATISTICS OF CROPS, AREAS, RAINFALL, ETC.

BY L. P. BROCKETT, A. M., M. D.

ONE OF THE EDITORS OF THE "NEW AMERICAN ENCYCLOPÆDIA," "APPLETON'S ANNUAL," AND "JOHNSON'S UNIVERSAL ILLUSTRATED CYCLOPÆDIA," ETC., ETC,, ETC.

With Numerous Illustrations and Maps

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PREFACE.

IN the summer of 1879 the publishers of this work entered into negotiations with the writer for the preparation of a work on the West; it was to be an octavo volume of about five hundred pages; and, having had considerable experience in geographical and historical works, the writer felt confident of its completion in the early spring of 1880. But as he proceeded with his work, both he and his publishers felt that their original plan was too circumscribed for the subject before them. The country to be described was vast, beyond our ordinary conceptions of vastness; much of it had never been adequately described, and the descriptions hitherto published were as far behind the existing facts as a ten-year-old almanac. The tide of immigration had doubled and quadrupled since 1876, and what was a howling wilderness, with only a half dozen straggling settlements, five years before, had already attained the population and organization of a State. The railways, which during the six years of financial depression, had added very little to their mileage in the new States and Territories, were now stretching their iron fingers across the continent, pioneers instead of followers of settlement and civilization. The loaded trains groaned beneath the weight of the superabundant crops; over all the hillsides the cattle roamed, fat, sleek and contented, in unnumbered thousands; all the plains were spangled with millions of white-fleeced sheep. Along both slopes of the Rocky Mountains, from Texas to British America, in the summits and passes of the Sierra Madre, the Sierra Nevada and the Cascades, as well as in the smaller outlying ranges between, and even on the hills of the lower Coast Range, gold and silver, quicksilver and platinum, copper, lead and zinc, coal, salt and sulphur, were yielding up their treasures; and every day was adding largely to the amount. The population, which was pouring into this vast empire, was composed of almost every people under the sun; and while the leaven of sturdy law-abiding citizens from the Atlantic States was large, it remained to be seen whether the amalgamation would result in an intelligent and patriotic citizenship; whether education, moral principle, and higher aims than mere money-getting, would gain the ascendency.

Then the year 1880 proved, from almost its beginning, to be an exceptional year, especially in its relations to the West. Our decennial census was to be taken, and it would be possible by the close of the year, but not earlier, to ascertain whether the boasted increase of these Western States and Territories was justified by the cold and careful enumerations of the census supervisors. Six hundred thousand emigrants reached our shores during the year, and more than twice that number of our own citizens migrated to the West. The railway kings were enlisting their syndicates and making their combinations, which have resulted in a twelvemonth in arrangements for the speedy completion of four new trunk routes to the Pacific on our own territory, and of the Canadian Pacific on our northern border. Eleven States and Territories, heretofore either in part or wholly inaccessible by rail, are now, or will be in a few months, provided with railroad transit across their entire breadth or length; and the year on which we have entered is only carrying out right royally the plans and projects of its imperial predecessor.

It was evident to both publishers and author that our plans required extension and enlargement, and so we went from ordinary octavo to royal octavo; from 500 to 700, to 1000, and finally to over 1300 pages. Resolved to represent what had never previously been even attempted, and what for lack of material could not have been attempted with success—the present condition of each of the States and Territories which go to make up "Our Western Empire"—no pains nor expense has been spared to gain from every source every fact which could illustrate their topography, geology and mineralogy, climate, soil, productions, mineral wealth, pastoral facilities, population, accumulated wealth, education and religion, with notices of the Indian tribes found in their borders. For these purposes, every book and pamphlet, official and other, every report, railroad publication, mining record, every newspaper and every telegraphic report affecting any of these States or Territories, has been carefully scanned to the number of more than three thousand, and a correspondence opened and maintained with many hundreds of officials and others.

The result is before the public. It has been a labor of love, notwithstanding the toil it has required. That it is absolutely free from error is impossible; but the great care which has been taken to secure accuracy leads to the hope that there are no errors of great magnitude. At all events, it could not have been completed with as great a measure of perfection as it now possesses, a day earlier than the present.

No man was ever blessed with more kindly and thoughtful friends than the writer. Every request for information has been most promptly and heartily

met by those to whom it was addressed; and in many cases voluntary contributions of great labor and value have been added. Two most valued and helpful correspondents have died while the work was in progress: his Excellency, William A. Howard, Governor of Dakota, and Hon. Alfred Gray, Secretary of the Kansas State Board of Agriculture. Of the living, the warm and hearty thanks of the writer are due to his Excellency, Gen. John C. Fremont, Governor of Arizona, for valuable information relative to that Territory; to Hon. W. H. H. Beadle, of Yankton, Dakota, Superintendent of Public Instruction of Dakota, for much information and valuable memoranda in regard to Southeastern Dakota and the Black Hills; to J. B. Power, Esq., of St. Paul, Minnesota, for a valuable essay, and many important documents in regard to Montana and Dakota; to H. H. Young, Esq., Secretary of Minnesota Board of Emigration, for documents, etc., relative to Minnesota; to Hon. Andrew McKinley, of St. Louis, President of Missouri State Board of Immigration, for letters and valuable documents; to his Excellency, Albinus Nance, Governor of Nebraska, for many documents; to his Excellency, J. P. St. John, Governor of Kansas, and J. K. Hudson, Esq., Mr. Gray's successor as Secretary of the Board of Agriculture of that State, for documents; to Robert E. Strahorn, Esq., of Omaha, for valuable documents and descriptions; to A. L. Webber, Esq., of Hot Springs, and to United States Senator A. H. Garland, for aid in regard to Arkansas; to A. L. Stokes, Esq., of Chicago, for valuable documents in regard to Oregon; to Edward J. Brockett, of Orange, N. J., for many valuable historical and descriptive works; to Charles C. Savage, Esq., of Brooklyn, for valuable documents and information concerning Colorado; to Gen. N. A. Miles, U. S. A., for official reports of the exploration of the Yellowstone region; and especially to Rev. Wayland Hoyt, D. D., of Brooklyn, for his invaluable aid in regard to Montana and the Yellowstone Park. There may be others whose aid ought to be acknowledged, but whose names are not now recalled. If so, they will please accept the grateful thanks of one whose memory of names is less tenacious than of loving deeds.

In the hope that this book may contribute to the honor and glory of our beloved country, both at home and abroad, the writer subscribes himself the public's most humble servant. L. P. B.

BROOKLYN, *February*, 1881.

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OUR WESTERN EMPIRE;

OR,

THE NEW WEST BEYOND THE MISSISSIPPI.

PART I.

OUR WESTERN EMPIRE.

CHAPTER I.

WHAT IT COMPREHENDS—THE WEST BEYOND THE MISSISSIPPI—ITS AREA AND EXTENT—COMPARISON WITH OTHER EMPIRES—CLIMATE—MOUNTAINS—NATURAL PHENOMENA—SOIL—THE ALKALINE, VOLCANIC AND "BAD LANDS"—PREDOMINANCE OF ARABLE AND PASTURE LANDS—NUTRITIOUS GRASSES IN THE GRAZING LANDS.

"OUR WESTERN EMPIRE" is of greater extent than any other Empire of Christendom except Russia and Brazil, and in population, enterprise, and advantages for future growth is the peer of any; but it has no monarch, hereditary or elective, to rule its wide domain. It forms a large part—more than two-thirds of the Great Republic of the United States of America, and over all its vast extent, an intelligent and industrious, moral and capable people rule themselves. Their chief magistrates, their governors and executive officers, are men of the people, selected by the people, for short terms of service, and replaced by others, when those terms expire.

What, then, do we understand "Our Western Empire" to comprehend? All of that portion of the United States lying west of the Mississippi, and including the new Territory of Alaska. Its northern boundaries are the Arctic Ocean and Behring's Sea and Straits west of the 140th meridian; and east of that, British America; its western limit the Pacific Ocean; its southern, Mexico and the Mexican Gulf; its eastern, the Mississippi river

from its mouth to the Canada line, and the west line of British America, above the fifty-fourth parallel. It has an area of 2,671,884 square miles, of which 577,390 or about one-fifth, belongs to Alaska. It extends over 42° of latitude, and in its farthest western boundary, "by Ounalaska's lonely shore," over 103° of longitude.

Leaving Alaska out of the question, as a mere dependency, the remainder of "Our Western Empire" comprises 24° of latitude and 36° of longitude, having a breadth of nearly 2,000 miles from east to west, and a length from north to south of 1,700 miles, with an area of 2,094,494 square miles. The whole of Europe except Russia, including the great German Empire, the Austro-Hungarian Empire, the Republic of France, the United Kingdom of Great Britain and Ireland, the Kingdoms of Turkey, Italy, Spain, Portugal, Sweden, Norway and Denmark, and the minor States and principalities, have in all only an area of 1,678,791 square miles, about four-fifths of "Our Western Empire" exclusive of Alaska, or including it, less than three-fifths. Its population is of course much less than that of the larger European States, though somewhat greater than that of the Brazilian Empire, and increasing at a rate never equalled in the world's history.

No empire in the world has a greater diversity of climate; from the more than six months' winter of the northern border, and the mountainous regions, on some of which rest eternal snows, to the tropical heats of Arizona and Southern Texas, there is the greatest possible diversity of moisture and drought, of heat and cold, of moderate, equable and health-giving temperature, and of rapid change, and fickle, inconstant skies. Like other large empires, it has great diversities of surface. Three ranges of lofty mountains traverse it from north to south with their numerous outlying spurs, their broad plateaux and table-lands rising to a height of 6,000 to 9,000 feet, their *mesas* or isolated flat-topped mountain summits, their deep and terrible cañons, and their long valleys, sometimes narrow and precipitous, sometimes broad seas of verdure and flowers. These are: the Rocky Mountains, appropriately named "the backbone of the Continent," and occupying a

position about midway between the Mississippi river and the Pacific Ocean; west of these, and parallel with them, the Sierra Nevada, or Snowy Range, whose peaks tower up into heights corresponding with those of the Alps; and still farther west, and looking out upon the Pacific, the Coast Range, generally of lower altitude, but containing some lofty summits, whose snow-clad tops are the landmarks of the coast. Between the Rocky Mountains and the Sierra Nevada, is the great Utah or Salt Lake Basin, a vast depressed tract, none of whose streams flow outward, and some of whose lakes are salt and bitter. It has also its volcanic regions, and areas of erosion, where Dame Nature has played most fantastic tricks, now rearing lofty statues, monuments, castles, cathedrals, gateways, now scooping out vast series of basins of mineral waters either hot or cold, such as put all artificial baths to shame; anon sending at intervals its geyser-fountains two hundred and fifty feet into the air; or filling the quaking and trembling earth with jets of hot steam, reeking with sulphurous odors. At some points, after a fearful descent into some apparently dark and gloomy ravine or cañon, all the hills or mountains around one seem to have put on their holiday attire; one has donned for its bridal veil a beautiful and semi-transparent waterfall, whose height is so great that the water seems pulverized into glittering dust ere it reaches the valley; another, with a greater supply of water, forms four or five gigantic cascades, each higher than Niagara, in its downward career; while still another, in a rift between the mountain summits, forms a stream of moderate size in a perpendicular fall, a thousand feet or more, sheer down into the valley. Broad lakes, some of them salt and some fresh, with many outlets or with none, are found on mountain tops or in the centre of wide valleys; while, as we have said, one vast basin has its own system of lakes and rivers which find no way of reaching the sea.

Like other empires, not all the land has a rich and fertile soil. There are mountains, where the rocks are cold, bleak, bare and precipitous; there are cañons and ravines, whose nearly perpendicular walls, from 3,000 to 6,000 feet in height, only let in the sunlight at midday, and their clayey and rocky sides, of parti-

colored hues, afford no hold for weed, vine, shrub or tree. There are plains, plateaux and *mesas* covered with alkaline powder, and having as their only vegetation the gray, lichen-hued sage-brush; plains on which the gentle rain and soft falling dew seldom or never descends—yet these monotonous and apparently barren plains, under the influence of irrigation, yield most abundant crops, and even the despised sage-brush furnishes a delicious pasturage for cattle. There are also considerable tracts where, in former times, the eroding influences of mountain streams have cut the deep strata of clay into the most fantastic forms—lands so utterly barren, that no toil could extract from them the least vestige of a crop—the "Bad Lands" of the Canadian trappers; and there are also some stretches of volcanic lands, for one of which the foul and mephitic vapors, and the earthquake shocks, have prompted the expressive name of Death Valley.

But while these extraordinary displays of the power of natural forces render this Great West a true Wonderland, they really comprise but a small proportion of its surface, and no region of equal extent has a larger proportion of available and productive lands. The quantity of arable soil is immense. The wheat fields of Iowa, Minnesota, Northern and Southeastern Dakota, Kansas and Nebraska, the lands suited to the growth of Indian corn in these States and Territories, and in Missouri, Arkansas and the Indian Territory, and in portions of Colorado and New Mexico, the cotton lands of Texas, Arkansas and New Mexico, and, on the Pacific slope, the wheat and barley fields and the vineyards and orchards of California, the wheat and corn fields of Oregon and Washington, are beyond all comparison for excellence, on this continent or any other.

In the way of grazing lands, no other country can compare with them. There are not only the cattle upon a thousand hills or plains, but thousands and tens of thousands of cattle on each vast plain or mountain slope. The States and Territories of Texas, New Mexico, Arizona, Colorado, Wyoming, Utah, Northwestern Dakota, Montana, Idaho, Oregon, Washington and California, can furnish, within a few years, all the beef and mutton needed to feed the rest of the world. The grasses here are

more nutritious and fattening, and give to the flesh of the cattle a more gamey flavor than those of any other known country; and even those lands which were at first reckoned as portions of the Great American Desert, lands given over to alkaline deposits and sage-brush, and on which there was but very little rainfall, now prove admirably adapted to pasturage, and, either with or without irrigation, most bounteous in their production of grain and root crops. And in this connection we may well raise the question which we next discuss.

CHAPTER II.

THE GREAT AMERICAN DESERT: WHERE IS IT?—THE HUNDREDTH MERIDIAN —"ELI PERKINS'S" SCARE—THE FACTS IN REPLY—COLONEL (BREVET BRIGADIER-GENERAL) HAZEN ON THE NORTHERN PACIFIC—GOVERNOR HOWARD'S ANSWER, AND OTHER FACTS—DAKOTA—WYOMING AND ITS AGRICULTURE—MONTANA—B. R. AND MR. Z. L. WHITE ON ITS CROPS—THE SMALL MODICUM OF TRUTH IN THESE "DESERT" STORIES—THE REPORTED "DESERT" BEYOND THE ROCKIES—THE UTAH AND NEVADA DESERT—TESTIMONY OF SURVEYORS-GENERAL—THE TEXAN DESERT AND ARIZONA—THE GREAT AMERICAN DESERT A MYTH.

THIRTY or forty years ago all our maps had a wide space, and some of them two or three wide spaces, inscribed, "Great American Desert." Nearly the whole of the present States of Kansas, Nebraska and Colorado, and Western Minnesota; the Territories of Wyoming, Dakota, Montana, and Idaho, Western Texas, and after we had conquered "a piece" from Mexico, Arizona, most of New Mexico, Utah and Nevada, were included in this comprehensive designation. By and by silver, and some gold, were found in Nevada, and in the neighborhood of Pike's Peak, in what is now Colorado; but though the existence of the precious metals there could not be denied, yet the terrors of the desert to be passed through (terrors of whose reality the wagon-trail marked at almost every step by skeletons of cattle, and too often, alas! by the bones of emigrants, gave most ghastly proof) were such that only the most stout-hearted could brave them.

After some years the tide of emigration, which at first had

been confined to the eastern counties of Kansas and Nebraska, and had not reached the western counties of Iowa, and still less those of Minnesota, began to rise and overflow the adjacent counties and districts. The Union Pacific, the Northern Pacific, the Kansas Pacific, and the Atchison, Topeka and Santa Fé Railways had plunged into this desert, and being all land grant roads, had made the discovery that these lands were not really a desert, but were capable of yielding excellent crops, and of furnishing superior pasturage to cattle and sheep. The line of settlement has advanced with each year till now it has reached the 101st meridian west from Greenwich, in Kansas, Nebraska and Dakota, and overleaping all barriers has extended to the foothills and peaks of the Rocky Mountains in Colorado, Wyoming and Montana, and with moderate irrigation has produced from these supposed desert-lands the most astonishing crops, and has furnished, as we have already said, pasturage so rich and abundant, to hundreds of thousands of cattle and sheep, that their flesh is more highly prized than any other in the market.

Yet there have not been wanting those who from one motive or another, have sought to depreciate these lands, and have declared, in the face of the most conclusive evidence, that the whole region west of the 100th meridian was a barren desert, incapable of producing crops or furnishing pasturage sufficient for the subsistence of men or animals, and that it would remain so until God changed the physical laws which govern the distribution of clouds, and rain, levelled the mountains, and made the climate like that of the East. It is very easy to theorize on these matters, and to demonstrate that because, according to certain premises, a certain result should follow, therefore it will inevitably follow; but he is not a wise man who neglects to test the truth of his theories by facts.

The two regions, which, within the past decade, have been persistently denounced by these pseudo-scientific theorists as portions of the Great American Desert, rainless, treeless, barren and incapable of ever being inhabited, are the regions lying near the 100th meridian west from Greenwich and westward indefinitely,

though some of these pessimists admitted that there might be some fertile valleys among the Rocky Mountains; and second, the region from about the 107th meridian westward to the 114th. The first tract includes Western Texas, at least two-thirds of the Indian Territory, the western third of Kansas, almost half of Nebraska, Eastern New Mexico, more than half of Colorado, nearly all of Wyoming, more than half of Dakota, and the whole of Montana. In regard to Kansas, Nebraska, and Colorado, as late as the winter or early spring of 1879, Mr. Landon, a popular lecturer, better known to the public under his *nom de plume* of Eli Perkins, published in the Cincinnati *Enquirer*, and soon after in the New York *Sun*, the following article:

LET EMIGRANTS WESTWARD LOOK OUT!

An awful trap is being set for credulous emigrants. Thousands of these emigrants are settling west of the rain belt, and they don't know it. They are going out too far on the Atchison, Topeka and Santa Fé, the Kansas Pacific, the Union Pacific, and the Northern Pacific Railroads.

"Where is the drought line?" asks the reader.

"Draw a line from Austin, Texas, to Bismarck, Minnesota, on the Northern Pacific, and all west of that line is the drought country. Five years out of eight, crops will entirely fail west of this line. Last year was an exception to the rule, and this is why so many emigrants are venturing too far West this year. The land-sharks are deceiving them, and are pushing a vast army of emigrants into a famine region."

"What makes this region west of the 100th parallel a desert region?"

"Because it rains just as much water as there is water evaporated each year. If it rained more water than is evaporated, it would run down into the ocean, and the land would soon be covered with water. Rains run to the ocean in rivers, and the air evaporates the water of the ocean and carries it inland. Clouds form rainfalls, and back goes the water on to the earth, then into the ocean again. Now, before the air from the Gulf or ocean reaches Bismarck, or the middle of Nebraska or Kansas, this wet air which started from the ocean becomes dry. There is no water in it; the water has all fallen out of it in rain, and it has run back to the sea."

"But why is San Antonio subject to drought when it is so close to the Gulf?"

"Because the air of San Antonio, on the Staked Plains in Texas, and in Arizona, comes up through Mexico. It is dry before it starts. It does not come from the Gulf. Mexico is hot. A perpetual current of hot, dry air blows over Mexico and fans Arizona, New Mexico, Utah and Colorado with atmosphere as dry as wind from the Desert of Sahara. This dry-air current, blowing

up from Mexico and Arizona, strikes the high mountains in Colorado. Here, in the centre of the continent, within seventy-five miles of Pike's Peak, is the source of the Red, Colorado, Rio Grande, Arkansas and Missouri rivers. This is the backbone of North America. The high, cold peaks condense any moisture that there may be in the air coming up from the south, and make it into snow. Then this cold, dry air passes on up the centre of the continent, making a perpetual desert. It prevents any damp air from coming east of the 100th parallel. When we reach the Northern Pacific and Manitoba another current of wind, a damp current, blows from the Pacific Ocean. There is no desert there, where the Pacific wind heads off the wind from Mexico. Now, I say, thousands of innocent emigrants have taken up farms during the last year west of the rain parallel. Of course they will be ruined, and you will see them coming back broken-hearted and discouraged."

"Will it always be a desert west of the 100th parallel?"

"Yes, until the Almighty changes the course of the winds, takes down the mountain-peaks, and stops the clouds from raining all their water out in the East before they get to the desert."

ELI PERKINS.

We will not stop here to notice the deplorable ignorance manifest in almost every line of this article of Eli Perkins, ignorance which would cause any intelligent school-boy of twelve years old to blush with shame, such as persistently speaking of meridians of longitude as parallels; locating Bismarck in Minnesota, mistaking the longitude of the places of which he speaks, and contradicting himself by saying in one sentence that the air which reaches Bismarck is dry, and there is no rain in it, and in the next that "when we reach the Northern Pacific and Manitoba, another current of wind, a damp current, blows from the Pacific Ocean. There is no desert there, where the Pacific wind heads off the wind from Mexico." Yet Bismarck is on that Northern Pacific Railroad, and just south of Manitoba. It would be as well for "Eli Perkins" to go to school for a few months before he attempts to write for the papers. Now please note the following facts. In Kansas, the rainfall at Fort Wallace, ninety miles west of the 100th meridian, averaged yearly in 1871, 1872, 1873, and 1874, 13.47 inches; in 1875, 1876, 1877, and 1878, 15.05 inches; an average gain of 1.58 inches yearly. In 1879, it was 15.30 inches in the first three-quarters of the year, and would undoubtedly reach 18 inches or more in the full year. This

can hardly be called a rainless region. As to the crops in Kansas, this region west of the 100th meridian has only been settled from three to eight years, and in that time there has been but one failure of the crops, and that not from drought, but from grasshoppers. The average yield of wheat in these counties was from nineteen to twenty-four bushels to the acre, and of corn forty bushels to the acre. The dairy products were much beyond the consumption.

Colorado is between the 102d and the 109th meridians, and so, according to Mr. Landon, entirely in the desert; yet its rainfall for 1876, 1877 and 1878, average 15.78 inches, and was much more than that in 1879, and in the lower and more arable lands ranged from nineteen to twenty-one inches. Owing to its vast mining wealth, but a very small portion of its surface has yet been cultivated; but in 1878, 66,691 acres yielded 1,310,000 bushels of excellent wheat, an average of 19.6 bushels to the acre, while the southern counties, which are the driest, yielded 22.6 bushels to the acre. In the same year, there were raised 750,000 bushels of other cereals, 450,000 bushels of potatoes and 50,000 tons of hay. The agricultural products of the State were valued at $3,515,000, aside from its live-stock, which was nearly five times as much. So far from being "ruined and coming back broken-hearted and discouraged," the agriculturists of Kansas and Colorado, west of the 100th meridian, in 1879 broke up twice as much ground as the previous year and planted it in full faith of more abundant crops than the previous year, and were not disappointed.

"Eli Perkins" seems to be a little in doubt whether the Great American Desert reaches as far north as the Northern Pacific Railroad. He thinks there may be some Pacific moisture there, though how it manages to come over the Rocky Mountains, without having all its moisture squeezed or frozen out of it, he does not explain. But another of these scientific theorists entertains no doubts that the whole course of the Northern Pacific Railroad, from Minnesota westward through Dakota and Montana, and probably Idaho, and for fifty miles each side of that railway, is a perfectly barren desert and must ever remain so. He denounces

(or did in 1874) the projectors and managers of the Northern Pacific Railway, as a company of swindlers, who were undertaking to palm off these worthless lands on unsuspecting emigrants. A thousand acres of these lands would not, he thinks, yield a support for a single family. This voluble denouncer of a great public enterprise was Colonel W. B. Hazen, U. S. A., Brevet Brigadier-General, stationed for three years at Fort Buford, in Northwestern Dakota, and his only knowledge of the lands of this region, which he proclaimed to be a portion of the Great American Desert, was derived from three or four journeys up and down the Missouri river, in a steamboat. Colonel Hazen has undoubtedly heard of the "Bad Lands of Dakota," and might possibly have seen a portion of them, as they are near the Missouri, at one part of its course, but he was not warranted in concluding that the whole of these great territories was of the same description. "The Bad Lands," lands where the mountain streams have eaten their way through beds of clay and have cut them into most fantastic forms, are undoubtedly barren, and will probably produce nothing except minerals and fossils; but they are of very moderate extent. Colonel Wm. H. H. Beadle, Superintendent of Public Instruction in Dakota, and late Private Secretary to Governor Howard, a man who has explored very thoroughly all parts of Dakota, says that "the Bad Lands" in Dakota do not exceed 75,000 acres of barren land (only about three townships), the rest being either arable or good grazing lands. Governor Howard, of Dakota, has well said in his report to the Secretary of the Interior, in September, 1879:

> It is but a short time since vast herds of buffalo roamed undisturbed over these prairies; now farms stocked with cattle and sheep everywhere abound. It is not long since we were taught in our Eastern homes and in our schools, and learned from our geographies the story of the Bad Lands, the "Great American Desert," and were left to believe that Dakota for barrenness was only equalled by the Desert of Sahara, and that its chilling blasts were equal to the cold of Greenland; but since it has been demonstrated that Dakota has a soil exceedingly rich, has more arable and less waste land in proportion to its size than any State or Territory in the whole Union, and since millions of bushels of grain are already waiting transportation to the markets of the world, capital, proverbially timid, is stretching out its arms, and, with hooks of steel, is drawing to itself the carrying trade of an empire.

In Northeastern Dakota alone in 1879 there were 375,972 acres of land under cultivation, of which 266,618 acres were devoted to wheat, and yielded 5,332,360 bushels of the best grade of wheat, an average of 22 bushels to the acre, though 40 bushels were often produced. Corn yielded 75 bushels and upwards to the acre, and oats from 60 to 75 bushels, while from 300 to 600 bushels of potatoes, and corresponding amounts of other root crops rewarded the farmer's toil. Southeastern Dakota is equally prolific in its crops; and even in the Black Hills, which were supposed to possess no agricultural value, and were only prized for their mineral wealth, the husbandman's toil is rewarded by the most abundant returns. Wyoming, though largely a grazing Territory, has yet much arable land, and though this bugbear of a Great American Desert has in the past greatly hindered the settlement of this large and valuable Territory, which is destined to be in the not distant future one of the richest of all the Western States and Territories, settlers are beginning to discover that some of the best lands on the continent are to be found in its valleys and along its mountain slopes. The crops, on these apparently barren lands, when fertilized by one or two irrigations annually, or even without them, by deep plowing, are almost incredible. Even the most unpromising of these lands are found by the stock-raisers to furnish the most nutritious pasturage. "The raising of cattle on an extensive scale is becoming important and profitable in Wyoming," says the Land Office Report for 1878.

In regard to Montana we shall have more to say when we come to speak of its productions and climate as a separate Territory. The following item, however, is conclusive of the fact that it is not a desert agriculturally. The Land Office estimates the arable lands of the Territory at about 6,500,000 acres, and the grazing lands at nearly three times that amount.

The crop correspondent of the New York *Bulletin* sends the following from Chicago, Nov. 27th: "The United States consul at Winnepeg has lately published a letter in the St. Paul *Pioneer Press* with reference to the wheat-producing belt of the 'Far West.' The article is full of interesting facts. He says: 'The

most favored of all the territorial organizations is Montana.' I have to-day received the following 'crop note' from my correspondent there, which I send you intact:

"'BOZEMAN, Gallatin county, Montana, Nov. 6, 1879.

"'Grain in this county nearly all threshed. A larger acreage of wheat and oats than ever before; yield rather more than average. One field of spring wheat averaged fifty-three bushels per acre; thirty acres in Jefferson valley averaged fifty-nine bushels. Fifty-five acres winter wheat averaged fifty-six bushels; six and a quarter acres of the same averaged sixty-nine bushels. The wheat crop of the county—winter and spring—will average at least thirty-eight bushels per acre. Many crops are nearly or quite as good as those mentioned. Many crops of oats turned out sixty to one hundred bushels per acre. In one field 1,030 bushels were threshed from nine acres. The oat crop of the county will average fully fifty bushels per acre. A very small area was sown in barley last spring; will average about forty-five bushels. Quality of all kinds of grain good. B. R.'"

Mr. Zimri L. White, the accomplished, careful and conscientious correspondent of the New York *Tribune*, whom no one will accuse of the least tendency to overstatement, says of Montana farming, after spending nearly two months there in the summer and autumn of 1879:

"The average yield of wheat in Montana is at least twenty-five bushels to an acre. Other writers have placed it at from thirty to forty bushels, and fifty bushels is by no means an uncommon crop; but taking the whole country together, I doubt if the farmer can depend upon much more than twenty-five. This is ten bushels, or 66 per cent. more, than what is considered a good crop in the great grain States of the Mississippi valley. The wheat of Montana is also of a very excellent quality. An analysis of samples of Montana wheat, made at the Agricultural Department in Washington, shows 18 per cent. more nitrogeneous or flesh-producing matter than Minnesota wheat, and that bulk for bulk it weighed about 6 per cent. more. I have before me a sample of spring wheat of the crop of 1878, raised by Mr. Reeves in the Prickly Pear valley, that averages to weigh sixty-four pounds to a measured bushel. Some of the crops of wheat that have been raised in Montana have been almost fabulous. Forty, fifty, and even sixty bushels to an acre are not uncommon crops.

Several years ago the State Fair Association offered a premium for the best acre of wheat raised that season, and the award was made to Mr. Raymond, of the Prickly Pear valley, who had 102 measured bushels on a single acre. The committee who made the award were prominent citizens of Montana, and one of them has told me that the same year a farmer in the Gallatin valley raised an equally large average crop on a forty-acre lot, but as he could not show that he had more than 102 bushels on any single acre, the committee decided that he was not entitled to the premium.

"I have seen in August this year many fields of wheat, both standing and in the shock, in the country around Helena, and I have not seen one that appeared to have less than thirty bushels to an acre. In many fields the shocks of grain stood almost as thick as the sheaves in the fields of the Mississippi valley.

"Oats and barley grow as well as wheat. The average yield of oats to the acre is considerably greater than that of wheat, and the weight per bushel is much above the standard. Mr. Reeves gave me a sample of oats from his farm which he said would average to weigh forty-six pounds to a bushel. General Brisbin says that Mr. Burton raised a field of oats which averaged 101 bushels to an acre, and a field of barley on which there were 113 bushels to an acre.

"The soil of Montana seems to be especially fitted for the production of large crops of garden vegetables. The best market garden I ever saw, if abundant yield is a criterion, is that of Mr. Dorrington in the Prickly Pear valley. He sold $2,000 worth of strawberries, and his root crops, such as turnips, onions, beets, parsnips, etc., seemed literally to fill the ground. He expected to take ten tons of onions from a small patch of ground, and would receive five cents a pound for them in Helena. The following table compiled by General Brisbin shows what the product of the gardens cultivated by troops at Fort Ellis was, in 1877:

Company and Regiment.	Number of Acres.	Bushels Potatoes.	Bushels Onions.	Bushels Turnips.	Bushels Carrots.	Bushels Beets.	Bushels Parsnips.	Bushels Salsify.	Heads of Cabbage.
F, 2d Cavalry.....	7½	1,100	90	60	60	50	10	.....	3,600
G, " "	5	550	60	60	35	15	20	.....	2,500
H, " "	6	1,200	130	35	40	40	25	.....	3,300
L, " "	5	700	50	150	25	.....	.....	.....	2,300
G, 7th Infantry...	3	313	6	40	12	.....	20	3	800
Totals.....	26½	3,865	336	785	172	105	75	3	12,500

"The value of the several articles if bought at the fort would have been: Potatoes, $3,865; onions, $2,352; turnips, $85; carrots, $206.40; beets, $315; parsnips, $225; salsify, $9.40; cabbage, $125. Total, $7,182.80. The garden crops at Fort Ellis in other years have been fully one-third greater for the same amount of ground.

"As a rule the farms of Montana have to be irrigated, and in most of the valleys there is an abundance of water for this purpose. The cost of constructing good canals for the irrigation of 160 acres of land is of course considerable, but when once completed the expense of keeping them in order is very small, while the ability of the farmer to regulate absolutely the amount of moisture which his crop shall have more than compensates for all the extra labor and expense which irrigation makes necessary."

The facts in regard to this region between the 100th and 107th meridians seem to be (not reckoning too closely the exact line of either meridian) that there are some tracts, of very moderate extent in them, which are neither arable nor grazing lands—such as the "bad lands" of Dakota, and a small district of Nebraska and Wyoming, and portions of the Yellowstone Park and its vicinity; such, too, as some of the mountain regions in Colorado, Wyoming and Montana, where there are frightful perpendicular precipices, from 1,000 to 5,000 feet in depth, the results of upheaval, volcanic action or erosion, but these constitute only comparatively small and isolated tracts of a belt, 350 to 400 miles in width, and 1,700 miles in length. For the rest, at least one-fifth

is arable, either with or without irrigation, and yields enormous crops; three-fifths are the best grazing lands to be found anywhere, and one-fifth is good and serviceable timber, much of it of large size. Can anything better be said of any land the sun shines on? The proportion of lands susceptible of improvement is larger than that of Great Britain or Germany, and very nearly equal to that of France; and the arable lands are richer and more productive without manures, than those of these countries with them.

But what of the second region, where the maps still keep up the inscription, "Great American Desert?" Stretching westward from the 108th meridian in Texas, Arizona and Colorado, the line trends still farther west, as it proceeds north, and occupies most of the Great Valley between the Rocky Mountains and the Sierra Nevada or Cascade range, and includes Western Texas, the whole of Arizona, New Mexico, Western Colorado and Wyoming, all of Utah and most of Nevada, Idaho, and Eastern Oregon and Washington Territory. The most ardent believers in a "Great American Desert" do not now, whatever they may have done in the past, venture to pronounce all of this territory a desert, for there are too many evidences that considerable portions of the region are remarkably fertile; yet, taken as a whole, it is far less susceptible of immediate cultivation than the first region already described. It includes the Great Salt Lake Basin, with its peculiar volcanic formations, the great table lands of Western Texas, Arizona and New Mexico, and the equally elevated plateaux of Idaho, Oregon and Washington, and the deep and terrible cañons of the Colorado and its tributaries. Nearly all this region is rich in minerals, and would eventually be occupied, were it an arid desert, throughout its whole extent; but there is a large quantity of arable land, capable with irrigation, which in most sections is practicable, of yielding immense crops; there are many millions of acres of grazing lands where all the flocks and herds of the continent could find good pasturage, and there are extensive forests, some of them of stinted growth, but others of gigantic pines, cedars, firs and tulip trees. Mingled with these are districts where all culture is impossible, where

Nature has indulged in her wildest freaks, and where all the forces of the volcano, the earthquake, and the erosive and destructive power of glacier, river, lake, and mountain torrent, have combined to make ruins grander and more impressive, than those of all the wars which have taken place, since our planet was inhabited by man.

Yet these desolations are not sufficiently extensive in any one section to make a very large desert, certainly not a "Great American Desert." One of the districts which the map-makers of the present year are most persistently designating as the "Great American Desert" is the western half of Utah, and the eastern half of Nevada. Yet of this very region, a writer of undoubted authority says, in the autumn of 1879:

"The farmers here have developed something new in agriculture—new in this region at least. There are here and elsewhere vast tracts of 'desert lands,' or lands which are so high above the stream that they can never be irrigated. Several years ago wheat was sown upon small patches of this seemingly arid and valueless soil. A tolerably fair crop was raised without artificial moisture or unusual rain, and now broad areas of this kind of land are being put under cultivation annually, producing as high as twenty bushels of wheat per acre. These are really warm alluvial soils formed by the crumbling of mountain ranges."

The pamphlet issued by the Utah Board of Trade in 1879, while commending the general fertility of the Territory under irrigation, which is generally practised, and in some sections without it, says very frankly, of the region lying west of Great Salt Lake in that Territory:

"The western third of the Territory from end to end is an alternation of mountain, desert, sink and lake, with few oases of arable or grazing lands. Great Salt Lake covers an area of 3,000 to 4,000 square miles, and the desert west of it a still larger area. Rush valley has mining and agricultural settlements, but much more pastoral than arable land, and so has Skull valley to the westward. But from these south to the rim of the basin are only occasional habitable spots, and they are due to springs.

Concerning the other States and Territories implicated in this charge of being desert lands, we offer the following as the latest and most credible testimony. The Surveyor-General of Idaho says: "There are immense tracts of sage-brush lands—the so-called 'desert lands'—that only await irrigating canals, to make them as productive as most lands in the Western States, yielding their forty bushels of wheat per acre, as our people have often demonstrated by actual experiment." The Surveyor-General of Utah says: "Notwithstanding the opinion of many who deem our lands 'arid, desert, and worthless,' these same lands under proper tillage produce forty to fifty bushels of wheat, seventy to eighty bushels of oats and barley, from two hundred to four hundred bushels of potatoes to the acre, and fruits and vegetables equal to any other State or Territory in quantity and quality."

The Surveyor-General of Nevada says: "In our sage-brush lands, alfalfa, the cereals and all vegetables, flourish in profusion where water can be obtained, and the State is swiftly becoming one of the great stock-raising States of the Union."

The Surveyor-General of New Mexico says: "There is a much larger portion of New Mexico adapted to agriculture, than is generally supposed by those who have seen but little of the seasons, and what the capabilities of the soil are. The valleys of the San Juan, Rio Grande, Gila, Pecos, Red river, Dry Cimmaron and others, streams with their hundreds of tributaries, afford an immense area of arable land, the real extent of which is yet only partially known. Near the foot of the various mountain ranges there is sufficient rainfall to render irrigation unnecessary in many localities, even were it practicable; and fine crops of corn, wheat, oats and vegetables are raised, while the mountain sides and plains, covered at all seasons with the nutritious gramma grass, afford an admirable range for stock."

Of Northwestern Texas, an able Texan writer, who has spent years there, after speaking of the prevalent notions that it is a dry country adapted to nothing but grazing, and perhaps very poorly for that; that it is too rugged for culture, even if the soil was of good quality, which they believe is not the fact, and that the herders are ruffians and brigands, says: "Nothing could be

further from the truth than these notions. While it is true that this vast territory which we are describing is mainly a grazing country, it is also true that it abounds in fertile valleys, and rich locations of large extent, which are as well watered and fertile as any in the nation. Its rivers are without exception formed from springs; they are as clear as any crystal, and furnish water power that is almost limitless."

Arizona alone remains of the possible deserts of this western region; yet the Surveyor-General of this Territory tells us that the valleys of its rivers and streams are irrigable, and that when irrigated they yield immense crops; while the hills and plains furnish abundant and nutritious pasturage, and stock-raising is a profitable pursuit; that the Territory furnishes more grain, flour, bacon, lard, butter, cattle, mules and horses than are needed for home consumption, and that considerable quantities of all are exported. Fruits are comparatively plenty and cheap.

Still more conclusive on this point is the testimony of Major-General J. C. Frémont, the present Governor of Arizona. From actual investigation and a comparison of its present condition with what it was when he visited it thirty years ago, he declares that most of Arizona is arable, that its rainfall ranges from fifteen inches to twenty-four inches (this too was written when the rainfall had been much less than usual for five years; in a letter to the writer about Christmas, 1879, he stated that they were then in the midst of an unprecedented rain storm which had lasted for nearly two weeks, had raised the rivers to a great height and had flooded much of the country), that the crops of wheat even when raised by the Indians were very heavy, the Maricopas sending at one time in August, 1879, 200 tons of wheat of the best quality to San Francisco, where it brought $2.22 the hundred pounds, and that most of the Indian tribes were subsisting by agriculture. This surely cannot be a wholly desert land.

But while it is almost mathematically proved that the "Great American Desert" is a myth, receding from us as we try to approach it, it is not to be denied that here, as in other empires, there are some desert lands, treeless, though not quite rainless:

often incapable of cultivation, though they may be rich in fossils or in the precious metals; and that in these deserts may be found some of the most wonderful phenomena on the globe.

CHAPTER III.

THE WHOLE REGION ABOUNDING IN MINERAL WEALTH—PRODUCTION OF GOLD AND SILVER, OTHER METALS, ETC.—FORESTS—GRASSES—ROOT CROPS—FRUITS—VINICULTURE.

MOST of these States and Territories abound in mineral wealth. All the Territories and all the States except Minnesota, Nebraska and Kansas have either gold or silver mines or both, and it is by no means certain that even these will prove to be exceptions, though it is to be hoped they may; for agricultural products furnish a surer and better avenue to the prosperity of the entire population, than the richest mines of the precious metals. The golden grain of these States is a better possession than the gold mines of California or Colorado, or the silver of Nevada or Montana.

Yet we would not underrate the vast mineral wealth of this Western Empire. It is possible, though not at all certain, that some of the Peruvian mines or those of Mexico may have more extensive deposits of gold or silver than are already opened, or are yet to be discovered in the Great West; but the production of none of them has been as great, in so short a period, as that of our mines, and we have just arrived at a stage of progress, when our production may be almost indefinitely increased. During the first ten years after the discovery of gold and silver in California, and the West, it is difficult to estimate with accuracy the production of the precious metals there; but Professor Rossiter W. Raymond, who has devoted much time and study to the problem, names, as the result of his inquiries, a sum total of gold and silver which, by adding the production of 1878 and 1879, gives an aggregate for the Great West for the thirty years ending

June 30, 1879, of $1,947,055,834, almost two billions of the precious metals. By a singular coincidence these are very nearly the amount of the product of the ten principal items of our agriculture for the year 1879. That product was $1,904,480,659. The completion of the Sutro tunnel in Nevada, which will make deep mining practicable, in those hitherto productive lodes, and the discoveries of carbonate ores of silver and chlorides or horn silver in Utah, in the San Juan and Gunnison districts and elsewhere, on the western slopes of the Rocky Mountains in Colorado, the new and extensive deposits of both gold and silver in the Black Hills, in Utah and in Montana, and the increasing annual production of bullion, warrant the belief that we are just entering upon a new era in the production of the precious metals, which will far exceed that of the combined production of the Pacific States and Australia, twenty-five years ago.

But our mineral productions in our Western Empire are by no means confined to gold and silver. *Quicksilver*, which is an absolute necessity for gold mining the world over, is more abundant in California, Nevada and Arizona than anywhere else in the world, and though, in the past, tedious litigation has prevented the mines from yielding their full product, yet not only has the large demand for our own mines been supplied, but we have exported millions of flasks to other countries. Nickel, platinum, and in vast quantities, copper, lead, iron and zinc, are among the products of this young empire; and coal of all qualities is scattered in localities where it is most needed.

Portions of this Western Empire are lacking in forest growths. The vast prairies and plains east of the Rocky Mountains had been so often burned over by the Indians, either carelessly or to promote the growth of the grasses, on which the buffalo, their principal game, fed, that though in times long ago they were covered with heavy forests, they seemed to have lost their ability to sustain any large amount of timber. Only near the banks of streams was there any considerable growth of trees, and these, in some sections, only the comparatively worthless cottonwood. But this deficiency will soon pass away. Encouraged by the Timber culture act of Congress, and by the desire to produce

trees instead of sending great distances for lumber, millions of trees have been planted, largely of the rapidly growing kinds, as the ailantus, locust, Osage orange, etc.; and even on the alkaline plains they are growing and thriving, and have already increased to a sensible extent the amount of the scanty rainfall. But only a portion of the region lying between the Mississippi and the Rocky Mountains can be called treeless. In Minnesota, Dakota, Montana, Missouri, Arkansas, parts of Texas and the Indian Territory, there are vast tracts of heavy timber, and the lumber exported from some of these States forms a very considerable portion of their productive wealth. West of the Rocky Mountains there is generally no lack of forests, especially on the mountain slopes; Utah, New Mexico and Arizona are, however, but sparingly supplied with timber, and much of the land suffers from drought except where irrigation is possible. On the Pacific slope, portions of California and Nevada, all of Western Oregon and Washington are remarkable for the gigantic height and bulk of their forest trees. The Redwoods and Sequoias, which range from 300 to 475 feet in height, are not the only giants of these forests; several species of pine and fir and some of the cedars tower from 250 to 350 feet in height on the lower hills of the Coast range, in California, Oregon and Washington. In Eastern Washington and Oregon there are extensive, elevated plains, without much timber, which are very cold in winter and intensely hot in summer. In Wyoming and Colorado the mountains are generally clothed with forests, up to a point somewhat below the snow line; but the plains, plateaux and foothills are very often devoid of trees, except along the water-courses, or where they have been planted by man.

Over much of this vast territory, nearly all of it beyond the Rocky Mountains, and the alkaline plains east of that range, there is little or nothing which can be called *sod;* the long, dry summers would destroy it if it existed. But the buffalo and gramma grasses, more nutritious than our cultivated grasses, are adapted to the summer drought, and furnish all the year round a most delicious pasturage for cattle. The bunch grass, and the white sage-brush (after frost), are eagerly cropped.

Wherever, as in California, Nevada, and portions of New Mexico, the cultivation of grasses for feeding cattle has been found desirable, the Alfalfa grass, a species of South American lucerne, which yields two or three enormous crops a year, and is admirably adapted to this climate, furnishes at small expense a succulent and nutritious food for cattle and sheep. There are also other forage grasses, most of them native to the coast, which amply supply the absence of our sod-making grasses in the Atlantic States.

In the season of melting snows, and moderate rains, these desolate and dreary plains are resplendent with flowers of every hue, and many of them redolent of the sweetest perfumes.

The root crops of this entire region are remarkable alike for their abundance, the great size they attain, and their excellent quality. In the deep, rich, and easily penetrated soil of all these States and Territories root crops seem to run riot, and grow without stint. The common potato, the sweet potato and the yam, yield from 400 to 600 bushels to the acre, and are, perhaps, the most profitable crops which can be raised. Turnips, both yellow and white, carrots, beets, etc., yield fabulous quantities of such gigantic size that they are hardly recognizable. The whole melon tribe, including the pumpkin, squash, and cucumber, as well as the watermelon, muskmelon, cantelope, and citron-melon exhibit their greatest fertility and most abundant productiveness in the most arid and desert-looking of these lands. Arizona, Southern California, the southern part of New Mexico, and Western Texas, are peculiarly adapted to these creeping vines and their cooling fruits.

This Great West is destined to be the garden of the world, in its cultivation and conservation of edible fruits and their products. Its great variety of climates and temperatures, and the elevation of its arable lands, even in semi-tropical regions, permits, and will continue to permit and demand, the production of the greatest variety of choice fruits to be found in any one region on the earth's surface. In the northern portion, the apples, pears, quinces, plums, cherries, and small fruits of Minnesota, Dakota, Montana, Idaho, Washington, Oregon and

Northern California are unsurpassed either in size or flavor by those of any other part of the world. It has been asserted that the larger fruits of California, as well as its vegetables, though of great size, lack the succulency and fine flavor of those raised in the Eastern States, but there is no reason to believe that this is true. Fruits carried to great distances from their native soil, and kept for months or years, do lose something of their flavor, as is well known; but eaten where they are grown, they are unsurpassed in excellence. The belt below this, consisting of the States of Iowa, Missouri, Southern Dakota, Kansas and Nebraska, Wyoming, Northern Colorado, Utah, Nevada and Central California, adds to this list the peach, the apricot, and, above all, the grape. Already California is more largely engaged in the culture of the vine than any other country in the world. Every known species and variety which possesses merit is grown there, and though her great vineyards are so young, she is only second to France in the amount of her wine production. Nowhere can finer "raisins of the sun" be produced than there. Her peaches are excellent, but not so much attention has been given to their culture, as in other regions.

The whole belt of States and Territories we have named are capable of a like development in viniculture with California. Their grapes may have a slightly different flavor, and the wines produced from them may be as distinguishable, by the cultivated taste of the connoisseur, as those of Tokay and Xeres or Rheims; but they will be in as great demand as the wines of the Californian vintage.

Farther south, in Arkansas, the Indian Territory, Texas, Arizona, Southern New Mexico, Southern Utah and Nevada, and Southern California, sub-tropical fruits abound—the orange, lemon, lime, fig, olive, pomegranate, banana, guava, Madeira nut, pecan, and the finest and most luscious varieties of the peach, are some of the treasures which Dame Nature lays up for her children in the sunny South. There are also many native fruits and nuts, less widely known, but not less delicious or grateful to the taste, than those we have named, to be found in the forests of the Great West.

CHAPTER IV.

WILD ANIMALS AND GAME—BEASTS OF PREY—GRIZZLY AND OTHER BEARS—MR. MURPHY'S GRIZZLY BEAR STORY—THE COUGAR, PUMA, OR PANTHER—THE JAGUAR AND OTHER FELIDÆ—LYNXES—THE MARTEN AND WEASEL TRIBE—THE GRAY WOLF—THE COYOTE—AMPHIBIA—THE WHALE TRIBE—BIRDS OF PREY—PERCHERS AND SONG BIRDS—PIGEONS AND GROUSE—WADERS AND SWIMMERS—REPTILES—FISHES—MOLLUSKS AND CRUSTACEANS—DOMESTIC ANIMALS.

MANY of the wild animals of our Western Empire are peculiar to that region. The Bison or American buffalo, whose range extended originally from the Rocky Mountains to the Appalachians, has for these many years past been only found west of the Mississippi, and as settlement and civilization advanced westward he has been driven back to the plains and foothills of the Rocky Mountains, a tract of not more than three hundred miles in width, and perhaps twelve hundred in length from north to south, and even this was encroached upon every year by the new towns springing up all along the line. Since the advent of railroads, crossing these plains, the number of bison has rapidly diminished. Many thousands were shot from the cars for fun, and left to die on the plains; hunters destroyed tens of thousands for mere sport. More than as many more were slaughtered for the hams and tongues, and the Indians killed from one to two millions annually for the flesh, and the robes or skins. It is estimated that within the past ten years, not less than twenty millions of these noble animals have been slain, and that hardly more than 300,000 remain. The bison is not found west of the Rocky Mountains.* The moose, though plentiful in British

* Colonel Richard J. Dodge, United States Army, a famous hunter, speaks of another species, or at least a well-marked variety of the buffalo, known to hunters as the mountain or wood buffalo, or "the bison." It has shorter but stouter legs than the common buffalo, is very shy, and by no means plentiful even in its chosen haunts, and inhabits only the deepest, darkest defiles and cañons, or the craggy and almost precipitous sides of mountains, from which it will not depart, while its congener prefers the plains. Except in one instance, no sportsman has bagged more than one, but its existence is well vouched for, though, so far as we are aware, it has never been described by any other writer.

ROCKY MOUNTAIN GOAT, ELK, RED DEER, BLACK BEAR, FOX, MOOSE, WOLF, PANTHER, GRIZZLY BEAR, COYOTE, PRAIRIE DOG, WILD CAT, BUFFALO, WILD HORSE.

Columbia and Alaska, is only found in the region in the northern part of Washington Territory, in Northern Idaho, and Montana.

The Elk, the next largest of the game animals east of the Rocky Mountains, has nearly the same range as the Buffalo, though it usually seeks the vicinity of the river valleys. It is less abundant than the bison, but has only partially escaped the indiscriminate slaughter to which those unfortunate animals have been subjected. They are often found in large numbers (three or four thousand it is said) in the great parks of Colorado, and in Montana.

There are three species of deer, the black-tailed, white-tailed, and mule deer; and at least one species of antelope, a graceful, beautiful creature. West of the Rocky Mountains, there is a representative of the Ibex family in the Bighorn or mountain sheep, and one of the goat family—the wild Rocky Mountain goat, which may, perhaps, be allied to the goat antelopes of the Himalaya Mountains. Of smaller four-footed game and rodents, there are six or eight species of hare and rabbits, one bearing the name of the Jackass rabbit, from the enormous length of its ears; the beaver, musk rat and mammoth mole; squirrels of ten species, five of gophers or prairie dogs, the yellow-haired porcupine, four species of kangaroo mice, the usual variety of moles, rats, mice and dormice.

Of beasts of prey there are a considerable number, and some of them formidable in size and strength. There are probably two species, and possibly three, of bears east of the Rocky Mountains: the black, the cinnamon, and a smaller brown one, known as the Mexican bear.* The bear is omnivorous in his diet; ants, grubs, mice, moles, squirrels, rabbits, eggs, berries, grapes and fruit, all seem alike to him, but if he has a special vanity, it is for honey. He does not attack man unless in extreme hunger, or in protecting the cubs; but if attacked makes a very stubborn fight, especially at close quarters. His claws are very sharp and strong. Beyond the Rocky Mountains the formidable and somewhat ferocious grizzly bear, the largest American plantigrade, except possibly the Arctic or white bear,

* Some practical zoölogists contend that these are not different species but simply varieties.

is added to the number. The black, brown, and cinnamon bears usually avoid a conflict with man unless attacked, when they fight fiercely. It is said that among the miners of Western Colorado, a class of men not lacking in courage or pluck, when some new-comer, ambitious to show his prowess, proposes to go out and hunt the bears, which are very numerous there, the shrewd old miner, who is well versed in bear nature, will reply: "Guess not; I haven't lost any bear." The grizzly bear, especially if hungry, is not wont to wait for a provocation to a fight, and he possesses so thick a hide and so much vitality, that it is very difficult to disable or kill him by even two or three well-aimed shots. When wounded his rage is fearful, and his long and strong claws enable him to make very short work of an antagonist who comes within reach of them.*

The cougar, puma or panther, sometimes called the American lion, is another very formidable animal; somewhat smaller than the African lion or the Bengal tiger, it has as much ferocity and almost as much strength as either. It is, however, cowardly like

* Mr. J. M. Murphy, in his "Sporting Adventures in the Far West," devotes one chapter to the grizzly bear, and relates some very humorous stories of experiences in hunting it. Formidable and ferocious as it is, the grizzly is terrified by the human voice, when loud yells and cries are uttered, and will run away at once. Mr. Murphy says that a certain judge of San Francisco, who, while a good hunter and a capital humorist, was of somewhat intemperate habits, had engaged with a few friends to go out for a week's shooting among the grouse and quail, and was asked to be ready to join the party at a very early hour in the morning, so that a camping place could be reached in the afternoon. The night before starting he attended a ball and became so much intoxicated that on his way home he fell down several times in the mire, much to the detriment of his evening dress and opera hat. Just after reaching home the carriage came to take him to the rendezvous, and he insisted on going in the plight he was in. After some remonstrance he was taken as he was, and the party travelled to the mountains about forty miles distant, pitched camp and, building a fire, prepared for supper. A Spaniard approached them and said that there was a grizzly a few rods off in the bushes. The judge, who was dozing near the fire, roused up at once and said that he would go and bring it into the camp. His companions laughed at him and chaffed him, but his temper was roused, and seizing an empty shot-gun, he said he would prove his assertion, and strode off into the shrubbery. In about twenty minutes there was a great commotion in the bushes, and all the party seized their guns and prepared for some unknown danger. In another minute the bushes parted and out came the judge without a hat, and running with such speed as to cause his hair and coat-tails to stand out at right angles to his body. As he approached, he shouted at the top of his voice: "Clear the track; here we come, *the bear and me*, confound our souls." They did clear the track, and the judge rushed through the fire and did not stop till he had run a good half mile to the rear. His companions stopped the bear and caused it to retreat by a few yells and shots, but the foolhardy judge was the butt of many a joke on his race with the bear.

"ME AND THE BAR'S COMING."

all its tribe, and seldom or never attacks man except when very hungry or in defence of its young. When attacked it is a formidable animal, its strong claws and great muscular power giving it great advantage. It is, when full-grown, about four feet eight inches in length, exclusive of its tail, and weighs 150 or 160 pounds. It is an inhabitant of the forests, and rarely goes any great distance from them. The jaguar or American tiger is also found in Texas, Arizona, New Mexico and Southern California. It is a larger and perhaps fiercer animal than the cougar, but is nowhere abundant and is not found at all north of the thirty-ninth parallel. A smaller, but equally fierce and perhaps equally cowardly member of the feline family, is the catamount, ocelot, or tiger-cat,* while the wild cat, with its short blunt tail, and the lynx, of which there are three species—the Canada lynx, the bay lynx or red cat, and the banded lynx—complete the wild felines of the region. Of the marten tribe and its congeners there are many genera and species. The marten proper or American sable, the fitch marten, stone marten, wolverine or fisher, two species of skunk, the mink, the yellow-cheeked weasel, the otter and sea otter, the badger, raccoon; five species of fox, the raccoon fox or mountain cat. Next in order come the wolves. The American large gray, dusky or black wolf (all these distinctions of color being found in the same species) is a far less ferocious animal than his European congener; he is cowardly, and when attacked by dogs or men always tries to find safety in flight. There are not more than one or two instances known where these wolves have attacked a man, and then it was only when they were frantic with hunger, when a large pack of them were together, and when the man was carrying some game. They are great thieves, and will carry off lambs or sheep, pigs, calves or young colts, and when hunger has made them desperate, they will hunt antelopes, deer and even the buffalo. Their bite is very sharp, and they always endeavor to hamstring their prey, if it is a large animal. They are so destructive to sheep and young cattle that great numbers

* This name is also given by some to the Canada lynx, but improperly, as all the lynxes differ in structure from the true cats.

of them are killed by poison, usually by strychnine. There are a class of men in the West known as "Wolfers" who make a special business of killing wolves, and selling their pelts, which are valuable. This is a profitable business, but those who engage in it undergo great privations and hardships, and they very often spend their hard-won gains in miserable debauchery.

The coyote or barking wolf is an intermediate link between the gray wolf and the fox, and maintains about the same position in this country which the hyenas do in the East. He is a thief, and a mean, cowardly, vile-smelling thief, but he subserves one useful purpose—he is an indefatigable scavenger, though a very dirty and cruel one. He will dig up the bodies of the dead and feast upon them, and every animal that is wounded or sick falls a prey to him. If nothing better can be found he will prey upon chickens, rats, mice, moles, or any other of the small rodents. A pack of coyotes have been known to attack a wounded buck and strip every bone clean in ten minutes. They are often covered with sores from feasting on dead bodies. Colonel Dodge insists that the prairie wolf is not the genuine coyote, and that the coyote is a meaner animal found only in Texas.

The cetacea of the Pacific coast include the right and California gray whale, the hump-back and fin-back, two beaked whales, the sperm whale, black fish, walrus, and three species of porpoise. The amphibia are the sea elephant, three or four sea lions, two species each of seal and sea otter.

The birds of this vast territory number more than 500 species already described, and many more discovered but not yet fully described. There are twenty-five species of climbers, nearly two-thirds of them wood-peckers; more than forty species of birds of prey, including six of the eagle family, twenty hawks, buzzard hawks and falcons; twelve or thirteen species of owls; the king of the vultures, as large as the condor and the lammergeier; and the turkey-vulture or turkey-buzzard, so common in the South.

Of the perchers, fly-catchers, and grain-pluckers, most of them song birds, there are nearly 200 species; in the first group are included crows, ravens, magpies, jays, jackdaws and king-fishers;

EAGLE, VULTURE, HAWK, PHEASANT, PTARMIGAN, CALIFORNIA PARTRIDGE, PRAIRIE HEN, TURKEY, FLAMINGO, CRANE, IBIS, SWAN, GOOSE, DUCKS.

in the second and third groups, fly-catchers, several species of humming-birds, swallows, wax-wings, shrikes, tanagers, robins and thrushes, wrens, chickadees, grosbeaks, finches, linnets, orioles, larks and sparrows.

The pigeon family have five or six representatives, including the California and the band-tailed pigeon, the ring, the turtle and the ground doves. There are probably two species of pheasant. The grouse family are numerous, and include blue grouse, ruffed grouse, the sage hen, which feeds upon the sage-brush of the alkaline lands and whose flesh though tender is very bitter; the prairie hen, at least five species of quail, two of partridges, and three or four species of ptarmigan. There are more than sixty species of waders, including cranes, herons, bitterns, ibises, flamingoes, plover, kill-deer, avocets, English snipe, jack-snipe, sandpipers, curlews, rails, rice-birds, etc., etc. The swimmers are still more numerous, over one hundred species having been described, including many species of geese, which frequent the lakes and broader streams, brants, teal of at least a dozen species, as many of ducks, the canvas-back being found in great numbers in his best estate, scooters, coots, sheldrakes, mergansers, pelicans, cormorants, albatrosses, fulmars, petrels, gulls, terns, loons, dippers, auks, sea-pigeons, and murres.

The reptiles of the Pacific coast, and its rivers and lakes, differ from those of the States and Territories whose waters drain into the Gulf of Mexico. In the former there are no true saurians (alligators or crocodiles), except in the Colorado and its affluents; in the latter the alligator and probably the crocodile are found in great numbers below the thirty-fifth parallel. The Pacific States and Territories have five species of rattlesnake, and no other venomous snake unless possibly a viper; while the latter have as many species of the rattlesnake, and at least three other venomous snakes, and possibly more. There are about thirty species of harmless snakes, five of tortoises, seven or eight land turtles, terrapins, etc.; about forty species of lizards, and nearly fifty frogs, toads, horned toads, salamanders, proteuses, etc., etc.

There are more than five hundred species of fish, most of them

edible in the waters of the Pacific and the Gulf, and in the thousands of fresh and salt lakes, and the numerous rivers of this vast region. Among these are ten species of the Salmonidæ, native to the Pacific coast, besides several others now naturalized; the taking, packing and canning of the salmon forms one of the largest and most rapidly increasing industries of Oregon and Washington Territory; the rivers and lakes swarm with trout. Seven or eight species of the cod family, about twenty species of eels, ten of mackerel, and two of the bonita or Spanish mackerel, numerous species of the perch family and its congeners, the blue-fish, eight or nine species of bass, the lake white-fish (introduced); three species of tautog; one, the red-fish, a most delicious table fish; about twenty species of flat-fish and flounders; twelve species of shad, herring, anchovies, etc.; nearly thirty of the carp tribe, weak-fish, balloon-fish; and over forty of the cartilaginous fishes, sharks, rays, sun-fish, sturgeons, etc., etc. There are seventy-five species of mollusks, including a great variety of clams, quahaugs, oysters, mussels, scollops, and fresh-water unionidæ, whelks, limpets, sea-snails, cuttle-fish, polypi, octopi, squids, nautili, etc.

Of crustaceans, there are about twenty species, including lobsters, crabs, hard and soft shell, king crabs, star-fish, fresh-water lobsters, shrimps, prawns, crawfish, etc.

No country in the world has a larger proportion of excellent pasturage land. While much of this is as yet unoccupied by herdsmen, the amount of live-stock is increasing at an exceedingly rapid rate. The estimates of the Agricultural Department at Washington, which, on live-stock, especially in the West, are generally considerably below the truth, gave, in December, 1878, 3,807,500 horses, more than one-third of all in the United States; 630,300 mules, about the same proportion of the whole; 3,650,000 milch cows, about one-third of the whole number in the Union; 11,588,000 other cattle, or more than one-half of the whole; 19,000,000 sheep, or one-half of the whole; and 12,000,000 swine, or almost two-fifths of the whole. The number in December, 1879, not yet reported, must be at least twenty per cent. in advance of these figures.

CHAPTER V.

POPULATION—THE INCREASE SINCE 1870—TABLE SHOWING THE ESTIMATED INCREASE IN EACH STATE AND TERRITORY—NOTES IN REGARD TO EACH STATE AND TERRITORY.

THIS whole region is new to settlement, except the States of Missouri and Arkansas; the former was admitted into the Union in March, 1821, and the latter June 15th, 1836. Nine of the other States or Territories have been organized with their present boundaries over thirty-five years, and several of the States and all the Territories are less than thirty years old. According to the census of 1870, there were in the whole region west of the Mississippi 6,877,069 inhabitants, besides nearly 300,000 tribal or wild Indians. The growth of population since that time has been almost incredibly rapid. In order to show how rapid has been the growth of this region we present herewith the results of the census taken in June, 1880—the official figures where it was possible to obtain them, and the approximations in round numbers, where it was not. We have added to these the number of Indians on reservations, in every State or Territory where there were large reservations, taking our figures from the latest report of the Indian Office in 1879. It will be seen that the present population aggregates 11,421,274, an increase of 4,544,205, or about 67.5 per cent., within the last ten years. The great States regard an increase of ten or eleven per cent. in the population in ten years as a remarkably rapid growth, and only one or two of them attain that; but here has been an increase of more than six times their best growth in the same time; while fully three-fourths of this advance has been achieved during the last four or five years.

The following table shows the extraordinary growth of some of these States and Territories; and we explain below the causes which have induced this exceptional growth.

State or Territory.	Population 1870.	Population 1880.	State or Territory.	Population 1870.	Population 1880.
Arkansas .	484,471	802,564	Texas (*g*)	818,579	1,597,509
California .	560,247	864,686	Arizona (*h*)	9,658	40,441
Colorado (*a*)	39,864	194,649	Dakota (*i*)	14,181	135,180
Iowa (*b*) .	1,194,020	1,624,463	Idaho . .	14,999	32,611
Kansas (*c*)	364,399	995,966	Montana(*j*)	20,595	39,157
Min'sota (*d*)	439,706	780,807	Indian Ter.	69,000	75,000
Missouri .	1,721,295	2,168,804	New Mex.(*k*	91,874	118,430
Nebraska (*e*)	122,293	452,432	Utah (*l*)	86,786	143,907
Nevada . .	42,491	62,265	Washington	23,955	75,120
Oregon (*f*)	90,923	174,767	Wyoming	9,118	20,788
Louisiana	726,915	940,263	Totals .	6,877,069	11,339,809

(*a*) Colorado owes its rapid growth in the last decade to its superb climate, to its great advantages as a herding region, and above all to the extraordinary discoveries of rich ores of silver and gold on both the eastern and western slopes of the Rocky Mountains, in the San Juan district, in Leadville and vicinity, at Silverton, Ouray, Gunnison, and many other points of Western Colorado.

(*b*) Iowa is essentially a prairie State, with a rich and fertile soil, and being gridironed by railroads, most of them having land-grants, and its advantages diligently made known, it has made large additions to its population.

(*c*) Kansas owes its almost miraculous growth to its favorable location, to its excellent farming lands, and especially to the great enterprise and energy, with which the Atchison, Topeka and Santa Fé Railroad has opened to settlement and to markets, the whole upper Arkansas valley, one of the finest farming and grazing regions on the continent.

(*d*) Minnesota owes much of its growth to its fine climate, its rich wheat lands, especially those of the valley of the Red river of the North, and to the great enterprise of both her farmers and manufacturers, by which her wheat and flour have become known all over the world, as the finest produced anywhere.

(*e*) Nebraska has made a great advance within ten years, almost quadrupling her population, mainly through her excellent situation, her fine, arable lands, and the great efforts made by the Union Pacific and other land endowed roads, to make her advantages known.

(*f*) Oregon has been largely built up by emigration called thither by her extensive salmon fisheries, her immense lumber business, the great fertility and productiveness of her soil, and her rich and valuable mines. Her facilities for water communication have been of great advantage in bringing her products to market; but as yet railways have not aided largely in developing her territory.

(*g*) Texas has received large additions to its population from several causes: its fine cotton and sugar lands have attracted very many settlers from the Atlantic and Gulf States of the South, as well as from the Mississippi valley, who hoped to better their condition by the change; her vast ranges for cattle, and

the double demand for cattle for the ranges of the New Northwest, and for beef for the English and French markets, have drawn great numbers of ranchmen, herdmen, cattle-buyers, etc., to the State. There has been also a large immigration of English farmers and laborers, and of the best class of Germans to the State; and the extension of several of the railroad lines has induced a considerable influx of people from Missouri, Illinois, Kentucky and Tennessee.

(*h*) Arizona has not grown so rapidly as some of the other Territories, for, until recently, she has had difficulties with the Indian tribes, and her arid soil, most of which can only be cultivated successfully by irrigation, was still arid for want of the means to build irrigating canals, or bore artesian wells; her mines, which were and are exceedingly rich, were almost inaccessible for want of railroad and wagon road facilities. These difficulties are now in course of removal, the Southern Pacific having reached Tucson, the former capital, and the Territory is responding most heartily to the new impulse it has received within the past two years. The Indians, under the efficient management of Governor Frémont, are friendly and peaceful, and heavy and continued rains have changed the face of nature. Its mines are richer, and its lands more fertile than they have been thought to be.

(*i*) Dakota has made the most extraordinary growth of any State or Territory in the entire West, and this has been due to several causes, operating in different sections, at nearly the same time. Southeastern Dakota has been the portion of the Territory best known, and its fertile lands have attracted emigrants from Europe, as well as from the Eastern States. The Mennonites established a large colony here, and the Catholics are now purchasing lands for the same purpose. This section lying north and east of the Missouri river, and in the lower valley of the Dakota or James river, is very accessible, both by the Missouri and Dakota rivers, and by three railroad lines which penetrate this region. Northeastern Dakota owes its rapid growth almost entirely to two railways, and the enterprise with which they have advertised their lands; the Northern Pacific, which in the face of the greatest difficulties has opened a line nearly across the Territory, above the 46th parallel, and has brought into market some of the finest and most productive lands in the Northwest; and the St. Paul, Minneapolis and Manitoba road, and its branches, which have opened to settlement the whole valley of the Red river of the North, which sent to market in 1878, 5,600,000 bushels of the finest spring wheat. The Black Hills Region, in Southwestern Dakota, was first brought into notice by the discovery there of immense deposits of gold and silver. Much of the region around is barren, but the mines are exceedingly rich, and the population is rapidly increasing.

(*j*) Montana has as yet no railroads, except the extension of the Utah Northern, but soon will have; the Northern Pacific crossing the Territory about midway, and the Utah and Northern penetrating it from the south, eventually to meet the Northern Pacific. The latter road has recently reached Helena, the capital. The Missouri river is navigable for most of its course in the Territory, as is the Yellowstone, though partially obstructed by rapids.

But Montana has many fertile and very rich valleys, excellent pasture lands, and some of the best gold and silver mines in the whole Northwest. Its population will greatly increase in the next decade.

(*l*) Utah has grown rapidly in spite of great obstacles, and mainly by emigration of two kinds: of Mormons from Europe, and of "Gentiles," *i. e.*, Non-Mormons, from the Eastern States, drawn thither by its exceedingly rich mines. The ores of the Territory in all directions seem to yield greater quantities of gold and silver than almost any others which have been opened; and with greater facilities of access they must at no distant date pour a volume of gold and silver into the markets of the world which will make great changes in the prices of other commodities.

CHAPTER VI.

THE NATIONALITIES AND RACES REPRESENTED—THE INDIANS—DIFFERENT TRIBES, AND THEIR CHARACTERISTICS—THE MOQUIS OF ARIZONA—NOTE CONCERNING THEM—AFRICANS AND COLORED PERSONS GENERALLY—CHINESE AND JAPANESE—HISPANO-AMERICANS—EUROPEANS OF DIFFERENT NATIONALITIES—BRITISH, BRITISH AMERICAN, GERMAN, SCANDINAVIAN, FRENCH, ITALIAN, SPANISH, ETC.—AMERICANS BORN IN THE STATES.

INCLUDING the Indians in the Indian Territory, the Pueblos in New Mexico and Arizona, and the Indians employed on ranches in California, Nevada, Oregon and Washington, and the tribal Indians on the plains and elsewhere, there are probably not less than 300,000 Indians of all races in the Great West.

These Indians are of many tribes, and their languages, habits and modes of life differ materially. A comparatively small number evidently belong to two of the races which preceded the North American Indian on this continent. The Pueblos of New Mexico, who are also found in small numbers in Arizona, have their name from their practice of living in towns or villages, *pueblo* being the Mexican name for a town or village. They live in adobe houses, cultivate the soil, and though in secret idolaters, are outwardly obedient to the priests, and devout Catholics. They are a quiet, patient, good-tempered race, evidently Aztec, and having no other affinity with the American Indians than their color and hair. There are several villages in Arizona,

New Mexico and Colorado, of the cliff-dwellers, or Moquis, a still earlier race, of which they seem to be the only survivors. Their dwellings are hewn in the perpendicular rocks of some *mésa* or *butte*, or crown its height, and are only accessible by ladders or rude rock stairways. Their cattle and sheep occupy usually only the top of the mesa, and here were constructed also large reservoirs for water, which they use for themselves and their cattle. They are engaged in manufactures as well as in agriculture, and their blankets, their cordage, their bread manufactured in thin sheets from the blue corn which they cultivate, their ornaments, etc., are very curious. They are as much advanced in civilization as the Peruvians of South America, and possibly belong to the same race.*

In the Indian Territory, the tribes removed thither from Georgia, Alabama and Mississippi, in 1832 and 1833, the Cherokees, Choctaws, Creeks, Chickasaws and Seminoles, have farms and good dwellings, and show no disposition to lead a nomadic life. Of the other fifteen or sixteen tribes or fractions of tribes, now occupying portions of the Territory, some are becoming accustomed to the herdsman's life and seem contented; others do

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* Very few of our explorers or tourists have visited these singular and interesting people in their rocky fastnesses. Among the few are Prof. J. S. Newberry, now of the Columbia College School of Mines, and an eminent scientist, Colonel J. W. Powell, the pioneer explorer of the Rio Colorado, and General J. C. Frémont. They are certainly a much more intelligent and highly civilized people than any of the Indian tribes now existing on this continent, and in all probability are the remnants of a race which preceded the Aztees, the inhabitants of Mexico when that country was first discovered. Their cliff dwellings exhibit remarkable architectural skill, and their religious ceremonies, of which Colonel Powell has given a most interesting account in *Scribner's Monthly*, while very singular, indicate their origin from one of the primitive races of Northwestern Asia. They are generally regarded as fire-worshippers, but like the Parsees, their worship seems to have been symbolical, and to have regarded fire and the sun, the great source of fire, as only the symbols of the creating and vivifying power which pervades all nature. Their manufactures were rude, but the products were of great excellence. We have ourselves seen a blanket, which Prof. Newberry obtained from them, woven from the wool or curly hair of their sheep or goats, and into which when suspended by its four corners, three pailsful of water were emptied, and after nearly a half-hour the under surface was not moist in the slightest degree. Their ornaments of gold, silver and copper displayed a high degree of artistic skill. Their bread, made from the maize of different colors, red, blue, yellow, white, etc., which they cultivate, pounded into meal in a mortar and made into a thin paste, when baked was no thicker than writing paper, each sheet being about fourteen by eighteen inches, and folded so that the pile of edible sheets resembled a ream of blue or colored paper. In these villages four or five languages are spoken, none of them bearing any known relation to those of the other Indians.

not take kindly to even partial civilization, and are restless and uneasy. This is particularly true of the Comanches, the few Apaches who are in the Territory, and some of the later comers, as the Cheyennes, Arapahoes and Poncas. The nomadic Indians, though of many tribes and languages, yet belong for the most part to four or five groups. The largest, most numerous, and most warlike of these are the Dakotas or Sioux, and the Shoshones, Snake Indians or Utes. In the former group are included not only the Unkapapas, Tetons, Crows, etc., but the Winnebagoes, Assiniboins, Omahas, Poncas, Ioways, Otoes, Mandans and Minitaris. Their hunting grounds extended from the Canadian line through Western Minnesota, Dakota, Montana, Western Iowa, Nebraska, and Kansas, and part of Wyoming, into Northern Colorado. Some tribes of this group have been almost constantly hostile to the whites, and have more than once perpetrated terrible massacres. The horrible scenes in Minnesota in 1862–3 were the work of the Crows, one of the tribes of this group. The butchery of Custer's gallant force was also perpetrated by bands of this group. Sitting Bull is the chief of one of the Sioux tribes. They have been very often at war with the Utes.

The Shoshones, or Snake Indians, very possibly outnumber the Sioux. They include not only the Shoshones proper, in Oregon and Washington Territories, but the Bannacks, Wihinasht, Comanches, Kizht and Netela, the Modocs, and the various tribes of Utes, the Pah Utes, Pi-utes, White River Utes, Uintahs, Uncompahgre Utes, etc. Ouray is a chief of the Uncompahgre Utes, and Douglas of the White River Utes. These tribes are found in Oregon, Washington, Idaho, Western Montana, California, Nevada, Utah, Wyoming, Colorado, and some of them in Northern Texas. Among the smaller groups are the Sahaptin or Nez Percés, under which name are included also the Walla Wallas, Yakimas, Pelouse and Klikitats of Washington and Oregon; the Selish or Flat-heads, under which name are included the Pend d'Oreilles, the Cœur d'Alenes, Spokanes, Piskous, Nesk'wally, Chehallish, Cowlitz and Killamooks or Tillamooks of Idaho, Oregon and Washington; the

Yumas include the Coco-Maricopas, Cuchans, Mohaves, Hualapais and Yavapais, and the Diegueños of Arizona; the Pimas include the Pima Apaches, the Coyote Apaches, and other Apache tribes, as well as the Pimas proper of Arizona and New Mexico.

The number of "colored persons of African descent" is not far from 700,000, there having been a considerable exodus of negroes from Mississippi, Tennessee and other Southern States east of the Mississippi into Texas, Arkansas, Kansas, and Nebraska since the census of 1870, and especially in 1878, 1879 and 1880.

The number of Chinese and Japanese now in all these States and Territories does not exceed 100,000 and perhaps not 75,000. It is more difficult to determine the number of persons of Hispano-American parentage, whether of the whole or half-blood, since, in Texas, California, Arizona, New Mexico, Nevada and perhaps also in Colorado, a considerable number were of such parentage, yet born in those States and Territories, before they came into possession of the United States. As nearly as we can estimate, these Hispano-Americans, whether born in our new States and Territories or in Mexico, must number somewhat more than 100,000. Of about equal number are the emigrants born in British America, who are mostly Canadian French, and in the Northwest, a considerable percentage of the trappers and hunters often of mixed blood, from the Northwest and Hudson's Bay Companies.

The immigrants from Great Britain and Ireland, who numbered, in 1870, in this region 346,364, must now exceed a million, for Utah has received thence large numbers of Mormon converts; while Texas, Kansas, Nebraska, Dakota, Minnesota, and Iowa have had large accessions of British farmers, artisans, and laborers, and Colorado, Arizona, Nevada, California, Montana, Oregon, Wyoming, and the Black Hills region, have been largely aided in the development of their great mining interests, not merely by British capital, but by British labor.

In the last decade, also, the German population of this region has increased from 310,645 in 1870 to nearly or quite a million

in 1880, for in farm work, in mechanical and in mining pursuits, the German has never failed to keep pace with the toilers of other races. German capital, too, has been liberally invested in the best mines.

In 1870, the Scandinavians in this region numbered 121,578; but they were only the vanguard of a more abundant immigration, which has made the Norse tongue familiar as English, throughout Minnesota, much of Iowa, Dakota, Nebraska, Kansas, and portions of Wyoming and Montana. There are certainly 400,000, and perhaps more, Scandinavians and children of Scandinavian parents in the Northwest. For the rest, there are 25,000 or more Mennonites and other Russian Protestants from Russia, 10,000 or 12,000 Italians, half that number of Hungarians, over 20,000 Bohemians (Czechs), nearly as many Austrians (Germans), 35,000 or 40,000 French, 25,000 Swiss, 10,000 or 12,000 Hollanders, 5,000 Belgians, about the same number of Portuguese, 1,000 Spaniards, about the same number of West Indians, and nearly as many from the islands of the Pacific, and from Western South America.

Asia and Africa and Australia contribute their several quotas, small ones, it is true, to make up the mixed multitude, from all lands, who have flocked hither within the past thirty years.

Probably somewhat more than one-half of the whole number were born in the United States, and of white American parentage. Except in the older States of this Western Empire, Missouri, Arkansas, Texas, Iowa, and California, and in a smaller degree, Minnesota, Kansas, and Oregon; very few of these citizens who have attained adult age, are native to this region, and "to the manor born." Every State of the Union has contributed its quota, the majority in the Northern and Central States and Territories having come from New England and the Northern States, New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Illinois and Wisconsin; while the emigrants to Texas, Arkansas, the Indian Territory, Arizona, New Mexico, Southern Colorado, and Utah, and Southern California, are very largely from the Southern and Southwestern States, though Southern Illinois has contributed a considerable share of the recent emigrants to Texas.

CHAPTER VII.

CHARACTERISTICS AND PECULIARITIES OF THE POPULATION—HUMOROUS ASPECTS OF THE BLENDING OF DIFFERENT NATIONS—THE NEW DIALECT—SPECIMENS OF IT—THE PROPENSITY TO HUMOROUS EXAGGERATION—INCIDENTS, MANNERS AND HABITS OF RANCH-OWNERS AND RANCHMEN—COLONIES OF DIFFERENT NATIONALITIES AND RELIGIONS—MENNONITES—STUNDISTS—MORMONS—CATHOLIC EMIGRATION—ASSOCIATIONS OF CAPITALISTS FOR MINING, HERDING, WOOL-GROWING, OR FARMING PURPOSES—OTHER MODES OF SETTLEMENT.

No such experiment in the blending of the different races of men into one homogeneous nation, has ever been attempted, on a scale so grand and extensive, as that now in progress in our Western Empire. Will it prove a success? Here we find the New Englander, intelligent and often scholarly, but almost always shrewd, sharp, and enterprising, cheek by jowl with the tall, lank, bilious-looking Southern, less enterprising, perhaps, yet equally sharp in his way, with a dogged energy, and often an irritable temper. The quick, nervous, impulsive, but capable New Yorker has for a partner a dreamy and apparently stolid German, who is, nevertheless, fully awake to business matters. The quiet but acquisitive Pennsylvanian is linked with a wild, blundering, impulsive, and jovial Irishman. Sprigs of British aristocracy and British snobs are found in all callings, from the highest to the lowest, and the mercurial Frenchman, the proud and haughty Spaniard, the dark-browed Italian, and the versatile Russian, are all found occupying, in apparent harmony, the same sod-house or dug-out. The Israelite is everywhere, and at all times ready to turn an honest penny. Far from dealing always in old clothes "shust as goot as new," he is a banker, a mine owner, a capitalist, or a landed proprietor. In the mining regions, especially, this commingling of different nationalities has led almost to a new nationality, certainly to a new dialect, at first almost unintelligible to the new-comer, but very speedily acquired by a few weeks' residence. Every man has his title, generally applied with considerable shrewdness and appropri-

ateness, but, except in rare instances, retained as long as he remains in the region. Very few rank as low as "Captain" or "Major," though the latter has some currency; but "Colonel" or "Commodore" are the most usual titles, while in a few instances, where neither the military nor naval appellation seems appropriate, a man is recognized as "Jedge" (Judge). "John Phœnix" (the late Lieutenant G. H. Derby) gives a laughable illustration of this practice, almost thirty years ago, in California, where he relates, that going on board ship, for the long return voyage round the Horn, and being very much depressed from the fact that he had no friends to accompany him to the ship, and wish him "*bon voyage*," as all the rest seemed to have, he at last, just as the ship was moving off, lifted his hat in desperation and called out to some make-believe friend in the crowd on shore, "Good-bye, Colonel." In an instant, he said, hundreds of hats were in the air, and the shout rang out in reply from hundreds of throats: "Good-bye, Colonel." But the slang expressions of this mining dialect are too numerous to be recorded. New-comers are "Tender-feet;" a dead man has "passed in his checks;" one who has been killed in a brawl or street-fight "died with his boots on." A man who is both liberal and just, "pans out well;" one who has excited the displeasure of his "pards" (associates or fellow-workers) is "off color." If a man shows pluck or grit under adverse circumstances he "has got sand." Earth or gravel containing considerable free gold is subjected to the "panning" process, with good results. A vein of gold or silver, yielding largely at first but gradually becoming smaller as the rocky walls come closer together, is said to "peter out," and a man of large pretensions, but of gradually diminishing performance, has the same epithet applied to him. A ravine is a "gulch;" a pool of water at the bottom of a mine, a "sumph."

Bad whiskey is "*tarantula juice*;" prospectors who are ignorant of their business and disposed to grumble are "*gruber-grubbers;*" and when they make a precarious livelihood from what game they can kill with old squirrel rifles, they are said to "live on *snaps*," the snaps of the rifles which did not bring down any game. A new-comer speaks of the large-heartedness of

some of the miners he has met, and the reply is: "Yes, there's a good many of them big-hearted fellers in this country. You see them small-souled cusses *takes too much irrigation to bring 'em out.* They've just got to git up and git." The word "irrigate," which in this expression has manifest reference to the results of irrigation in producing immense crops on the arid lands, has also another signification in the West. "Stranger," said a rough-looking miner to a clerical-looking gentleman, in one of the Concord coaches, "do you irrigate?" producing at the same time a bottle. "If you mean to ask whether I drink, sir, I do not," was the dignified reply. "Stranger, have you any objection to our irrigating?" was the next question. "No, sir," was the reply. After the irrigation had been completed, the miner, who afterward turned out to be a large mine-owner, propounded a second question. "Stranger, do you fumigate?" "If you mean to ask do I smoke, sir, I do not." "Well, stranger, do you object to our fumigating?" "No, sir; certainly not," was the prompt reply. It should be added to this story that at their journey's end, when the clergyman, a day or two later, called for his hotel bill, he was told that it had been paid by the miner, who had thus manifested his respect for his manly refusal to indulge in drinking or smoking.

This mining and herding dialect seems to be a conglomerate in which many Spanish and Mexican words are mingled with Indian terms, Chinese "pigeon-talk," Chinook, Eastern and Southern Americanisms, and perhaps mining terms and phrases from Great Britain and the continent. It is astonishing that a dialect, so utterly void of rules or system, can be acquired so rapidly. In one-tenth the time required for the acquisition of any regular well-organized language, any one will acquire this outrageous dialect and become thoroughly proficient in it.

The herdsmen and shepherds, and in many cases their employers also, are as rough as the miners in their language and dress. It is not uncommon to find among these rough, unkempt and mud-bespattered men, graduates from our Eastern universities and colleges, men who have enjoyed all the amenities of the most refined society, but who, discarding all conventionalities,

have chosen to live thus roughly and uncouthly. In some instances sons of English peers, themselves graduates from Oxford or Cambridge, have followed the same course. A correspondent of the New York *Tribune* relates that he found in Leadville, in a building, half tent and half shanty, occupied by a miner and his family, a Steinway grand piano, perfectly in tune, a choice and well-selected library, and both in charge of a lady as refined and accomplished as could be met with in the best circles in our great cities, and these luxuries of civilization had been brought thither when the freight by ox or mule-team from the nearest railroad station, then eighty or a hundred miles away, was fifty cents a pound.

Among all classes the American fondness for humorous exaggeration crops out. A miner will tell a stranger, with a perfectly serious face, that a mine of very small promise has "millions in it," and perhaps in the next breath, examining a choice specimen of ore, he will throw it from him contemptuously, declaring that it won't yield more than 110 per cent. of pure silver. He will describe to another, with a face beaming with pity, "how discouraged the miners were, because they had to dig through four feet of solid silver before they could get at the gold;" or when the large yield of silver is spoken of, he will say: "Pshaw! that is of no account; there is a man down in Iowa that has invented a process for making silver for fifty dollars a ton; so that is no good." This same tendency to exaggeration is sometimes acquired by our English cousins after a short residence here. "Haven't you any larger happles than those here?" inquired a cockney tourist of a market woman in Washington market, New York, pointing to a huge watermelon. "Can't you do hany better than that?" "Happles!" retorted the market woman, herself of English birth. "Hanybody would know you was Hinglish. Them hain't happles; them's huckleberries!"

The farmers are not as rough or rude in their mode of life as the herdsmen, shepherds or miners; though at first, on the frontier, the luxuries of society, whether in habitation, equipment, dress, or table fare, are neglected, and only the necessaries of life are sought.

Yet it is the testimony of ladies of the highest character who have penetrated into these mining hamlets, or the sheep or cattle ranches, that nowhere in the wide world have they been treated with more courtesy, deference and respect, than among these apparently rough men. Miss Isabella L. Bird, an English lady of high social position and adventurous spirit, whose "A Lady's Life in the Rocky Mountains" is a most charming record of actual adventures in Colorado, found that even a noted outlaw and brigand, known as "Rocky Mountain Jim," manifested in his conduct toward women, the intelligence, chivalry and refinement of a gentleman.

In almost all the States and Territories of this western region there are numerous colonies, where a body of settlers, bound together by the ties of common race or nationality, community of religious faith, the desire of prosecuting a common avocation or pursuit, or, in some instances, from mere neighborhood, or general similarity of views, or from being natives of the same State at the East, have purchased a tract of land in common, and founded a colony, or settling on adjacent lands by mutual agreement, have become helpful to each other, and thus enjoyed the advantages of a colony without the difficulties incidental to a colonial organization. Many of these colonies have proved very successful, a few as conspicuously unsuccessful. Four or five adopted at first the principle of a community of lands, and perhaps of goods, but all or nearly all have subsequently abandoned it. In the regions where irrigation is required, some of the colonies made their canals and ditches the property of the whole colony, and each individual who used the water paid a water-rate; others had them constructed by a company, and those who used the water paid toll. Of the colonies on a secular, and partly, perhaps, on a political basis, the most successful have been the colony of Greeley, in Colorado, founded by the lamented Meeker, and its almost as prosperous neighbors, Longmont and Evans. In Minnesota there have been many Scandinavian colonies founded, Swedish, Norwegian, and Danish, and these often so near each other as to make considerable tracts Scandinavian in character, and for a time in speech. These colonies

have gradually extended into Northeastern Dakota. The Norse element is an excellent one in our country, for the Scandinavians are a hardy, frugal, industrious, and thrifty people. In Iowa, Southern Minnesota and Southeastern Dakota, as well as in Nebraska, there are many German colonies, generally of an excellent character. In Southeastern and Northeastern Dakota, as well as in Manitoba, and still more in Kansas, the Mennonites, a religious denomination already known in the Atlantic States, Russian by birth, but of German origin, have settled in large colonies, and form a valuable addition to our farming population.* In Dakota, and perhaps also in Kansas, they have been accompanied by other religionists of somewhat similar views, but of Sclavonic or Russian origin. These call themselves simply "Christians," but are known to the Russian government as either *Molokani* or *Stundisti*. These have settled on lands adjacent to the Mennonites. In some of these States and Territories there are also colonies of Bohemians (Czechs), of Moravians, and we believe also of Tyrolese and Swiss. In Southeastern Dakota, Nebraska and Kansas there are also many colonies of English and Scotch, mostly farmers, though some are artisans. Kansas has one, and perhaps more than one, French colony, where silk culture and the manufacture of silk has been carried on, though, while awaiting the growth of the mulberry, and sufficient work for their filature, they have turned the silk mill into a cheese factory. There are also French and Hungarian colonists engaged in viniculture in California. A considerable colony of Japanese came to California some years since to engage in the culture of tea, and perhaps some other Japanese products, but we have no recent intelligence of their success.

In Colorado, New Mexico, Arizona, Nevada and Utah there

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* Mr. H. J. Van Dyke, Jr., writing of these Mennonites in their Manitoba settlement, says that an innkeeper at Winnipeg stoutly insisted that they were "no good." On being asked his reason for such a declaration, he still persisted that they were of no account. "Are they not industrious?" "Ye-es." "Are they not thrifty?" "Ye-es." "Don't they pay for what they buy promptly?" "Ye-es. But I'll tell you, when they come here, if any of them want to drink, every man pays for his own liquor. They never treat the crowd. I don't think they are of much account." The innkeeper's reason would seem to be decidedly creditable to the Mennonites.

are many associations for mining purposes, composed entirely of English or Scotch capitalists, employing almost exclusively British miners, and having their principal offices in London. In Colorado, Wyoming, Montana, and Texas, there are also British associations engaged in the stock business. In Utah, where almost three-fourths of the population are Mormons, and most of them believe in polygamy, while several thousands of them actually practice it, the Mormon immigration is almost wholly from Great Britain, though a small number come from the Scandinavian countries. As most of these immigrants are practical polygamists, our Government has recently sought to restrain the influx of such open violators of our laws. In New Mexico the greater part of the inhabitants, certainly nine-tenths, including both the original inhabitants and the immigrants, are nominally or really members of the Roman Catholic Church. The policy of our Government is, and has always been, opposed to the entire control of a State or Territory by one sect or denomination alone, inasmuch as perfect freedom of conscience, except where it violates the rights of others, is the cardinal principle of our national Constitution. Where one sect is largely dominant in a State or Territory, the rights of the minority are almost invariably invaded. In Utah this predominance involves also the practice of polygamy, which is an added violation of our national laws; and in New Mexico the school moneys derived from the sale of school lands have been misdirected by the Jesuits and other religious orders, who have the entire control of education there, not only to the payment of teachers of theology in Roman Catholic seminaries, but to the payment of the board of students of theology.

So far as colonies of Roman Catholics are concerned, they are perfectly right and proper, and very considerable settlements have been organized under the auspices of bishops and archbishops, in Dakota, Nebraska, Texas and Oregon, and perhaps in some other States and Territories. No objection is made to the organization of Mormon colonies, provided they obey the laws; and, as a matter of fact, the Mormons have planted large colonies in Idaho, and smaller ones in Colorado and Arizona.

In a few instances colonies of American Protestant denominations have settled in a single township, and have done well. There are Episcopal, Presbyterian, Methodist and possibly Baptist colonies of this sort. Generally, however, our American colonists prefer a diversity of religious beliefs in their settlements.

Recently, two methods of settlement and improvement of lands have been adopted. They are both of doubtful expediency, so far as the future of the States and Territories is concerned, though of great present profit and success in the development of new regions. The first method has been largely practised in California, and is coming into vogue in the newer States and Territories. A capitalist, usually, though not always, a practical farmer, stock-raiser or mining operator, or sometimes an association of capitalists, acting by their superintendent or general manager, purchases a large tract of land, often many thousands of acres, adapted to his purpose, whether of raising grain, wine-making, stock or wool-growing, or mining, erects the necessary buildings, and procures the best and latest machinery for his purpose, and hires his laborers, who may be the poorer classes of foreigners, Mexicans, Indians, or Chinese, and works his estate exclusively, or almost exclusively, with such labor, his machinery or steam-driven agricultural implements supplying the place of very large numbers of laborers. If he is a farmer, and in the smooth prairie lands, he breaks up the soil with his gangs of steam-plows, or an army of plowing machines each drawn by four horses or mules; sows his wheat or other grains with steam or four-horse drills; irrigates his lands, if irrigation is necessary, by water raised from an artesian well, by steam or wind-power; reaps, gathers and binds or more expeditiously still, clips off the heads of the grain and deposits them in an accompanying wagon by bushels, whence they are transferred by a chute to the threshing-machine, which threshes, winnows, separates and sacks the grain with little human intervention. When the market is at its highest point, he sends to it his hundred thousand or two hundred thousand bushels of wheat, his oats, barley, and corn in nearly equal amounts, and employing cheap labor, his net profits on a single year's crops may be reckoned by the hundred

thousand dollars, though his cultivation may be less thorough, and the yield per acre smaller, than on smaller and more carefully tilled farms. All this is very well for the capitalist, and equally well for the exporter of grain; but it is not so well for the State or Territory, nor for its permanent and successful development. These large estates prevent the formation of villages and towns, and the establishment of primary and grammar schools; encourage absenteeism, and tend to the establishment of a privileged and oligarchical class; and in the not distant future, when the public lands and the railroad lands are all sold, will bring about a condition of things such as now exists in Great Britain, and sooner than there, because the cultivation is more superficial and the land, skinned for present crops, will soon lose its fertility. It is a significant fact in this connection, that on the great "Dalrymple farm" in Northern Dakota, with its more than 30,000 acres in grain, the yield per acre is much less than that of adjacent small farms, and that the yield per acre diminishes with each successive crop, though the land is the best in the Red River valley.

The great cattle and sheep ranches are in some respects still more objectionable, inasmuch as the herdsman's life has a strong tendency towards a condition of semi-civilization. The owner of these immense flocks and herds may be, indeed, like the Oriental patriarchs, a man of culture and refinement, a poet or historian, a king among men, and may surround his children with all the luxuries of civilization; but his herdsmen or shepherds, without opportunities of education, and far from civilizing influences, will, in the course of time, become mere boors and hinds. In the wasteful methods of stock-raising in these regions, it is estimated that it requires fifty acres of the mountain pasturage to feed a single steer, and where the herd amounts, as it not unfrequently does, to 4,000 or 5,000 head, it may require a whole county to furnish them with sufficient pasture. This isolated life inevitably leads to results, directly opposed to the whole genius of our institutions. In the sale of the public lands, the policy of the government has been, to have the holdings small, and the settlers within such neighborhood to each other, that schools, churches, and villages, could be maintained; this

has been, to some extent, also the policy of the land-grant railroads, though those holding large grants have too often departed from it; but the pressure to sell large quantities of grazing lands, and in some instances farming lands also, has been so great, that the government officers and the railroad officials have too often yielded to it. In Texas, Arizona, New Mexico, Nevada, and California, the old Spanish and Mexican land-laws have prevailed, under which a square league of land was about the smallest parcel put upon the market, and from six to thirty leagues not an uncommon purchase. California is already suffering from these immense estates.

Another plan now prevailing to some extent, especially among the English middle classes, people of fixed incomes which terminate with their lives, is perhaps less objectionable though tending in the same direction. These people, younger sons of the nobility or gentry, retired army or navy officers, clergymen or their families, civil servants, etc., come to the western country and purchase one or two quarter sections or more, have them broken up, and perhaps a log-house or sod-house built, and let them, the first year for half the crop, and in the years that follow for $1.25 to $1.50 per acre. If their means are sufficient, they repeat this process, every year, till they have 2,500 or 3,000 acres leased in this way, and this gives them a comfortable annual income. This is less objectionable than the purchase of large tracts, because these quarter sections need not be contiguous, and there will thus be an opportunity for sufficiently close settlement to permit the establishment of good schools and villages; and these land-holders may sell their improved farms, at prices which will permit them to make still larger investments; but there is a strong tendency, in the process, toward the formation of a landed aristocracy.

CHAPTER VIII.

VARIETY OF SOILS AND SURFACE—GEOGRAPHY AND GEOGNOSY—SOILS—GEOLOGY—CHARACTERISTICS OF THE ROCKY MOUNTAINS—VOLCANIC REMAINS OF THE YELLOWSTONE COUNTRY—THE GEYSERS—THE VICINITY OF SALT LAKE—PROFESSOR GEIKIE'S SUMMARY OF THE GEOLOGY OF THE CENTRAL REGION—MINERALOGY.

THE variety of soils in this vast region is almost infinite, and in this chapter we can only glance at the principal causes which lead to such diversity. There are nearly 2,000 miles of coast, washed by the ocean and gulf on the Pacific and in Texas, upon all of which has been cast by the waves, sand and alluvium to a greater or less breadth, for thousands of years. The very heavy rains on the west coast and the western slope of the Coast range, aided during the glacial epoch by the movements of the huge glaciers, the largest by far which ever existed on our earth, disintegrated the rocks, and washed down upon the foot-hills their constituents, varying according to the nature of the rocks, and varying also in the fineness of their comminution, in proportion as they were for a longer or shorter time ground by the slow but irresistible motion of the glaciers. The same causes produced similar effects, in the early periods, on both the eastern and western slopes of the Sierra Nevada and the Rocky Mountains. The great but now elevated valley between those two mountain chains, as well as the greater part of the plains east of the Rocky Mountains, were for ages the bed of immense lakes or inland seas, while the southern portion of California and Nevada connecting with the Pacific, through the Tejon pass, which was then another strait of Gibraltar, formed an American Mediterranean, where there is now only a desert. The upheaval of the bottoms of all these salt or fresh lakes, led to their drainage, by the Colorado and its affluents, the Rio Grande, the Arkansas, the Yellowstone, the Missouri and the Snake rivers. Most of these rivers, and pre-eminently the Colorado and its tributaries, cut their way through the soft and disintegrating rocks which formed

their beds, to such a depth as to make their channels deep cañons, sometimes from 3,000 to 6,000 feet below the surface of the plateau, through which they had their course. The plateaux were thus robbed of all their rainfall, and in the course of time, became dry and largely uninhabitable, and what was once a populous region, with its large and strong cities, was changed into an arid and desert land.

In some portions of these elevated plains thus drained of their moisture, the surface of the earth is covered, especially during a long, dry season, with alkaline salts, sulphate of soda and potassa, sulphate of magnesia, common salt, and occasionally biborate of soda, the *borax* of commerce. On these lands, in their natural condition, there grows only the despised sage-brush. In the rare instances where springs are found, the water is apt to be brackish.

Yet these alkaline lands, when broken up by deep plowing and well irrigated, yield most astonishing crops, and continue to do so year after year, while, by cultivation, the rainfall is increased, and the barren land becomes as the garden of Eden.

Where irrigation is impossible, and the amount of alkali is excessive, these lands are yet of some value for grazing, and the white sage-brush, once regarded as the most worthless of all shrubs, is found to yield a nutritious pasturage for cattle, after the frost has touched it.

Farther south, on what is known as the *Llano Estacado* or "staked plain" of Northwestern Texas and New Mexico, that remarkable product of a dry country, the mezquite tree, is found in abundance, and its large and long roots (nine-tenths of its woody fibre being below the surface), its trunk, its leaves, its bark, and its gum are all valuable. Where these lands are broken up and plowed deeply, the roots of the mezquite aid in bringing up the moisture from below, and the rainfall increases from year to year. Eventually all these alkaline lands, or nearly all, will be brought under cultivation, and will prove, either with or without irrigation, some of the most productive and valuable lands of the West.

The soil of "the plains," under which general term is included the territory lying west of the Mississippi, and especially west

of the Missouri river, and extending to the Rocky Mountains, is, with some exceptions, very rich and permanently productive. The region lying between the Mississippi and Missouri rivers is not properly a plain or plateau, for there are considerable ranges of mountains though of no great elevation. In some parts of it, as in Minnesota, Iowa, and Eastern Dakota, the prairies or gradually rising plateaux predominate.

But the "plains" proper include Southern Dakota, below the Black Hills, Nebraska, Kansas, Eastern Colorado, Wyoming Territory, and most of Texas. There are some "Bad Lands," though only a few small tracts in this region; but the greater part of it is an alluvium of extraordinary depth, ranging from five to one hundred and fifty, and in some cases two hundred feet. For ages this region was the bed of vast fresh water lakes, and received from the streams rushing down from the Rocky Mountains, vast quantities of loess, the debris of the decomposed rocks. Gradually it was upheaved, and the bed of the lakes became marshes, their waters being drained off through the Missouri and its affluents, the Platte, the Arkansas and Red rivers, and the Rio Grande. The process of slow upheaval still continuing, these marshes, which had been continually enriched by the silt from the overflow of the rivers, and by the decay of vegetation for thousands of years, became dry land, and land of unexampled fertility. The fires kindled in their grass and forests by roaming Indian tribes, prevented the growth of forest trees, over large tracts of this region, and so diminished the rainfall; while the countless herds of buffalo in their headlong tramps southward, beat the soil down into a solid and impenetrable crust, which permitted the rainfall to run off without soaking the earth. Without breaking up this solid crust, successful cultivation was impossible. With it, the crops were so bountiful as to astonish the most sanguine.

Texas, having a more varied surface, has also a greater variety of soils than any other of the States or Territories, with the possible exception of California. The coast soil is a sandy, grayish loam, well adapted to cotton and rice, and, where darker and richer, the best sugar land in the United States. The river

bottom lands are black, rich and sticky at times, and form the best cotton land in the State. Sometimes small tracts lack either the phosphates, or sulphates, or both; and crops will not grow on them. These are known as "poison soils." A dark, gray soil, in the timber lands, is found excellent for all kinds of fruits; this is sometimes called the mulatto soil. The deep red soils, containing some oxides of iron, are also well adapted to fruit, and to grains generally. The chocolate soils of Western Texas are, perhaps, the finest in the State, producing cotton, corn and semi-tropical fruits. The sandy and dryer soils of the north, even on the lands adjacent to the Staked Plains, yield, with deep plowing, very large crops of wheat. Wheat is also a good crop on the red soil.

There are, of course, barren soils in these States and Territories, though many of those which are so regarded need only irrigation and deep plowing to make them abundantly productive.

The details of the geological structure of this vast region, if they were attainable, would fill many volumes, for we have every form of cosmic and geologic action represented here which has taken place in any part of our globe—among which we may name the tertiary and alluvial and diluvial deposits which have been made on its 2,000 miles and more of coast line during their alternate elevations and depressions; the upheaval of the lofty mountain ridges from the broad and level plains; the effects of former extensive volcanic action, and its remaining, though comparatively enfeebled, activity at various points. Then, too, there are the great phenomena of glacial action, on a scale much vaster than that of any existing glaciers; the huge horse-shoe-shaped moraines, in some cases filling up valleys, in others producing large lakes; the erosions produced from the ice streams of these glaciers, and from the mountain floods, and the broken barriers of some great lakes; the depressions produced by earthquake convulsions, and the exposure of horizontal strata of great thickness of the Cretaceous and Carboniferous formations, where the sharp plough of the glacier had cut its way, or the force of the mountain torrents, of great volume, had worn their deep cañons through them.

The grand outlines of its geologic structure which we have thus formulated show conclusively that, if the science of geology had had its birth in this great empire of the West instead of the comparatively limited formations of Western Europe, we should have had a system, which would have required fewer additions and accommodations, to fit it to represent the geological structure of all the continents, and many of the questions, which even now vex the souls of scientists, would have received their final solution.

Considerable portions of this vast region have never been explored geologically, except by a very superficial reconnoissance at distant points; among these are Texas and most of California, Washington Territory and much of Utah, Nevada, Arizona and New Mexico. The first three seem to have geological features peculiar to themselves, to which we may allude more fully when speaking of them individually. The geological structure of the more central States and Territories, and the effects of glacial action upon them, are very admirably summarized in a recent lecture of Professor Archibald Geikie, the eminent Scottish geologist, who visited them in 1879, portions of which we quote:

"He had," he said, "three objects in the expedition—(1) To study the effects of atmospheric agencies and of erosion generally upon the surface of the land; and there was no region where those lessons could be learned with more powerful impressiveness than in those great plateaux and table-lands. (2) To study the relation which the structure of the rocks underneath bore to the form of the surface. In this country and in Europe generally one was continually brought face to face with evidence of dislocations, profusion of igneous rocks, faults and so on, which greatly complicated the geological structure, and made it sometimes by no means easy to tell how far the present irregularities of the surface were due to unequal waste of surface, and how far to the direct effects of underground causes. The western regions of America which retained to this day for thousands of square miles the horizontality which they had originally, presented wonderful facilities for the discussion of this subject. (3) To watch with his own eyes some of the

last phases of volcanic action. He had been familiar with these as displayed in Italy and in the Lipari Isles; but he was anxious to see some of those marvellous evidences of the gradual wearing and decay of a vast volcanic area which were so well seen in the famous region of the Yellowstone."

The Professor went on to give a brief account of his journey, mentioning that in crossing the prairies toward the Rocky Mountains he noted, in the few sections that occurred, soft, gray clays and marls, evidently cretaceous, and sometimes tertiary rocks. Getting down at some of the stations, and looking at the ant-hills and burrows of the prairie-dog, he found that the surface of the prairie was veneered with a thin coating of pinkish, fine-grained sand, sometimes approaching to gravel, its color being due to the presence of a great many small pieces of fresh felspar. It was clear that this mineral, as well as the quartz and fragments of topaz which he saw, did not belong to the strata in which they lay. In going west the grains of sand began to get coarser, and assume the form of distinct pebbles, till, when he reached the mountains, these became huge blocks and boulders, evidently derived from the hills in their neighborhood. After submitting that the phrase "Rocky Mountains" was a very unfortunate one, as applied to the great number of independent ridges comparable to waves, that covered this part of America, the Professor said that he halted for a little while on the flanks of the first great mountain ranges—those that formed the colossal bulwarks of Colorado. As seen from the prairies, they form a very picturesque line of peaks. They had been pushed as a great wedge through the rocks forming the prairies, and had carried those rocks up with them. Crystalline masses formed the central core and crest of the range, and this feature was combined with some very interesting facts connected with the surface erosion of the district. He found then where all the pink felspar and gravel had come from; it had been borne down from this region, where great masses of pink granite, gray gneiss and other crystalline rocks formed the core of the mountains. He found that the mountains themselves had been covered with glaciers, which had gone out into the plains and shed their huge

horseshoe-shaped moraines, where now everything was parched and barren. Having crossed the watershed of the Rocky Mountains, he struck westward into the Uintah, one of the few ranges in that region that had an east and west direction. The central portion of this range consisted, not of crystalline rocks wedged through the older rocks, but of carboniferous rocks that had been upraised as a great flat dome, and had been above water for a very long time. This carboniferous centre was particularly interesting from the fact of its presenting the strata perfectly horizontal. They could be seen, terrace after terrace, for miles, and it could be noted whether or not they had been cut through, by faults, to what extent they had been twisted, and to what extent eroded by atmospheric influences. Getting on the tops of these great mountains, he could see that the strata were almost entirely horizontal for miles, and that the valleys had been trenched out of them, not by means of faults at all, but actually by erosion of the surface. He found also that the numerous lakes were true remains of erosion, that they had not been formed by any subterranean movements, but actually gouged out by the ice that once covered those mountains. Striking into one of the valleys, he found beautiful horseshoe moraines. These had gone across the valley and formed a succession of lakes; while the beavers had made a great many more lakes in places not reached by the moraines. In most of those valleys there were hundreds of acres of bog-land, entirely due to the damming of the waters by the beavers. The plains in the neighborhood of the Uintah Mountains, were called "Bad Lands," because they were crumbling down under the action of the weather, and nothing would grow upon them. A skeleton found in a hill of that district was brought to Professor Marsh, and turned out to be the bones of an extinct and undescribed reptile.

From the Uintah Mountains Professor Geikie found his way north into the Yellowstone country, and examined the fading traces of volcanic action. The volcanoes seemed in that region to have confined themselves very much to the valleys. The heights on either hand consisted of crystalline rocks; the bottom of the valley had been literally deluged with sheets of lava.

These were examined with considerable care. In the course of the examination, huge mounds of gravel and stones were met with, which, at the first glance, were evidently moraines. The first was marked by a huge block of rock, an erratic of coarse granite different from the rocks round about. Such blocks he found to increase in number as he went up the valley; and on entering the second cañon, or gorge, he found the sides exquisitely glaciated. It was clear, therefore, that not only was this second cañon old; it was older than the glacial period; it supplied a channel for the glacier that ground its way out from those mountains. Endeavoring to estimate the minimum thickness of the ice, he traced striæ up to 1,000 feet, and they evidently went higher than that. But in going farther up the valley, he found that the erratic blocks of granite and gneiss dropped by the glacier as it melted went far above the 1,000-feet limit; he got them on the shoulder of one of the great hills overlooking the valley 1,600 or 1,700 feet above the bottom of the valley; the ice, therefore, must have been 1,600 or 1,700 feet thick. It thus appeared that not only did those mountains possess glaciers, but some of these were of such thickness as to deserve the name of ice-sheets, covering the whole surrounding region. As to the volcanic phenomena of the district, he saw evidence of a long series of eruptions, one after another, separated by prolonged intervals, during which the river was at work cutting out the older lavas, the newer lavas filling up the hollows eroded by the river. In the grand cañon of the Yellowstone, he saw the most marvellous piece of mineral color anywhere to be seen in the world. It was cut out of tufts of lavas, showing sulphur yellow, green, vermilion, crimson, and orange tints, so marvellous that it was impossible to transfer them to paper.

Leaving the Yellowstone Valley, he struck southwestward into the famous geyser regions, where a number of geysers had been made known of late years more wonderful than those of Iceland. He tried hard here to get a pool to wash in, but could find nothing below 212°, and the only chance of getting a bath was to get into some hole where the water had had time to cool after flowing out of the hot crater. The whole ground was

honeycombed with holes, every one of which was filled with gurgling, boiling water. Some went off with wonderful regularity, others were more capricious; and the chief geyser, which threw up an enormous body of water and steam, was very uncertain in its movements. In one part of the district he came upon a marvellous mud spring, the centre of it boiling like a great porridge-pot full of white and very pasty porridge. Steam rose through this, and, after forming great bubbles, burst, the mud thrown out forming a sort of rim round the crater. After describing a meeting with Indians on their way to a great council, the Professor said his road after that lay across what he supposed was one of the most wonderful lava fields in the world —hundreds and thousands of square miles of country—a sort of rough plain—having been absolutely deluged with lava. How this lava was poured out he at present could hardly tell; it seemed to have risen through long fissures, and spread out so as to fill a vast area. Here and there along the margin of it were distinct volcanic mounds, apparently formed during later stages of its volcanic history.

Coming at length to the Salt Lake territory, one of the first geological features that struck him was the evidence of the former vast expansion of the Salt Lake. He found traces of a terrace well marked along the sides of the mountains, about 1,000 feet above the present level, and so succeeded in discovering what was the relation between the extended lake, which must have been a great many times larger than the present one, and 1,000 feet deeper, and the glaciers which at one time covered the Wahsatch and the Yellowstone Mountains. Striking into some of the cañons descending from the Wahsatch into the Salt Lake basin, he found evidence of wonderful glaciation. The rocks were smoothed and polished and striated by the glaciers that had come down from the heights, and these glaciers had carried with them great quantities of moraine matter. Huge mounds of rubbish blocked up the valleys here and there, and these mounds came down to the level of the highest terrace. That was to say, that, when the Salt Lake extended far beyond its present area, and was over 1,000 feet deeper than now, the glaciers from the

Wahsatch Mountains came down to its edge and shed their bergs over its waters. On his return journey the Professor resumed the examination of the prairies. Coming out of the Colorado Mountains, he noted, in connection with the gravel formerly observed, great quantities of a peculiar gray clay. This clay was inter-stratified with the gravel, and here and there contained a small lacustrine, or terrestrial shell. It was, therefore, a fresh-water deposit, a deposit swept by the waters coming down from the mountains over the prairie; and marked an interval in the period during which the gravel and sand were being thrown down. He traced the gravel mounds over an extensive tract, and he found the gravel had been deposited irregularly, just as would have been the case from the action of water escaping from the melting ends of the ice. A great current would traverse the plain in one direction; then the ice mass would send water in another, so that the whole prairie must have been flooded with water derived from the melting ends of the vast sheets of ice. It was those excessive floods that brought down the gravel and sand; and during that time there were intervals when nothing but the finest mud was coming down, just as was seen in the valleys of the Rhine and Danube.

It seems to be demonstrated by the discoveries of the past few years that no equal portion of the earth's surface contains so large an amount of available mineral wealth as this Western Empire. In only three of the twenty States and Territories which are comprised within it, viz., Louisiana, Kansas, and Nebraska, has there been wanting gold or silver ores, and it is as yet uncertain whether two of these may not yield silver in paying quantities. All the others contain both metals, usually in large quantities, and some of them have, in addition, large mines of quicksilver, and smaller but profitable ones of platinum. The so-called baser but really more useful metals, copper, zinc, lead, and iron, are found in every known form and in the greatest profusion. *Lead* is the most usual basis or matrix of the silver mines, either in the form of galena, or of carbonate, and sometimes of carburet, etc.; but *copper* and *zinc* are not unfrequently found in combination with both gold and silver,

Both copper and zinc are also found, uncombined with either gold or silver, and of such purity as to be profitably mined in many localities.

Iron ores are found abundantly in every State and Territory, and every known ore is found in some districts, and frequently several different ores, as the magnetic, the hæmatite, or the specular ores, in close proximity to each other, and all in the immediate vicinity of coal beds. The railroad iron and steel of the future will be made from native ores in close neighborhood to the tracks where it is needed. But it is not alone for railroad iron or steel rails, that these vast iron deposits can be utilized. The iron of Utah, of California, of Montana, of Colorado, Texas, Missouri and Arizona is not surpassed by any in the world; and when the time shall come, if it ever does, when the long conflict between heavy guns and armored ships shall be decided, our furnaces in this Western Empire will furnish the iron and our foundries the iron and steel plates or the guns which are to shatter them, of a quality which has never been equalled. For all building purposes, and for suspension bridges, for hardware, cutlery, tubing, gas, water, and sewer pipes; for stoves, ranges, furnaces, and heaters, and every other use, to which the best qualities of iron and steel are capable of being applied, the iron ores of the Great West will be found sufficient to supply the needs of a world.

Nickel, now coming so rapidly into use for so many purposes, is an incidental product of many of the iron mines, and can be largely produced. As yet we are importing all or nearly all the *tin* we use, but the tin deposits in California, and in several of the other States and Territories, when once developed by capital and skill, may prove as profitable as those of Cornwall or the Straits of Banca.

Of the rarer metals, which possess but a limited economical value, most are found as abundantly in the Great West as anywhere. Osmium and iridium, two of the hardest of known metals, used in the gold-pen manufacture, as well as in other cases where hard and infusible points are required, are found only on the Pacific coast; many of the exceedingly rare metals

known only to chemists, are obtained from earths or mineral waters found here, while arsenic, antimony, bismuth, cerium, etc., etc., are found in connection with the ores of other metals.

The elementary bases of the mineral earths and salts are more easily separated here than elsewhere; and the mineral springs and volcanic geysers and fountains of the Yellowstone, of many places in California and Nevada, of Colorado, Arizona and Texas, yield not only all the salts of soda, potassa and lime, but their elementary bases also. Borax (biborate of soda) is found as a crust over shallow lakes in California and Nevada; carbonate of soda, very pure in the so-called alkaline lands; nitrates of soda and potassa, in commercial quantities, at various points; sulphate of lime (the commercial plaster of Paris) comes to light not only in its ordinary condition of gypsum, of great value as a fertilizer, but in its rarer and more beautiful forms of selenite, alabaster, etc. Salt is found in every shape, from the rock-salt, hewn out in great cubical blocks, to the brine springs of varying density, and the salt basins around the Great Salt Lake and along the shores and bays of the Pacific. The manufacture of salt on a large scale is one of the most profitable enterprises which could be undertaken. The market is unlimited, and the prices would be remunerative. Most of the mineral salts and acids might be manufactured also on the large scale at many points.

Asphaltum and petroleum are found in large quantities in California, Utah, Wyoming and in the volcanic region around the headwaters of the Yellowstone; and both are likely to be extensively utilized in the near future. Coal occurs abundantly and of all qualities at numerous points in this region. Lignite (the coal formation of the tertiary) is mined in Kansas, Colorado, Wyoming, and perhaps farther west. It is of very good quality, and is used on the railroad locomotives, in manufactories and dwellings to some extent. There is also a bituminous coal of very good quality, but not a coking coal, in Kansas, Wyoming (where the coal-beds are very extensive), in Colorado, and in Utah and New Mexico. The coal-beds in Utah, New Mexico and Arizona are extensive, and of extraordinary thickness. The

coal is of excellent quality, and some of it anthracite and semi-anthracite. There are extensive coal-beds also on the Pacific coast, and those of Washington Territory, and the islands off the coast, are anthracite of the very best quality. Coal is also found, and of good quality, in Texas and Arkansas, but the reliance for fuel there is yet mostly on wood. Marls and peats are found in many of the States and Territories, and, like the gypsum, may yet come into demand for replacing some of the elements of vegetation, which have been drawn from the rich soil by the too frequent sowing of the same crop. At present, however, the soil seems absolutely inexhaustible, and with a proper rotation of crops and constant deep ploughing it probably is so.

There are found in the Rocky Mountains, the Sierra Nevada, the Cascade Mountains, the Coast Range, and the numerous cross ranges and lateral spurs—such as the Uintah, the Wahsatch, the Bitter Root, Wind river, Sweet Water or Laramie ranges, and at the entrance or exit of the cañons of the Colorado, building-stones of the greatest variety, granite, sienite, marbles of all hues and qualities, limestones, slates and sandstones of every shade. Many of the marbles are very beautiful and exquisitely veined; others of the purest and most brilliant white, suitable for statuary and ornamental purposes.

In the Yellowstone Lake region, in the vicinity of the Great Salt Lake, and in the sides of the cañons of the Yellowstone, Snake, Columbia, Colorado, and other large rivers, the stratified clays exhibit such an infinity of shades of the most brilliant colors as to baffle the skill of the most accomplished artist, and throw him into the depths of despair at his inability to reproduce them.

What are known as the "Bad Lands" in Dakota, Nebraska, Wyoming, and Montana abound in fossils, and recent explorations show that there are deposited here in the successive strata, eroded by water and ice, the material from which can be traced the history of families of animals in their various stages of advance or degradation, to a greater extent than in any other explored region of the earth's surface. Vastly greater discoveries undoubtedly remain to be made, and it is perhaps safe to

predict, that these wild and utterly desolate lands will yet yield, to the scientific explorer, a complete history of the mammals and reptiles which lived on the earth in the carboniferous and cretaceous periods.

In that class of minerals known as precious stones there is hardly anything lacking except the diamond, and it is certainly within the bounds of possibility that even that may yet be found. What are known as California diamonds, though possessing many characteristics of the true gem, are probably only very fine specimens of crystals of quartz or silica. But the other valuable gems, as emeralds, probably also rubies and topazes, precious beryls, chrysolite, amethyst, gold-stones, tourmalines, jades, the beautiful copper ore known as malachite, agates and carnelians of great beauty, jet, etc., etc., are sufficiently plentiful, in one part of the country or another.

Porcelain clays, ochres, barytes, and other minerals and earths of economic use are found in most of the States and Territories. Mineral springs, and waters of every variety and every degree of temperature, from boiling to freezing, are found everywhere in the mountains, and not a few in the plains. Colorado, Montana, Idaho, Wyoming, Utah, California, Arizona, Texas and Arkansas abound in these healing waters. In Colorado there are hundreds of them already claiming patronage, each with some peculiar merit. In the Yellowstone Park and its vicinity most of the springs are too hot for bathing; but when partially cooled, possess remarkable hygienic virtues.

CHAPTER IX.

CLIMATES—VARIETY OF CLIMATE—CAUSES—RAINFALL—COMPARISON OF DIFFERENT SECTIONS—CAUSES OF DEFICIENT RAINFALL—WINDS—CHARACTER AND EFFECT OF DIFFERENT WINDS—THE HOT WINDS FROM MEXICO.

IN a region extending 1,700 miles from north to south, and 1,800 from east to west, there would be a considerable range of climatic conditions, even if the whole tract were nearly a dead

level; but when two-thirds or three-fourths of it is traversed by mountain chains, many of whose summits have an elevation of 13,000 to 14,000 feet, and the average height of its plateaux and valleys ranges from 4,000 to 8.500 feet; when on the more northern summits, snow lies throughout the year; and when the temperature of at least the western half is modified by the breezes and moisture from the Pacific, by the influences of the Pacific gulf stream, and by the climatic law that the Western coast of a continent has always a milder and higher temperature than the East coast; when, also, the temperature of the Southwest is elevated by the hot and dry winds which come from tropical Mexico; and the cyclones formed in the Caribbean sea and the Mexican gulf contribute their share to the disturbance of atmospheric conditions, there would seem to be causes enough to account for the extraordinary diversities of climate which prevail in this Western Empire.

The climate on the northwestern coast in Washington Territory and Oregon is temperate, and the range comparatively small. The mercury seldom rises above 90° F., in many seasons not reaching that figure, and rarely falls below 10° or 12°. In some seasons the lowest point reached is 18° or 20°. The average annual range is from 70° to 80°. The range on the California coast, at Los Angeles, San Diego, etc., is still smaller, in some years not exceeding 55° or 60°. In San Francisco the range is not over 50° or 53°—between 39° and 90° or 92°. These equable climates are very favorable to the health of invalids, especially to such as are suffering from pulmonary diseases. East of the Coast range, and in a still greater degree, east of the Cascades or Sierra Nevada and the Rocky Mountains, we find greater extremes of cold, and in some instances of heat also. The plains of Eastern Washington and Oregon have extreme heat in summer, rising sometimes to or above 100° F., and cold equally extreme in winter, falling to —30° or even lower in winter, making the annual range not less than 130° F. But probably Pembina, in Dakota, just on the British line, 49° north latitude, is the coldest inhabited place in all this Western Empire, and as the summer heat is intense, though for a brief period only, its

annual range is the greatest. The spirit thermometer often marks —50° in the winter, and in the winter of 1879–80 it is reported to have fallen to —60°. As it attains 94° in the summer, this gives a range of 154°. The remainder of Dakota and Minnesota is not subject to such extreme changes, though the valley of the Red river of the North seems to be the gateway through which the biting cold from the Arctic regions finds its way southward. The interior valleys of California are much hotter in summer than the coast, and the winter temperature is somewhat lower. Their range is from 76° to 83°. In portions of New Mexico the climate is more equable, the mercury rarely rising in Santa Fé above 90°, though for one or two days in December it may drop to zero. But the hottest portions of this whole region are unquestionably Southern Arizona and Southern Texas. At Yuma, Maricopa Wells, Tucson, Phœnix, Wickenberg and other towns of Southern Arizona, and at Rio Grande City, Laredo, Corsicana and other towns of Southern Texas (Galveston excepted, in consequence of its island climate), the summer heat during June, July, August and September reaches 117°, and occasionally even more, and rises above 100° usually for three-fourths of the days of those months. Some years ago a company of soldiers were stationed at a fort in one of the interior valleys of California. The weather was fearfully hot, the mercury at over 110° in the shade, and the men were grumbling as only soldiers can grumble at the heat. After a time one old soldier, bronzed by the tropical heats, said: "Boys, stop grumbling; this weather is not to be compared with what we had at Fort Yuma." "Were you ever at Fort Yuma?" asked the soldiers. "Yes, I was there three years," said the veteran. "Well, how hot was it there? How high did the thermometer get?" "I don't know anything about your thermometers," answered the soldier; "but I can tell you this: when I had been there about two years, two of our fellows died, and they were pretty hard fellows, too. Well, the second night after they died they came back after their blankets, and they hadn't wanted them once in all the while they had been in Yuma."

In the region known as the plains, which embraces the greater

part of Minnesota, Iowa, Western Missouri, Nebraska, Kansas, Southeastern Dakota, Eastern Wyoming and Eastern Colorado, part of Arkansas and the Indian Territory, and Northern Texas, the climate is generally warm in summer, though the heat is not intense. The spring opens earlier as we proceed southward, and the autumn is later. There are strong winds and sometimes cyclones, but, except in Minnesota and Iowa, the snow does not cover the ground for any long period, and cattle and sheep require little or no shelter or winter feeding. Prudent herdsmen and sheep-masters make provision for fifty or sixty days shelter of their herds or flocks, and for feeding them during that time; but in at least two seasons out of three, the food and shelter are not needed, or for a few days only. This does not apply to the two States named above, where the winter generally lasts for at least four or five months. There is, moreover, a very considerable difference in the climate of these plains, resulting from their increasing elevation as we proceed westward. Though they are called plains and prairies, they are really plateaux, rising gradually from the Mississippi or Missouri river to the eastern slope of the Rocky Mountains. Their elevation on the eastern border of the plateau is from 600 to 800 feet above the sea. At the western boundary of Kansas and Nebraska it is over 5,000 feet above the sea, and at the foothills of the Rocky Mountains in Eastern Colorado between 6,000 and 7,000 feet. Indeed, so gradual is the ascent, and so nearly of the same height with the passes in the Rocky Mountains (that over which the Union Pacific crosses being only about 8,700 feet above the sea) that passengers on that road often inquire, when they will begin to ascend the Rocky Mountains, after they have crossed this pass, or, as the western people say, "the divide." On these more elevated lands the sun may be hot at mid-day in summer, but the nights, and evening, and morning, are always cool and refreshing. The annual range of the thermometer is only from fifty-five to sixty degrees, and cattle, and sheep, except, perhaps, once in eight or ten years, can browse throughout the entire winter without shelter. The absence of trees in the western portion of this plateau also modifies this climate to some extent, making the summer's heat more

intense, and the cold, wintry winds more searching, and far-reaching in their effect. The changes now going on, all along this region, as the result of breaking up the hard beaten soil, and planting trees in great numbers, will not be without their effect in modifying the temperature; and by the interposition of masses of timber, breaking the fury of the winds.

There can be no doubt that, apart from such diseases as may be induced or aggravated by a rarefied atmosphere, this elevated region is more healthful than any other on our continent. There are enough who die from natural or unnatural causes, but the dry, pure, invigorating atmosphere of the Rocky Mountain plateaux is eminently conducive to health, especially to those who are suffering from pulmonary diseases. Still to reap the full benefit of this climate, the health-seeker must stay there. A return to the East after one, or two, or even four years almost inevitably brings back the disease, and causes it to prove fatal.

We have elsewhere discussed the rainfall of most portions of this vast Western Empire. It is even more varied in quantity, in different districts, than is the climate in temperature. The Northwest coast, in Washington, Oregon, and the extreme northern portion of California, have, at some points, a more copious rainfall than any other portion of the United States, though nearly approached by some points on the Atlantic coast. In two or three places in the States and Territory named, the annual precipitation ranges from 123 to 135 inches, and once or twice has exceeded even the latter figure: ten or eleven feet of rainfall. At San Diego on the same coast, but nearly 1,000 miles farther south, the rainfall in 1876–77 was but 3.80 inches; and at Fort Yuma, near the mouth of the Colorado, in 1877–78, but 2.00 inches. These are the extremes. On the Gulf coast in Texas, the precipitation is large, ranging from fifty-four to sixty-seven inches. In the interior the amount varies with the longitude. From the Mississippi river to about the 97th degree of west longitude it ranges from forty-five inches to twenty-eight inches, diminishing as we proceed westward. From this meridian to about 117, it ranges from twenty-five inches to twelve inches, or perhaps 11.5 in some seasons. Farther west it rises to thirty-three inches, and

between the Cascades and the Rocky Mountains attains at some points to forty-two inches. Of course there are variations from north to south as well as from east to west; variations produced also by the presence or absence of extensive forests, by the compactness of the soil, owing to its having been for hundreds of years trodden under the hoofs of millions of bisons, or its porousness from thorough cultivation. The electrical condition of the atmosphere has also much to do with the amount of precipitation. In general it may be said that fully two-thirds of the arable lands of the Great West have a sufficient amount of precipitation to raise any desired crops, with deep plowing, and the other third, while requiring moderate and in some cases very thorough irrigation to produce the largest crops, are so situated as to be able at moderate expense to obtain all the water needed for this purpose, and under its influence yield such abundant crops as to pay, in one or at the utmost two years, the cost of the ditches. Indeed the proprietors of the irrigated lands look down with a half-contemptuous pity upon the poor farmers who are dependent upon the rainfall alone for their crops. "Poor fellows," they say, "when they sow their grain or plant their crops, they can never tell what will befall them: they may have too much rain, and their crops will be drowned out, or rot in the earth, or they may not have enough, and their fields will be burned by the fiery breath of the sun; they can never tell whether they can raise a crop or not. With us, now, the whole matter can be determined with mathematical exactness. We know just how much water is needed to bring the land to its highest productiveness, and we give it just that much and no more. If we have rains we irrigate less; if the season is dry, we turn on more water, and we have a good crop every year." As the vacillating judge said: "There is a good deal to be said on both sides of this question."

We have already alluded to the high winds which prevail over some portions of this vast region; but the investigations of the Signal Service officers have in a great degree systematized our knowledge on this subject. On the Pacific coast, and as far eastward as the summit of the Sierra Nevada or Cascade Mountains, and possibly for a part of the distance, where they obtain access

through transverse valleys to the western slope of the Rocky Mountains, the west winds from the Pacific Ocean, laden with moisture, sweep across the mountains and valleys, depositing much of their water as snow upon the mountains. These are cool but not cold winds. From Hudson's Bay and the ice-clad waters of the north comes down, especially in winter, a cold, piercing wind, through the broad valley of the Red river of the North, producing intense cold and often snows on the plains, and spending much of its fury on the Mississippi valley and States farther east. This is perhaps the source of the Texas Northers, though the severity of the cold has been much diminished before it reaches the Gulf coast. East winds are not prevalent in any part of this region, and when they do occur have no special character or significance. A south wind from the Gulf of Mexico is much more frequent, and is generally a moist and grateful wind; sometimes in the summer it may bring with it electrical phenomena, and be the herald of destructive cyclones. The southwest wind which sweeps across Arizona, Western Texas, New Mexico, and Southern Utah, and Nevada, affecting also at times Western Colorado and Wyoming, is from Mexico, and has been heated in its passage across the semi-tropical lands of Mexico and Central America till it blows a hot blast over these lands which intensifies the summer's heat, though it may make the autumn and winter milder. As the country becomes settled and cultivated, this hot wind will lose something of its intensity, and become rather an agreeable adjuvant in mitigating the cold of the wintry months.

CHAPTER X.

THE VARIOUS PROCESSES OF MINING—PLACER MINING—GOLD DISCOVERY IN CALIFORNIA—THE PAN—THE ROCKER—THE DITCH AND THE "TOM"—THE SLUICE—HYDRAULIC MINING—HYDRAULIC MINING NOT ÆSTHETIC—LODE OR QUARTZ MINING—TRUE FISSURE VEINS—THE "COUNTRY" ROCK—CHIMNEYS, CHIMES, OR BONANZAS—POCKETS—CONTACT LODES—GOLD COMBINED WITH SULPHURETS—STOPING—DEPTH OF MINES—THE REDUCTION OF PYRITOUS ORES—GOLD WITH OXIDE OF IRON—COST OF REDUCTION OF GOLD—DISCOVERIES OF SILVER ORES—SILVER WIDELY DIFFUSED—MODES OF REDUCTION—THE BEST MINING REGIONS—PLACER MINING: THE BEST LOCATIONS—DIFFICULTIES OF PLACER MINING—DIFFICULTIES OF LODE OR VEIN MINING—THE BEST MINES BOUGHT UP BY CAPITALISTS—THE BEST LOCATIONS FOR EXPERTS.

WE confine our attention for the present to mining for gold and silver, including, however, the ores of lead and copper and perhaps iron, with which they are found combined or commingled. Gold mining is of two kinds, and each kind has its several processes. These two kinds are *Placer* mining, and *Lode* mining. Silver is always found only in lodes, but these are of various forms or combinations. Placers are deposits of gold nearly in a pure state, which at some time, remote or recent, have been washed out of the veins or lodes into which they were injected by some convulsion of nature, by the long continued action of running water, and deposited with gravel or clay on the bed rock of the stream which bore them down its current. The beds of most of the streams flowing from the mountains, especially if they have cut deep channels in the rocks in any portion of their course, were found to contain these placers, of greater or less value; but the placers which are found in the beds of ancient streams, which by upheaval or change of course have ceased to flow, and are perhaps now many hundred feet below the surface, are usually more productive than those of more recent origin. The placer gold is free gold; that is, it is uncombined with any other mineral, and may exist as a powder, as scales, or as little pellets or nuggets of considerable size. In California, as everywhere else, it was the first gold discovered, and *there*, by accident.

The story of this discovery has been often related; but the statement made by the late Hon. J. Ross Browne in 1867, when he was United States Mining Commissioner, is believed to be the only one which gives the facts as they were. Mr. Browne says:

"It was on the 19th day of January, 1848, ten days before the treaty of Guadalupe-Hidalgo was signed, and three months before the ratified copies were exchanged, that James W. Marshall, while engaged in digging a race for a saw-mill at Coloma, about thirty-five miles eastward from Sutter's Fort, found some pieces of yellow metal, which he and the half-dozen men working with him at the mill supposed to be gold. He felt confident that he had made a discovery of great importance, but he knew nothing of either chemistry or gold mining, so he could not prove the nature of the metal or tell how to obtain it in paying quantities. Every morning he went down to the race to look for the bits of the metal; but the other men at the mill thought Marshall was very wild in his ideas, and they continued their labors in building the mill, and in sowing wheat, and planting vegetables. The swift current of the mill-race washed away a considerable body of earthy matter, leaving the coarse particles of gold behind, so Marshall's collection of specimens continued to accumulate, and his associates began to think there might be something in his gold mine after all. About the middle of February, a Mr. Bennett, one of the party employed at the mill, went to San Francisco for the purpose of learning whether this metal was precious, and there he was introduced to Isaac Humphrey, who had washed for gold in Georgia. The experienced miner saw at a glance that he had the true stuff before him, and after a few inquiries he was satisfied that the diggings must be rich. He made immediate preparation to go to the mill, and tried to persuade some of his friends to go with him, but they thought it would be only a waste of time and money, so he went with Bennett for his sole companion.

"He arrived at Coloma on the 7th of March, and found the work at the mill going on as if no gold existed in the neighborhood. The next day he took a pan and spade and washed some of the dirt from the bottom of the mill-race in places where

Marshall had found his specimens, and in a few hours Humphrey declared that these mines were far richer than any in Georgia.

"He now made a rocker, and went to work washing gold industriously, and every day yielded him an ounce or two of metal. The men at the mill made rockers for themselves, and all were soon busy in search of the yellow metal.

"Everything else was abandoned; the rumor of the discovery spread slowly. In the middle of March, Pearson B. Reading, the owner of a large ranch at the head of the Sacramento valley, happened to visit Sutter's Fort, and hearing of the mining at Coloma, he went thither to see it. He said that if similarity of formation could be taken as proof, there must be gold mines near his ranch, so after observing the method of washing, he posted off, and in a few weeks he was at work on the bars of Clear creek, nearly two hundred miles northwestward from Coloma. A few days after Reading had left, John Bidwell, since representative of the northern district of the State in the lower house of Congress, came to Coloma, and the result of his visit was that in less than a month he had a party of Indians from his ranch washing gold on the bars of Feather river, seventy-five miles northwestward from Coloma. Thus the mines were opened at far distant points."

On the 29th of May, 1848, the only paper published in San Francisco said: "The whole country, from San Francisco to Los Angeles, and from the sea-shore to the base of the Sierra Nevada, resounds with the sordid cry of *gold! gold! gold!* while the field is left half planted, the house half built, and everything neglected but the manufacture of picks and shovels, and the means of transportation to the spot where one man obtained $128 worth of the real stuff in one day's washing; and the average for all concerned is $20 per diem."

"The towns and farms were deserted, or left to the care of women and children, while rancheros, wood-choppers, mechanics, vaqueros, and soldiers and sailors, who had deserted or obtained leave of absence, devoted all their energies to washing the auriferous gravel of the Sacramento basin. Never satisfied, however much they might be making, they were continually

looking for new placers which might yield them twice or thrice as much as they had made before. Thus the area of their labors gradually extended, and at the end of 1848 miners were at work in every large stream on the western slope of the Sierra Nevada, from the Feather to the Tuolumne river, a distance of 150 miles, and also at Reading's diggings, in the northwestern corner of the Sacramento valley."

For the first two years the miners who made these discoveries depended for their profits mainly on the pan and the rocker. The placer miner's pan was made of sheet-iron or tinned iron, with a flat bottom about a foot in diameter, and sides six inches high, inclining outwards at an angle of forty or fifty degrees. The gold was found, as it usually is, in a tough clay which enveloped gravel and large pebbles as well as sand. This clay must be thoroughly dissolved or reduced to the condition of fluid mud; and so the miner filled his pan with it, went to the bank of the river or stream, squatted down there, put his pan under water, and shook it horizontally, so as to get the mass thoroughly soaked; then picked out the larger stones with one hand and mashed up the largest and toughest lumps of clay, and again shook his pan under water, and when all the dirt seemed to be dissolved so that the gold could be carried to the bottom by its weight, he tilted up the pan a little to let the thin mud and light sand run out, repeating this process till all was washed out except the metal which remained at the bottom.

After a time this process was found too slow, and the rocker took its place. This was constructed somewhat like a child's cradle, but the upper end was considerably higher than the lower, and contained a large riddle or colander of sheet-iron punched with holes on the bottom; underneath the floor of the rocker was provided with cleats or riffles, extending nearly across, to catch the gold. The miner filled his riddle with pay-dirt and rocked the rocker with one hand while he poured water upon the dirt and riddle with the other. The water and the motion dissolved the clay and carried it down to the floor of the rocker, where the cleats caught the gold, while the mud and water ran off. The riddle could be taken off to throw out the larger stones.

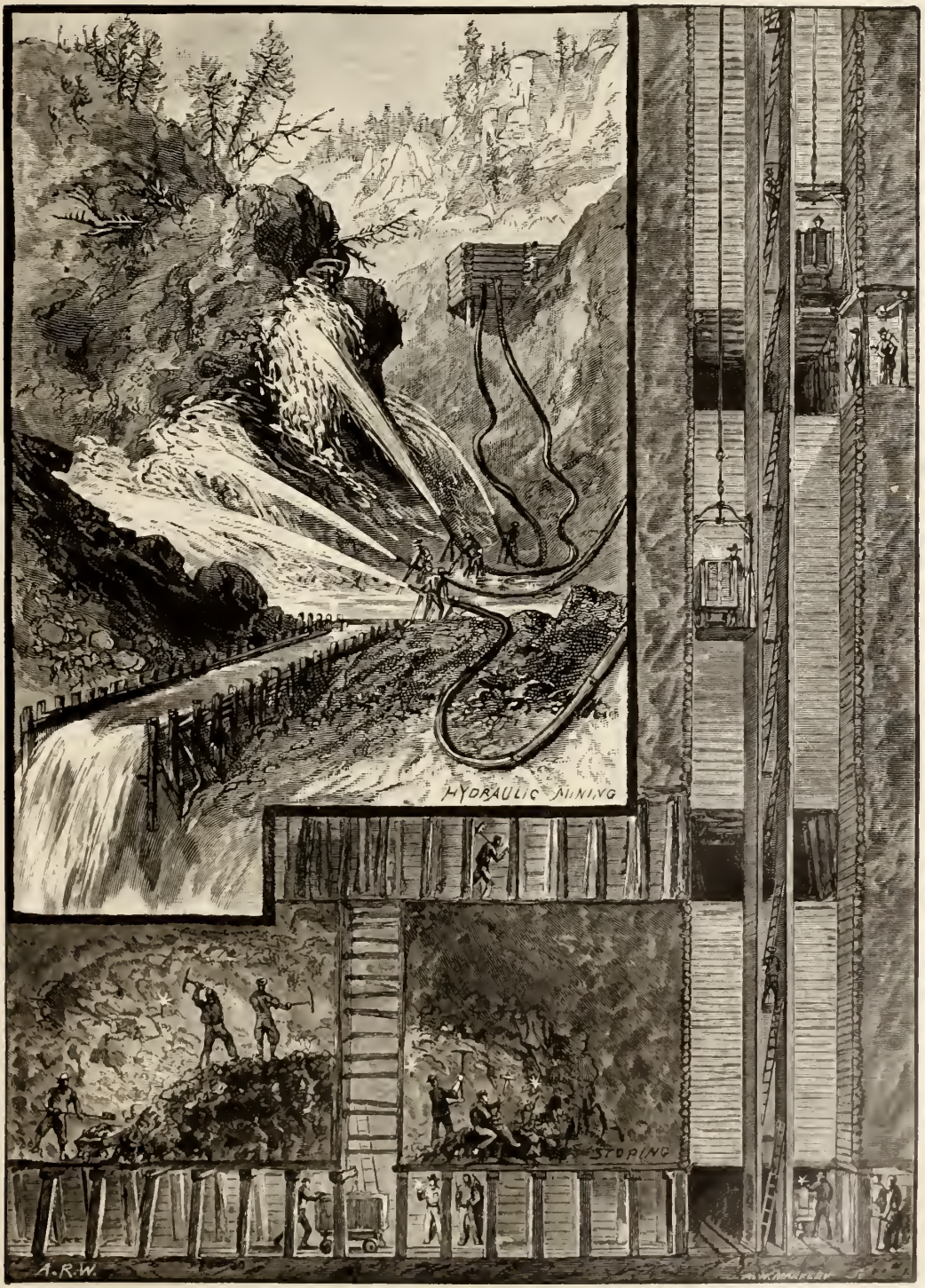
Soon the rocker was abandoned because it could not work fast enough, and ditches were dug and flumes constructed to bring the water from a sufficient height to do the washing-out of the clay and gravel without so much manual labor and with more abundant production; some of these flumes were very large and many miles in extent, and erected at an immense cost. With the ditches came in first the "Tom," which had previously been used in Georgia: a trough twelve feet long, eight inches deep, fifteen inches wide at the head and thirty at the foot; a riddle of sheet-iron, punched with holes half an inch in diameter, formed the bottom of the "Tom" at the lower end, so placed that all the water and the mud should fall through the holes of the riddle, and none pass over the sides or end. The water fell into a flat box with cleats on the bottom, giving passage at alternate ends to the mud and water, while the gold was caught on the cleats or riffles. A stream of water ran constantly through the "Tom," into the head of which the pay-dirt was thrown by several men, while one threw out the stones too large to pass the riddle and threw back to the head the lumps of clay which had reached the foot without being dissolved.

The "Tom" was succeeded by "the Sluice," a board-trough from a hundred to five thousand feet long, having a descent of one foot in twenty, and with riffles at the lower end to catch the gold. Twenty men or more could throw in the pay-dirt at the upper end, and the water in its long and rapid course would tear the lumps to pieces, and before reaching the end deposit the gold on the riffles, from which it is taken four or five times a day. Where the gold was in fine powder or scales, quicksilver was placed on the riffles to form an instantaneous amalgam, and thus very much of the gold was saved. This sluice was unquestionably the most efficient and successful of all the contrivances in aid of placer-mining; but there was now a new difficulty, or a series of them, to be overcome. The placers in the river and creek-beds and near the surface of gravel-beds, were beginning to give out; in many places, too, these placer-deposits had been traced up to the lodes or veins in the rocks which had been worn down by the water of the stream, and which had thus fur-

nished the placer-deposits. It was discovered, also, that there were, in many places, extensive deposits of gold-bearing gravel, hills of considerable height and length, which had, untold ages before, been the beds of rivers, but had been upheaved, and were now rich placers, if they could be broken down and the pay-dirt run through the sluices. To do this by hand labor was too costly and wearisome. Even now, in the best sluices connected with good ditches, the labor of twenty-five or thirty men in a fair placer-deposit, was not sufficient to supply the sluice with pay-dirt, and much of the costly water ran to waste.

The remedy for these difficulties was found in "hydraulic mining." The sluice was enlarged, and its upper portion expanded so as to take in a width of perhaps a hundred feet of the adjacent hill, which had previously been found to contain gold; water was supplied to it from a ditch usually with a considerable head, and standing at a convenient distance, say 200 feet or more, from the face of the hill, a strong miner directed upon it a stream of water from a hose-pipe or nozzle having a diameter of three to six inches, and a head of two or three hundred feet. The effect of this continuous stream of water coming with such force must be seen to be appreciated; wherever it struck it tore away earth, gravel and boulders; if the pipe was directed on a point some distance below the surface of the hill, the crust above it soon fell, and one, two or three hundred cubic yards of earth were washed into the sluice in a single day. Bars were placed across the sluice to arrest and turn off the larger stones and boulders, and four or five men could accomplish more and gain larger returns than four or five hundred by the old processes.

This process of washing down the hills has been continued, and is still in progress in many portions of the gold-bearing regions of the Great West. Sometimes the clay which binds together the gold-bearing gravel and sand is too tough and compact to be broken down even by the force of the hydraulic stream; then the miner tunnels the hill at its base and introduces an immense charge of gunpowder, giant-powder, gun-cotton, dynamite or nitro-glycerine, which, when exploded, breaks up the tough clay and renders the hitherto difficult task of the hydraulic pipe easy



A SECTION OF A MINE—HYDRAULIC MINING.

and swift. By this process of hydraulic mining the gold production has been largely maintained at nearly its old standard, and millions of dollars worth of gold bullion have been put upon the market. The ordinary placer mining is nearly at an end, except at some of the newer points. It is still conducted, to some extent, in Arizona, New Mexico, in portions of Wyoming, and in the Black Hills; but hydraulic mining is now practised wherever the ancient deposits of gold in gravel can be found, and water with a sufficient head can be obtained.

Hydraulic, or even sluice mining is not an æsthetic pursuit; the regions where it is practised may be, before the miner's advent, like the garden of the Lord for beauty; but after his work is completed, they bear no resemblance to anything, except the chaos which greeted the eye of the seer at the dawn of the Mosaic record of the rehabilitation of the earth for the use of man,—"without form and void"—"*Tohu e bohu*"—"the line of confusion and the stones of emptiness." It is impossible to conceive of anything more desolate, more utterly forbidding, than a region which has been subjected to this hydraulic mining treatment; boulders of all sizes are scattered over the surface, and around them coarse gravel, incapable of sustaining vegetation; the streams are filled up with a fine clay, and very possibly overflow their banks, producing dreary marshes, and the whole vista is one of extreme desolation and ruin.

We have already spoken of the tracing up of the gold deposits of the placers to the lodes or veins from which they had been washed out; let us now turn to these veins or lodes, and ascertain what were the processes by which the precious metal was extracted from them, or, in other words, how lode, or, as it is often called, quartz mining is conducted.

And, first, of the vein or lode. Where this contains gold (and it is of gold mining we are now speaking), it is almost always a vein of quartz, and usually of the milky opaque kind, scarcely showing any signs of crystallization. It is often found in slate, sometimes in porphyritic rock. The quartz is sometimes very hard, sometimes soft and crumbling; it may show the gold, if that is in particles of considerable size, but where it is in fine grains,

it frequently does not show it at all. The gold is very irregularly distributed in the quartz, some portions being largely charged with it, while again, for long distances, the quartz vein is entirely barren of gold. Sometimes the vein contains rounded pebbles, or, as Eastern men would say, cobble-stones, of large size, of very hard quartz, containing no gold, but bridging or plugging the vein. These are generally surrounded by soft, sometimes crumbling, quartz, which usually contains some gold. They are called by the miners "boulder veins." Sometimes the course of the vein is blocked by a mass of porphyry or hard slate, which completely stops the miner's progress until it is cut through, and it may extend for several feet or yards. This is called by the miners a "horse."

A true fissure vein is one which is formed by the filling up of a crack or fissure in the harder rocks (occasioned by earthquake, upheaval, or in some other way) with conglomerate, quartz and other matters, into which gold, either free or in combination with other metals or minerals, has been injected at intervals, in a fluid state. The width of the vein is the width of the crack or fissure; its length, the length to which the fissure extends within a moderate distance of the surface; its depth may be limited by the depth of the stratum in which it occurs, but more generally extends far lower than any mining excavations can reach. The fissures and the veins are found at all conceivable angles or dips. Rarely they are found nearly horizontal, but this though at first a seeming advantage, is hardly a real one, inasmuch as from the nearly level character of the land adjacent there will be great difficulty eventually in freeing the lower levels of the mine from the water which accumulates. Often the dip of the fissure and the strata adjacent is at an angle of twenty, thirty, forty, or fifty degrees with the surface; sometimes it is even perpendicular; and where the angle is considerable and the vein or lode is first discovered on a hillside or near its summit, a tunnel run at a much lower level, so as to strike the vein, affords the best means of draining it.

Not only does the fissure dip at very various angles, but it may penetrate the harder rocks at any angle varying from the

perpendicular, so that the entire vein may enter the rocks in a slanting direction, and the walls of slate or porphyry which enclose the vein, and are called in miners' parlance "country rock," may slope at an angle of forty-five degrees, or be even nearly horizontal in position, while they have at the same time the downward trend of the rocky stratum to which they belong.

The true fissure vein may have, and the best veins often do have, chimneys, chutes, bonanzas, or branch fissures, generally connecting with the main vein or lode on its upper side, at an angle of from thirty to forty-five degrees, which may be richer in gold than the main vein. These chutes or chimneys often extend downward into the true or main vein, and are thought to determine in part its value. The mining geologists think that they were deposited much as soot is in a chimney, the gold being in a fluid or gaseous condition at the time.

Gold as well as silver is sometimes found in considerable quantities in pockets, or small cavities in the rocks, and these, which are sometimes of moderate extent, may yield a fortune to one or two men; but these pockets are seldom connected with a true fissure vein, and when once exhausted, are not of any value, even as indications of the presence of fissure veins or lodes in the vicinity.

It was supposed previous to 1877, that the experience of centuries in mining for gold and silver had developed all the modes in which the precious metals or their ores, were deposited in the earth, to be brought out for the use of man. The placer mines, and the veins or lodes, the true fissure veins, as they were called, were reckoned the only methods by which, in the processes of nature, large quantities of these metals or ores were deposited. There might be, indeed, pockets and chimneys of nearly pure metal, which, when the miner stumbled upon them, would add greatly to his profits so long as they lasted; but these were only incidents or accidents, not to be taken into account in scientific mining. It was reserved for the opening of mines of silver and gold at Leadville, and subsequently at other points in the San Juan and Gunnison districts, and probably also in Utah, to bring to light two discoveries which are of the greatest importance to

miners and holders of mining property. The first and most obvious one was that silver, and to some extent also gold, in combination with lead, existed in large quantities and very rich ores, in other forms than the argentiferous galena or sulphuret, and that sulphur was not a necessary accompaniment of silver and gold ores, whether in combination with lead, zinc, copper, or iron. The *carbonates* of lead, etc., have proved the most productive of combinations. The second discovery was still more important, and is only just beginning to be understood: it is, *that the deposits of ore need not be in fissure veins, or lodes, in placers, in pockets, or in chimneys;* but that there is another form, perhaps as productive, and certainly more easily worked —that of "*contact lodes*," by which are meant deposits of silver ore, spread with a considerable thickness over the surface of a stratum of rock, and following it in all its sinuosities and its dip over a great extent. Unlike the fissure veins, these are not of great depth, though sometimes they occur in two or three layers with the strata of sandstone or limestone between. These contact lodes generally occur in cavernous limestone or sandstone.

As we have already intimated, gold is found in the lodes, either free—*i. e.*, pure or nearly so, or combined with sulphurets of iron, copper, lead or zinc, in the form of pyrites. Its treatment after it comes from the mine differs somewhat in the two cases. The amount of gold in the quartz is often very small—smaller one hundred feet below the surface than near the surface; but, except in the barren portions of the vein, not diminishing or increasing very greatly in the lowest levels which have been reached (and some of these exceed 3,000 feet, or three-fifths of a mile). Quartz or ore which will assay twenty-three or four dollars per ton, and which yields after being put through the stamp batteries and the amalgamating process eighteen dollars per ton, is regarded as very good. Not over one-fourth of the gold mines exceed this, and very many fall below it, and are yet worked at a moderate profit.

THE MINING AND REDUCING PROCESSES are these: A lode or vein having been traced out which bears evidence of being a true fissure vein, and the claim (1,500 feet in length, and 300 in width,

being the general extent of a single claim) being duly entered, the mine-owner begins operations by sinking a shaft in the line of the vein to ascertain its quality, and, when the shaft is down fifty or a hundred feet, running an adit or level along the course of the vein to ascertain its quality at that depth; sometimes a *winze* is cut,—two adits at different levels cutting across the vein or veins at levels fifty feet apart, and connected with each other at their further extremity by a shaft which does not rise to the surface. Sometimes, if the shaft is on the top or side of a hill, a tunnel is run to it from the base of the hill for the purposes of drainage, ventilation and the more easy transportation of the ore. If on the examination of the quartz, or ore taken from the vein at this depth, the promise of success is good, additional capital is enlisted, and the shaft is constructed to a greater depth, levels or adits run at different levels and of considerable length, rails put down on the levels, steam-hoisting machinery set up at the mouth of the shaft, pumping machinery put in to relieve the mine of the accumulation of water (which is often very hot—as high as 154° F. in some of the Nevada mines), and stoping, either overhand or underhand, commenced, especially if the vein or veins dip at an angle of 40° or 50°. Stoping is the breaking out with a pickaxe the quartz of the vein, and letting it fall on the level ready to be hoisted by the machinery. If the miner stands at his work and brings down the quartz from the vein at the level of his breast or above, it is called "overhand stoping;" if he picks it from about his feet or below and stoops, sits or crouches at his work, and the masses thus broken out fall to the level below, it is "underhand stoping."

This mining, if profitable, may be extended to as great a depth as may be desired, the only checks upon it being, the great expense of the pumping apparatus at considerable depths, and the difficulty of freeing the mine from water; the more than torrid temperature in the deep mines, and the time and expense of hoisting the ores from such great depths. By a tunnel like the Sutro tunnel, the water can be carried off at moderate expense, the heat greatly mitigated by free ventilation, and the ores hoisted and brought to the surface at a much lower cost; but such tunnels are exceedingly expensive.

The ore broken out and hoisted to the surface is now ready for reduction. If the masses are of large size they are at first put through the rock-breaker, which reduces them to the size of a goose-egg; they are next conducted to the stamp-batteries or stamp-mill, where they are fed into the stamping-machine, a cylindrical machine, whose walls are of hardened chilled iron, its floor or mortar of the hardest steel, and a solid mass of chilled iron faced with hard steel, of cylindrical form, descends with a twisting motion upon the quartz, grinding and crushing it to powder—the inner surface of the cylinder is coated generally with quicksilver, and the powdered quartz mingled with water in the stamping-machine, flows out upon amalgamated copper plates, which have a sufficient extent to catch the larger part of the gold particles. The stamping-machine is cleaned out at frequent intervals, and the plates have their coating of amalgam removed, the superfluous quicksilver is squeezed out through buckskin, and the remainder expelled by heat, the sublimed quicksilver being recovered for future use. The gold remains a spongy mass, but is melted and cast in the form of an ingot.

This is the improved process of to-day, the result of twenty-five years of experiment and invention. By this process about seventy-five per cent. of the gold is saved, whereas with the ruder processes of the arastra and the earlier stamp-mills, only from sixteen to forty per cent. of the gold was secured; and the working over of the tailings of the arastras and of the long Toms, and early sluices, by Chinese miners, yielded them a very profitable harvest of gold. A new process has recently been devised, which, bringing galvanic action to bear upon the masses of ore of the size of a goose-egg, reduces them to a state of disintegration, rendering the stamp-mills unnecessary and causing the lumps to crumble upon mere pressure, sets the entire gold in the ore free instantly, and thus dispensing with much costly machinery, at the same time greatly increases the gold production.

If, as was largely the case in Colorado and to some extent in some of the other States and Territories, the gold was combined with the sulphurets, and came from the mine as pyrites, it was, either before or after being put into the rock-breaker, roasted to

expel the sulphur, which prevented amalgamation. This is now done at some mills in the open air, at others in furnaces. When roasted it is reduced to powder under water in the stamp-mills, amalgamated in the mortars, passed over the amalgamated copper plates, and beyond these made to flow over rough, thick, hairy, woollen blankets, which catch a considerable quantity of the gold which is saved by repeated washings; the stream of water, still thick with the powdered quartz, falls into tanks called buddling tanks, where it settles, and from the lower portion of the buddled tailings, a dollar or two more of gold is extracted. By a process invented by T. A. Edison, the electrician, these buddled tailings are made to yield up a large and profitable residue of the gold hitherto wasted.

In the Black Hills, Dakota, the gold is largely combined or encrusted with oxide of iron, and requires a somewhat different treatment, to free it from the iron, which prevents the gold from amalgamating, and requires the patient labor of the Chinese to extract that which remains in the tailings. This oxide of iron, in the placer deposits, coats over the gold and gravel and forms a dense and firm cement, sometimes of great extent, which cannot be washed out in the sluice-boxes, but requires to be put through the stamp batteries like the quartz from the lodes. The gold mines of the Black Hills are so situated, far up on the hills, that the ore can be carried directly into the stamp-mills by chutes, and hence, though the gold ores are of low grade, averaging not more than $10 or $12 per ton, the cost of reduction is so small, ranging from $1.80 to $4.50 per ton, that the profit on these uniform low grade ores is better than is obtained on ores of higher grade, which cost more for reduction.

Where the ores contain gold and silver in combination with copper, lead, or zinc, and sulphur, a more active, expensive and protracted treatment is necessary; but this belongs rather to silver than gold-mining. Where the raw amalgamation and wet crushing process described above is all that is necessary, gold can be reduced from the quartz for from $3 to $5 per ton, and thus, unless the transportation is too expensive, it is possible to reduce low grade ores, those containing from $15 to $20 of gold

to the ton, and make a fair profit on the business. The plant or first cost of a stamp-mill of five, ten, or even twenty stamps is not now so great, as to deter the owners of a good mine from setting it up; or if it is the property of parties who are not miners but who understand their business, two or three mines of moderate size can keep it constantly employed. By this process, while from seventy to seventy-five per cent. of the gold is saved, much, generally all, of the silver is lost, and the whole of the copper, lead and zinc.

Silver was first discovered, in any considerable quantity, in these States and Territories, in Nevada in 1857 by the Grosh brothers; but owing to its being largely combined with gold, and the death of the discoverers soon after, the discovery was not prosecuted at first very vigorously. In June, 1859, the first great discovery of silver was made on a part of what is now known as the Comstock lode, the grounds of the Ophir Mining Company. Peter O'Reilly and Patrick McLaughlin were the discoverers, but as the land was claimed by Kirby and others, they employed Henry Comstock to purchase the land. Comstock negotiated at the same time one or two other claims, and finally purchased the whole tract, to which he gave his name, but appreciated its value so little, that he sold it for a few thousand dollars, and regarded himself as having made an excellent bargain. From that Comstock lode or vein, more than three hundred millions of dollars have been taken since that time—a period of twenty years.

Silver is found in all, or nearly all, the different systems of rocks forming the crust of the earth, from Azoic to Tertiary. Like the gold and gold ores, it is found only in veins, though these are sometimes of great width, the Comstock lode varying from twenty to one hundred and fifty feet.* The depth of these veins, like those of the gold, has never been ascertained, but it is known in some cases to exceed 2,650 feet. The ores contain the silver in various conditions and combinations. In Nevada, it is com-

* Since the partial failure of these veins, and the discovery of contact lodes at Leadville, the idea is gaining ground that a part of the deposits of the Comstock, and especially those veins a hundred and fifty feet wide, may be contact lodes.

bined with a certain proportion of gold, and is found as a sulphuret of silver and lead (argentiferous galena), a sulphuret of silver and copper (copper pyrites), of zinc, and combined with sulphurets of iron, antimony, tellurium and other base metals; as native or virgin silver; as chloride of silver or horn silver; as a richly argentiferous carbonate of lead, copper, zinc or iron, and in yet other combinations, which can only be reduced by long and tedious labor and at great expense.

A large proportion of the silver from the mines on the Comstock lode can be reduced by the dry stamping and amalgamating process. These are those in which the percentage of lead is small and that of gold large. In these cases the lead is lost, but the reduction costs only from four to five dollars a ton. Ores containing more lead, or copper, zinc, etc., are variously treated by roasting, smelting, treating with copper, iron, or "lead riches," mixing with salt to change the sulphurets into chlorides, chlorodizing, leaching, melting in a reverbatory furnace, etc. The ores of Colorado are partly sulphurets and partly carbonates, and in some of them there is a large amount of native silver. The Utah ores are very largely chlorides or chlorides and sulphurets, with some "horn" or native silver; some of the California ores of more recent discovery are carbonates. Those of Montana are mostly sulphurets, but mingled with such a variety of base metals and in such a condition that the reduction is effected with great difficulty. Indeed until the recent establishment of the Alta Montana mill and works at Wickes, most of the ores from the Montana mines have been only concentrated, and sent out of the Territory for reduction. The Alta mill concentrates, and employs seven or eight different processes of reduction, all of them expensive and requiring costly and complicated machinery. Ores are reduced by these processes at a cost of from $15.75 to $50, so that low grade ores do not pay for mining, if they contain much of the base metals.

It is not necessary to occupy our pages with minute description of these various processes, or the machinery constructed for them. They can only be worked by experts, and the great competition for business in the numerous reduction establishments secures the miner against exorbitant prices.

It is difficult to say which are absolutely the *best* mining regions. There are advantages and disadvantages about them all, to the practical miner or the resident mine-owner. In those mines which have been established from fifteen to twenty-five years, like many of those in California and Nevada, the shares are high priced, if the mines continue to be valuable; the depth of the mines is so great, and the danger of the accumulation of water so constant, that the expenses are enormous, and large as the dividends are, the assessments made on the shares for improvements nearly equal, and in some cases exceed all the declared profits. There are, indeed, all the appliances of civilization, and the miner or mine-owner is not subjected to the hardships and privations, from which those suffer who attempt to open mines in a new country. Placer mining is best adapted to the young and enterprising miner who has little or no capital. He needs at the outset only his tin or iron pan, his pick and shovel and perhaps a little quicksilver, and his haversack of provisions—yes, besides these he needs sufficient knowledge of mining to know where he will be likely to find a place with a moderately rapid stream of water at hand, and when found, to determine whether it will pay for working, or whether its best pay streaks have already been worked over. Even if his gains are but moderate at first, they will increase under favoring circumstances, till he can substitute the "Tom" for his pan, and the sluice for the "Tom," and employing help can increase his income rapidly. But placer mining is, in its nature, very uncertain. The miner may come upon barren spots where there is no pay-dirt, and his little hoard is fast becoming exhausted; or, which is worse, he may come to the end of the placer, or, as in the Black Hills, may find it a hard lava-like mass, agglutinated and firmly cemented together by the oxide of iron, which he cannot wash away nor pulverize, and hence, like the tramp, he is obliged to move on. Meantime his life is of the hardest and roughest, his dwelling is either a dúg-out in the side of a hill, or a sod-hut, reared and roofed by his own unskilful hands; his food is hard, coarse, and badly cooked, for he cooks it himself, as best he can; he is much of the time in wet clothing, in his work of washing the gold;

without society, without books, without a Sabbath or any religious privileges. After a longer or shorter time, the placer gives out, and he must find another. What he has saved of his gains he has, but there is no right, no claim, to be disposed of; he can only pull up stakes, and begin again. For placer mining the Black Hills, Western Colorado, Montana, and perhaps some portions of Wyoming, and Idaho, Oregon, and Washington Territory, offer the best locations.

For lode or vein mining more capital is needed for success; and a practical knowledge of mining is almost indispensable. It makes little difference whether the miner seeks a gold or silver lode; he must be sure of these four things: that he is not on land already claimed by anybody; that any apparent vein he may discover is a true fissure-vein, and not a placer-deposit, nor a mere pocket; that the dip of the vein is such as to permit its successful working; and that the ores are of a sufficiently high grade to pay the costs of reduction and leave a small margin of profit. Here again the privations in the mode of living come in, and unless the miner has considerable capital, he is liable to see his money and his hard toil both go for little or nothing, and the great rewards for which he hoped, pass into the pockets of some one who has more money but less brains than himself; when he has reached the end of his means, and is obliged to sell at any price which the avarice of the buyer will prompt him to give.

If he can hold out and hold on, and enlist sufficient capital to assist in the full development of his mine, there is a fortune before him, but in all the mining regions there are not two dozen well-developed mines, of which the original discoverers are still proprietors. Most of these mines have from $150,000 to $5,000,000 or more invested, and even these gigantic capitals do not always yield a profit. In California, Nevada, Utah, and even in the newer mines of Colorado, Montana, and the Black Hills, capitalists stand ready to gobble up any promising mines, paying always the lowest prices at which they can be bought, but developing them as speedily as possible, by a lavish expenditure for machinery and appliances, and by sinking lower levels

in the mines. In Nevada the bonanza kings own all the best mines, and work them together or separately. In Colorado a group of millionnaires, or rather, as "Josh Billings" would put it, ten-millionnaires, have obtained control of all the richest mines around Leadville; in the Black Hills one gigantic California firm own all the valuable mines on the great Belt near Deadwood, and stand ready to purchase any other promising mine. In Utah and Montana Eastern capitalists control the largest mines.

For the skilful mining engineer, or the intelligent practical miner, if he prefers gold mining, the Black Hills, Colorado, New Mexico and Arizona offer the best fields, and perhaps Oregon and Washington Territory furnish some good opportunities for industrious and skilful men. For silver mining, Colorado, possibly Nevada, Arizona, Utah, Montana, New Mexico, and perhaps Idaho. Texas may yet develop some good mines of gold and silver, but there is thus far nothing specially attractive there. California is not opening many new mines, and the old ones have little need of new-comers.

To capitalists desirous of investing in mining enterprises, we have no advice to offer. They have generally their own ideas about such investments: if these ideas are correct, they will be successful; if not, so much the worse for them.

CHAPTER XI.

OTHER METALS AND MINERAL PRODUCTS—QUICKSILVER—COPPER—LEAD AND ZINC—IRON—PLATINUM—TIN—NICKEL—IRIDIUM AND OSMIUM—TELLURIUM—ANTIMONY—ARSENIC—MANGANESE—SULPHUR—BORAX—SODA—SALT—COAL—WOOD AND CHARCOAL AS FUEL—MINERAL SPRINGS.

MERCURY or quicksilver is found rarely in its native or metallic state, but generally as cinnabar or sulphide of mercury, abundantly at many points in the Coast Range of the Pacific coast, but is only mined and reduced to any considerable extent in California, where the New Almaden and the New Idria mines will probably exceed the great Spanish mines from which they

take their names. Several other mines in the vicinity of these are in operation, and whenever there is an increased demand for the metal, will prove profitable; but now that the long litigation which closed the two principal mines for a number of years is settled, their production will greatly increase. The opening of so many new gold mines, and the great extent to which hydraulic mining is now carried, insures a prompt market at paying prices, for all the quicksilver which these mines can produce, for thus far the reduction of gold without quicksilver has been found impossible. There are large deposits of cinnabar, apparently inexhaustible, in Washoe and Nye counties, Nevada, in Utah, and alleged discoveries of it have been made in Oregon and in Arizona.

Copper.—The ores of this metal, and the native metal itself, though not in large masses as in the Lake Superior region, are found in nearly every State and Territory of the Great West. It is found in all forms; without admixture with other metals, as malachite, the beautiful green carbonate of copper, the red, blue, gray, yellow, and vitreous carbonates and oxides, as copper-glance, tetrahedrite, and in every other known form of crystallization; as copper pyrites in combination with gold, and in various proportions, in combination with silver, both in the carbonates and sulphides.

There are hundreds of copper mines in California, the metal occurring in some form in nearly every county in the State. Some of these have proved unprofitable, owing to mismanagement, distance from market, and difficulty or impossibility of their reduction near home. Recently improved methods of smelting have been introduced in California and other States, and it is no longer necessary to ship the ores to Baltimore or to Swansea, Wales, to be reduced.

Arizona is very rich in copper ores, and they can be very easily worked. They yield from thirty-six to sixty per cent. or more of pure copper. Some of them are already sending large quantities of block-copper to San Francisco. Nevada has an abundance of copper, but it is mostly in combination with the silver. The copper veins of Northern California extend into

Southwestern Oregon, and are even richer there than in California. Copper has also been discovered in Eastern Oregon. Washington Territory has its full share of copper, though its mines are as yet undeveloped.

Both Idaho and Montana are rich in copper, both in combination with silver and alone. Montana parts her copper from the silver in some of her smelting-works and ships it to the East.

So far as yet discovered, the copper in Dakota, at the Black Hills, is mostly combined with gold and silver, but deposits of it, not thus alloyed, may yet be discovered. In Minnesota the great copper field is around the shores of Lake Superior; the copper deposits of the Ontonagon district in Northern Michigan, dipping under the lake, and reappearing on the Western shore.

Proceeding southward, Iowa has some copper, but not developed. Missouri, large beds of it, formerly worked extensively, but now of such low grade as not to be profitably exploited; Nebraska only a small deposit in the southeast; while Kansas, which abounds in lead and zinc, has not yet developed any copper. Wyoming is abundantly supplied with most of the ores of copper. In Colorado, from $90,000 to $1 20,000 value of copper, parted from silver and gold, is sent to market every year. There are also mines of copper alone. But New Mexico, while all her mines of gold, silver and lead are rich, excels all the other States and Territories of the West in the wealth of her copper mines, which are now in a fair way to be developed on a large scale. Arkansas has large deposits of copper ore among her other mineral wealth; it is found, though not developed, in the Indian Territory, and Texas can furnish a supply, not only for all the copper-heads, but for all the copper-bottoms of the world.

Lead is as widely diffused as copper; perhaps even more extensively. Wherever silver is found, lead is almost invariably present, either as sulphuret (galena), carbonate, or oxide. And where silver is absent, or present only in infinitesimal proportions, as in Kansas, Minnesota, Iowa, and Missouri, and in some of the mines of Wyoming, Dakota and Montana, the lead puts in its

appearance, as sufficient of itself, without the more costly metal. The quantities of it parted from silver are enormous, the supply from two districts of Nevada alone being nearly sufficient for the American market, and that of Colorado nearly a million of dollars annually. The other great mining regions add to this vast total, and Kansas, Missouri, Iowa, and other States east of the Mississippi, aid in rolling up an immense aggregate. Fortunately the demand for lead is great and constant, not limited to the arts of war and the slaughter of game, but extending also to many of the arts of peace, being used in rolls, sheets, and piping and tubing, furnishing the basis of nearly all of our paints, and of many of our drugs.

Zinc is not quite so widely distributed, but is often found in combination with silver and lead. It is also found by itself, or with lead in the form of sulphuret (Blende), silicate (calamine), or carbonate (Smithsonite). It is mined and reduced quite largely in Kansas, and to some extent in Missouri and California.

The resources of our Western Empire, for the production of *Iron* and *Steel*, have no parallel on the globe. No one of the States and Territories composing it lacks deposits of iron ore, in some of its many and varied forms; and in many of them it is found of such excellent quality, and in such immediate proximity to coal-beds, and the necessary fluxes, that the cost of production is reduced to the lowest minimum. The great railways which traverse the continent can have their iron and steel rails manufactured within 500 feet of their tracks, and of such quality as cannot be obtained at any price abroad. The mountains of iron ore yielding from fifty to ninety per cent. of the pure metal, which are found in Missouri, Utah, Oregon, California, Wyoming, Texas and Montana, only needed the present demand for iron and steel to stimulate their development, and in a short time there will be enough iron and steel, of the best quality, produced in these States and Territories, to supply not only all the iron and steel rails (and it is estimated that nearly 2,000,000 tons of these will be needed the present year), but all the machinery for mining, milling, manufacturing and agricultural purposes, all the

iron and steel for steamers and ships, whether for commerce or naval purposes, all the steel guns, all the bridges, all the buildings, all the hardware, car-wheels, cutlery, and all of both metals that is needed for any other purpose under the sun, not only within the limits of our Western Empire, but all the world over. Duty or no duty, neither England nor any other nation of Europe can compete with furnaces, where the ore, fluxes and coal can be thrown directly into the furnace through chutes, without handling, and the prime cost of all the material and its conversion into steel, need not exceed from $10 to $12 per ton, while the product is of the very best quality. But the first cost of the establishment of these furnaces, and the rolling-mills, machine-shops, foundries, etc., etc., is very large, and requires, and will require, the investment of many millions of capital, though, once under way, the returns will be enormous, and the rapid growth of these establishments will be gigantic. European capitalists are already transferring their furnaces and workmen to this country in large numbers, and they are wise in doing so. Within the next five years there will be a demand for the services of every skilled worker in iron and steel who may land in this country, and at good wages.

The consumption of iron and steel, of our own production, and imported from abroad in 1879, was 4,410,000 tons, of which 510,000 tons were imported; we are perfectly safe in predicting that, in 1889, it will exceed 12,000,000 tons, and all of it will be raised from our own mines, and smelted in our own furnaces.

Platinum is found pure, and in combination with gold, iridium and iridosmin on the coast of California and Oregon, and in some of the gold mines of Colorado and Arizona and perhaps elsewhere. The quantity is not large, indeed it is a rare metal everywhere, the Russian mines, which furnish from 4,200 to 5,000 pounds annually, producing about four-fifths of the whole amount yielded by all countries. The whole quantity produced in the United States does not probably exceed 450 or 500 pounds. Mr. Edison, the inventor, in 1879 desired to use platinum wires for holding the carbons for his divided electric

lights, and addressed inquiries to all parties connected with gold-mining operations in regard to a possible or probable supply of the metal. He found that it was much more widely diffused than had generally been supposed, but that it was found in such small quantities that any considerable increased demand would enhance the price beyond the limit which he could afford to pay, and he substituted a less expensive material for it. Platinum is now worth from $70 to $75 per pound.

Tin is not found in large quantities in any part of the United States, but the greater part of what does occur is in California, Nevada, Idaho, Missouri, Arizona and Texas. It is also found in the State of Durango, in Mexico. It is mostly found in its best form as cassiterite or oxide of tin, and is classed as mine tin, stream tin, and wood tin. This ore contains about seventy-eight per cent. of pure metal. The entire production of the world is from 28,000 to 30,000 tons, of which more than three-fifths comes from the East Indies, from Banca and the straits of Malacca. The American production is not sufficient to exert any appreciable influence on the market.

Nickel, which is now becoming a metal of so much economic value in the useful arts, is found in our Western Empire, as elsewhere, in combination with several of the ores of iron. It forms but a very small constituent in these ores, from two to five per cent., and occurs oftenest in the argillaceous ores. By proper treatment of the ores, it is removed in the slag, and is concentrated by various processes till the *matte* contains about thirty-five per cent., when it is dissolved out by acids. Its use in electro-plating is very important in the arts, and requires considerable skill in its successful manipulation. Nickel in a pure state is worth about $3 a pound.

Iridium and *Osmium*, or rather the compound known as *Iridosmin*, which contains both metals, and usually a small percentage of rhodium, and sometimes ruthenium, is found in small hard grains and sometimes in scales, in the placer deposits, and associates with platinum. The alloy is the hardest of known metallic bodies, and is infusible except under the oxy-hydrogen blow-pipe. The iridosmin is used in its native condition for pointing the nibs

of gold pens, being as nearly as possible indestructible either by accidents, or by the chemicals in the ink, and being very hard. Only the rounded particles are suitable for this purpose, and these constitute only from one-fifth to one-tenth of the whole. The price a few years since was $250 per ounce. From three to eight ounces are obtained at the Assay offices in the melting of one million of dollars of gold. The iridium, when isolated, furnishes the basis of a black used in decorating porcelain, which when baked in, is indestructible.

Tellurium is found in combination with both gold and silver as tellurides of those metals. It belongs to the same class of elementary bodies as sulphur, and imitates it in most of its compounds. It has little economic value, but is a great source of annoyance in the reduction works, in California, Colorado, and Montana, from the intensely poisonous and fœtid properties of its compounds. It is found sparingly in most of the larger gold deposits.

Antimony, *Arsenic*, and *Manganese*, are found as sulphides, sulphates, carbonates, oxides, and in rarer forms, in combination with silver, copper, lead, zinc, and iron, sometimes impairing, at others enhancing, the value of the compound. In most cases the antimony and arsenic are expelled in the smelter's furnace. The manganese in its combination with iron is, to a certain extent, beneficial.

Sulphur, in the form of sulphides and sulphates, is present in a large proportion of the silver, lead, copper, zinc, and iron ores. But it is also found in a native state in large masses or deposits, in those portions of California which were formerly subject to volcanic eruptions, in Humboldt county, in Nevada, at several points in Utah, especially in Millard county, where the deposit is more than twenty feet thick; at Brimstone Mountain in the Yellowstone Park region, in Dakota, New Mexico, Arizona, and Texas. Sulphuric and muriatic acid are produced at some of the smelting works from the sulphurets of iron, copper, and lead; while the sulphates of soda, magnesia and potassa, are obtained in a nearly pure state in the alkaline lakes of California, Nevada, Utah and Wyoming. The sulphate of lime (gypsum or plaster

of Paris) is found in extensive deposits nearly or quite pure, in almost every State and Territory of the region, and in California, Colorado, Texas, and perhaps elsewhere, it assumes also its beautiful forms of alabaster and selenite. The sulphates of zinc, copper, and iron, if they do not exist naturally, are easily formed by the reduction of the sulphurets of those metals.

Borax (chemically the biborate of soda) is found at several points in California and Nevada, in the mud and the water of alkaline lakes; and is now produced of great purity, and in such large quantities as to have revolutionized the market, and caused the price of the article at retail to fall from fifty or sixty cents below twenty cents per pound. It is either gathered in crystals, evaporated from the water, or procured from the mud, by washing or by lixiviation. The supply seems inexhaustible, though the demand has greatly increased since the market began to be supplied from the Pacific coast.

Soda, both as caustic soda, and carbonate of soda or pearlash, and also as sulphate of soda or Glauber's salts, exists naturally in the Great Salt Lake and its vicinity; at several places in California and Nevada, and in the alkaline lands. It is also found in the Yellowstone region and in Texas. That found in Utah is so nearly chemically pure as hardly to need refining.

Salt.—This invaluable mineral is widely diffused over this vast region. On the shores of the Pacific it is procured by solar evaporation and boiling. All over California there are salt springs, and in many places salt lakes, from which incrustations of nearly pure salt can be gathered. In Nevada it is found in large bodies in the beds of desiccated lakes, in the waters of salt lakes, and in mountain deposits. In Utah, the Great Salt Lake is a saturated solution of common salt, five gallons of it yielding one and three-fourths gallons of crystallized salt. It is now manufactured largely from the waters of the lake, and much is produced by natural solar evaporation. Rock-salt, much of it almost perfectly pure, is mined in Salt Creek Cañon and on the Sevier river. The northern part of Utah abounds in salt springs, which pour their waters into the Salt Lake. Wyoming has also its salt deposits, as well as Kansas and Nebraska, many of them

in the form of brine springs. Arkansas, the Indian Territory, and Texas have also brine springs, salt lakes, and deposits of salt. Arizona and New Mexico have salt deposits and salt lakes. The supply in most of the States and Territories now exceeds the demand, but the growing requirements of the smelting and reduction works for it, in the reduction of pyritous ores, and to some extent the carbonates also, as well as its use for domestic and packing purposes, insure a future demand which will require the erection of additional salt-works.

Coal is found at many points in this vast region, and of many different qualities. There are four distinct coal-fields between the Mississippi river and the Pacific ocean, and they comprise an area of more than 200,000 square miles. The first of these coal-fields extends from Iowa, in which State it covers a large area, through Missouri, Eastern Nebraska and Kansas, Arkansas, the eastern portion of the Indian Territory, and Eastern Texas. This is called the Missouri coal-field. It is a bituminous coal, from the middle coal measures of the carboniferous system, in many places of excellent quality, and belongs to the class of coking coals, being valuable for heating and smelting purposes. The total area of this coal-field is somewhat more than 47,000 square miles, or a little larger than the State of Pennsylvania. The second of the coal-fields begins in British America, near the Saskatchewan river, and passes southward through Dakota, Eastern Montana, Western Nebraska, and Kansas, and Eastern Wyoming, through Colorado, east of the Rocky Mountains, Northeastern New Mexico, and Central and Western Texas. It is a lignite coal, belonging to the cretaceous period, and in some parts of its course yields a very fair heating coal, furnishing some gas, but not coking. In some of the places where it is mined, it assumes the characteristics of a cannel coal, though of inferior quality. It covers an area of about 40,000 square miles, but much of it is too deep for successful mining, especially as the quality of the coal is not of the first class.

The third coal-field is a very remarkable one. Like the second, it commences in British America, passes through Western Montana and Idaho, through Western Wyoming and Utah,

through Western Colorado and New Mexico, and perhaps Eastern Nevada, through Arizona and Northwestern Texas, and into Mexico. Like the second coal-field, it is a lignite, but of the tertiary instead of the cretaceous period, being found at the north only in the miocene, but in Texas, principally, in the eocene rocks. In Western Colorado, in Utah, and in New Mexico, near Santa Fé, volcanic action has changed it into an anthracite coal, that in New Mexico being of a quality nearly equal to that of the Pennsylvania mines. The coal-beds of La Plata county, Colorado, in the vicinity of Animas City, have recently proved to be anthracite, probably tertiary lignites changed by volcanic action. At other places, as in parts of Utah, it has been hanged into a semi-bituminous coal. Some beds of it coke and give evidence of being good smelting coals.

The fourth coal-field is in reality two coal-fields which interlock, the one, lignites of the tertiary, which pass through Eastern Washington and Oregon, and in California appear on both sides of the Coast range; the other, coming from Alaska, and furnishing on Vancouver island and in the Straits of San Juan de Fuca some mines of excellent bituminous coal, and passing down the coast of Washington and Oregon, growing constantly poorer and more charged with sulphur, become, in California, interlaced with the deposits of the tertiary lignite. At one or two points, as at Monte Diablo, they yield a fair quality of bituminous coal. The last-named branch of this coal-field is found only in the cretaceous rocks, and as it approaches former or recent centres of volcanic action changes, as on Vancouver island, to a semi-bituminous coal, and in the Queen Charlotte islands, off the coast of British Columbia, to a true anthracite of excellent quality. This double coal-field covers nearly 60,000 square miles, and the preceding one over 50,000. The San Francisco market is supplied with cannel-coal from England and Australia; bituminous and semi-bituminous from Chili and Vancover island; anthracite from Pennsylvania and Queen Charlotte islands; Cumberland and other bituminous coals from Pittsburgh, Leavenworth and Wyoming, and Pacific coast lignites from Bellingham Bay, Washington Territory, Coos Bay, Oregon, and Monte Diablo in Cali-

fornia. The Colorado and New Mexican coals will also appear in its markets as soon as a more direct railroad communication is established.

In many portions of this vast territory, where fuel for smelting purposes is required either for the reduction of the precious metals and lead or copper, or for the production of pig-iron and Bessemer steel, the forests are still so dense and convenient that wood or charcoal is cheaper than coal. But other sections are obliged to rely upon coal and upon that which can be coked; and in some of the States or Territories, as for example in Nevada, these coking coals, or the coke made from them, are brought from long distances, and at a considerable expense.

Intimately connected with coal, geologically, are two other mineral products, *Asphaltum* and *Petroleum*. In California there are lakes, or rather marshes, which after the winter rains have a shallow depth of water on their surfaces, which are covered to a considerable depth with asphaltum, in varying degrees of hardness, some of it being of the consistency of molasses, and entangling the cattle, which are drawn thither by the hope of finding water, and perish in the sticky mass; nearer the edges it is hardened, and becomes the solid asphalt of commerce. These lakes or marshes are found in San Luis Obispo, Santa Barbara, Tulare, and Los Angeles counties. Some petroleum is found with them, but the best petroleum oils of California, and they are of excellent quality, are in Humboldt, Colusa, and Contra Costa counties, and in the vicinity of Monte Diablo; but all the coast counties have petroleum springs. Petroleum has also been discovered in Nevada, though it has not been developed. In Northwestern Colorado, on the White river, in and near the Ute Reservation, there are extensive springs and marshes of petroleum, asphalt, and mineral tar. There are also petroleum springs on the headwaters of the Arkansas river, near Denver. The petroleum region of Northwestern Colorado extends northward through Western Wyoming, Montana, and possibly Idaho. Recently extensive springs and wells of petroleum of excellent quality have been discovered and worked about ninety miles north of Point of Rocks, on the Union Pacific Railway, in Wyom-

ing Territory. The last report of the Union Pacific Railway, presented in March, 1880, says that the supply is apparently inexhaustible; that it is used extensively on the railway, and that it will probably be shipped eastward and westward in large quantities, as soon as arrangements can be made for its transportation. Petroleum and beds of mineral or paraffin-wax have been discovered in Utah, in the vicinity of the Spanish Fork cañon. The mineral wax is of the same quality of that found in Galicia, Austria. In Kansas there are numerous gas-wells, some of them furnishing a sufficient quantity of illuminating gas to light a city of 30,000 inhabitants. These indicate the existence of reservoirs of petroleum below the shales or bituminous rocks, through which the wells are bored. There are also indications of the presence of petroleum in Missouri, Arkansas, and Texas.

Of other mineral products, not already noticed, we may mention mica, which is found in extensive deposits, though not yet in very large sheets, at numerous points in the Rocky Mountains, as well as in the Cascade Mountains; alum (sulphate of alumina) found in great quantity and nearly pure, in Utah; kaolin and other porcelain clays, and the finest of glass-sand in all the States and Territories west of the Rocky Mountains. Most of the silicates are also found in combination.

But aside from the mines of the precious metals, nothing in the mineral world has excited so much interest in all parts of this vast region, as the abundance and variety of its mineral springs and geysers. The known geysers, some of them the most remarkable yet discovered anywhere, are found in California, in the Yellowstone Park, and near the headwaters of the Yellowstone, the Jefferson, Madison, and Gallatin rivers. This region, like that in California, has been the scene of volcanic action. In our description of the Yellowstone National Park, we shall give a detailed account of these and other remarkable phenomena, found in that true wonder-land. But the springs thought to possess medicinal or healing virtues are myriads in number, as well as in character. Some, like the scores of Hot Springs in Arkansas, Texas, Colorado, Nevada, California, Utah, Montana, and Wyoming, have no appreciable mineral constituents, but owe

their healing properties either to their thermal quality (the heat ranging from 95 to 225° F.) or to some not fully understood electric influence, which is thought to pervade them; others, whether cold or warm, owe their reputed medicinal virtue to their impregnation with sulphur, iron, lime, potassa, soda, lithia, phosphorus, or some and perhaps several of the sulphates, carbonates, phosphates, nitrates, lithiates, chlorides, bromides, or iodides, or other compounds of metals, alkalies, and alkaline earths, and mineral acids, and generally the more nauseous and diabolic the taste and smell of these villanous compounds from Nature's laboratory, the greater the healing virtues they are believed to contain. But nowhere in the wide world are there spas of such capacity, surrounded by such magnificent scenery, or possessing such natural advantages, to amuse and delight the visitor, and drive away *ennui*, as are to be found in Texas, Arkansas, and in still greater numbers in Colorado, the Yellowstone region, Utah, Montana, Dakota, Minnesota, Nevada, California, New Mexico, Oregon and Washington. Nature has done its part with a most bountiful hand, and in many of these places man has done his part to make the whole surroundings attractive. Already are the springs of the Yellowstone Park, the most celebrated of those in Colorado, Utah, Nevada, California, Arkansas, and Texas, widely known and appreciated in Europe, and every season brings many hundreds of European visitors hither, in search of a new sensation.

CHAPTER XII.

AGRICULTURE—ARABLE LANDS EAST OF THE ROCKY MOUNTAINS—MINNESOTA FARMING LANDS AND PRODUCTS—DAKOTA TERRITORY FARMING LANDS—MONTANA FARMS—IOWA FARMS—MISSOURI FARMING LANDS—NEBRASKA FARMING LANDS—KANSAS FARMING—ARKANSAS FARMS—THE INDIAN TERRITORY AS A FARMING REGION—TEXAS FARMING, GRAIN, COTTON, ETC.—REVIEW OF FARMING LANDS EAST OF ROCKY MOUNTAINS—MUCH POOR AND INDIFFERENT FARMING—REVOLUTION IN FARMING PRODUCED BY AGRICULTURAL MACHINERY—ROOT CROPS—COTTON—SUGAR—FRUIT CULTURE—TEXTILE FIBRES AND TOBACCO—THE ROCKY MOUNTAIN REGION—WONDERFUL RESULTS OF IRRIGATION—BEYOND THE ROCKIES—FROM THE SIERRA NEVADA TO THE COAST RANGE—CALIFORNIA—VINICULTURE IN CALIFORNIA—THE PRODUCTS OF OREGON AND WASHINGTON.

No very close approximation of the amount of arable lands in our Western Empire can be made. The reports of the Surveyors-General to the Land Office each year develop the fact that, in the newer States and Territories, thousands of acres, previously deemed incapable of cultivation, have been conquered by the enterprising settlers, and must henceforth be recorded as arable lands of extraordinary fertility. We have alluded to this, in our chapter on the Great American Desert; but it is a fact which will bear repetition and illustration. Nearly the whole region lying between the Mississippi river and the Rocky Mountains was regarded fifty years ago as a desert land, incapable of any considerable cultivation, and given over to the buffalo, the panther, and the prairie wolf; yet in no part of the vast domain of the United States, and certainly in no other country under the sun, is there a body of land of equal extent, in which there are so few acres unfit for cultivation, or so many which, with irrigation or without it, will yield such bountiful crops. The land lying between the Rocky Mountains and the Sierra Nevada or Cascade Range, has more mountains, and more grazing lands; some of it, too, is incapable of culture, and is more valuable for the mineral wealth which lies beneath the surface, than for any crops which can be raised from it. Some of these lands are volcanic,

and the lava and volcanic scoriæ have not yet been long enough exposed to the influences of sun, and rain, and glacial action, to render them fertile as they will eventually become. Of a considerable portion of this region, also, it may be said, that it has not yet been explored with sufficient thoroughness, to settle the questions whether it is best adapted to cultivation or grazing, or whether it is unfit for either.

Perhaps we cannot now come nearer the truth than to say, that, of the 2,028,000 square miles comprised between the Mississippi and the Pacific, from 750,000 to 800,000 miles may fairly be reckoned arable. Of this one-fourth, and possibly a little more, may require more or less irrigation, for some years to come, to bring out their highest productiveness; but this is regarded by the farmers themselves as an advantage, rather than a disadvantage, since by means of it, they are assured of large and excellent crops every year.

None of the States lying between the Rocky Mountains and the Mississippi river have much waste or unimprovable land. Missouri, Arkansas, and portions of the Indian Territory, and Northwestern Texas are more mountainous than the others, and have some grazing, and some sterile lands. The Black Hills in Dakota (some portions of which are capable of cultivation, and yield excellent crops), and the Bad Lands in that Territory (which, however, amount to only 75,000 acres or about three townships) and Nebraska, are the only other exceptions to the general rule. Minnesota, Iowa, most of Nebraska, Kansas, the greater part of Eastern Wyoming and Eastern Colorado, Dakota, except as above noted, Eastern Montana, the larger part of Missouri, Arkansas, the Indian Territory, and Texas, are not surpassed in the quality or productiveness of their soil, by any portions of equal extent in the known world. Look at these facts, and remember that none of these States or Territories have one-third and most of them not one-tenth of their arable lands under cultivation. Minnesota, one of the newest of these States, has but about one-eleventh of its area—4,900,000 acres out of nearly 54,000,000—under cultivation; yet it produced in 1879, on 2,769,369 acres, 35,000,000 bushels of spring wheat of a quality

which has never been surpassed; a crop of corn of about 19,000,000 bushels on about 475,000 acres; more than 21,000,000 bushels of oats, on 510,000 acres of land; over 3,000,000 bushels of the other cereals, barley, rye and buckwheat, on 110,000 acres; over 4,100,000 bushels of potatoes, on less than 40,000 acres of land; and 1,800,000 tons of hay on less than 950,000 acres. A large part of these crops were produced on lands broken up for the first time, and much of the cultivation was crude and imperfect, yet the yield per acre averaged larger than that of any other State, though not so large as it should. Many of these new farms, when properly tilled, yielded over large tracts from thirty-three to forty-five bushels (sixty pounds) of wheat to the acre, and deep plowing and careful seeding by drill, would have brought the same results everywhere in the wheat lands. Dakota Territory, which in 1870 had less than 13,000 white inhabitants and now has over 200,000, though it only began to grow about three years ago, yielded in 1879 from 266,618 acres in its northeastern counties alone, 5,332,360 bushels of spring wheat, and nearly as much more in Southeastern Dakota. The average yield was twenty-two bushels to the acre, and might have been thirty with the same labor. Other crops are equally productive. The land is mostly prairie, and at least three-fifths of this production was from the first crop ever harvested. Montana is a still newer region, and has much mountainous country. It is roughly computed to have 15,000,000 acres of arable lands, and 38,000,000 acres of grazing lands; but its arable lands are the most fertile the sun shines upon. Its 30,000 acres in wheat produced an average of twenty-five bushels (weighing sixty-four pounds) to the acre; its yield of Indian corn averages forty bushels; that of oats and barley fifty bushels; of potatoes 200 bushels, etc.

Iowa, an older, though still a young State, has about one-third of her area under cultivation. Her land is rich and fertile, but wheat in 1878 was a comparative failure there. Indian corn the same year was a very successful crop, 175,000,000 bushels being raised on 4,686,000 acres of land—an average of 37.4 bushels to the acre. The crops of oats, barley, potatoes, and hay

were also large, and eight items of agricultural crops aggregated a value of $65,586,000.

Missouri, the oldest State west of the Mississippi, has about one-fourth of her 42,000,000 acres under cultivation. Her crop of Indian corn in 1878 was 93,062,000 bushels—an average yield of 26.2 bushels to the acre; the wheat crop, 20,196,000—an average of only eleven bushels to the acre; oats, 19,584,000—an average of 30.6 bushels to the acre; potatoes, 5,415,000 bushels, averaging seventy-five bushels to the acre; tobacco, 23,023,000 pounds, averaging 770 pounds to the acre; hay, 1,620,000 tons, averaging 1.62 tons to the acre. Smaller quantities of rye, buckwheat, and barley were produced, and hemp and flax were raised to some extent. The State has also extensive vineyards, and large quantities of grapes and wine are sent to market. The aggregate value of her agricultural productions in that year was about sixty-five millions of dollars.

Nebraska has an area of 48,636,800 acres, of which less than 3,500,000 or about one-fourteenth of the whole are under cultivation. It is one of the newer States, having been admitted into the Union in 1867. Corn and wheat are the principal cereals cultivated, the crop of the former ranging from forty to fifty-four million bushels, an average yield of forty-two bushels to the acre; and of the latter from fourteen to eighteen million bushels, mostly of spring wheat, an average of fifteen bushels to the acre. Rye and oats are also raised in considerable quantities; rye yielding an average of nearly twenty bushels to the acre, and oats about thirty-four bushels. Potatoes and other root crops do well, potatoes averaging 125 bushels to the acre. Hay yields nearly two tons to the acre. Fruit culture is a very large interest in the State, and its fruits are of the best quality. The entire crops of 1879 exceeded $25,000,000 in value.

Kansas, from its central position, its fine climate, its large body of arable lands, its railroad facilities, and its indomitable enterprise, has come to be regarded as the garden spot of the Great West. Its lands are probably no more fertile than those of some of the other States and Territories, but they have been more extensively advertised, more promptly settled, and are cul-

tivated with an energy and thoroughness, which cannot fail to produce the highest results. The mining fever has not distracted the attention of her settlers. It is hardly probable that any considerable amount of gold or silver ores will be found within its bounds, and though it has some lead, zinc, copper, and considerable coal, its mining interests will probably, for all the future, be subordinate to the agricultural development of the State.

Of the 51,770,240 acres which are contained within the bounds of Kansas, 7,769,926 were under cultivation in 1879, of which 1,270,493 were plowed for the first time that year. About one-fifth of the cultivated area was devoted to wheat, and two-fifths to Indian corn. In Kansas, both winter and spring wheat are cultivated, though the winter wheat predominates in the ratio of five to one. In 1878 the wheat crop was 32,315,358 bushels, or 20.5 bushels per acre for winter wheat, but in 1879, owing to late plowing and sowing, and a dry winter and spring, it was not quite 20,000,000 bushels. The corn crop, on the other hand, was 89,324,971 bushels in 1878, and about 109,000,000 bushels in 1879. This was almost sixty bushels to the acre. Oats yielded 17,411,473 bushels in 1878, but only 13,400,000 bushels in 1879; rye yielded 2,722,000 bushels in 1878, 21.3 bushels to the acre; barley 1,562,793 bushels in 1878, being 29.7 bushels to the acre; Irish potatoes, 4,256,336 bushels in 1878, being 83.3 bushels to the acre. In 1879 the yield was smaller. 1,590,000 tons of hay and forage were cut, of an aggregate value of $5,700,000. Large quantities of sorghum and broom corn were also raised, and 2,721,459 gallons of sorghum syrup produced. Flax, hemp, castor beans, sweet potatoes, tobacco, cotton, and a vast amount of fruit, were the other agricultural products of the State in 1878 and 1879. The total value of field and garden products in 1878 was $52,859,857. In 1879, notwithstanding the partial failure of the wheat crop, it was $60,129,781, on account of the increased production of hay, sorghum, broom corn, and potatoes, and the material advance of prices.

Arkansas has a much more varied surface than Kansas; mountains, valleys, forests, and mines of silver, lead copper

iron and coal, and quarries of novaculite or oil-stone, mill-stones, marble and lithographic-stone. It has also a more varied climate, from the semi-tropical temperature of its bottom-lands, to the cool and bracing air of its mountain districts. Its productions are more varied, cotton being its great staple, and corn coming next in order; while the other cereals are only moderately cultivated, and fruits, to which it is well adapted, figuring largely in its agricultural products. Of the 33,406,720 acres of land in the State, one-half is still a forest, while only about 2,500,000 acres are under cultivation, and perhaps three times that quantity are good grazing lands. The staple crop is cotton, of which nearly 800,000 bales were produced in 1878 on 1,165,850 acres, an average of about three-fourths of a bale to the acre. The yield of Indian corn the same year was about 23,000,000 bushels on 958,000 acres, twenty-four bushels and a fraction to the acre. Of wheat in 1878 only 1,038,000 bushels were raised, an average of but six bushels to the acre. Of rye and oats the quantity grown was but small, though of the latter it was 1,665,420 bushels, a yield of 24.6 bushels to the acre. Potatoes yielded 121 bushels to the acre, but only 8,200 acres were planted in this crop. Of the sweet potato and perhaps of the Irish potato also, the agriculturists of Arkansas insist that they can raise two crops a year. Hay is not a large crop, though the yield is as good as in most States, being 1.80 tons to the acre. Fruits of all kinds are abundant and of excellent quality. A considerable quantity of wine is made, both from wild grapes, which are of unusual excellence in the State, and from the Scuppernong, Post Oak, Herbemont, Norton's Seedling, and other cultivated grapes.

The Indian Territory, which joins Arkansas on the west, contains much valuable farming-land, and some which is not desirable. The Cherokees, Choctaws, Chickasaws, and Creeks, as well as some of the other Indian tribes settled here, have among them many good farmers, who produce large crops from the fertile soil. We cannot obtain statistics of the agricultural productions of the Territory, and as the United States government is bound by the highest obligations of honor and justice to protect these Indians in their right to the soil, and to prevent law-

less adventurers from settling there, it is of no particular consequence that we should be able to give particulars, which might only serve to stimulate the greed of the lawless.

Texas has a vast territory, 175,600,000 acres, and every variety of soil, surface, climate, and rainfall. While probably 50,000,000 acres of its lands are cultivable, though not more than three-fifths of this amount can be reckoned arable land of the first-class, not more than 6,000,000 acres have yet been cultivated, and much of this very carelessly and imperfectly. Eastern Texas is sandy, and not very fertile; Central Texas has a rich soil, and for a width of 200 miles is the best cotton region in the United States, and is capable of producing the cotton supply of the world. Yet, in 1878, only 1,808,386 acres were planted in cotton and yielded 497,310,000 pounds of cotton, an average of 275 pounds to the acre.* The northern part of this central tract is excellent corn land, and from 2,246,000 acres, the greater part of it in this region, 58,396,000 bushels of corn were produced in 1878, twenty-six bushels to the acre. For wheat, rye, and oats, only a very small portion of the State is well adapted, the wheat belt being far smaller than that of Kansas. Only 450,000 acres were sown in wheat, 3,000 in rye and 149,500 in oats in 1878, and the yield was 7,200,000 bushels of wheat, sixteen bushels to the acre; 54,000 bushels of rye, eighteen bushels to the acre, and 5,531,500 bushels of oats, thirty-seven bushels to the acre. Irish potatoes are not so prolific or so good as the sweet potatoes, and root-crops generally do not yield remarkably well. The pea-nut, ground-nut or goober, is perhaps an exception, as it is very prolific in the sandy soils. Tobacco, hemp, ramie, and flax are profitable crops, where they are carefully cultivated. Small fruits and market-garden vegetables do well, and being marketed early, afford a good profit. Peaches, cherries, and grapes, are also of excellent quality, and some of the latter produce wines of fine flavor, when rightly handled. A prevalent fault in their production, is the addition of too much cane-sugar, which gives an excess of alcohol and impairs their bouquet.

* The average Texas bale of cotton is 480 pounds; so that the average yield was only three-fifths of a bale.

Sugar from the sugar-cane, and also from sorghum, is produced in very considerable quantity in Texas, but the former is an uncertain crop. The latter under the new stimulus given to its production by recent discoveries, is likely to become much more profitable.

Western Texas is much better adapted to grazing than to farming, and Northwestern Texas, except in its river bottoms, is a comparative desert, though its mining lands may attract to it some population.

This, with the exception of Eastern Colorado, whose agricultural lands are but slightly developed as yet, constitutes a description of most of the arable lands lying east of the Rocky Mountains. Our brief review of them shows that hardly more than one-tenth of these lands is yet under cultivation; yet if, in 1878, this region alone yielded 135,000,000 bushels of wheat, and 502,000,000 bushels of Indian corn, what may be expected when its arable lands shall all be subjected to the plow?

It is to be noticed, also, that much of the farming in this region is not, and under the circumstances could not be expected to be, of the best character. The emigrant, whose scanty means have only enabled him to reach his western home, pay the first fees, build his sod-house, and with a poor and weak team, or perhaps by changing works, break up the firm and hard sod, is very sure to be unskilled in western farming, however much of an adept he may have been in agricultural pursuits in his own country, and so the plowing which should have gone to the depth of fifteen or eighteen inches at least, does not penetrate more than three to four, and both it and the planting are deferred till too late in the autumn, if the crop is to be winter wheat, or in the spring if it is to be spring wheat. If there is drought in winter or spring, deep plowing would have saved the crop, while shallow plowing prevents vigorous growth. The proper cultivation of the crop is prevented also by the limited means of the settler, and in harvesting it, he cannot readily avail himself of the agricultural machinery, which so lightens labor, and makes large farming possible and profitable.

The complete revolution which has taken place in the last

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twenty-five or thirty years in farm work, is nowhere so evident as at the West. The plowing on the best farms is done by a gang-plow drawn by four horses, or, in some cases, by a steam-plow, and a steam or two-horse harrow breaks the clods. If the crop is to be wheat, or any of the other cereals, it is not sown broadcast, but drilled in with a two or four-horse seeding machine at such distances as to give the grain as it comes up an opportunity to tiller or spread out. Or, as in some of the States, a centrifugal sower scatters it evenly within a given radius, and thus accomplishes the same object. In this way only about one-fourth as much seed is required, and a greater crop is raised. In Minnesota eighty pounds of spring wheat is sown to the acre. Some farmers prefer to plant Indian corn first on the broken and rotted sod, and follow with wheat or other small grains. The corn is cultivated once or twice with a horse-hoe or cultivator, and the ground is left clean and free for the wheat crop. But the perfection of the agricultural machinery is seen in gathering the crop. The original reaper has been improved till it would not be recognized in its new form. It is now the harvester, and cuts, gathers, binds, and loads the grain for the threshing machine, which in turn threshes, winnows, cleans, assorts and in some cases sacks the grain. Another improvement cuts and gathers into a close box-wagon all the heads of the grain as they stand, and when the wagon is filled, empties its entire load into the threshing machine. A single farmer in Dakota, the present year, puts 30,000 acres in wheat, and has provided thirty-five threshing machines and 140 harvesters to gather and prepare for market the crop. Wheat, raised in this way, or if on a much smaller scale, on lands properly plowed, sowed, cultivated and harvested, should yield from thirty-three to forty-five bushels per acre, or double the crop grown by careless and slovenly farming. The crop of Indian corn on these new lands should be from sixty to eighty bushels to the acre, or more, where irrigation is practised; that of oats from seventy to seventy-five bushels, and of barley forty-five to fifty-five bushels. In Arkansas and Texas, by early planting, two crops of wheat or even Indian corn can be raised in a year; but very little of the farming there is of a

high order, and even on rich lands the yield per acre is shamefully small.

Root crops, potatoes, turnips, rutabagas, beets, carrots, sweet-potatoes, yams, and the like, require deep plowing, and thorough cultivation in the first stage of growth, but will take care of themselves afterward. The yield, in light but fertile loam, is enormous. In Minnesota, Dakota and Montana, from 300 to 600 bushels of potatoes of the best quality are raised to the acre, and from 800 to 1,000 bushels of turnips and beets.

In the cotton region, on the best cotton-lands in the world, where the minimum of production should be two bales of ginned cotton or 960 pounds, too many of the farmers are content with a yield of half or two-fifths of a bale.

This whole region is destined to become famous for its sugar production. Sorghum has been cultivated largely all over these States and Territories, and millions of gallons of sorghum syrup made; but it is only within the last two years that it has been discovered that the early amber sorghum, a variety which ripens early, and before frost, is the best for the Northern States and Territories, though some of the larger kinds will yield more where the seasons are longer, it being only necessary that they should not suffer from frost before the seeds are ripe, and that the ripening is necessary to its crystallization into sugar. It has been ascertained by experiment that one ton or more of sugar can be produced from an acre, and that with ordinary cultivation and care, three-fourths of a ton to the acre is a certain crop. The sugar is pronounced superior to the Louisiana or Texas cane sugar. A sugar equally good, but in somewhat less quantity can be made from the stalks of Indian corn, and in both cases the ripe corn and the sorghum seed are saved. The Egyptian rice corn, which is now cultivated extensively in Kansas, and which yields from sixty to seventy-five bushels of its rice-like seed to the acre, belongs to the sorghum family, and will doubtless produce large quantities of sugar. As the United States are now paying $100,000,000 annually for the sugar we import, this addition to our products will be very welcome.

The sugar-cane, as grown in Louisiana, Texas, and Florida, is

an exotic, and never comes to maturity in our climate, but is propagated by cuttings. These become exhausted in a few years, and require renewal from tropical countries. They are, moreover, very sensitive to climatic changes, and often fail entirely. The sorghum, on the contrary, is hardy, ripens early, and is almost indifferent to climate, flourishing equally well in Northern Dakota and Texas. There is, throughout most of this region, irrespective of the grazing lands, a large demand for forage grasses and plants, to supplement the pasturage for horses, mules, asses, milch cows and cattle, kept for farm use, and the small flocks of sheep and goats which the farmer finds it profitable to keep. The buffalo, gramma and blue joint grasses soon give place, in cultivated lands, to clover, timothy and herd's grass; but it has been found that corn sown for forage purposes, late in the season, Alfalfa clover, Hungarian grass, Egyptian rice corn, the millets, and especially the pearl millet, lately introduced, and in the north, wild rice, furnish more nutritious and abundant food for domestic animals than any of the ordinary grasses. The pearl millet is said to yield on rich soil three crops in a season, and the enormous quantity of ninety tons of green or ten tons of dry forage to the acre. Other grasses, like the Texas millet, seem well adapted to the use of stock, and are coming into cultivation for this purpose.

This whole region is well adapted to fruit culture. The apple of different varieties, and, to a less extent, the pear, flourishes from Minnesota to Arkansas; the peach from Iowa and Missouri to the Gulf; quinces from Minnesota to Kansas, and cherries and plums from Northern Dakota to the Gulf. Of smaller fruits, grapes, native and wild, as well as the cultivated varieties, are found everywhere, though the hardy species alone flourish at the North, whether wild or cultivated, while the more robust summer grapes (*Vitis æstivalis*), native and foreign, take their place in the South. The strawberry flourishes everywhere, but is six weeks earlier in Texas than in Minnesota. The raspberry, blackberry, currant, and whortleberry, are better adapted to the Northern and Middle States and Territories than to the South; but the papaw and the banana, the pomegranate, fig, orange,

lemon, and olive, are found in the South alone. In the way of nuts, the North has the chestnut, hickory-nut, black walnut, butternut, hazel-nut, and beech-nut; while the South has the pecan, the chinquepin, the filbert, the hard-shell almond, and can have the English walnut, and pistachio nut, if they will cultivate it.

Of textile fibres, hemp grows in all latitudes: flax mostly in the North, cotton, ramie, jute, tampico, agave fibre and cactus fibres in the South, while the dry, wiry grasses of the river bottoms of the Mississippi and its western tributaries, now coming into demand for paper stock, are mainly the product of the northern region.

Tobacco grows in almost all latitudes, but Missouri, Arkansas, and Texas are the only States in which it is largely cultivated.

The Rocky Mountains consist of two, and a part of the distance, three principal ranges, having a general direction of north-northwest to south-southeast, and numerous spurs and out-liers connecting these ranges and extending from them westward. The eastern slope has no spurs extending eastward unless we except some hills of no great elevation in Wyoming. The Black Hills in Dakota, the Osage and Ozark Mountains in Missouri and Arkansas, belong to a different mountain system. While these mountain ranges have many peaks or summits from 13,000 to 14,000 feet in height, and some even higher, the table-lands from which the summits rise are generally from 5,500 to 8,500 feet in height, and most of the passes by which the ranges are crossed do not exceed that elevation. There are also many valleys and parks between the ranges, which contain fine tracts of arable land; but the greater part of the land included within these ranges is better adapted for grazing than farming; and considerable portions are only valuable for mining and the operations connected with it. The grazing lands of Colorado, Wyoming and Montana are mainly, though not entirely, on these mountain plateaux and parks; but the probabilities are, that there will be enough good farming-lands found in the valleys and parks, to supply the wants of the large mining, herding and non-producing classes who are even now filling up this mountain region with great rapidity. The wheat and other grains, Indian

corn, sorghum sugar, root crops, and vegetables, milk, butter, and cheese, and pork, can be furnished by the farmers, as well as most of the fruits, while the herdsmen can furnish the beef and mutton, and the sportsmen, the game, large and small; but there will be little farm produce from the mountains to export.

Much of what is grown in the mountains will require irrigation, and with it will yield most bountifully. Even the best authenticated statements of the enormous crops produced by irrigation are received with incredulity. Seventy, eighty, and in some cases even one hundred bushels of wheat, not on one acre alone, but on a tract of thirty or fifty acres; a like amount of barley; eighty to a hundred and ten bushels of oats; and from 150 to 200 bushels of Indian corn; 400, 500, and 600 bushels of potatoes to the acre; these amounts, incredible as they seem, are materially below what is claimed for these lands, some of which without water would have proved utterly barren and worthless. In Montana these mountain valleys do not lack water, the rainfall being there sufficient to produce good crops, and the whole region abounding in streams.

Between the western slope of the Rocky Mountain ranges and the eastern slope of the Sierra Nevada, or, as they are called in Oregon and Washington Territory, the Cascade Mountains, the character of the lands varies as you go southward from British Columbia. In the eastern part of Washington Territory and Oregon, the lands form generally a high, treeless plateau, moderately fertile, but, except in the river bottoms, generally better adapted to grazing than to cultivation. Farther south, within the limits of the Great Basin which includes nearly one-half of Utah and Nevada, the area of cultivable land is comparatively small, though by means of irrigation it is much increased; considerable tracts are unfit even for grazing purposes, but these are generally good mining-lands. East and south of the Great Basin are the sources of the Grand, Green, San Juan and Little Colorado, as well as other smaller tributaries of the Rio Colorado of the West, and that great river itself. These all flow through Western Colorado, Southeastern Utah, Western New Mexico and Arizona, in such deep cañons that they leave many of the

mesas and table-lands of these territories to drought and sterility, except where irrigation is possible, or when, as in the autumn and winter of 1879–1880, extraordinary and protracted rains deluged the country. Yet this region is well adapted to grazing, and by a scanty irrigation will yield the crops and fruits necessary for the sustenance of its inhabitants. In New Mexico and Arizona there are, with irrigation, a larger amount of arable lands than has hitherto been supposed.

Governor Frémont writes that, in the summer of 1879, a little band of Maricopa Indians, near Prescott, who had taken to farming, sent to San Francisco, over the Southern California road, ten car loads,—200 tons, of wheat of their own raising, which was of such excellent quality that it brought $2.24 the hundred pounds when the usual market price was only $2.10. The land on which such wheat could be grown, in an unusually dry season, must be counted arable.

West of the Sierra Nevada and Cascades, we find a fine agricultural region, Western Washington, Oregon, and California. This is the land of gigantic forest trees, the sequoias, the cedars, firs, and loftiest pines, the tulip tree, liquidambar and other forest trees, which have no rivals in the Northern Hemisphere. It is also the land of wheat and barley, of Indian corn and oats, of the vine, and its abundant wine product, as well as raisins of the best quality; and in its southern portion, of the orange, lemon and lime, the olive, the fig, the pomegranate, and the Madeira nut or English walnut, and the French and Italian chestnut. The latter is, in Italy, largely cultivated for the food-producing quality of its nuts.

The wheat crop of California is larger than that of any other State, ranging from 36,000,000 to 50,000,000 bushels annually, and is of the very best quality, bringing, in European markets, higher prices than any other. It never rains in harvest-time in California, and, on the large grain ranches, the giant header clips off the heads of the wheat, sweeps them into the huge wagon-box from which they are shot into the threshing-machine, which is geared on to the header, and the reaping and threshing are carried on simultaneously; while the grain as it comes from the

threshing-machine is sacked automatically, and the sacks are piled in heaps in the field, remaining uninjured in the pure, dry air, till they are sent to market or shipped for Europe. A large part of the crop is shipped in July. Barley is also a very important crop, California producing more than one-third of the whole barley crop of the United States, and nearly three times as much as any other State. Its product in 1878 was about 15,000,000 bushels, an average of twenty-three bushels to the acre, though forty to sixty bushels is not an unusual product. The production of oats is hardly sufficient to supply the State demand, being but 4,350,000 bushels in 1878, though considerable dependence is placed on wild oats, which are used largely for hay. Indian corn is also a small crop, about 3,500,000 bushels in 1878, or about thirty-five bushels to the acre. The Alfalfa and the various species of millet, including the pearl millet and the Dhourra or Egyptian rice-corn, are cultivated by the dairymen for fodder. Beans are largely grown. The root crops are more remarkable for enormous growth than for fine flavor. The sugar-beet yields several crops, and contains a high percentage of sugar. Hops are also an important crop, and other minor crops add to the aggregate of production. The fruits of California have a deservedly high reputation. The apple must yield the palm to those of Oregon, Washington, or the States and Territories farther East, but the pear, quince, peach, apricot, cherry, orange, lemon, pomegranate, fig, prune, plum, olive, currant, strawberry, blackberry, raspberry, banana, plantain, and pineapple all attain a high degree of excellence and a marvellous size.

In addition to the native grape and the Mission grape, both of which are very largely grown, every known variety of grape found in Europe or America is cultivated here, and both in the flavor and quality of the fruit, and the abundance of the yield, they all greatly surpass their product where they are native. The production of raisins was at first a partial failure, in consequence of incomplete drying, but having learned the art of drying these as well as most other fruits, the raisins of the sun, from California, in their recent samples, surpass those of any

other part of the globe. The dried-fruits of the State, after failures from careless drying, are now beginning to take rank with the best in the world. The California wines and brandies have not till recently attained to their best condition. They were too strongly alcoholic, fiery and heady, and were put upon the market before they had had sufficient age to ripen them. The conditions of climate and dryness were not taken into account by the wine-growers, and the Mission grape being largely used for wine-making, its peculiar, earthy taste impaired the value of the wine. These difficulties have been, now, in a great measure overcome, and the present and future vintages of California will compare favorably with the best wines of Europe, with the additional advantage of being purer. The California brandy, when it has a sufficient age, is preferred by connoisseurs to the best cognac. There is yet, however, a considerable importation, not only of French brandies, but of the lighter and cheaper French wines, especially clarets, which might be made there of really better quality than the imported wines.

Both Oregon and Washington Territory contain, besides their great amount of timber lands, and their extensive ranges for grazing, large tracts of fertile, arable lands. There is no lack of rainfall in the region west of the Cascade Mountains. At some points the skies weep too constantly for successful grain culture, but this very excess of moisture gives to the forests a more gigantic growth, and to the grasses a larger and more vigorous development. For the most part, however, Oregon and Washington are well adapted to the culture of the cereals. Even Eastern Washington and Oregon, formerly regarded as a desert and rainless region, proves, notwithstanding its whitish, alkaline soil, and its moderate rainfall, one of the finest wheat regions in the world. With deep plowing no irrigation is needed, and the wheat, large, full-berried, and of the very best quality, weighing from sixty-five to sixty-nine pounds to the bushel (the legal weight is sixty pounds), turns out from thirty to sixty bushels to the acre; many of the farms averaging from forty to fifty bushels for their entire crop. In 1879 the wheat crop of Oregon exceeded 10,000,000 bushels, and that of Washington

was about half as much, simply because there were not men enough to sow a larger crop. All the small grains, rye, oats, barley, and buckwheat are successfully cultivated there; oats yielding from seventy to eighty bushels to the acre. Indian corn is a tolerably sure crop in Oregon, but less so in Washington on account of the cool nights. The root crops yield enormously, and there is a ready market for them at good prices at home among the lumbermen, fishermen, and manufacturing population of the towns. Flax, though cultivated mainly for the seed, is of excellent quality, the lint being longer, finer and silkier than elsewhere. Of fruits, the apple and pear are unsurpassed, and most of the small fruits are successfully cultivated. Oregon apples, pears, and berries command a high price in the San Francisco market.

CHAPTER XIII.

TIMBER AND LUMBER—TREE-PLANTING—THE FOREST GROWTHS IN DIFFERENT SECTIONS—CALIFORNIA FORESTS—HORTICULTURE AND FRUIT-CULTURE—FLORICULTURE—WILD FLOWERS—MARKET GARDENING.

As we have already seen, a considerable portion of this Great West is but scantily supplied with forest trees. In 1871, a careful estimate put down, in these twenty States and Territories, the woodland, as covering 198,124,802 acres; but in the nine years which have since elapsed, the demand for railroad ties and structures, for bridges, for machinery, partly of wood, for mines, for dwellings, and public buildings, and for export, has diminished this area by nearly or quite twenty-five per cent. Minnesota, Missouri, Oregon, and Washington, and perhaps Texas, and Arkansas to a moderate extent, are the only States or Territories that export lumber. Montana has good timberlands, but she is not as yet producing more than lumber enough for the home demand. Iowa, Nebraska, Dakota, Kansas, Wyoming, Colorado, Utah, New Mexico, Arizona, and Nevada, have not timber and lumber enough for their own needs, and are

obliged to import a large share of what is consumed. The Indian Territory has a moderate amount, but the adjacent railroads are fast consuming it. Idaho has considerable forests on its mountains, but much of it is not accessible. The gigantic forests of California have been so recklessly wasted, that she now imports largely of timber, lumber, and fire-wood. In the prairie States, liberal premiums have been offered for tree-planting by the State authorities; and the National Government, by their Timber-Culture Act and its amendments, have sought to promote the cultivation of forest trees. The railroad companies, which have large land grants, have also encouraged tree-culture. But though these efforts have led to the planting of some millions of trees, many of them die the first or second year, and the whole number planted, in six or seven years, bears but a small proportion to the annual destruction of the forests.

The forest growths differ materially in different sections. In the northeast, Minnesota and Northern Dakota, pine is pre-eminent, though there are some of the harder woods scattered through the forests. In Missouri, cottonwoods, and the *bois d'arc* or Osage orange, mingle with the other hard woods and pine and hemlock. Montana has pines and firs, and some oaks, black walnuts, maples, etc., etc. Oregon and Washington are remarkable in their western halves for gigantic firs, and have also a fair share of pines, spruces, red cedars, and sequoias. From these and the almost inexhaustible forests of Alaska, and British Columbia, the Pacific coast will probably draw its supplies of lumber and timber for many years to come. The forests of Eastern and Middle Texas, and Arkansas, are largely composed of hard woods; there are eight or ten species of oak, one an evergreen, though not the genuine live-oak; chinquepin, hickory, black walnut, cherry and ash; and in Northern Arkansas the tulip tree or yellow poplar, the sweet, sour, and black gum, cypress and the Osage orange, etc., etc. In Northwestern Texas, there are some forests of pine and fir. The mountains of Arizona, Colorado, and New Mexico, are generally covered, nearly to the snow line, with evergreen forests (pitch, yellow, and spruce pine), but the trees are not usually of such gigantic size as are

found on the Pacific coast. Along the streams the inevitable cottonwood, locust, buckeye, box elder (*negundo*), and maple, are found in moderate quantities.

The forest growths of California are (or rather were, for, except in a few of the counties, they are rapidly passing away) for the most part wholly unlike those of the region east of the Rocky Mountains. Its largest trees, the sequoias, are of the redwood or cedar family. The *Sequoia gigantea* has attained in some instances to a height exceeding 450 feet, and very few of them when their growth was attained are under 325 feet. The tallest now standing is said to be 376 feet in height. Their circumference is as remarkable as their height, ranging from eighty to one hundred and twenty feet. The largest now standing measures 106 feet in circumference at its base. The *Sequoia sempervirens*, or redwood of the Coast Range (the *Sequoia gigantea* is only found on the western slope of the Sierra Nevada), is but little smaller than the *Sequoia gigantea;* often attaining a height of 300 feet, and a circumference of from sixty to eighty feet. The sugar pine (*Pinus Lambertiana*) and the Douglas' spruce (*Abies Douglasii*) both attain a height of 250 to 300 feet, with a circumference of forty to forty-five feet. The California yellow pine (*Pinus ponderosa*) is often 225 feet high. Sabine's or the nut-pine (*Pinus Sabiniana*), the western balsam-fir (*Picea grandis*), and the white cedar (*Libocedrus decurrens*) all attain a height of 150 feet; and among the deciduous trees, the burr oak, and the western chinquepin, one of the chestnut family, reach 125 feet. Many other trees unknown at the east, some of them semi-tropical, are 100 feet or more in height. Two of the oaks are evergreens.

The trees planted or raised from the seed, under the Timber, Culture and other acts, have been almost entirely of the rapidly growing kinds, the cottonwood, the ailantus, the locust, the Osage orange, the vine, maple, and white maple, etc. Few of these have much value for timber, but most of them are good for fuel, and some make moderately durable railroad ties. There must be added, however, to this list of trees, planted by settlers, one which is likely to prove of great value in a sanitary point of view,

as well as eventually as a timber tree, the *Eucalyptus globulus*, a tree which has the reputation of arresting the progress of marsh miasms, and of rendering the regions in which it is planted healthy. Unfortunately, this species is not hardy above latitude 39° or 40° north, but some of the other species of *Eucalyptus* may be less susceptible to the cold. One species, found in Australia, contests with the *Sequoia gigantea* of California, the title to be considered the largest tree in the world. It is said to be at least of greater circumference.

In the newer portions of this vast region, the farmer has been so intent on bringing the greatest possible amount of his grain or root crops to market, that there has been comparatively little opportunity for developing æsthetic taste in the cultivation of a flower-garden; and yet in sections where two years ago the sod was unbroken, the grounds around the often humble cabin or sod-house give evidence of refinement in the variety of flowers already blooming there. In Iowa, Missouri, Minnesota, Nebraska, Kansas, Texas, California, Oregon, Nevada, and Eastern and Central Colorado and New Mexico, the flower-gardens are often gay with beautiful flowers, of kinds unknown at the East, and as often redolent with the sweetest perfumes. Many shrubs, which at the East are hardly half-hardy, and cannot in our climate be preserved through the winter, on the Pacific coast and in Texas, become trees of twenty or thirty feet in height. Among these we may name the fuchsia of several species, with its beautiful flowers of crimson, white, scarlet, yellow and blush; the heliotrope, with its rich perfume, which becomes a flourishing tree; the mignonette, the smilax, here so delicate, there a hardy climber; the magnolia grandiflora, the syringa, there a stately tree, the lily family, etc., etc.

Wild flowers of great beauty and fragrance abound throughout all this region, except the alkaline or sage-brush lands, the Llano Estacado and the dry *mesas* of Arizona, and the two latter during and after the scanty rains, are resplendent with brilliant blossoming verdure, and during their dry seasons, the cacti, though of uncouth and ungainly forms, produce flowers of gorgeous hues, and some of them of wonderful beauty.

As to kitchen and market-gardens, they are found most abundantly in the neighborhood of the towns and cities. A large proportion of them are cultivated by Europeans, the Germans, perhaps, being most numerous among the larger market-gardeners. Their products are of almost unlimited variety: cabbage, cauliflower, kohl-rabi, onions, leeks, garlics, early sweet corn, sweet potatoes, the common potato of many varieties, yams, okra, gumbo, asparagus, celery, spinage, and other greens, vegetable oysters, egg-plants, radishes, lettuce, artichokes, turnips, beets, mangel-wurzel, ruta-baga, carrots, parsnips, squashes, pumpkins, muskmelons, watermelons, citrons, cucumbers, gherkins, peppers, the flavoring plants, thyme, summer-savory, sage, endive, peppergrass, water-cresses, parsley, orange leaves, bay leaves, etc., etc. Many of them deal also in the small fruits in their season. To those who have been accustomed to this business in Europe or in the Eastern States, there is a fine field for enterprise here; a very few acres of the fertile soil are sufficient, and for some years at least, and in most cases for one or two generations, no manure beyond that made upon the place will be needed, only deep and thorough tillage, to produce such vegetables as cannot be produced elsewhere. In the vicinity of any of the rapidly growing towns of the mining region, there is no danger of a glut in the market for these products, and if the market-gardener can manage to keep two or three milch cows of the best grade, his milk and butter will prove additionally profitable. In this connection, too, the rearing of fowls, whose feeding and care is inexpensive, in connection with the market-garden business, is a source of large profit.

CHAPTER XIV.

New Directions in which Agricultural Industry may be Developed, and in which it is already Developing—Millet and other Forage Crops—Silk-Culture—Rearing the Silk-worm—Stifling the Cocoons—Reeling—The Filature—Schappé or Spun-Silk—Cocoons do not bear Transportation well—Advantages of Silk-Culture in the West—The Silkville Experiment—Prices of Raw Silk and of Silk-worm Eggs—Probability of a Large Demand for Raw Silk—Textile Fibres—Flax and Hemp—Paper Stock: Esparto Grass, Tule, Marsh-mallow, etc.—Ramie, Jute, Tampico—The Nettle—Dye Stuffs—Cochineal—Oil-Producing Plants—The Olive—Cotton-seed Oil—Hemp-seed and Linseed Oil—Oil of Sunflower Seeds and other Seeds—Sesamum Indicum—Tar Weed (Madia Sativa)—Pea-nut, Ground-nut or Goober—Castor Bean (Ricinus Communis and Sanguinarius)—Tea and Coffee Cultivation—Fruit and Nut-bearing Trees and Shrubs—The Olive—Oranges and Lemons—Pomegranate—Fig—Banana, Plantain, Pineapple, Guava and other Tropical Fruits—Papaw—Nut-bearing Trees and Shrubs—Introduction of Foreign Nuts—English Walnut—Italian Chestnut—Almond—Other Fruit-bearing Shrubs—Japanese Persimmon, Carob, Jujube, Mezquite, etc.—Trees and Shrubs containing Tannin—The Sumacs—The Wattles—The Spiræas or Hardhacks.

We have already spoken of the cultivation of the Minnesota early amber-cane, or sorghum, and of the great impulse which has been given to its culture within two years past by the discovery that it contains its largest proportion of sugar, and almost its only crystallizable sugar, when it is ripe; and have shown that not only can the seed be saved by waiting till this time, but that the yield of sugar is so large, and is produced by such simple processes, that it is the most profitable crop a farmer can raise, and will materially diminish, if it does not entirely abolish, the necessity of our importing immense quantities of sugar from the West Indies, Demerara, Brazil and the Sandwich Islands. Our importation of sugars now costs us $100,000,000 annually. We may be, within ten years, and possibly within five, exporters instead of importers of raw sugars.

It has been ascertained that the stalks of our Indian corn yield, when the corn is ripe, about seventy-five per cent. of the quan-

tity of sugar produced by the amber sorghum; that the millets, the Egyptian rice corn, and probably broom corn also, which is largely cultivated in some portions of the West, yield quite as much as the Indian corn. Here is a great opportunity for a new and lucrative industry, and there is little danger of overdoing it.

The cultivation of the millets, and especially of the pearl millet and the Egyptian rice corn, already introduced into Kansas and some of the other States, both as a forage plant and for the production of sugar, and the increase in the crops of Alfalfa, Lucerne, Hungarian grass, and possibly some of the other forage grasses, is well worthy of attention. We shall have more to say on this subject in connection with stock-farming. The yield of forage from some of them is enormous.

The rearing of silk-worms is an industry which, if rightly managed, might be made very successful. It does not require a very large outlay, but will be best conducted by colonies, some of the members of which have been practically familiar with the business elsewhere.

There is necessary, in starting the business, a plantation of mulberry trees, but this need not be large at first, and the tree grows very rapidly. The white mulberry (*Morus alba*) is perhaps the best, though some prefer the black (*Morus nigra*) or the many-leaved (*Morus multicaulis*).* Other trees afford food for silk-worms, such as the Osage orange, regarded by many as equal to the mulberry, the ailantus, the weeping-willow (*Salix Babylonica*), the kilmarnock willow, some of the osiers, several species of oak, and the garden lettuce, but the silk is better from the mulberry than from most of the others, and if well managed, no more expensive. When the mulberry trees are large enough to furnish a good supply of leaves, the silk-worm eggs should be procured, and the purchaser should avoid any fancy varieties, of which there are many in the market, but should confine himself to those kinds which will produce the large, single crop sulphur yellow, lemon yellow, or white cocoons. These in the long run

* M. Boissiere thinks the Lpoa or Japanese mulberry (*Morus japonica*) better than any other, as fourteen and a half pounds of its leaves will make one pound of cocoons, while of the white mulberry, twenty pounds are required, and of the *morettia* new species fifteen pounds, and the rose mulberry seventeen pounds.

will pay best. Shelves, or layers of brush, separated by proper supports, should be provided for feeding the worms, and the feeding, if the number is considerable, will keep the children pretty busy night and day for from three to five weeks. When the worms are ready to begin to spin, the brush is better than shelves or frames. When the cocoons are finished a few of the best shaped and largest must be reserved for the production of eggs, and the rest "stifled;" *i. e.*, the chrysalides killed, either by subjecting them to the fumes of camphor, or some of the other hydro-carbons, or to steam heat, or baking them. It is not best for the families to reel the cocoons themselves; if there is a colony of silk-growers, some of them will probably be skilful reelers, and one filature or reeling establishment is enough for a hundred silk-growers. Machines recently invented make reeling on a large scale easier than it was, and if the silk-growers bring their cocoons at an average price to the filature, receiving their pay when the silk is reeled and sold, a moderate capital only will be required. Raw silk is not so bulky as to make its transportation very expensive, but if at a distance from market the silk may be doubled, twisted, and thrown, or brought into the condition of tram and organzine, without any great addition to the cost. The pierced cocoons, or those through which the chrysalis has escaped, as well as wild silk-worm cocoons, if there are any, and the floss or outside silk of the reeled cocoons, may also be utilized in such an establishment, being boiled for a long time in soap and water, cut up, carded and spun to form the spun silk, or Schappé. Eventually it may be desirable to establish a factory for the production of sewing silk, ribbons, handkerchiefs, fringes and trimmings, dress goods, satins, laces, or velvets. The last are not as yet produced in this country. Cocoons are too bulky to bear long transportation, and the only successful silk-culture must either be, that in which one filature with skilled reelers works up the cocoons from a hundred families of silk-growers, or one in which the silk-worm eggs are produced for the market in large quantities. There is an active demand for these at high prices, but even if the business was conducted with only this end in view, the pierced cocoons might be utilized with profit.

One advantage of the silk-culture is, that it occupies but a few weeks of the year, and most of the work can be performed by children, while other farm or manufacturing work can be prosecuted during the remainder of the year. M. Boissiere has established a cheese factory to employ his operatives the remainder of the year. Conducted as we have indicated, it can hardly fail to be profitable in connection with the cultivation of other crops. The silk-worm disease which has so largely reduced the silk product of Italy and France, is not likely to be introduced here, but the silk-grower should select localities not subject to frequent and violent storms, or to severe thunder-storms, or rapid and extreme changes of temperature during the time of feeding, as the worm is then very sensitive, and easily killed. M. E. V. Boissiere, the French silk-grower and manufacturer already mentioned, has started silk-growing and silk manufacture with a colony of French silk-growers on a small scale at Silkville, Williamsburg P. O., Franklin county, Kansas, and after a struggle of several years, has succeeded in producing raw silk equal in quality to the best French and Italian, and his worms, though originally from the eggs from the moths of diseased worms, have proved perfectly healthy. A considerable portion of the raw silk produced at Silkville is reeled by hand by the daughters of the silk-growers, who had become experts in reeling in France.

The cocoons from French silk-worms are much larger and more easily reeled than those from Chinese or Japanese worms, and M. Crozier, M. Boissiere's manager, says that in 1878 the raw silk produced there brought in the French market 130 francs the kilogram, or about $10 a pound. At this price the raw silk affords a better profit than the production of silk-worm eggs for market, and is safer, as the price of the eggs varies so much, and the demand for them is liable to be below the supply. In 1877, France alone paid 1,691,400 francs = $338,280 to this country for silk-worm eggs; but a part of these proving worthless, from bad management, there was a decided falling off in the demand in 1878 and 1879.

But the price of raw silk also fluctuates widely, ranging within the ten years 1868–1878, for the best Italian, from $7.25 to

$15; for the best Japanese (Maibash) from $3.75 to $9.12, and for the Chinese (Tsatlee III.) from $4.25 to $8 per pound. In 1878 the prices were still lower, averaging at the close of the year only about $2.50 per pound, for all qualities, European and Asiatic. It has since advanced materially. To command the highest price, however, the raw silk must be reeled with the greatest care and skill, so as to make a uniform thread, and on this account it can never be done successfully by inexperienced hands, and is best done by machines with skilled reelers.

The great increase in the silk manufacture in this country will create a large and steady demand for raw silk, and if it can be produced at paying prices, by the methods we have indicated, or if silk-factories can be established in the Western States and Territories, which will combine reeling with the manufacture of silk, this will become a favorite industry among the enterprising farmers of the Great West.

Another wide field for enterprise is in the direction of the cultivation of a greater variety of *textile fibres*. Even flax and hemp, the most common of the textiles after cotton, have not had a fair chance in the West. With the facilities afforded by our unrivalled machinery for the breaking of flax and hemp, and the abundance of pure water for bleaching, Minnesota and Dakota ought to have many millions of acres in these two crops.

The great demand for paper stock should cover all the marsh lands of Missouri, Nebraska and Kansas with Esparto grass, tule, marsh-mallow or the cane-brake; while farther south the palmetto could be produced, on lands now considered worthless, for the same purpose. The vast amount of wheat-straw and wild hay of Minnesota, Dakota, Nebraska and Kansas might be converted into paper and straw-board, to much greater profit than is gained by using both as fuel for running threshing-machines and factories. The new invention, by which, by chemical saturation and powerful compression, straw-board can be made into an artificial wood almost as hard as iron, and fit for all the uses of the best ornamental woods, at hardly more than a tithe of their cost, ought to be worth millions of dollars to those States, and to California, where the straw is also burned.

But the production of textiles is not limited to these fibres. Ramie, one of the most delicate and beautiful of textiles, has been raised successfully in Texas and Arkansas. Jute is even more successfully cultivated throughout the entire region below forty-two degrees, and there is a steady and large demand for it. The various fibres known as Tampico, Honduras grass, Panama grass and Agave fibre, can all be raised easily and profitably in Texas, Arkansas, Arizona and New Mexico; while the over-abundant cacti of Texas and Arizona can be utilized for the production of strong and excellent fibres suited both for rope and bagging purposes and for paper stock. A species of cactus, which grows in immense jungles or "*chaparral*" in Southern California, has already been utilized for making mattresses, for which its beautiful white and easily-curled elastic fibre, fit it admirably.

The Germans have achieved a good degree of success in cultivating *the nettle*, both for its textile fibres and as a good and desirable fodder. They cultivate their native plant, the *Urtica dioica*, but the *Bœhmeria nivea*, a Chinese and Indian nettle, from which comes the *China grass*, or *Ramie*, is said to be better where the climate is not too cold. A Canadian species, *Urtica Canabina*, is also highly commended. The cultivation is very simple; the nettle will grow on the very poorest land (though, of course, larger and better on that which is richer); its fibres are finer and better than hemp, and fully equal to the best flax, and it will yield from 300 to 500 pounds of white, fine fibre to the acre, while it is more easily hackled than either flax or hemp. It is worth a trial. The fodder can be saved in cutting it for the fibre, and is much relished by cattle.

Since the discovery and large production of the aniline colors from coal and gas tar, there has been a decreasing demand for madder, cochineal and other vegetable and animal dyes, but there is yet a considerable call for them, if only for the extraction of their ultimate coloring principles. Yet the cultivation of madder is not more difficult than that of most root crops, and where it is grown on a large scale the extraction of its active principle, alizarine, will afford large profit.

The cochineal is composed of the dried bodies of insects which feed upon the cactus, and the most widely diffused species of it. Their entomological name is *Coccus cacti*, and beside the usefulness of the cactus in furnishing textile fibres, it can be utilized to any required extent, in Arizona and Western Texas, in rearing this valuable little insect.

Another new direction for farming industry is found in the cultivation of oil-producing plants. The olive will flourish and yield fruit in most of the region south of the 38th parallel. It endures drought well, and will mature its valuable fruit, even in Arizona and New Mexico; and both the fruit and oil will command a ready market. It is already cultivated to some extent in California and Texas, and its culture deserves to be greatly increased.

The extraction of oil, and the sale of the oil-cake from the cotton-seed, is an industry which is already becoming very extensive in Arkansas, Louisiana and Texas, and is a great boon to the cotton-planter, transforming, as it does, what was formerly a nuisance into a valuable product. But there are other plants and seeds which furnish equally valuable oils, and which may be cultivated with very little labor. We have already spoken of the culture of flax and hemp under the head of textiles: but the seeds of each are very valuable both in their natural condition, and crushed, or ground, and pressed, yielding the linseed and hemp oils, so valuable in the arts, and the oil-cake, in demand for fattening cattle, and increasing the quantity and quality of the milk of milch cows. Other oil-producing plants, which admit of easy cultivation and yield a liberal return, are the *Sunflower*, which yields from 275 to 300 pounds of oil per acre, and an excellent oil-cake, and has a deservedly high reputation for absorbing and rendering innocuous, marsh exhalations; the two species of colewort (the common and curled) which yield from 650 to 875 pounds of oil to the acre, and almost a ton of seed; the winter and summer rape, which furnishes also good fodder, while the seed is in demand aside from its use in furnishing oil; the Swedish turnip-seed, and the turnip cabbage-seed, both yielding a good manufacturing oil; the gold-of-pleasure and the white

poppy—all of these yield from 550 to 650 pounds of oil to the acre. The *Sesamum indicum*, which grows well in the region below the parallel of 39°, is one of the most valuable of oil-producing plants in the world. It yields about forty per cent. of oil, and is an annual of simple and easy cultivation. The black-seeded variety is the best. It is sown thinly in drills. The oil, for all medicinal and pharmaceutical purposes, is fully equal to the best olive-oil, and keeps for many years without becoming rancid. It is preferred in the East, for table purposes, to the best olive-oil, and from its freedom from smell, is much used for extracting the perfume of fragrant flowers. The expressed cake is mixed with honey and preserved citron as a conserve, and without admixture, furnishes a food for bees. It is already cultivated to some extent in the South.

The tar-weed (*Madia sativa*) is found abundantly on the Pacific Slope, where it is indigenous. Its seeds contain an oil which is used as a salad-oil, and for all purposes to which olive-oil is applicable. It is easily cultivated, and yields from 550 to 650 pounds of oil to the acre. It is used in Europe largely to mix with olive-oil.

But, after all, the most profitable of the oil-producing plants for cultivation, is the *ground nut*, or *pea-nut*, usually called goober in the Southwest. It will grow on light or gravelly soil, and with decent cultivation should yield from forty to sixty bushels to the acre, and has been known to yield from 120 to 125 bushels. The whole plant is valuable. The vine makes excellent forage or fodder, the tubers or nuts are much in demand, when baked or roasted, by children and some adults. The oil expressed from them is of excellent quality, fully equal to olive-oil, and for many purposes superior, as for illuminating and lubricating purposes. It does not readily become rancid, and is very sweet and delicate. The pea-nut is largely imported into France, and the oil expressed there, and sold as the best olive-oil. The oil is also produced largely in the East India Islands, and on the African coast, whence it is exported to be used in the manufacture of the finest soaps. The nuts are also ground up and mixed with cacao, for the manufacture of choco-

late, and in the production of chocolate for confectionery—the cacao is now generally omitted.

Taking all its uses into account, there is hardly a more surely profitable crop than pea-nuts, especially if enough engage in it to warrant the erection of an oil mill. The price of nuts per bushel has varied in the past from sixty cents to $2.25; but they are not likely to fall below $1.25 per bushel hereafter. The yield of oil is from forty to forty-five per cent. of their weight.

The *castor bean* yields a crop which always has a prompt, though not a very high market value. It grows readily and rapidly, and the gathering of the crop is easily accomplished. It has been raised to a considerable extent in Kansas, Nebraska, Texas, and perhaps some of the other States. The crop seems to have been carelessly cultivated or gathered, for, on soils like those where it was grown, the average crop should be at least twenty to twenty-five bushels to the acre, while in very few instances did it exceed fifteen bushels, and in the majority it was only ten or eleven. The price paid for the beans was about one dollar a bushel, a price which gives a very large profit to the mills which express the oil, inasmuch as the beans should yield forty-seven per cent. of oil.* With more care in cultivating the crop, and a sufficient number engaged in raising it in one neighborhood to sustain a co-operative mill in the vicinity, the crop might become a tolerably profitable one.

There are undoubtedly some districts of considerable extent in the Great West, where, under favorable circumstances, both tea and coffee might be successfully cultivated, the former especially, and yet we hesitate to commend it as a desirable industry, for several reasons; it requires a considerable investment, though not all in one year; there are no returns under six or seven years, and the tea gardens must be sufficiently extensive to warrant the establishment of a large factory with many employés to prepare the teas, while there are so many opportunities for investing capital, which will bring a quick return, that

* It is probable that the *Ricinus sanguinarius*, or the *Ricinus minor*, both French species of the castor bean, would yield more bushels to the acre, and more oil to the bushel, than the *Ricinus communis*, the species most generally cultivated here.

it is difficult to command it for such an enterprise. Furthermore it is uncertain whether the leaves can be cured in such a way as to enable them to compete successfully with the Assamese, Chinese, and Japanese teas; and even if they were superior to them in flavor and quality, whether the public taste, which always prefers foreign to home-made productions, would regard them with favor. The coffee plantations require a still longer period of waiting before obtaining the first crop, though there is less time and skill required in its preparation for the market, when it is brought to the bearing condition. Coffee is, however, essentially a tropical production, and though there is a possibility of success in its cultivation, in Southern California, Arizona, and Southern Texas, there is hardly sufficient certainty to warrant the outlay necessary to make it a product of any great commercial value.

There remain to be considered the fruit and nut-bearing trees and shrubs which admit of profitable cultivation. We have already spoken of the olive, valuable alike for its fruit, its oil and its beautiful wood. Its cultivation has been attempted on a small scale with a fair measure of success, in Texas and Southern California, and perhaps also in New Mexico. It was cultivated, though with no great care and probably not of the best varieties, at the Jesuit Missions, and though these trees from long neglect have grown wild, they would furnish stocks for grafting the newer varieties upon. It is probable that the olive might be profitably cultivated in all the region south of the 39th parallel, which is not too elevated. It is worth the trial, for though the numerous substitutes for olive-oil may to some extent reduce its value, yet the olive has too many good qualities ever to become an unprofitable tree. The orange and lemon, which have become so popular and profitable in Florida, are already cultivated to some extent in Louisiana, Texas and Southern California, and might be, if they are not, in Southern Arizona. It is probable that some of the varieties from China or Persia, if not the several native varieties, might be cultivated as far north as the 38th parallel, though most of them would be injured by the occasional severe frosts which, at rare intervals, extend almost to the Gulf

coast of Texas. One species, the *Citrus Japonica*, or Kum-quat, bears a small but excellent orange, and is perfectly hardy. The lemon is not as hardy as the orange, but its culture is even more profitable. The shaddock, or large bitter orange, and the Seville, or bitter orange of the south of Europe, are both more hardy than most of the sweet varieties, but their fruit is less profitable. The citron, from the thick peel or rind of which the preserved citron of commerce is prepared, is not, we believe, cultivated on this continent, and its culture is diminishing in Europe. When an orange-grove is not in danger of frost it becomes in time immensely profitable, but it yields very little (and it is better that it should not mature any) fruit till it is ten years old. From the tenth to the twentieth year it will yield every year a good and constantly increasing crop of fruit, and a still larger one each year, from the twentieth to the thirtieth year. In an ordinarily healthy growth, without forcing, it does not attain its full maturity till about its thirtieth year. We have not deemed it necessary, in the case of either the tea or the orange-culture, to go into details, in regard to the processes of cultivation, or the preparation of the products for the market. In the case of the tea, these are not well settled, and in that of the orange and lemon, different climates and different varieties require diverse treatment. Those who contemplate their culture will be, necessarily, persons having considerable capital at command, and they will do well to make a special study of the subject, before investing. For this purpose, there are numerous essays and treatises to be had, some of them giving the results of careful, protracted, and intelligent experience.

The *pomegranate* is already cultivated in California and Texas, as well as in the Gulf States east of the Mississippi. Its delicious fruit finds a ready market at good prices, and the imperfect fruit is in demand for the manufacture of citric acid. It is capable of successful cultivation in all the region south of the 39th parallel, except those portions which are too elevated or too dry for fruit-culture.

The cultivation of the fig is not new in California, Arizona, Texas, Arkansas, or Louisiana, but it is capable of great exten-

sion, and could be profitably grown, either for the fresh or dried fruit in Southern Kansas, Southern Colorado, New Mexico, Arizona (wherever irrigation is possible, or there is sufficient rainfall), and nearly the whole of California. There are few fruits which yield as good a return from a small expenditure of labor. The banana, plantain, pine apple, guava, and other tropical fruits, flourish in the southern counties of Texas and Southern California, though they are at rare intervals, even there, affected by frost. The papaw, our indigenous fruit of the banana family, is hardier and ripens regularly in all the region south of the 40th parallel. It is worth cultivating, and might be so improved as to be a rival of the plantain. The indigenous nut-bearing trees and shrubs, the hickory-nut, butter-nut, black walnut, chestnut, beechnut, and hazel-nut, in the North; the piñon or edible nut of one of the species of pine in the region west of the Rocky Mountains, and the pecan nut, chinquepin, and filbert, which, though not indigenous, grows wild, in the South, are all capable of extensive propagation, though the chestnut only thrives on soils of a particular quality. The pecan is one of the best of our indigenous nuts, and grows on a shrub or bush of moderate height.

The foreign nuts which are already partially introduced, and which are likely to prove profitable in cultivation, are: 1. The English walnut, sometimes called also the Madeira nut, a fine, stately tree, which at twelve years of growth yields a large crop annually of the very fine nuts we know as English walnuts. 2. The Italian chestnut, whose large nuts yield a nutritious flour, and one which keeps well for two years or more. In Tuscany and Lucca, there are several millions of these trees, and the flour from the chestnuts furnishes the principal, and sometimes the entire farinaceous food of many thousands of the inhabitants. This, too, is a stately tree, and proves easy of culture here, while it may be readily grafted upon our native chestnut. It is admirably adapted to the western slopes of our mountains, and will thrive luxuriously there. 3. The almond, which being a congener of the peach, thrives wherever the peach can be successfully cultivated. The soft-shell almond is not as hardy as the hard-shell, and a sharp frost is fatal to either; but in Southern

California, Arizona, Southern New Mexico, and Texas, both can be, and are successfully cultivated. The pistachio nut is also on trial, and will probably prove successful. Of other fruit-bearing shrubs and trees, we may name the Japanese persimmon, lately introduced, and said to be an excellent fruit, much superior to our native species, which however has some good qualities; the carob, a legume-bearing tree, whose pods and beans are supposed to have been the husks fed to the swine, in the parable of the prodigal son; the jujube, whose pulp forms the material for the jujube paste of commerce, and the mezquite, indigenous in Texas, whose bark and root yield tannin in large quantities, whose pods furnish a nutritious food, and whose gum is almost identical with gum tragacanth.

Of trees and shrubs containing large amounts of tannin or tannic acid, besides the mezquite, there are five or six species of the rhus or sumac; four at least native, and containing from eight to twenty-five per cent. of tannin, and two foreign, the Venetian and the Sicilian sumac, which contain a little more. These are both cultivated here.* The wattle, an Australian tree of the acacia family, of which there are two species—the golden and the black wattle, *Acacia pycnantha* and *decurrens*—is also a valuable tree for the tannin its bark produces. It attains its full growth in ten years, yields from twenty-four to thirty-six per cent. of tannin, and its wood is valuable for fences, for tools, and for fuel, being nearly or quite equal to hickory, for the last purpose. It grows in dry soils, and in almost rainless regions, and would be of great value for planting on the plains under the Timber-Culture Act.

All the species of *Spiræa* contain a large percentage of tannin. Some of these, as the *Spiræa tomentosa*, or common hardhack, and *Spiræa alba*, or white hardhack, are common weeds, and can be easily raised on the poorest lands, yielding three to five tons to the acre. The extract from this would be

* We are not aware that the bark of the ailantus has ever been tested for tannin, but as it belongs to the sumac family, it is reasonable to suppose that it may be somewhat rich in that principle. If it should prove to be, its rapid growth would make it nearly as valuable as the wattles of which mention is made above.

superior to the best bark extract. The foreign species are of larger growth and are much cultivated as ornamental shrubs. It is doubtful whether they contain a larger proportion of tannin than the native species.

New forms of industry and profitable labor in connection with farming, are constantly brought to the attention of the public, some of them valuable, others valueless; but those which have been detailed in this chapter are sufficiently numerous to satisfy any ordinary ambition; they have all been tested, and none of them, like the cultivation of the opium poppy, which has been commended by some writers, are of a character which will injure rather than benefit mankind.

CHAPTER XV.

STOCK-RAISING—CATTLE-HERDING, AND THE REARING OF HORSES AND MULES—THE GRAZING LANDS—THE STOCK-GROWING REGION, *par excellence*—WINTER CARE OF STOCK—NUMBER OF CATTLE IN THE WEST IN 1879—THE HERDSMEN OR COW-BOYS—STOCK-RAISING PROFITABLE IF WELL MANAGED—STOCK-RAISING IN TEXAS—CLIMATIC ADVANTAGES—PASTURING ON THE GREAT RANGES, OR ON ONE'S OWN LAND—EXPENSE OF REARING CATTLE IN TEXAS—THE TWO EXTREMES IN STOCK-RAISING IN TEXAS—EXAMPLES—BEGINNING ON A SMALL SCALE—GROWTH OF A TEXAS STOCK-RANCHE—STOCK-RAISING IN KANSAS AND COLORADO—JOINT STOCK MANAGEMENT OF A RANCHE—THE COLORADO CATTLE COMPANY'S ESTATE OF HERMOSILLO—ANOTHER COLORADO COMPANY—STATISTICS—THE ESTIMATE OF MR. A. A. HAYES, JR.—THE DIFFERENCE OF PROFIT BETWEEN "STORE" CATTLE AND "FAT" CATTLE—MR. BARCLAY'S ACCOUNT—THE ENGLISH VIEW OF THE MATTER—STOCK-RAISING IN THE NORTHERN AND NORTHWESTERN STATES AND TERRITORIES—SHELTER AND FOOD FOR STOCK—FUTURE ADVANTAGES FOR SHIPPING CHOICE STOCK FROM THESE STATES AND TERRITORIES TO EUROPE—DAIRY-FARMING—STOCK-RAISING AND DAIRY-FARMING IN CALIFORNIA—HORSE-FARMING AND REARING—MULES—CAMELS.

WE have already spoken of the vast extent of grazing lands found in this great Western Empire. What is the actual area of these lands can only be approximately estimated, since every year large districts, previously supposed to be only available for grazing and almost worthless even for that purpose, are

found to be susceptible of cultivation, and to yield immense crops when subjected to culture. There are, furthermore, many tracts which have not yet been surveyed and are really unexplored even by the Indian, or the hunter and trapper; in some, and perhaps many, of these there are beautiful valleys, narrow, yet covered with a rich and succulent herbage, which will fatten and nourish large herds of cattle. As nearly as we can estimate, there must be somewhat more than a million of square miles of these grazing lands; enough to supply the whole world with beef, mutton, leather, and wool.

Most of the States and Territories have considerable tracts of grazing lands, but the stock-growing regions, *par excellence*, are Dakota, Montana, a part of Idaho, Eastern Washington, and Oregon, California, New Mexico, Colorado, Wyoming, Western Nebraska, Western Kansas, the Indian Territory, and Western Texas. Texas has at present larger herds of cattle than any other section, and exports live-stock and the carcasses of slaughtered beef in refrigerator steamers to Europe in large quantities; but the finest beeves sent to our Eastern markets and to Europe are those from Colorado, Western Kansas and Nebraska, Montana, Dakota, and Wyoming. The native grasses of the Rocky Mountain parks and valleys are unrivalled for their nutritive qualities, and cattle fed on them will fatten with but very little grain. When the immigrants began to pour into the Pike's Peak region in great numbers, in 1858 and 1859, many of them lost everything except their cattle, and in their despair, finding these unable to draw their loads any further, they unyoked them and turned them out into the parks and grazing lands of that region to shift for themselves, believing that they would not be able to endure the fast approaching winter. The cattle went off, and for several months nothing was seen of them. The settlers at length started out to find their bones, but to their great surprise found them not only alive, but fat and sleek from the nutritious buffalo and gamma grasses, which, though cured by the sun, retained all their sweetness and nourishment.

In most of this Rocky Mountain region there is no winter shelter for cattle, and they hardly need any oftener than one

winter in ten. A few of the more prudent stockmen put up rough, cheap sheds, and cut with a mowing-machine a score or two tons of the natural grasses, against a long or cold storm; but it is so seldom that these precautions are necessary, that their fellow-stockmen laugh at them for their carefulness. Even in Montana and Dakota the pasturage grounds are so seldom visited by severe or desolating storms, that provision for them is the exception and not the rule. In Oregon and Washington somewhat greater attention is paid to the sheltering of the stock, but in California no effort is made in that direction.

The aggregate amount of cattle in the Great West, at the end of 1878, was estimated by the Agricultural Department as 3,350,400 milch cows, and 12,259,000 oxen and other cattle. The estimate was below the truth, as the local statistics show, and especially in Colorado and the Territories. To this total of 15,609,400 neat cattle were to be added over three million head in the Territories not estimated by the department. The aggregate numbers at the close of 1879 were certainly not less than 19,000,000, and this increase was probably in about the same ratio in milch cows and in oxen and other cattle. The net increase in the great herds is about forty-five per cent. a year, though occasionally, in a year of unusually severe weather, it may fall off to thirty-five or thirty-eight per cent. In Texas and in the large herding districts elsewhere, no attempt is made to obtain the milk for use or for the production of butter or cheese, dairy-farming being regarded as an entirely distinct business from stock-raising, and having no connection with it. This distinction is carried so far in Texas, that the largest stock-growers, owning from 10,000 to 50,000 head of cattle, either purchase their milk, butter and cheese, or go without it.

The cattle are under the care of herders or "cow-boys," who see that they are driven to the best pasture, and where they can have a good supply of water. These cow-boys lead a lonely and hard life, being in the saddle most of the day, and lodging in small and comfortless huts at night. Once a year, there is what is called a "round up," when the vast herds of different owners, which have pastured together over the great tracts of as yet

unsurveyed government lands, are brought together, and each owner or his herdsmen separate their own herds, and brand the calves which follow their mothers. This is a time of excitement, and where the herds are large and wild, of considerable danger, as should one of the herdsmen be unhorsed in front of the rushing herds, he would be trampled to death instantly. The herdsmen are usually very expert in the use of the lariat or lasso, and will bring a refractory cow or bullock to its knees in a moment, with the most unerring precision. The cattle intended for slaughter or shipping are usually caught in this way. A large proportion of the Texas and California herdsmen are Mexicans, but in Colorado, Kansas, Montana, and Wyoming a majority are Americans, English, Irish, and Canadians. The usual wages are from $16 to $20 per month and food and lodging.

Properly managed, the business of raising stock is profitable, but it requires considerable capital, or if that is wanting, a thorough knowledge of the business and good executive ability, to achieve any marked success. Time is an important element in the profitable management of this as well as of farming and fruit-culture. The man who begins, even with a very moderate capital, takes good care of his stock, improves the breed carefully, and watches the small leaks, which ruin so many men, will find himself at the end of ten or twelve years, with a herd of cattle, which will yield him an ample income each year.

Of course there are differences in the mode of management of herds of cattle in the different regions in which this is a prominent industry. In Texas, the stock-raiser has some great advantages, and some disadvantages. One great advantage is the climate, which entirely precludes the necessity of any winter provision for his stock; they are better provided on the range, if they can have easy access to water, than they could be if shut up in a corral, or provided with hay, or even green forage. He has the advantage also in regard to his pasturage lands; he need not, unless he chooses, pay out a dollar for all the grazing land he desires to occupy, especially in Northwestern Texas, or if he prefers that his cattle should not become so wild, as they may

become on the great range, and wishes to have them where he can give some attention to them, and prevent them straying away, he can buy one, two, three, or a dozen square leagues of grazing lands, at a mere nominal price of a few cents per acre, and is not required to fence it; in this case he must employ a herdsman to every 1,500 or 2,000 head of cattle, though he will save most of the expense of rounding up, which he would have if the herd were looked after only once a year, when they were to be branded. Of course, the expenses of rearing cattle are much less here than farther north; the first cost of cows with calves being only from $8 to $15, and of stock cattle from $4 to $7; and Mexican herdsmen and rounders being plenty at from $12 to $18 per month; but on the other hand, Texas cattle are not as large or as fat as those raised farther north, and do not command as high a price. Until 1872 or 1873 there was little effort made to improve the breeds of cattle in that State, but since that time, many Durham, Hereford and Devon bulls have been imported into the State.

In Texas, more than in any other State or Territory, are found the two extremes of stock-raising; the wealthy patriarch with his herds of 40,000, 50,000, 80,000, or even 100,000 cattle, perhaps 15,000 or 20,000 horses, and 20,000 to 50,000 sheep; and possibly in the same county, or as near as circumstances will permit, the small herdsman with his eighty or one hundred cows, two or three bulls, and possibly one or two hundred sheep; and it is often the case that the man who now counts his cattle by tens or scores of thousands, began, twenty-five or thirty years ago, on a scale no larger than his humble neighbor. Father Nugent, an English Catholic priest, who visited Texas and spent some months there, wrote to the Liverpool *Times*, August 12th, 1871: "Here is one of a hundred examples of a poor man becoming rich without a copper. Twenty-five years ago an Irishman engaged with a stock-raiser. There was no money to be given, but he was to be boarded and found in everything, and in the place of wages he was to receive one cow and a calf each month. Now he is worth $100,000 in cash, and sends to market each year from fifteen to twenty thousand head of cattle. Here is a

sailor, formerly a man before the mast, who has now six steamers on the Rio Grande, 80,000 head of cattle, 25,000 head of horse stock, 12,000 sheep, and 150,000 acres of land, and last year invested $29,000 in the Jackson & New Orleans Railroad." Thomas O'Connor, a soldier in the Texan war of independence, received his discharge in 1837, when his only earthly possessions were a Spanish pony, saddle and bridle, two old belt-pistols, one of them broken off at the breech, and an old rifle-gun. He went into the business of raising stock on this capital, and forty years later had 80,000 head of cattle, 500 saddle and stock horses, and 26,664 acres of land, with a river front of six leagues. In 1851, a gentleman named Adams started a ranche (or grazing farm) twelve miles west of San Antonio with only 200 head of cattle. Upon his death his sons continued the business, and in 1877 sold the ranche, delivering to the purchasers 68,000 head of cattle. In 1858 Captain Richard King, who had been a cabin-boy on board a coasting vessel, came to Texas with a capital of pluck and energy, but with no money. Selecting a ranche at Santa Gertrudes, thirty-five miles west of Corpus Christi, he commenced rearing stock in a very small way. In 1878, twenty years later, he had 60,000 acres of land all fenced, over 50,000 head of cattle, more than 10,000 horses and mules, 22,000 sheep, and 8,000 Angora and grade goats. He brands 15,000 calves yearly, sends about 10,000 beeves to market every year, and 30,000 fleeces, besides a large number of horses and mules.

The beginners on a small scale having, we will say, a ranche of 2,000 acres, which will not cost, on the pasturage lands of Texas, more than $1,000, and with the cabins, corrals, etc., from $300 to $500 more, can purchase 100 cows with calves for from $12 to $14 each, and two good Hereford or Durham bulls at $50 each—the entire investment not exceeding $3,000. The milk from these cows, allowing one-half to the calves, will furnish milk, butter, and cheese enough to support the family from the first, with the aid of a small vegetable garden. The calves being detained for six months in the corral, and "roped off," after drawing about half the milk, the cows will be gentle and come home at night regularly,—until the herd becomes too large

to be managed easily at the homestead. The increase from this stock, as has been demonstrated by repeated experiment, will be in twelve years not less than 14,537. Selling off a portion from year to year, at a fair market valuation, and the remainder at the end of twelve years to close out the business, will show the aggregate receipts to have been not less than $101,750, aside from the value of the ranche, which will have more than doubled in that time. From this is only to be deducted the cost of an extra hand after the fifth year and an additional one each year thereafter. For this expense $4,250 is an ample allowance, leaving $97,500 net for the twelve years' work. The stock will support itself without the outlay of a dollar for hay or grain. This shows a very handsome profit, even with stock at low prices. But, of course, the profit of a great ranche, properly managed, is proportionately greater.

In Kansas and Colorado stock-ranches or farms are managed somewhat differently. The buffalo and gama, or gamma grass, of the unbroken pasturage lands, is somewhat more nutritious and fattening than that of Texas, and the stocks of cattle are of better blood. At present it is not difficult to obtain pasturage for even a large herd, on unsurveyed government lands, the stock-raiser entering perhaps three quarter-sections under the Pre-emption, Homestead, and Timber Culture Acts, in order to secure water for his herd. But there is this difficulty in regard to these unsurveyed lands, that the surveys are going on with considerable rapidity, the frontier of arable farming lands is pushing westward at the rate of fifteen or twenty miles a year; and ere long the stock-raiser will find himself pushed by the tide of farming immigrants, and will be compelled "to move on." Congress has now before it a bill to sell the pasturage lands supposed to be only fit for pasturage, at a low rate, in lots of four miles square, or about 8,000 acres, reserving its mineral rights below the soil. It will thus be possible to obtain, in perpetuity, stock ranges at a moderate price.

The purchasable stock in these States is of better grade than the Texas cows or steers, and brings better prices. Cows are worth from $18 to $20 per head at three years old, and steers

from $8 to $10 at two years old. No sensible stock-raiser would think of purchasing any but the best pure blood or high grade bulls. There must also be some provision made for the shelter, either by sheds or by means of natural or planted forests, if not for the feeding of cattle from the severe storms of the elevated grazing lands of Kansas, Colorado, and Wyoming; and the wise manager will provide a moderate supply of good hay or forage and shelter for the storms which sometimes sweep down from the north. The herders or cow-boys are of a higher grade than most of the Texan herders, and command usually $20 a month, with food and shelter, etc., found.

All this costs money, but the Kansas and Colorado cattle have so high a reputation, both at the East and in England, that they command high prices and pay a large profit. But it results from this condition of things that stock-raising cannot be very successfully carried on in these States, or indeed, in most of those north of the thirty-seventh parallel, except on at least a moderately large scale. A man with little or no capital, but thoroughly acquainted with the business and the care of stock, can make a good arrangement for conducting the business with a capitalist, who does not understand it, putting his skill and knowledge against the other's capital, and perhaps taking his salary in cattle. In many cases these large ranches are owned by joint-stock companies, and the business is conducted by a manager, who, if honest and capable, can, in a few years, make an immense fortune for his employers, and a very satisfactory one for himself.

Let us give one example of stock-raising on a large scale in Colorado: the Colorado Cattle Company's estate of Hermosillo, in Pueblo and Huerfano counties, on the Huerfano river and its tributaries. The estate consists of 91,000 acres, with half a million acres more of mountain land dependent upon it. Four thousand acres were under cultivation by the former owner, Colonel Craig, and yielded forty bushels of wheat to the acre; seventy-five to eighty of corn, seventy-five of oats, and abundance of vegetables; 15,000 acres were in timber, mostly of the larger evergreens, and the remainder of the estate was dotted with clumps of the piñon pine, affording shelter to the stock.

The sale was for $350,000, and included 10,000 steers of the best grades, 100 Kentucky and Canadian bulls, great numbers of horses, sheep, goats, etc. The company immediately placed upon it 20,000 additional steers for fattening, and increased materially the number of cows, bulls and other stock, intending to feed their cattle with grain, before sending them to market, and to make this the most complete and extensive stock-ranche in the Union. One large source of profit is found in purchasing steers two years old, of good breeds, and keeping them a year or more at a very small expense, and selling them well fattened for the markets. A profit of from $10 to $15 per head can be made on them, and the net profit, as in the case of this company, would be more than $200,000 per year.

The following table, copied from Mr. Frank Fossett's "Colorado," gives the profits on the cattle increase alone for seven years. The company is supposed to have a nominal capital of $500,000, but there is nothing to indicate that more than one-half of it was paid up. The profits were to be enhanced by the purchase of, say, 5,000 two-year old steers each year, and their sale, after fattening, a year later. The amount of land is not stated, but it could not be less than 25,000 acres, with a reserve of unsurveyed Government lands, of perhaps 30,000 acres more, for which no rent is paid.

COWS.

YEAR.	Number of Cows.	Number of Calves.	Number of Heifer Calves.	Value when yearlings at $10 per head.	Increased Value when two yr's old at $5 per head.	Increased Value when three yr's old at $3 per head.	Value when three yr's old at $18 per head.
One.....	4,000	3,200	1,600	$16,000	$8,000	$4,800	$28,800
Two.....	4,000	3,200	1,600	16,000	8,000	4,800	28,800
Three.....	5,600	4,480	2,240	22,400	11,200	6,720	40,320
Four.....	7,200	5,760	2,880	28,800	14,400	8,640	51,840
Five.....	9,440	7,552	3,776	37,760	18,880	.....	56,640
Six.....	12,200	9,856	4,928	49,280	.....	.....	49,280
Seven.....	16,096	12,877	6,438	at $6 per head	.....	.....	38,628
Original Cows at $18 a head	4,000	.....	.....	.....	.....	.....	72,000
							$366,308

STEERS.

Year			Number of Steer Calves.	Value when yearlings at $10 per head.	Increased Value when two yr's old at $6 per head.	Increased Value when three yr's old at $10 a head.	Value when three yr's old at $26 per head.
One	.....	.....	1,600	$16,000	$9,600	$16,000	$41,600
Two	.....	.....	1,600	16,000	9,600	16,000	41,600
Three	.....	.....	2,240	22,400	13,440	22,400	58,240
Four	.....	.....	2,880	28,800	17,280	28,800	74,880
Five	.....	.....	3,776	37,760	22,656	.....	60,416
Six	.....	.....	4,928	49,280	.....	.....	49,280
Seven	.....	.....	6,438	at $6 per head	.....	.....	38,628
							364,644
Add for Cows and Heifer Calves as above							366,308
Total product in seven years of 4,000 Cows costing $72,000, including cost of Cows							$730,952

The profits or increase on the seventh year alone would be $254,792, or more than fifty per cent. on the capital of $500,000. The profits on the eighth year would be $327,444; and for the ninth, tenth, eleventh, and twelfth years a constantly increasing proportion, viz.: ninth year $452,322, tenth year $519,473, and so on.

To this may be added the profit each year of buying 5,000 two-year old steers and selling the next year at $10 or more advance, netting $50,000 of clear profit, which is much more than the annual cost of running the ranche. The annual increase of calves is calculated at 80 per cent. of the number of cows, allowing 20 per cent. (a liberal allowance) for accidents and losses. Mr. Fossett makes no estimate of the cost of the ranche and necessary buildings, and in his estimate of stock, makes no estimate for the bulls. Of these, for the herd with which they commenced, eighty full-blood Herefords or Durhams, costing not over $6,000 (the best are the cheapest), or, if Holsteins, perhaps $8,000, would insure cattle which would bring the highest prices in the market. As these cattle are raised for beef, and not for milkers, there would be no advantage in an Ayrshire, Alderney, or Jersey cross.

Mr. A. A. Hayes, Jr., in *Harper's Monthly*, for November, 1879, gives the figures for a ranche of about the same number

of cows, in Southern Colorado, somewhat more in detail, but unfortunately, he does not carry it beyond the third year. Still, in that time, with an investment of $154,149, of which $50,000 is the cost of the ranche (10,000 acres, with privilege of grazing on other mountain lands), $76,000 cost of stock, and $28,149 capital, used in expenses for the three years, he shows net profits of $129,651 ($114,651 profits on stock and $15,000 in appreciation of the value of the property), making the total assets at the end of three years $283,800. These profits would be greatly increased in the years that followed, for the first three years are the years of greatest outlay, and in the later years there is no possibility of such losses as would wipe out any considerable amount of the increasing profits. Land will, of course, soon be higher, and the free pasturage will diminish as the arable lands are more clearly defined, and the grazing lands are surveyed and put upon the market; but every ranche should have a considerable quantity of arable lands, as the ability of the stock-raiser to fatten his beeves for the market from his own grain will make a great difference in the price he can obtain for them. All the great ranches of Kansas, Nebraska, and Colorado will soon be within easy distance of the great trunk railroad lines which will take their beeves on the hoof to St. Louis, Chicago, or Duluth, whence they can be shipped for Europe direct.

Hitherto they have been carried by rail from these States as *store cattle* (the steers weighing about 1,400 pounds), to Illinois, where they were fattened and shipped from Chicago to Liverpool. The Chicago dealers paid about $37 for them in Colorado and sold them in Liverpool for $100, while the entire transportation between Colorado and Liverpool did not cost over $30.

Hon. J. W. Barclay, M. P., who visited Colorado for the third time in the autumn of 1879, and from whose article in the *Fortnightly Review*, of January 1, 1880, these figures are taken, uses them to insist that the British Government should allow the importation by English farmers of store cattle; from our position they seem to afford a much more powerful argument for the fattening of his stock by the Kansas or Colorado stock-grower; as he might thereby receive the greater part of the $33 per

head which now goes into the pocket of the Chicago dealer and shipper. Mr. Barclay demonstrates that we can land fattened cattle at Liverpool at an average price of $90 to $100, yielding us a very large profit and still greatly undersell the British stock-raiser in his own market. The shipping of slaughtered beeves in refrigerator cars and steamers with the recent improvements in artificial refrigeration offers still greater profits.

In the more northern and northwestern States and Territories, of which Montana may perhaps be taken as the type, there are some slight differences in the management of the business, as well as in the pasturage and the character of the stock. In all these States and Territories pasturage is free; that is, the government lands, as yet unsurveyed, furnish, and will for years to come, abundant pasturage in well-watered valleys for much larger numbers of cattle than are likely to be raised there. There is no buffalo or gama grass there, but the bunch grass, especially in Montana, is more nutritious than either, and the stock fatten on it as well as they would on grain. The Montana beeves have an excellent reputation for juiciness, tenderness, and flavor; the only complaint in regard to them is that they are *too fat.*

There are no Texas cattle here: they are all of the American or native breed, or grade animals from Short-horn or Hereford stock. Many of the stock-raisers keep them out on the range all winter, and claim that their loss is not more than one or two per cent., as the bunch grass, which grows to the height of two or three feet, is not often covered with snow on the hillsides; but the best stock-men think it safer to provide some of the wild hay, which can be cut and stacked for $1 to $1.25 per ton, against possible emergencies, and also to provide rude shelter for their animals during severe storms. They have one cow-boy to 1,500 or 2,000 cattle. The cost of raising a steer for the first four years is from 60 cents to $1 per year. A three or four-year old steer is worth at the ranche about $20, at the larger towns or railroad points from $25 to $30. Much of the stock-raising is done in these territories by companies, usually joint-stock companies, who trust the management to a competent and

skilful expert, who becomes, after a time, a partner. There is a fine opening for good stock-farmers with little or no capital to make large fortunes in this business.

When railroads traverse these territories, as they soon will, the exceptionally fine stock raised here will command much higher prices, and can be shipped to England at considerably less expense than from Colorado. Increasing attention is being paid in Minnesota, Dakota, and Montana to dairy-farming, for which that region possesses fine facilities. Good butter commands a very high price all over that region, and the infusion of Ayrshire, Alderney, or Jersey blood into the stock intended for the dairies will enable the dairy-farmers to supply a vast demand at largely remunerative prices. Recent improvements in the breeding of dairy stock, and in all the processes of butter and cheese-making, have reduced the business almost to one of the exact sciences.

Stock-raising in California is not now comparatively so extensive a business as it was a few years ago, as former pasturage lands have been taken up for agricultural purposes. Before the American occupation much of the country was taken up in large ranches, often of from 50,000 to 150,000 acres, and the Hispano-American owner had his vast herds of Mexican cattle, long and sharp-horned, of vicious temper, thick hides, and lean, rather gamy flesh, droves of the Mexican or mustang horses, and very large flocks of the Mexican sheep, a degenerate breed from the original Spanish Merino. Very few of these ranches now remain, and the Mexican cattle have, for the most part, given place to Eastern cattle brought in by the early settlers and improved by breeding from the best pure-blooded stock. The stock now actually raised in California is very little beyond what is demanded for home use, and although considerable herds are exported, the deficiency in the Californian markets is made up by cattle brought from Oregon and Washington Territory. The general quality of California cattle is so high that they are in demand for breeding by the stock-growers of Colorado, Wyoming, and Montana, and command liberal prices for that purpose.

The climate of California is so mild that stock requires no

shelter, but the long dry season burns up the herbage so thoroughly that the best stock-growers find it necessary to sow the Alfalfa and other forage grasses largely to feed their stock in the dryest months. There are still many large ranches, but the proprietors are usually wide-awake Americans, and they do not confine themselves to raising stock. Extensive wheat-fields, vineyards or olive-groves, or the rearing of great numbers of horses or mules, or large flocks of sheep, also occupy their attention and prevent their exclusive interest in either pursuit. The herdsmen or cow-boys—*vaqueros* is the more sonorous Spanish name, and is most used in California—are often Mexicans, but quite as often French, German, Swiss, Swedes, or Irishmen. The lasso is used as in Texas in rounding up the herds, and the other features of the business do not differ materially from those already described, except that greater care is taken in improving the breeds by the introduction of the best imported cattle.

Dairy farming is rapidly increasing in California. The butter is generally good, and some of it of the "gilt-edged" quality. It brings a high price, ranging generally from 40 to 60 cents a pound, or, which is substantially the same thing, from 60 cents to $1.10 a roll, the roll, though nominally two pounds, always coming considerably short of that weight. The milk is of excellent quality, though there are comparatively few Alderneys or Jersey cows in the State. Cheese is not very largely produced, reliance for this product being had upon the Eastern cheese factories.

The rearing of horses and mules is not a large branch of the stock-raising industry west of the Mississippi river, except in California, Texas, and Arkansas, though it is increasing in Kansas, Colorado, and perhaps New Mexico. In Texas the greater part of the horses raised on the ranches are either mustangs (the descendants of the Spanish horses introduced into Mexico three centuries ago), very tough and serviceable, but vicious and tricky, or a cross between these and our larger American horse, somewhat larger than the mustang and less tricky, but not quite so tough. These are usually called bronchos. The Indian ponies belong to this cross. Horses of better

breeds are raised on smaller farms and brought into these States from States east of the Mississippi, but never in large droves. In California the Norman and Percheron horses are now being introduced in large numbers for draught horses. The rearing of horses and mules is said to be very profitable, and some of the large stock-ranches in Kansas and Colorado are turning their attention to it. The rapid extension of railroads in these new States and Territories creates a vastly increased demand for good horses for purposes of draught, for carriage use, and for the saddle. Every station has at least a dozen settlements tributary to it, all of which require teams to make the connection. The raising of mules is still more profitable, since the mule is more surefooted, hardier, and will live on poorer fare than the horse. He is more vicious and stubborn—granted, but that is partly due to the abuse to which he is subjected. Mules bring on the average a price considerably higher than horses. In the mining districts, and especially in the new mining regions, mules are in great demand as pack-animals, and for drawing the immense freight-wagons, and command high prices for these purposes. The great stage company, Barlow, Sanderson & Co., whose lines run daily or oftener to all parts of Western Colorado and Northern New Mexico, where there are practicable roads, keep hundreds of horses and a still larger number of mules in their stables.

An attempt has been made to introduce the camel into Texas, and it has met with a moderate degree of success. The animal would seem to be well adapted to a part of Texas, Arizona, Southern New Mexico, and Southern California, and if the Bactrian species could be introduced it might do well farther north; but the camel is better suited to the indolent oriental than to our wide-awake, restless, impatient Yankees.

CHAPTER XVI.

SHEEP-FARMING AND WOOL-GROWING—NUMBER OF SHEEP AND ANNUAL INCREASE OF LAMBS IN EACH STATE OR TERRITORY—THE GREAT WOOL STATES—IMPROVING THE BREED—MERINOS—COTSWOLDS—SOUTHDOWNS—LEICESTERS—TASTES DIFFER—PERILS OF THE FLOCKS FROM COLD, STARVATION, AND THIRST—WINTER SHELTER AND WINTER FOOD NECESSARY IN KANSAS AND FURTHER NORTH—DISEASES OF SHEEP—THE SHEEP THAT BROWSE AND THE SHEEP THAT CROP THEIR FOOD—SHRUBS AND PLANTS POISONOUS TO SHEEP—SHEEP-FARMING—THE SHEPHERDS—THE SHEEP-FARMER IN COLORADO—THE PURCHASE OF THE SHEEP-FARM—BUYING THE SHEEP—THE ACCOUNT—BEGINNING ON A SMALL SCALE: THE MAN WITH ONLY $1,000—CROSSING THE BREED WITH THE BIG-HORN—THE ANGORA AND OTHER GOATS—THE ROCKY MOUNTAIN GOAT.

THERE are none of the States or Territories of the Great West which are not engaged to a greater or less extent in the rearing of sheep, either for their wool or their flesh, or both; but the extent of the business, and the size of the flocks, differ very greatly in different sections. The latest statistics give the number of sheep in this Western Empire as approximately 20,810,000, somewhat more than one-half of all in the United States, and the numbers are increasing, at a ratio which will soon enable them to rival Australia in the supply of mutton and wool to the world.

California leads the whole country in numbers and perhaps in quality; her flocks numbering about 7,300,000, and averaging ninety lambs each year to every one hundred ewes. Texas follows with about 4,560,000, of an average quality somewhat below those of California, but improving. Her sheep-growers claim about eighty lambs annually to one hundred ewes. Colorado is next with 2,000,000 sheep, mostly of good quality, and modestly estimates her net increase at seventy-five lambs for one hundred ewes. Next follow in their order Missouri, Oregon, and New Mexico, with 1,450,000, 1,250,000, and 1,000,000 respectively. Those of New Mexico are largely of the old Mexican breed, and the Navajo Indians have flocks exceeding 500,000. Utah and Iowa are the only other States or Territories whose flocks approximate half a million.

The original stock on which all, or nearly all these flocks were started, were Mexican ewes, from the original Spanish Merinos brought over here, by the early Spanish settlers, in the sixteenth century, and largely raised on the Missions, which were so numerous in Mexico. They were, in the beginning, good stock for that time; but in three centuries of neglect, they had degenerated till they were a puny race, gaunt and small, and yielded only from three to four pounds of coarse felting wool annually. The California and Texas shepherds readily saw that there would be no profit, either in the wool or mutton of such sheep as these, and though a selection from these were the best ewes they could obtain, they procured, often at very high prices, the best imported or Eastern Merino, Cotswold or Leicester bucks, and began at once to improve the breed. Some of the experiments proved failures. It was found that the cross with the Leicester or Southdown was not desirable, at least until, by cross breeding, the size of the ewes had been materially increased. Moreover, it was more profitable to raise sheep for wool than for mutton, and while it was desirable to have an eye to increase of size, and to improvement of the flesh in the future, the most desirable improvement for the present was the increase of size, and of wool production, by breeding with the largest and best full Merino bucks; thereby producing in two or three crosses, a much larger and better fleeced sheep. The Merino wool is the best of the felting wools, and by careful breeding, the sheep can in five or six years be brought to yield from ten to twelve pounds per year, and eventually the bucks and wethers reach from seventeen to twenty-five pounds of washed wool.

The crosses with the Cotswolds bring a better sheep for mutton, and a fleece of perhaps equal weight, but it is of a different character—a medium long and fine combing wool, adapted to the manufacture of all kinds of worsted or hard-twisted goods, but not suitable for broadcloths, merinos, cashmeres or any description of the softer woollens.

Probably nine-tenths of these vast flocks, or nearly nineteen millions, approximate more or less closely to the Merino standard; while over the line in the Dominion of Canada, where the sheep

is raised quite as much for the flesh as for the fleece, the Cotswolds, Leicesters and Southdowns are greatly in excess of the Merinos.

Even in Texas, those sheep-masters are wisest, who provide some shelter, if not fodder for their flocks, in the severe storms which occasionally visit the hill slopes, which form the best pasturage for sheep. In Southern California, this is never done, but the greatest suffering to which the flocks are subjected comes from the failure of the pasturage, in the long and dry summer, and the failure also of water. In some years in that State, entire flocks have been almost annihilated by starvation and thirst, and when at last in desperation, the shepherds attempted to drive them to the fresher and moister pastures of the mountains, every foot of the way was strewn with the festering carcasses of the poor animals. By sad experience the sheep-masters of California have learned two things: first, that in the dry season at least, the pastures on the slopes and foot-hills of the mountains are much better for sheep, than those on the plains, or generally in the valleys: and second, that it is a wise measure of economy to sow Alfalfa, millet, Hungarian grass, or something of the sort, to feed to their sheep in seasons when the pasturage is scanty.

In Kansas, Colorado, and all the States and Territories farther north, both shelter and hay or grain are necessary, though not always furnished. In New Mexico and Arizona, the general practice is to furnish neither, though sometimes the flocks suffer in consequence. The greater part of the flocks in these two Territories is the Mexican sheep, which is hardier, though far less valuable, than the improved breeds of the other States and Territories.

Sheep suffer in some sections from a variety of diseases, many of them fatal, others greatly depreciating their value. Among these are *the scab*, the result of the attachment of an insect, the *Acarus scabiei*, first to the wool, and afterward to the skin and flesh of the sheep, causing severe torture and a most intolerable itching to the poor animal, causing it to rub off its wool and produce ugly sores on its back and sides, in which the pestiferous

insect riots and multiplies. This is cured by dipping the sheep several times in a strong decoction of tobacco, or in strong lime-water, or, better still, in a wash to which the impure carbolic acid of the quality known as "sheep-dip," has been added. This is by no means the only disease caused by parasitic insects, from which the sheep suffers. *The tick* is an insect which works its way through the wool into the flesh of the sheep, and, like the preceding, causes intolerable itching and loss of wool. Dipping the sheep when they first manifest the symptoms of its presence is an effectual cure. The various worms or maggots which enter the body of the sheep, or are taken in with the food and hatched in the stomach, are a cause of great suffering and mortality to the poor animal. Among these are the *grub in the head*, the fluke, or liver-rot, tape-worm, lung-worm, the white intestinal worms which cause "*the pale disease*" in lambs, or what is known as "*paper-skin*" in the full-grown sheep—and hydatids or worms in the bladder and kidneys. Most of these diseases are incurable, except in the earlier stages. The use of sulphur, spirits of turpentine, linseed oil, castor oil, Glauber salts, wood and cob ashes with salt, etc., are recommended, but in these, as in most cases of diseases of animals, the treatment is generally empirical, and without any very clear ideas of the indications to be fulfilled. *The foot-rot* is another troublesome and often fatal disease, which is especially prevalent in Texas. It is said to be caused by pasturing the sheep on low, moist lands. It first appears as a purulent sore behind the hoofs, and if not treated, not only produces great lameness in the animal, but causes the hoofs to slough off and the sheep to die. This is also best cured by the use of the "sheep-dip," or impure carbolic acid. The *black-leg* is a more speedily fatal disease, usually affecting young lambs; the legs become swollen, turn black, and seem filled with a black, decomposed blood, and the lamb dies within two or three days. It is said that bleeding on the first indications of the disease will cure it. Sheep are also subject to pleuro-pneumonia, to snuffles and snoring, to colics, constipation, diarrhœas and scouring. They are generally much more healthy in a tolerably dry atmosphere, and on high land along the slopes and

foot hills of the mountains. The *mesas*, or isolated table-lands of Arizona, New Mexico, Colorado, and Utah, would afford them good pasture-grounds, if, by artesian wells, or reservoirs, they could be supplied with the very moderate quantity of water they require. Such a region was found in Palestine, east of the Jordan, on the elevated plains or *mesas*, where the King of Moab, Mesha, and his predecessors, kept their myriads of sheep, 200,000 forming his annual tribute to the King of Israel.

Different breeds or varieties of sheep feed in different ways. The Cotswold and Leicester breeds crop the grass very closely, but do not browse, or eat the branches of trees or shrubs; the Merino, on the contrary, is a browsing animal, and where there are shrubs, plants, or young trees having limbs within reach, it prefers them to grass. This necessitates two precautions in pasturing this breed; they should not be pastured in an orchard, especially of young trees, as they will do great injury, though on a field of winter wheat during the winter or very early spring, their presence is rather beneficial than injurious, as they do not crop the roots so closely as other sheep.

Great care should be taken in their pastures that no poisonous shrubs or vines should remain within their reach; for the sheep has not the keen instinct to avoid poisons which the hog possesses. If poke-root (*Phytolacca decandra*), bitter-sweet (*Solanum dulcamara*), deadly nightshade (*Digitalis purpurea*), aconite, henbane (*Hyoscyamus*), or either the green or white hellebores, the poison ash, or the poisonous species of the *Rhus* or sumach, comes in his way, the sheep, and particularly the Merino sheep, will be sure to eat them and die.

Sheep-farming is more monotonous and unexciting than stock-raising, or the care of cattle or horses; for the sheep is a timid and harmless creature, easily controlled, and not as intelligent or sympathetic as the horse, the cow, or the dog. The shepherd has a lonely life in taking care of his flocks, and but for the companionship of his faithful and almost rational companions, the collies, or shepherd-dogs, his lot would be almost intolerable. But, humdrum as it is, it is more immediately profitable, and we suspect, even for a period of ten or twenty years, with flocks of large size, more permanently so, than the cattle range.

Let us illustrate this assertion by taking an actual case, in no respect exceptional, in Colorado. We select this State because from its central position we find here all or nearly all the advantages and disadvantages attending sheep-farming in any portion of "Our Western Empire." We take the case of a young man who has, or can command about $15,000, and who has resolved to put his money into a sheep-farm on the hills, or rather plateaux of Colorado. He selects as his location El Paso county, on the eastern slope of the Rocky Mountains, though he might have found locations, perhaps equally desirable, in Huerfano, Las Animas or Pueblo counties, or perhaps somewhat farther north. But in his choice, he must seek first for the great and important requisite—water.

Having found a township containing the necessary number of streams and, if possible, some springs, he next proceeds to purchase or secure title to his lands; for though he might, as the stock-raisers do, pasture his flock on the government lands, yet there is an irrepressible conflict in Colorado between the cattle-herders and owners, and the sheep-farmers and their shepherds, and the sheep-master will be better situated if he owns his land. If there is a land office near him, and a sale takes place, he can purchase a quarter section (160 acres) at the government price, $1.25 per acre. He can next pre-empt 160 acres more for $1.25 per acre and fees, having six or thirty months to pay for it and receive his title. Next he can claim 160 acres more under the Homestead Act, paying only fees, and having lived on it for five years can obtain his title, and lastly he can claim 160 acres more under the Timber-Culture Act, planting in the course of five years forty acres of trees upon it which he will need for the shelter of his flocks. He has now 640 acres, or one mile square, which may cost him, all told, possibly $500. But he needs more. How is he to obtain it? In one of three or four ways. If, as is probable, the bill now before Congress passed during the recent session, he can purchase, at a very low price, a tract of from four to eight square miles as pasturage land, subject to the liability of being explored below the surface for minerals, but with a guarantee of all his surface rights. If it did not, he can

buy up soldiers' or bounty land scrip at $3 or $3.50 per acre, which he can locate where he pleases. If he is within six or eight miles of a land-grant railroad (and all the railroads hereabouts have land-grants), he can purchase from them, probably at $5 per acre, on long time, the additional land he wants. Or he may very possibly find, as the man described by Mr. A. A. Hayes, Jr., in *Harper's Monthly* for January, 1880,* did, a sheep-farm for sale with its corrals, cabins, etc., favorably situated, but which its owner, tired of this monotonous life, and anxious to go back to civilization and Eastern comforts, was willing to sell for $4,000. It is ample for 5,000 sheep, but in order to be secure he avails himself of his privileges already described and secures an additional 640 acres. This purchase made, the young sheep-farmer has next to buy his sheep.

He avails himself of the judgment of an expert, buys 2,000 selected ewes, "second cross" if they are to be had, at $3 per head—$6,000; and 60 bucks at an average of $30—$1,800. He needs also a pair of mules and a saddle-horse, for which he has to pay about $275 more, and finds it best to break up eighty acres and sow it half in wheat and half in Alfalfa or some other forage crop. This costs him, perhaps, $500 more. He has now left, of his $15,000, $1,925 as working capital. This transaction is completed, we will say October 1. He must employ for this flock one herder, a cook, and for a time teamsters, etc. His ewes will come in during the following May, and from the 2,000 ewes, he will have living, on the first of the following October, a year from the time of making his purchase, at least 1,500 lambs or seventy-five per cent. of the whole number. (The Merino ewe very seldom has twin lambs.) This is a very liberal estimate for losses, blunders, etc. The Texan sheep-masters claim that they raise from eighty to ninety per cent., which would be 1,800, and surely with all his precautions he should do nearly or quite as well, but we prefer to understate rather than overstate the probable results of the business. Let us now go on with his account (supposing him to be an accurate

* We are indebted to Mr. Hayes' very able article on the "Shepherds of Colorado," for most of the details of this account of the expenses and profits of a sheep-farm.

and careful accountant) for the next three years. His gross increase of values and receipts for this first year will be:

1,500 lambs (average one-half ewes, one-half wethers), at $2 each .			$3,000 00
In June he shears his wool, and gets from:			
2,000 ewes, 5 lbs. each, or 10,000 lbs., at 21 cents .		$2,100 00	
60 bucks, 17 lbs. each, or 1,000 lbs., at 15 cents . .		150 00	2,250 00
			$5,250 00
Expenses:			
Herders, teamsters, cook, and provisions		$1,835 00	
Shearing 2,060 sheep, at 6 cents		123 60	
Hay and grain		275 00	
		$2,233 60	
Losses (all estimated as made up, in money):			
Ewes, 4 per cent. on $6,000	$240 00		
Bucks, 5 per cent. on $1,800	90 00	330 00	
Depreciation:			
On bucks, 5 per cent. on 1,800		90 00	2,653 60
Net profits for first year			$2,596 40

SECOND YEAR.

The 1,500 lambs will be a year older, and worth an additional 15 per cent. (or 15 per cent. on $3,000)			$450 00
1,500 new lambs will be worth, as before			3,000 00
And there will be of wool from			
2,000 sheep, 5 lbs. each, or 10,000 lbs., at 21 cents .		$2,100 00	
1,500 lambs, 4 lbs. each, or 6,000 lbs., at 21 cents .		1,260 00	
60 bucks, 17 lbs. each, or 1,000 lbs., at 15 cents .		150 00	3,510 00
			$6,960 00
Expenses:			
Herders, etc.		$2,060 00	
Shearing 3,560 sheep, at 6 cents		213 60	
Hay and grain		350 00	
		$2,623 60	
Losses:			
On ewes, 4 per cent. on $6,000	$240 00		
On bucks, 5 per cent. on $1,800	90 00		
On lambs, 7 per cent. on $3,000	210 00	540 00	
Depreciation:			
On ewes, 5 per cent. on $6,000	$300 00		
On bucks, 5 per cent. on $1,800	90 00	390 00	3,553 60
Net profits for second year			$3,406 40

THIRD YEAR.

The second year's lambs will be worth an additional 15 per cent., or, say (15 per cent. on $3,000)			$450 00
There will be 1,500 lambs from original 2,000 ewes, and, say, from new 750 ewes (one-half of 1,500, not more than 60 per cent. in first lambing, or, say, 450—in all, 1,950 lambs, at $2			3,900 00
Wool will be:			
From 3,500 ewes, 5½ lbs. each, or 19,250 lbs., at 21 cents	$4,042 50		
From 1,950 lambs, 4 lbs. each, or 7,800 lbs., at 21 cents	1,638 00		
From 60 bucks, 17 lbs. each, or 1,000 lbs., at 15 cents	150 00		5,830 50
			$10,180 50
Expenses:			
Herders and fodder	$2,970 00		
Shearing 5,510 sheep, at 6 cents	330 60		
New corrals, etc.	300 00		
	$3,600 60		
Losses:			
On ewes, 4 per cent. on $6,000	$240 00		
On new sheep, 4 per cent. on $4,500	180 00		
On lambs, 7 per cent. on $3,000	210 00		
On bucks, 5 per cent. on $1,800	90 00	720 00	
Depreciation:			
On old ewes, 10 per cent. on $6,000	$600 00		
On bucks, 20 per cent. on $1,800	360 00	960 00	5,280 60
Net profits for third year			$4,899 90

RECAPITULATION.

First year's profits	$2,596 40
Second year's profits	3,406 40
Third year's profits	4,899 90
Total	$10,902 70

At the end of five years after selling off the original 2,000 ewes, which are now more than replaced by those of a better grade, which will give larger lambs, and yield heavier fleeces, and disposing also of 2,000 wethers and lambs, our young sheep-master finds that his net profits received within the five years amount to a little more than $37,500, and that he has still on hand 3,500 ewes and ewe lambs, 2,013 wethers and male lambs all over a year old, 150 bucks of high grade and good size, and

that the increased value of his land and buildings being added to his stock its present value is $28,767. In other words he has earnings, stock on hand and improved land to show to the amount of $66,267, for an original investment of not more than $13,200, or about 500 per cent. advance in five years. Extend the time to ten years, and if he can obtain land he will, after selling off his surplus stock to the amount of at least $25,000, have a flock of 25,000 sheep, 450 bucks, and can shear from 180,000 to 200,000 pounds of wool annually, and his possessions, in land, buildings, and animals in the absence of any extraordinary misfortune, are worth from $100,000 to $120,000, and his net income over $40,000 a year.

Of course it is possible to build up a handsome fortune in the course of ten or twenty years from a much smaller beginning than this; there were instances, when land was lower and sheep-ranges on government lands were more available than now, when an investment of $1,000 resulted in an ample fortune in fifteen or twenty years. If, however, the emigrant knows something of the care of sheep, and has but a thousand dollars, our advice to him would be to secure land, if he can, under the Homestead and Timber-Culture Acts, or by pre-emption, and hire himself out in some capacity to a large sheep-farmer, either taking his pay in lambs to be herded with his employer's flock, or investing a part of his money in them, and gradually getting ready his cabin and corrals, putting out his trees, and hire, say, forty acres of his land broken and seeded to wheat, and perhaps an equal quantity to corn, Alfalfa or millet. In this way he can, at the end of three or four years, have a range of his own with 1,000 ewes to stock it and can go on swimmingly from that time. His wheat and forage plants, for which there is a ready sale, will bring him not only an ample support, if he takes his pay for herding in lambs, but will give him additional means for the purchase of land and stock. But we would not advise a young man to marry or to bring his family to this wild primitive life till he has a comfortable cabin and sheep-ranche of his own. The life of the shepherd on a large sheep-farm is isolated and lonely, though not in most sections fraught with any considerable dan-

ger; but his family would find it monotonous and wearisome beyond measure In Texas the sheep-farmer usually resides with his family in a village, which may be ten, twenty-five, or even fifty miles from his farm and flocks. It is not necessary that he should be daily in attendance there if he has competent and faithful shepherds.

As land becomes more valuable even for pasturage in this Great West, and there comes a demand for a hardier breed of sheep which can ascend to the higher mountain pastures, and whose flesh will be of finer flavor, it may be worthy of experiment to try the crossing of the wild native Rocky Mountain sheep or Big-horn with the largest Merino grades, and thus produce a large and hardy breed which will combine the excellencies of both. The Big-horn ranges in weight from 250 to 350 pounds, and thrives and fattens where the common sheep would starve. Its coat or fleece is a fine and silky hair rather than wool. Its flesh is tender and of excellent flavor. Its form and motions are graceful. If these qualities could be grafted upon the Merino, without materially injuring the value of its fleece, though they might change its character, it would be a great gain to the sheep-masters.

The rearing of the Angora goat has become a favorite industry with many of the larger stock-farmers of the West. A single stock-farm in Colorado has 8,000 of these animals, and they are largely raised in California, Texas, and to some extent in Kansas and Wyoming. Those raised here are usually grades from pure Angora or Syrian bucks crossed with selected she-goats of the native stock, and the crossing continued until the progeny is not more than one-eighth or one-sixteenth of the common stock. The mohair or curly glossy hair from these is said to be fully equal to the best Syrian mohair. They are hardy, of much larger size than the common goat, will live and thrive on the roughest and poorest fare, while their fleece is very valuable. If the so-called Rocky Mountain goat (*Aplocerus Montanus*) is really a goat and not a goat-like antelope—a point not yet quite settled—a cross of this and the Angora goat, which it strongly resembles, might be still better.

The flesh of the Angora goat is better than that of the common goat, and it yields about four quarts daily of an excellent and rich milk, while the cost of its keeping is only about one-twelfth that of a cow. In some sections this is an important consideration.

CHAPTER XVII.

EMPLOYMENTS IN CITIES, TOWNS AND VILLAGES—HORTICULTURE, FLORICULTURE, ARBORICULTURE—MERCANTILE BUSINESS—BANKING—THE PROFESSIONS, CLERGYMEN, LAWYERS, PHYSICIANS, ENGINEERS, ARTISTS, MUSICIANS, AND TEACHERS OF MUSIC, VOCAL AND INSTRUMENTAL—TEACHERS AND EDUCATORS—ARTISANS OF ALL TRADES—MACHINISTS, OPERATIVES, AND EMPLOYÉS IN MANUFACTURING ESTABLISHMENTS—EMPLOYMENTS CONNECTED WITH MINING, REDUCING, SMELTING, AND REFINING METALS—FARMING, HERDING, AND OTHER EMPLOYÉS—DAY-LABORERS—FACILITIES FOR MANUFACTURING—WATER-POWER, STEAM-POWER—WOOLLEN MANUFACTURE—COTTON MANUFACTURES AND COTTON SEED—OTHER TEXTILES—IRON AND IRON WARES—MACHINERY—MANUFACTURES OF WOOD, ETC.

"BUT," says the man who is contemplating a migration to the Great West, and who has read the preceding pages with great interest, "in all this, I do not find anything which exactly hits my case. I have not the capital necessary for the purchase or opening of a mine of gold or silver, of platinum or copper, of lead, zinc, or iron; nor have I the education in metallurgy, which would qualify me for that business, if I had the capital. I am not familiar with the timber or the lumber trade, and the capital for engaging in that is lacking. I have no practical acquaintance with farming, am no judge of soils, and if I were to put what little money I have into a farm, I should probably lose it all, and find myself a penniless stranger in a strange land. I have never been accustomed to the care of large herds of cattle or flocks of sheep, and if I had, these callings require a capital which is far beyond my means. Is there not something which a professional man, or an educated man of small means, or of a limited fixed income, or a retired army officer, engineer, chemist, or govern-

ment clerk, banker's clerk, accountant, tradesman, gardener, florist, nurseryman, carpenter, builder, painter, mason, marble worker, glazier, tinman, jeweller, blacksmith, brass-founder, paper-maker, factory operative, or willing and honest day-laborer can do?"

Yes, friend, there is room enough and work enough for all these classes, and to whichever of them you belong, if you are in prime health and vigor, and have enterprise, patience, endurance, and even a small capital, you can do well in your calling.

An English immigrant, who had tried a great variety of pursuits without adhering long to any, and whom Mr. A. A. Hayes, Jr., met on a sheep-farm in Colorado, herding sheep at $20 a month and his keeping, said to Mr. Hayes, with a grim resolution, "I tell you a feller can just make money in this country, *but he's got to have sand.*" *Sand* is the Colorado vernacular for *grit*, or dogged resolution.

The Great West is no place for any man who is easily discouraged or disheartened, and who, after a two or three months' trial of a business, into which he has thrown very little energy, becomes home-sick, and concludes that he had better return to the East or to Europe. Such a man will not succeed anywhere.

But to the man who has energy and pluck, who is not cast down because everything does not go just as he expected it would; the man who has given pledges to fortune, who has a wife and little ones dependent upon him, or who is looking forward to having a home to which he can bring one dearer to him than life, or who has parents or minor brothers and sisters, who must look to him for support, the man who knows how to do at least one thing well, and who is observant, patient, brave, honest and true, there is no part of the world where he can do better, whatever his calling, than this great Western Empire.

Such a man has been an assistant to a market-gardener, florist, or nurseryman at the East or in Europe. He has become familiar with the plants, flowers, shrubs, or young trees to be raised, and with the best methods of propagating and cultivating them, and he has been sufficiently prudent and far-sighted to save $400 or $500 to start in his new home at the West. Let

him locate his garden, or nursery, or market-garden, as near as may be to some one of the new towns, which are springing up all over this region. If he is early enough to take up his forty acres under the Timber-Culture Act, it will be just the thing, for he can plant his ten acres with trees for nursery purposes, and while obtaining his land for ten or fifteen dollars, can be making a profit from the trees, which give him the land. But if there is no suitable location of this kind available, he can buy land from the government, near the railroad, for $2.50 an acre, or with soldiers' bounty warrants, or from the railroad company, so that it will not cost him at the utmost over $200 for the forty acres he takes, and this on sufficient time, to enable him to realize on his first crop before paying for it. The breaking up the sod will be the first considerable expense, and this he can provide for, either by changing works with a neighbor, or, which will be better, by hiring out for a year to some one in one of the same lines of business with himself. Meantime he can put in his first crop, and, if he is wise, he will make that a root crop, potatoes, beets, turnips, ruta-bagas, sweet potatoes, or something of the sort. From this crop, even on twenty acres, he will realize enough to build his cabin, stock his nursery, flower-garden, or market-garden, and obtain a horse and wagon, or a pair of pack-mules or asses. Starting thus fairly in his second year, he will find, if he will make his place and wares known, that there is a ready and good market for everything he can raise; and so rich is the virgin soil, that for perhaps a score of years, no manure, or at most only that made on the place will be needed. At the end of three or, at the most, four years from the time he first plants his foot in the West, he is so well situated as to be able to support his family, or those dependent on him, in comfort, and that without impairing his business capital. If he is very enterprising he will be likely by this time to combine the three vocations of market-gardener, florist, and nurseryman, and acquiring more land, and employing the necessary help, he will soon be on the high road to fortune.

The intending immigrant has been perhaps a clerk or small proprietor of a grocery or a dry-goods shop, or of a druggist's

or apothecary shop. He has saved, by careful economy, $600 or $800. He understands his business well, knows where, when and how to buy, and how to sell. What can he do?

This is the most difficult class to provide for, and yet the case is by no means a hopeless one. We would advise that the immigrant should select some point where a village or town is just commencing, either in a mining or farming region, and visit it before purchasing his goods; find out what goods will be wanted, and what quantities, and then, having secured a town-lot before they have had an opportunity to rise much, and, if he can buy to advantage, a forty-acre lot in the vicinity, and arranging for the erection of a shop, of sods, logs, or slabs, only so that it is sufficiently roomy and cheap, let him buy his goods, if east of the Rocky Mountains, at Minneapolis, St. Paul, St. Joseph, Omaha, Kansas City, or Denver, Galveston, or Houston; or if he needs and can afford a larger stock, at Chicago, St. Louis, or New Orleans. There is no advantage in going farther East for the quantities he will want, and, ere long, the commercial travellers will visit him and take his orders, if he will allow them to do so. At first he will be obliged to buy on credit in part, but as soon as possible he should pay cash for his purchases, and in selling, a week's credit is better than a month's. Grocers, shopkeepers, and the mercantile class generally, are sure to be ruined if they buy and sell on credit. The shopkeeper should make his prices as low as possible, and deal justly and honestly by his customers, but he should insist on cash payments, or, at the utmost, give credit only for from ten to thirty days. Doing this, and buying closely, paying cash for everything as soon as possible, and living economically, the merchant, shopkeeper, or grocer, though he may not make money so rapidly as those in some other callings, cannot fail, whatever the times, and will be likely, in the course of a dozen years or so, to acquire a competence. The purchase of forty or eighty acres of land will prove advantageous, as it will add to his credit much more than its value, and when improved will add to his profits also.

For the young banker who is skilled in finance, and has a good credit at the East for his honor and integrity, even though he

may not have much capital, there is a good opening in almost every part of the West. Coming to a town or city with good references, and plenty of enterprise, he can, in the legitimate course of his business, make a fortune in a few years, if he will carefully avoid all reckless speculation. Men, and men in new mining and farming communities especially, are very credulous and reckless in trusting their money with anybody who will promise to take care of it for them; but they will be furious if they find that they have been defrauded. But both mining and the sale of crops require banking operations, and if these are well and honestly conducted, the young banker has an excellent opportunity for success.

The professions are somewhat in danger of being crowded, though "there is always," as Horace Greeley said, "plenty of room at the top." Clergymen coming to settle in the new towns or villages, if dependent upon their professions for a living, and having sufficient health to preach and act as pastors, will find it necessary in most cases, at first, to take an appointment from their denominational missionary boards, and draw a part of their pay from thence, as the young churches, in these new settlements, are generally composed of those who have yet their fortunes to make; and though they may be, and often are, liberal, even to an extent beyond their means, they cannot, at first, erect churches and support their pastors without aid. This condition of things is, however, but temporary, and the missionary societies at the East, with their wealthy clientage at home, furnish most of the aid required, till they are able to go alone. In cases of emigration in colonies, of which we shall have more to say by and by, the colonies are often of a single denomination, and bring their pastors with them. This has usually been the case with the Scandinavian, Mennonite, and Roman Catholic colonies from Europe, and with many of those from the Eastern States. If a clergyman of moderate means, who is not disposed, on account of health or for any other cause, to devote himself solely to his clerical duties, migrates to this western region, the way is open to him, of course, to engage in farming, wool-growing, stock-raising, mining or any other reputable employment, and his

chances of success are not lessened by his profession, while he may, if he is really an earnest Christian man, do a great amount of good.

The lawyers have a better chance for a fortune than the clergymen, especially in the mining districts, although they congregate there in large numbers. There is always a great deal of litigation in regard to mining property, and the disposition of mining estates; and in addition to this, crimes against the person, fights, shooting affrays, murders and suicides, the results of the two great vices of mining towns in their early history,—gambling and intemperance—are sufficiently rife to give employment to very many lawyers. In the farming towns there is less litigation, but conveyancing and disputes about boundaries, transportation, and prices of crops, and other matters, give the legal profession generally, a fair share of business. The joint-stock companies, which now carry on most of the mining, and a large part of the farming, stock-raising, and sheep-growing ranches, each have their counsel, and sometimes more than one.

In addition to this, the legal profession have almost a monopoly of politics. They slide into political life as easily as a duck takes to water, and sooner or later some of its prizes—membership of the State House of Representatives, State Senate, or Congress, United States Senatorships, Judgeships, from the lowest to the highest, United States Commissionerships, United States Marshalships, Clerks of courts, and of counties, or State offices—fall to their lot.

Physicians have not so good an outlook as the legal profession, though they swarm in the newer towns in great numbers, and perhaps the most arrant quacks have, at first, as good a chance as the best educated and most accomplished physicians. But time in this, as in most matters, brings about its revenges. Education, talent, integrity, and skill, will in the end triumph. There are probably, in most of the towns and villages of the West, more physicians than can get a living by their profession; but some of them, who are skilful as chemists or metallurgists, will become connected with mining interests; others, accomplished botanists, anatomists, zoölogists, or geologists, will turn aside to

these pursuits, and perhaps fill a professor's or teacher's chair; while others still will engage in farming, or sheep, or stock-raising; and with the rapidly increasing population, there will be room for more, if they are of the best sort. We cannot, however, advise physicians, born and educated in Europe, to come to the West, unless they come with colonies of their own countrymen; as our diseases and modes of practice differ materially from theirs, and our own physicians, like our own lawyers, would generally have the preference.

For engineers, and especially mining and civil engineers, of high character, intelligence and integrity, there is a wide field. The immensity of the mining interest and its rapid development will furnish profitable employment for every honest and skilful mining engineer who will go there. It is not the mines, or smelting and reduction works of gold, silver, quicksilver or lead alone which will furnish employment to them, but the great iron, copper and coal interests also will give them ample business. Civil engineers and surveyors will find their services needed in the construction of railroads, in the superintendence and designing of machinery, in the laying out of new lands, in the construction of new tunnels, draining and irrigating canals, and the erection of great public works.

The *true artist* is cosmopolitan, and will find himself as much at home, perhaps more, among the grand phenomena of nature in the West; its lofty mountains, often lifting their heads to the perpetual snows; the broad valleys, covered with verdure and flowers; the deep and frightfully dark cañons; the unusual forms, often grand and inspiring, sometimes grotesque, into which the water currents and the glaciers have cut and moulded the rocks; the geysers; the hot springs with their rainbow-hued basins; and all the wonders of scenery which Dame Nature spreads before his eyes as profusely as anywhere in the world, and he can draw from them an inspiration which will prompt him to loftier flights of genius than he has yet attained. But the artist is mortal, and must be sustained like the rest of the world, on mundane food, and wear such raiment as the exigencies of the seasons and of society demand. Can he find patrons of art in

these new lands? Most assuredly he can, and the higher and purer his artistic attainments, the more abundant will be his patronage. The vast wealth attained by a large number of mining and other capitalists in this region, is freely lavished on objects of art, and they are not generally so ignorant as not to know a good picture or group of statuary when they see it. Nowhere is the true artist more sure of hearty appreciation than here.

As to musicians and teachers of music, vocal and instrumental, there is no calling in greater demand. A very large proportion of the emigrants from Europe are Germans, lovers of music from their birth. Another considerable portion are Scandinavians, equally gifted in natural fondness for music, while for the others instrumental and vocal music has come to be considered a necessity. Nowhere is the performance of a really excellent brass band more thoroughly appreciated than in any of these western towns; the best opera-singers receive a far more enthusiastic reception, in the towns and cities of this western region, than awaits them in the great cities of the East. Every church and hall has its choir, and every town of 3,000 inhabitants its musical association for culture in vocal or instrumental music. As an instance of the fondness of the western people for parlor-music, an incident related by a visitor to Colorado may suffice. This gentleman went to Leadville, Colorado, when it was in the formative plastic condition, in the winter or spring of 1878. There were very few even frame buildings yet erected, and the majority of the citizens were living in large tents, happy if they could secure boards enough for a floor to keep them from the mud. Sod-houses were also in demand, among those who found the tents a little too frail for the strong winds. The nearest accessible railroad station was 130 miles distant, and the roads leading to it were horrible beyond description. The lowest price of transporting freight from the railroad station to Leadville was fifty cents a pound, and the railroad freights to their final station were also very high. There were yet very few women in the town, as the accommodations were so rough and poor. He had been doing some business with a young man

who was working energetically at a shaft of a new mine, and whom he found very intelligent, though roughly clad; and at the conclusion of his business, the young miner asked him to go home and dine with him if he could put up with "canned vittles." He accepted the invitation, and the miner led the way through the mud to one of these tent-houses. They were met at the door by a very beautiful young lady, whom the miner introduced as his wife. She was plainly but tastefully dressed, and her manners and conversation showed that she was a well-educated, refined and accomplished woman. As she arranged the table for their meal, the visitor looked about the room, and was astonished to see on one side a Chickering grand-piano. "How did you ever get that here?" he asked. "Oh," was the reply, "it was brought piece-meal on the backs of pack-mules, and we put it together after it came." "But it must have cost you an enormous sum to transport it so far?" "Well, yes, a little under $200, but then we were both so fond of music, and my wife is one of the best players I ever heard, and I was afraid she would be lonely here amid so many discomforts." The visitor expressed a desire to hear some pieces played, being himself a connoisseur in music, and when his hostess complied with his request, without any apologies or excuses, he was fain to confess that her husband had not overrated her skill.

The railroad has but just reached Leadville, but among the wares offered for sale in its principal thoroughfares, pianos and cabinet organs, as well as other musical instruments, hold a conspicuous place. In the farming districts the great ambition of the farmer, after he has purchased and paid for his harvester, is to get a "pianny" for his daughter.

"But," asks another anxious immigrant, "can you tell us whether the schoolmaster, or the teacher of any description has a chance there?" "Yes, indeed! There is a very active demand for good teachers all over this vast region, greater perhaps in the northern and middle tier than in the south, but a good teacher will find employment very readily anywhere. The immense amount of school-lands and their judicious management in all the new States and Territories, insures for them,

in the not distant future, such an endowment as can be found in no other country. Two sections (1,280 acres, or one-eighteenth of the whole area) in each township are set apart for common or public schools, and beside the interest on these funds, there is a State school fund, from the proceeds of fines, civil or military, the sale of estrays, etc., and a district tax which is at present three or four times the amount received from the school funds. Kansas, which is a fair representative of these States and Territories, will have, when its school lands are sold, a school fund of $13,000,000 for its common schools alone. It expended on these schools, in 1879, about $1,400,000, of which a full million was paid for teachers' wages; paying its male teachers a monthly average of about $33, and its female teachers about $26. This included town and country; the average wages in the towns were, of course, higher. In the older settled and more populous counties the average of monthly wages is, for the whole county, from $43 to $50 for male, and from $30 to $40 for female teachers.

There are also liberal appropriations of lands, in all these States and Territories, for the endowment of a State University, a State Agricultural College, and generally of Normal Schools and State Institutions for the Blind and Deaf Mutes. There are also, in each State and Territory, many private and denominational schools, some of them liberally endowed. These educational endowments are not suffered to remain unused. The progress of common school, as well as of higher education, has been, in nearly all this region, rapid beyond any former precedent. No village, no hamlet even, is without its district school, and the settler pays no tax with greater alacrity, than that for the maintenance of the school. There are two or three exceptions to this general prevalence of a desire for the best educational privileges.

In Utah the school funds, and generally the public schools, are under the control of the Mormons, and the opportunities of primary education do not average more than twelve weeks of tuition to the pupils in attendance, who are only 43.5 per cent. of the school population; and the higher schools are few and

not of high grade. This deficiency is partly made up by private or denominational schools, but these are not very well sustained.

In New Mexico, where a large proportion of the inhabitants are Hispano-Americans and Pueblo Indians, and more than ninety-five per cent. Roman Catholics, the control of the school funds has fallen into the hands of the Jesuits and other monastic and teaching orders of the Roman Catholic Church, and these moneys have been perverted to exclusive denominational teaching, and even to paying the board of theological students in Roman Catholic seminaries. These abuses cannot be prevented until there is a more enterprising and larger non-catholic population; but, until a change takes place, the Territory cannot come into the Union as a State, since it has not a fully Republican form of government.

In Texas and Arkansas, there has been, until recently, less interest in public instruction than in some of the more northern States; but this difference is fast disappearing, and the school systems of these States are being rapidly and efficiently organized.* Texas has a large number of private and denominational schools, many of them of a high grade. On its admission into the Union, having been previously an independent Republic, it did not cede its unclaimed lands to the United States Government, but retained them all in its own possession. The State has, however, made a very liberal provision of lands for school purposes, and will eventually have a large school fund.

For *artisans* of all the usual trades there is, in the newer States and Territories, ample employment. Carpenters and builders, masons and bricklayers, and generally tinners, painters, and glaziers, are in especial demand, and at fair wages. Bakers and confectioners find employment in the towns and cities, and the plumbers, gas-fitters, and brass-founders are mostly confined to the larger cities. Butchers are, of course, wanted everywhere, and fishermen and fish-dealers find generally ample employment on the coasts, and in the rivers and lakes of the interior, which abound in fish of most of the edible kinds.

* The newly awakened zeal for public school education in Arkansas is said to be almost phenomenal; and indicates a brilliant future for a State, which, in spite of great natural advantages, has, in the past, been apathetic, and lacking in public spirit and enterprise.

Hatters and furriers find business enough where furs and pelts are so plentiful; the blacksmith finds constant employ, and the saw-mill and grist-mill are kept busy, and profitably so. Machinists have abundant work in the mining districts, and to some extent also in the farming region, since the universal use of agricultural machinery often necessitates repairs which are beyond the ordinary skill of the blacksmith; and where there are extensive flouring mills, they, too, require the skill of an expert for their repairing.

Manufacturing is conducted with great advantage at many points, the admirable water-powers being so abundant, and operatives from woollen mills, cotton mills (a limited number), all kinds of wood-working factories, millers, sugar-boilers, brewers, smelters, furnace men, and workmen on coats, vests, and pantaloons, overalls, etc., etc., will find employment in Minnesota, Nebraska, Kansas, California or Texas, and the metal workers in most of the mining districts. Farm-hands, herdsmen, and shepherds will seldom fail of employment, in the farming and grazing regions, if they are trustworthy and faithful, even though they may not have had much previous experience.

The day-laborer, unskilled in any of the arts or trades, is welcomed in all parts of the West, if he is honest, temperate, and willing to work. On the farms there is plenty of work for him, except in mid-winter; in the grazing districts, there is always need for extra hands at fair wages, and he can, if he will, acquire, for a merely nominal sum, a piece of land sufficient for the needs of his family, and erecting a sod-house at only the cost of labor, can be comfortably situated, and, in a few years, can attain what to him will be a competence, such as he could never have acquired in the East or in Europe. In the mining districts, too, there is abundant work for brawny arms and powerful muscles. Here, also, he can have what land he needs, almost for the asking, and the chickens, eggs, potatoes, and other vegetables he can raise, and the pigs he will contrive to keep, will always command a high price at his own door. Then there are railroads to be built, canals and irrigating ditches to be dug, and sluices to be laid and tended.

The industrious, well-behaved, and honest day-laborer can nowhere have a better chance of bettering his position than in the Great West. Not a few of the great bonanza capitalists and mine-owners have, with commendable enterprise and industry, worked their way up from this very class. One of these men said to a friend, a few months ago, "Tom, I read the papers now-a-days what I can, though I make rather slow work of it, for you know my early eddication was neglected, all along of my having to carry a hod so much when I was a boy; but I find some things in the papers that bother me. I thought I knew all the wild varmint about here pretty well, for I have shot enough of 'em, but the papers are telling about a new one, which they say is very plenty, but I don't seem ever to have heerd of it before."

"What do they call it?" asked his friend. "A lynix," was the answer, "and that's what bothers me; I don't seem to remember no lynixes round here." "How do they spell it?" asked the other. "L-y-n-x—lynix," said the capitalist. "Why that spells *lynx;* you certainly know what lynxes are?" "*Lynx*, is it? To be sure I do; I've killed hundreds of 'em; but who ever thought of spelling *lynx* that a way; I supposed it was spelt *l-i-n-k-s.* What a fool I was, to be sure."

As to *manufacturing*, it is believed that no part of the world offers greater facilities for it than this Western Empire. Wherever water-power is desirable, there is no lack of the most magnificent water-falls on the globe. In the whole northern tier of States and Territories, Minnesota, Dakota, Montana, Idaho, Washington, and Oregon, there is water-power, yet unutilized, sufficient to put in motion all the machinery on the globe. In the middle tier—Missouri, Nebraska, Kansas, Wyoming, Colorado, Utah, Nevada, and California—there is an abundance; though in some of these States, as, for instance, in Kansas and Nebraska, the fall is not as great; while in the southern tier—Arkansas, Louisiana, Texas, Indian Territory, Arizona, and New Mexico—the water-power is sufficient, and more than sufficient, for all practical purposes, present and prospective.

If it should be contended that, under favorable circumstances,

steam-power is more economical than water-power, though we might be inclined to doubt it, where the water-supply was constant and from a sufficient head or height, still we can point the advocates of steam to the immense coal-beds already described, which traverse nearly or quite every State and Territory, and furnish a fuel which is very cheap, abundant and admirably adapted to its purpose. Within the next ten years wool will become one of the largest products of this region, and the wool-growers of the vast grazing districts will not consent to send their wool to the East, and have it manufactured there, to be returned to them, with its value enhanced, five or ten fold, or as in the finer goods, twenty or thirty fold. They will prefer to have it manufactured in their own vicinity, and thus not only the cost of a double transportation saved, but a considerable portion of the manufacturer's profit also.

Already the woollen goods of California and Oregon have a much higher reputation, in certain lines, than those produced elsewhere in Europe or America; and commanding the finest and most perfect machinery and workmen of the highest skill, with their wool at a lower price than it can be obtained elsewhere, there seems to be no good reason why any goods made wholly or in part of wool, should not be produced there, in the greatest perfection, and at the lowest price. The mohair goods made in part from the hair and fleece of the Angora goat, and in part from the long combing wool of the Cotswold or Leicester sheep, and, in the cheaper grades, a filling of cotton, can be made equally well here. The material is all at hand for making these goods of better quality, and at lower prices than they have ever yet brought.

In the southern tier of States and Territories, the manufacture of cotton goods can find its finest development. By a process discovered a few years since, the cotton can be spun into yarns of all degrees of fineness, just as it comes from the field, unginned, and with its beautiful and glossy fibres unbroken and unbruised by the teeth of the gin, while the cotton seed can be pressed for its valuable oil, and its oil-cake sold to the farmers and stock-raisers for their cattle. The cloths made from this

unginned cotton will far surpass in beauty and durability any cotton goods made elsewhere; while the cost of manufacture will be greatly reduced, and there will be no waste.

Other textiles, the growth of this region—flax, hemp, jute, ramie, agave and other fibres, the cactus fibre and the tulé rush, bunch grass, straw, etc.—can be manufactured very largely into cloths and into paper pulp, the uses of which are every day increasing, till already everything, from the driving-wheel of a locomotive, to a petroleum barrel, or a linen handkerchief, a house, a wash-pail, a lamp, or a pill-box, is made from it.

But it is not simply in the department of textiles that the Great West offers the best field for manufactures. Iron and steel can be smelted and manufactured more cheaply than anywhere else, and the telegraph wires which span the world, the rails which stretch across the continent, the steel plates for our new navy, the huge steel guns which will constitute its offensive armament, the locomotive and stationary engines, and the vast and complicated machinery used in the reduction or smelting of gold, silver, quicksilver, copper, lead, or zinc, as well as the agricultural machines which now cannot be manufactured fast enough to supply the demand, and the infinitude of iron and steel castings, will all be manufactured in this western land, not simply on its borders, as now, but in the very heart of the country.

The manufactures of wood in all their numberless varieties of wooden ware, furniture, machinery, carriages, wagons, carts and drays, doors, sashes, blinds, and even houses all complete, with inner walls of a compound of paper and gypsum, are already largely produced in many parts of this Great West, and are destined to an infinitely larger production, as the demand for them goes on increasing. There is then abundant room and employment for every honest, industrious man who will come, but no room for the idler, sluggard, or drone.

CHAPTER XVIII.

THE FUTURE, THE GLORIOUS FUTURE OF THIS GRAND EMPIRE OF THE WEST—THE CAUSES WHICH HAVE LED TO ITS GROWTH—BISHOP BERKELEY'S PREDICTION—THE "EMPIRE" HE SAW—THE GERM OF THE GREAT REPUBLIC—WHAT THE EMPIRE IS, AND WHAT IT IS TO BE—ITS GROWTH AND FUTURE CAPACITY—THE FUTURE CLIMATE—THE FUTURE SOIL AND PRODUCTIVENESS — INFLUENCE OF RAILROADS IN DEVELOPING THIS REGION —THE GOLD AND SILVER MINES AS AIDING IN THE DEVELOPMENT OF THE COUNTRY—THE FUTURE OF THE MINES OF THE PRECIOUS METALS—THE WESTERN SLOPES OF THE ROCKY MOUNTAINS FULL OF GOLD AND SILVER—RESULTS OF INCREASED PRODUCTION OF GOLD AND SILVER—EFFECT OF INCREASED PRODUCTION OF OTHER METALS—NO METAL BUT TIN TO BE IMPORTED—MINERAL EARTHS AND ELEMENTS TO BE DEVELOPED—COAL—PETROLEUM—METALLIC AND MINERAL PRODUCTS OF THE FAR WEST IN 1880 —THE PRODUCTION OF A. D. 1900—VEGETABLE PRODUCTS—WHEAT—INDIAN CORN—CORN CROP OF 1879—SORGHUM—SORGHUM SUGAR—OATS—BARLEY—RYE—BUCKWHEAT—EGYPTIAN RICE CORN—SUMMING UP OF CEREAL PRODUCTS —ROOT CROPS—POTATOES — SWEET-POTATOES — OTHER ROOT CROPS — ORCHARD PRODUCTS—TEXTILES—COTTON—THE FUTURE DEMAND FOR COTTON —WOOL—WOOL CLIP IN A. D. 1900—OTHER TEXTILES—THE HAY CROP—DAIRY PRODUCTS—TOBACCO—SUGAR, NOT FROM SORGHUM—HOPS—SUMMARY OF VEGETABLE PRODUCTS, EXCLUSIVE OF CEREALS—FISHERIES OF THE PACIFIC AND THE GULF, OF THE LAKES AND RIVERS OF THE INTERIOR—FISH-CULTURE, PRESENT AND PROSPECTIVE — LIVE-STOCK IN 1880 AND 1900—FOREST PRODUCTS—VARIOUS WAYS IN WHICH WOOD IS USED AND DESTROYED—PROBABLE VALUE OF FOREST PRODUCTS IN 1900—MANUFACTURES—FUTURE OF MANUFACTURES—COMMERCE—INTERNAL AND INTERSTATE COMMERCE—GENERAL SUMMARY—CHARACTER OF FUTURE POPULATION—LITTLE DANGER OF WAR—INDIANS—PROBABLE EARLY EXTINCTION OF INDIAN TRIBES—THE COLORED RACE—THE MEXICANS, CHINESE AND JAPANESE—PROBABILITY OF A LARGE INFLUX OF CHINESE ON THE PACIFIC COAST IN THE NEAR FUTURE—EUROPEAN IMMIGRANTS—EMIGRANTS FROM THE EASTERN UNITED STATES —THE CHARACTER OF ITS CITIZENS THE BEST GUARANTY OF ITS FUTURE.

"WESTWARD the course of empire takes its way;
The four first acts already past,
A fifth shall close the drama with the day;
Time's noblest offspring is the last."

So wrote Bishop Berkeley more than a hundred and fifty years ago, when this Great Western Empire, which we have

A VISION OF OUR WESTERN EMPIRE.

endeavored to describe, was utterly unknown to the civilized world, except from the reports of adventurous navigators who had touched upon its southern or western shores, or the journals of Jesuit missionaries, who had established themselves in California, New Mexico, and Texas, or the few hunters and trappers who had penetrated up the Missouri or its tributaries. The empire which he then saw in vision (for he had not at the time of the publication of this poem visited America) was composed of the colonies, which lay between the Appalachian range and the Atlantic. A population of not more than 1,200,000 was the nucleus of the future empire.

Yet in this mere handful of people scattered along the Atlantic coast from Maine to Georgia, lay the germ of the grandest empire this world has ever seen—an empire destined to realize in altogether another sense than the late British premier gave to it, when he quoted a few months ago, the dictum of the great Roman orator,—*Imperium et Libertas.* Here is, and is to be, *the empire* in its vastness of extent, its teeming population, its immensity of resources, its ripe and universal culture, and its moral power over the nations of the earth, and united with this *the liberty* which is the right and privilege of a great people—a liberty which is not license, but law; a government *of* the people, *for* the people, and *by* the people. And of this great empire, the portion largest in population, most abundant in resources, and foremost in all great enterprises is to be the region lying between the Mississippi river and the Western Sea. To-day, this region has more than eleven millions of inhabitants. In A. D. 1900 it will have fifty millions. In A. D. 1950 who shall say how many? The capacity of the country, in point of production, to sustain human life, has never yet been tested; but if, when our arable lands are not one-twentieth developed, and our grazing lands can feed twenty times the cattle and sheep now there, we are feeding fifty millions at home, and nearly twenty-five millions in Europe, what can we not do when our resources are tasked to their full extent?

But where shall we begin to speak of the future of this goodly heritage, with which God has endowed this Nation? We have

told you of its present varied but beneficent climate, with its western Gulf stream from the north, bringing mild and genial breezes to the Pacific shore; of its torrid heats, coming up from Mexico, to be tempered by the Arctic cold from the Valley of the Red river of the North. Is there to be an improvement in its climates? We fully believe so. The vast plains beaten almost to the solidity of stone by the hoofs of the buffalo for many hundred years, are being rapidly broken up by the plow, and warmth and moisture penetrate the soil. The rainfall is increasing, and these treeless plains are fast becoming clad with groves and islands of forest trees, which will turn what was once a desert into a fertile field. The *mesas* and *plateaux* beyond the Rocky Mountains, drained of their moisture by the deep cañons cut by the rivers, were once densely inhabited, and again, by the planting of forest trees, and the boring of drive and artesian wells, their capacity for cultivation, and for sustaining a large population, drawn thither by their mineral wealth, will be fully restored, and the region so long remarkable for its intense heat in summer will enjoy an equable temperature.

Are we to look for any improvement in the soil and its cultivation? There is every reason to expect it. The greater rainfall will render those lands arable, which have not hitherto been considered so; and irrigation, which is only yet in its infancy, will develop the best qualities of a soil, whose fertility is almost incredible. Deep plowing and careful seeding should largely increase the grain crops, and the use of forage grasses and cotton-seed cake give opportunity for much larger herds of cattle and sheep on smaller ranches, than the great herds now occupy. All these changes will come, for the spirit of enterprise and improvement is rife among these western citizens. It is difficult to predict to what points the tide of immigration will flow most strongly during the twenty or fifty years to come. The extraordinary efforts made by the railway companies, which have lands to sell, have had a great influence in directing it toward certain States and Territories. The railway companies of Minnesota, the Northern Pacific and its feeders, have made known to immigrants both in Europe and the United States, the great

advantages offered by the climate, soil, and manufacturing privileges of Minnesota, and especially the great fertility and productiveness of the Red River valley, and the lands adjacent in Dakota; while other railroad companies in Iowa and Southeastern Dakota have commended the farming lands of that section. The Chicago and Northwestern Railway, with its extensive connections, the Wabash, and the Chicago and Burlington, all of them connected with the Union and Central Pacific Railways, as well as the latter roads themselves, have rendered great service to Iowa, Nebraska, and Northern Kansas, and Colorado, as well as to the Territories beyond. So, too, the Atchison, Topeka and Santa Fé Railway has been so important a factor in the settlement of Southwestern Kansas, and Southern Colorado, that it is within the bounds of truth to say that it has hastened their development by more than twenty years. The roads extending from Missouri, through Arkansas and the Indian Territory into Texas, as well as the Texan roads themselves, have added three-fourths of a million of souls to the population of that State within the past ten years. On the Pacific Slope these agencies have not been so actively at work, but they are now fast developing at the Northwest in Oregon and Washington, and at the Southwest in Southern California, Arizona and New Mexico.

The wonderful development of the mines in Colorado, Montana, Utah, and the Black Hills, has contributed largely to the influx of population into those sections, within the past three or four years. There is every reason to suppose that the discoveries of the precious metals in these States and Territories are as yet only in their infancy, and that they will go on for years to come with increasing magnitude each year; while New Mexico, Arizona, Texas, Idaho, and Nevada, with its added facilities from its Sutro and other tunnels, and possibly Eastern Oregon and Washington, will fill up the measure of prosperity in this direction to overflowing.

It is vain to attempt to predict the quantities of gold and silver which will be produced in this region within the next fifty years: we only know that already the yield of silver has disturbed the pro-

portionate value of silver and gold, which had existed for the last five hundred years, when fifteen ounces of silver would purchase an ounce of gold. Now the ounce of gold is worth more than fifteen and a half ounces of silver, and with our vastly increased production it will soon require sixteen ounces to purchase an ounce of gold.

The prevalent opinion among the best mining geologists is that the western and some of the eastern slopes of the ranges composing the Rocky Mountain chain, and the spurs running east and west from it, are charged with lodes or veins of gold and silver-bearing ores; and there is every reason to believe that the eastern, and perhaps the western slope, of the Sierra Nevada, through its whole extent, is equally rich in these ores. They have been traced as far north as the line of British America, and, indeed, beyond it; they exist in Montana, Idaho, and Eastern Oregon, and Washington, in Nevada, Utah, and Wyoming, in Colorado, New Mexico, and Arizona (in the last three, perhaps, most abundantly of all), and in Western Texas. The valuable mines of California are mostly on the western slope of the Sierra Nevada, though a few are on the eastern slope of the Coast Range.

If this opinion of the geologists shall prove to be correct there is nothing to prevent the opening of three hundred thousand mines, all profitable, if well managed, and a yield of one thousand millions of gold and silver annually. Such a yield could not fail to produce two results: the further disturbance of the ratio between the values of gold and silver, since the production of silver will be far greater in bulk, and probably greater even in value, than that of gold; and a universal advance in the price of other commodities, or, which is the same thing, a depreciation of the purchasing power of gold.

But it is not solely in the so-called precious metals that the production will be so greatly increased; lead is combined with silver in certainly eighty per cent. of the ores; copper and zinc with both gold and silver in a very considerable proportion, and iron, platinum, osmium, and other rare metals in a small number. But all these metals, or rather their ores, are found in

great abundance without any admixture of the precious metals, and the ores of lead, copper, zinc, and iron are capable of immense development. Another decade will see copper ores reduced, and the copper refined, in the immediate neighborhood of the mines, in such quantities that there will be no necessity of importation of that metal, and still less of sending the concentrated ores to Swansea, or anywhere else, for reduction. Iron and steel will be made so abundantly and cheaply from the very best ores and by the best processes, that, instead of importing either to supply our greatly increased demand, we shall export both iron and steel to all the nations around us. Before the dawn of the twentieth century, tin will be the only metal we shall have occasion to import; and if, as seems probable, the small veins of tin already discovered in California, Nevada, Utah, Colorado, and Texas shall enlarge as they go deeper into the earth, this, too, may be stricken from the list of our imports. Platinum, nickel, aluminium, all destined to play an important part in our manufactures, in the near future, exist here, and can be produced as cheaply as anywhere else in the world.

All the metallic and mineral earths and elements used in medicine, chemistry, farming, or the useful arts, and all the salts of these, either exist as the natural productions of this region, or are capable of easy transformation into the compounds adapted to use.

Of other mineral products, coal exists in too large quantities, and of every known quality and variety, to make any lack of it possible for ages to come; whether required for the production of heat or steam, for manufacturing or for smelting, for coking coal for the production of iron and steel, or for family use, anthracite, semi-anthracite, bituminous, semi-bituminous and lignites, in all these forms, are to be had for the asking, at reasonable prices and at hundreds of points.

Petroleum, whose existence has long been known, but which has not been largely developed, is now found in such quantities in Wyoming and California as to have already become a large item in the traffic, and will eventually prove a formidable rival of the Eastern oil wells. If, before the close of the century, elec-

tricity does not become the universal illuminator, the oil wells of Wyoming and California may be taxed to the utmost to supply the illuminating and heating material for this Western Empire.

An eminent metallurgist and scientist has recently estimated the entire mineral production of the region west of the Mississippi for the year 1880 as worth $1,000,000,000, and has given the items on which his estimate is based. With the wonderful development which is now taking place in everything appertaining to mineral products and metallurgy, it is certainly within bounds to predict that the product of the year A. D. 1900 will not be less than $5,000,000,000, and the man who should estimate it at twice that sum could hardly be regarded as excessively sanguine in his anticipations.

Turning now to the vegetable and animal products of this region, what shall be our forecast for them twenty years hence?

Wheat, though not our largest grain crop, is the pioneer among the grains, being especially adapted to new lands, easily raised, and readily marketed, usually at a paying price. We estimate that the population of the United States, in A. D. 1900, will be not far from one hundred millions, of whom at least 90,000,000 will require wheat bread; and a barrel of flour, 200 pounds = eight bushels of wheat, will not be more than a fair supply for each. This would require 720,000,000 bushels for home consumption. Our last year's product (1879) was in round numbers 450,000,000 bushels, of which fully one-half, or about 230,000,000 bushels, was grown west of the Mississippi. But our export demand is now from 150,000,000 to 200,000,000 bushels, and is constantly increasing. Within the next twenty years, all the wheat districts of this Western Empire will be traversed so thoroughly by railroads that the wheat-grower in Montana, Oregon, or Washington will be able to obtain a fair price for his wheat, and to market it at once; the greater part of the arable lands of the whole region, and especially the wheat lands, will be under cultivation; better methods of plowing, seeding, and where necessary, irrigating and fertilizing the soil, will prevail, and the lowest average for the wheat crop will be twenty

if not twenty-five bushels to the acre. Under these circumstances the wheat crop of that year ought not to be less than 2,000,000,000 bushels, and may exceed that amount. This would be ample for our own supply with 1,000,000,000 bushels of wheat or its equivalent in flour for export. This crop should certainly be worth $2,000,000,000.

Indian corn is the largest of our grain crops, yielding, in 1879, in round numbers, 1,545,000,000 bushels. It is not certain to mature in the extreme northern portions of the Great West, but is a successful crop to the extreme southern limit, requiring for its perfection a longer summer than it can always command near the line of British America. We export of Indian corn and its various preparations, the equivalent of about 100,000,000 bushels, and our export of this is increasing; though the foreign demand for it is less than for wheat. But our home consumption is large and varied. It forms the principal food employed for fattening cattle, sheep, swine, and poultry, is largely used for feeding horses, especially those which are constantly worked, forms the staple article of food of at least 6,000,000 of our people, is manufactured into corn-meal, samp, hulled corn, or hominy, maizena, corn-starch, common starch, glucose, sugar, and syrup, fusel oil and whiskey. When the price is low, and markets not easily accessible, it is burned instead of coal, being somewhat cheaper and making a hotter fire. Its leaves and stalks, green or dried, are used as a fodder for cattle, and from the juice of its stalks, cut when the corn is just ripe, a cane-sugar is made. In all of these ways this grain is utilized, large as the crop may be.

Of this great crop which, at a low valuation, was worth nearly $600,000,000, a little more than two-fifths or about 650,000,000 bushels was raised in the region west of the Mississippi; Iowa being second only to Illinois in the magnitude of its corn crop, and Missouri, Kansas, Nebraska, Texas, and Minnesota being the other States of largest production. Although the production of this grain west of the Mississippi is destined to increase largely within the next twenty years, and may very possibly reach in that time the present product of the entire United

States or even a little more, yet we do not anticipate for it so rapid an increase proportionally as in the wheat crop, for several reasons. It cannot be grown so successfully or with as much certainty as some other crops in the whole of the region where the greatest agricultural activity and enterprise is displayed; other crops produced more easily and with greater certainty, will, to some extent, take its place. Among these we may name the pearl and other millets, and the Egyptian rice corn, all of which yield larger crops and with less labor, and are better liked by cattle, and form a less heavy food for horses and swine; the great progress which is making in the cultivation of barley, three-fifths of the whole crop being raised west of the Mississippi, and its substitution to some extent for corn for horses and cattle; and the wonderful impulse recently given to the culture of sorghum, and especially of the early amber sorghum, for the production of sugar. All the sorghums, as well as the millets, the rice corn, and the broom corn, belong to the *Zea* family, and the seeds of the sorghum furnish a valuable food for animals, while its stalk yields a considerably larger quantity of saccharine juice than the Indian corn. There is, however, an increasing demand for corn for the manufacture of glucose sugar and syrup. This industry has very recently become largely developed, immense factories for its production having been established, mostly since January, 1880, in Buffalo, Chicago, and other cities and towns in Indiana, Illinois and Iowa. One in Chicago has cost $650,000, and is said to have a capacity of 20,000 bushels of corn, equal to 300 tons of sugar per day. The net profit is said to be 300 per cent. The export demand for corn, while increasing, is not likely to be enlarged very rapidly, and will be rather in its products than in the corn itself, since its cultivation is also increasing in the south of Europe. But with the multiplication of the facilities for speedy and cheap transportation, the price will be enhanced, and it will no longer compete with coal as fuel. Should the crop of corn, in the region west of the Mississippi, amount, in A. D. 1900, to 1,600,000,000 bushels, it would be perfectly safe to estimate its value at $1,200,000,000.

We have alluded to the great probable increase in the culture of *sorghum*, and especially of the early amber variety, which ripens its seed long before frost comes. Though the smallest of the sorghums, and yielding a smaller quantity of juice than the other, the early amber kind is the one best adapted to the Northern States and Territories. Careful and oft-repeated experiments demonstrate that in ordinarily good corn-land, either by manuring and irrigation, or without, as is the case in most of the arable lands of the Great West, a crop can be raised which will yield on an average a ton or more of raw crystallized sugar to the acre.* With that yield it would be by far the most profitable crop which could be cultivated, as, in addition to the sugar, the leaves and seed form a very valuable food for cattle, and even the *bagasse* or exhausted stalks, where not required to furnish fuel for the evaporators, have a value for paper stock and for other purposes. Even if but three-quarters of a ton of sugar could be made to the acre, worth from $70 to $75 per ton, which is considerably below the present price of raw sugar, it would still be a very profitable crop, and one for which there would be an unlimited demand. We are importing annually from $80,000,000 to $100,000,000 value of sugar and sugar products, besides the amount made in Florida, Louisiana and Texas from the sugar-cane; and all our exertions to increase the production of sugar from the cane have proved ineffectual, and must continue to do so, because the sugar-cane cannot grow here from the seed, but is only propagated by cuttings, and gives but imperfect results, with very frequent failures. The culture of the sugar-beet for sugar has not, so far, proved successful on a large scale, and cannot probably compete with the sorghum.

If, by the cultivation of this plant. we can supply the present and constantly increasing demand for sugar, and prevent any necessity of importation, the devotion of three or five million acres to this crop will be one of the best measures which our Western farmers can adopt. The processes for sugar-making

* The experiments of the Agricultural Department in 1879, which were all with the early amber cane, give an average of 1,588 pounds to the acre, but these were not a fair test of what can be accomplished with other and larger varieties.

from sorghum are much simpler and less expensive than those for the sugar-cane. With an apparatus costing only from $100 to $150, any farmer can boil it down to a syrup which will yield at least twelve pounds of sugar to the gallon, and the syrup can be crystallized from this at any time within a year. General Le Duc advises that the farmers should not attempt anything more than the production of the syrup, and that there should be one or more sugar-mills in each county where the sorghum is cultivated, which will find constant employment throughout the year in crystallizing the sugar from the syrup. It is not to be forgotten, also, that when sugar becomes a domestic product, and the price of the refined article is lowered, as it will be, the consumption will be greatly increased, irrespective of the increase of our population, so that if we are paying $150,000,000 for sugar now, we shall expend certainly $500,000,000 for it twenty years hence, with our population doubled, and their appetite for sweets increased.

The next great cereal crop is *oats*, of which we now raise about 420,000,000 bushels in the entire United States, of which one-third is grown west of the Mississippi. The present value of the entire crop is about $125,000,000. Oats are so valuable both for human and animal food that we may confidently expect that the crop, which is so well adapted to the Northern and Central States and Territories, and yields so bountifully there (seventy to eighty bushels or more to the acre), will be more largely cultivated each year. Our exports of this grain, though not large (5,500,000 bushels in 1879), are increasing, while our imports of it have nearly ceased. We may safely set down the oat crop of the Great West, in A. D. 1900, at 500,000,000 bushels, and its money value as at least $175,000,000.

Of the other cereals, the production of *barley*, of which we now raise from 40,000,000 to 45,000,000 bushels, and import 6,000,000 or more, is likely to increase—not so much, it is to be hoped, for its use in the manufacture of malt liquors, as for its value for horses and cattle, and the fondness which the German, Scandinavian, and Russian emigrants have for it as an article of food. It is grown and marketed as easily as oats, and on suit-

able soils yields almost as largely. It brings from seventy-five cents to a dollar a bushel, and on the newer lands is a fairly profitable crop. The product of barley in the Great West, in A. D. 1900, may be safely set down at 200,000,000 bushels, and worth as many dollars.

Rye will also increase moderately. The crop for the whole country now ranges from 23,000,000 to 28,000,000 bushels, and it is worth from sixty to eighty cents per bushel. Not quite one-fourth of the whole crop was grown west of the Mississippi. It is not here, as in Europe, now largely used for food, though there is some demand for it in the manufacture of whiskey; it is seldom fed to cattle, but with the influx of emigrants from Central and Southern Europe, it will be more largely used for food.

It grows well on poor soils, and most of the soil in the Great West is too rich for it. It may reach 50,000,000 bushels, west of the Mississippi, by A. D. 1900, but that will be its utmost limit.

Buckwheat, the cereal which is least grown in the United States, its largest crop being only a little more than 13,000,000 bushels, is hardly an appreciable crop, west of the Mississippi, 350,000 bushels being the largest crop ever grown there. It is not probable that it will become a very important crop at any time, though it may reach 4,000,000 or 5,000,000 bushels, worth fifty or sixty cents per bushel.

The Egyptian rice corn, and the pearl millet, both cereals belonging to the millet family, are likely to be largely cultivated, within the next twenty years, both as forage plants, and for their seed or grains. They yield nearly as much seed as oats, and the amount of fodder which may be cut from them is from forty to eighty tons of green forage, or from seven to ten tons of dry, in three cuttings, in a single season. The grain of the rice corn is regarded by the Kansas farmer as superior to Indian corn for cattle and hogs, and many prefer its meal to corn or oat meal for human food. We may confidently expect that from these cereals or their congeners, the crop of A. D. 1900, west of the Mississippi, will not be less than 50,000,000 bushels of seed, or its equivalent of forage.

Thus much for the cereals.* We foot up the crop of A. D. 1900 as follows:

Wheat	2,000,000,000	bushels,	Value	$2,000,000,000
Indian Corn . . .	1,600,000,000	"	"	1,200,000,000
Sorghum Sugar, etc. .			"	500,000,000
Oats	500,000,000	"	"	175,000,000
Barley	200,000,000	"	"	200,000,000
Rye	50,000,000	"	"	40,000,000
Buckwheat . . .	5,000,000	"	"	2,500,000
Millet and Rice Corn	50,000,000	with forage,	"	50,000,000
				$4,167,500,000

Of the cereal production at dates still farther in the future it is not wise to speak. Circumstances may change; an oriental population, if largely in the ascendancy, may prefer other grains, and cultivate them by other processes, in the coming century; or root crops, or such edibles as the bread-fruit, the cassava, or the pith of the sago-palm, may be deemed preferable to those grains which we have been accustomed to consider the staff of life. The future century must provide its own bread.

We turn next to the root crops and the vegetables, which, though perhaps neither tubers, nor bulbs, serve to sustain life in man and beast. Potatoes rank first in the list—our common, sometimes called Irish potatoes—because they did not come from Ireland,—the *Solanum tuberosum.* Of these about 185,000,000 bushels were grown in 1879, although it was not regarded as a very favorable year for this crop. Of these about one-third, or 62,000,000 bushels, were grown west of the Mississippi. The labor of harvesting this crop is greater than that required on some others, though now materially diminished by the use of the potato-digger; but very few crops pay as well. In all the newer

* We have not deemed it necessary to speak of the production of *rice*, of which there are a few plantations in Western Louisiana and Texas; it is undoubtedly capable of great development, and in the event of a large migration of Mongolians to this Western Empire within the next twenty years, may receive it; but the experience of all the past is that, in warm climates, the cultivation of such cereals as require much labor and exposure of life and health, is not successfully prosecuted, except where labor is compulsory. Other cereals more easily cultivated will be substituted for this. The *wild rice*, a plant of northern growth, is extensively gathered for forage and hay, but is not cultivated, so far as we are aware.

lands, and many of the old ones, the yield is from 150 to 400 or even 500 bushels to the acre, while the price at the nearest market seldom falls below thirty-three cents per bushel, and ranges from this to sixty cents. A crop which will bring from $60 to $125 per acre is a profitable crop for the emigrant to raise, and as there is, and is likely to be, a demand for all that are grown, we may well expect that there will be a great increase in the production. The autumn of the year 1900 will very possibly give a crop of potatoes, west of the Mississippi, of not less than 650,000,000 bushels, worth probably half that number of dollars.

The sweet potato and yam, though largely grown in California, Arizona, New Mexico, Texas, Arkansas, and Kansas, will never approach to these figures, but may, twenty years hence, yield 50,000,000 bushels, and at a value of perhaps seventy-five cents per bushel. Neither of these tubers are exported to any great extent. In 1879, 625,000 bushels of the common potato were shipped to other countries, 550,000 bushels going to the West Indies and South America. There is some prospect of an increase of this demand both from the Pacific and the Texan ports, but the principal consumption will continue to be in the home markets.

Of the other root and vegetable crops, turnips, rutabagas, onions, leeks, mangel-wurzel, cabbage, kale, cauliflower, peas, beans, pumpkins, squashes, melons, okra, spinage, celery, cucumbers, tomatoes, pie-plant, egg-plants, salsify, green corn, radishes, lettuce, etc., though we know the present aggregate to be very large, and the prospective one vastly greater, yet it is difficult to arrive at any very definite estimates concerning it. The census of 1870 reported these products very imperfectly, probably omitting more than it reported. Its aggregates were nearly $27,000,000, while it is perfectly safe to put down the actual production as nearly or quite $50,000,000. Since that time these products have undergone an immense development, and whatever may be the census figures, the actual production cannot fall short of $100,000,000; indeed, the consumption of twenty-five of our largest cities would very nearly reach that sum. We

think that a fair estimate of the consumption of those articles by the 50,000,000 of people west of the Mississippi, in A. D. 1900, would not be less than $150,000,000.

The *orchard products* and the small fruit sales, including the wine and raisins from the grapes, the cider, etc., from apples, and the preserved, dried, and canned fruits, are next to be considered. In 1870 these products for the whole United States, so far as reported, amounted to about $53,000,000. Since that time the orchard, grape, wine, and small fruit products have nearly or quite quadrupled. The State of Kansas, which then was set down as having $173,000 of these products, reported, in 1878, $6,500,000 of orchard products alone, with less than half her trees in bearing; California has made even greater advance, and Oregon, Washington, Dakota, Nebraska, Minnesota, and Iowa at least an equal one. One hundred and sixty million dollars is a low estimate of these products for 1880, for the whole country, and twice that amount is equally low for the region west of the Mississippi in A. D. 1900.

Textiles come next in order. The cotton crop of 1879–80 is exceptionally large, the largest ever produced in this country, and, owing to the lateness and mildness of the autumn and early winter, picking was continued much later than usual. It is estimated as equal to 5,750,000 bales of 480 pounds, worth not less than $320,000,000. Nearly one-half of this great crop is raised west of the Mississippi, mostly in Louisiana, Texas, and Arkansas, though the Indian Territory, California, Arizona, Kansas, and Missouri add small quotas to the amount. The State of Texas alone has excellent cotton lands, as yet mostly uncultivated, of sufficient extent to grow not only the whole crop of 1879, but the entire supply of cotton needed for the consumption of the world—about 12,000,000 or 13,000,000 bales. And as the cotton lands east of the Mississippi, unless their methods of cultivation are greatly improved, shall be worn out, and become sterile, the natural tendency will be to transfer the greater part of the cotton production to Texas and Arkansas, where virgin soils will yield larger crops.

The culture of cotton in the South is not so scientific and thor-

ough as it should be. The average yield per acre in Texas is only about 275 pounds per acre, when it should be, and might be, with proper management, 960 pounds. Greater efforts for improvement are now making than at any previous time, and these cannot fail to result in increased production per acre.

Twenty years hence the largest demand for cotton will be for home consumption. Now less than one-third of the crop is retained here, and all the rest exported. That demand may reach 10,000,000 or 11,000,000 bales. If it does so, we believe that the whole amount or nearly the whole will be grown west of the Mississippi. We are led to this conclusion from the fact that the tendency in all our manufactures is to bring the place of manufacture as nearly as possible to the place of the production of the raw material. This is particularly true where the raw material is bulky and cumbrous, as is the case with cotton. For many long years the cotton was brought with great labor and cost to the shipping ports, sent thence to England and France, where it was made into yarns, thread, and fabrics, and these re-exported hither, and thus we were buying back our own cotton and paying from 400 to 600 per cent. for the privilege of doing so. Our manufacturers in New England sought to save a part of these profits to our own people, but the transportation of the cotton from the South to New England cost nearly as much as to England, and though there was some gain, yet there was a more excellent way. Already the change has begun, and it will be carried forward with rapidity. The yarns, at least, will be made from the unginned cotton, near the place where it is grown, and the seed utilized for oil and food for cattle and horses, while the yarn supplied to mills, perhaps in an adjacent State, is there manufactured into cloths, stronger, more lustrous, more beautiful, and wearing longer than any made in English, French, or Northern mills, and at a lower price. Manufacturing in this way, we can export our goods instead of our raw material; since no other nation can compete with us, either in the cheapness or the intrinsic value of our cotton goods. China, India, South America, Europe, and Northern and Southern Africa, and Australasia will gladly take all the cotton goods we can spare, and

it will task the energies of our manufacturers to supply all these and our home market; while our agriculturists will be stimulated by the demand to make two bales of cotton grow where now only a half bale is grown.

Wool has improved as much in quality as it has increased in quantity within the past decade, and the improvement and increase has but just begun. The wool clip of the region west of the Mississippi in 1879 exceeded 100,000,000 pounds, and was fully equal in quantity, and much superior in quality, to that of the whole United States in 1870.

The rapid multiplication of flocks of sheep of improved grades, throughout the whole region, insures to that region within twenty years, an annual clip of not less than 350,000,000 pounds, of an average value of not less than twenty-two cents per pound, or an aggregate of $77,000,000. This will all be required at home, and we shall cease to import wool for our manufacturers. The hair of the Angora goat and the grade goats, and possibly also that of the camel, will also be largely in demand, and there will be a sufficient supply at remunerative prices. Probably these textiles will make up the amount to full $100,000,000 by the year A. D. 1900.

Raw, or rather reeled silk, is now imported, to the extent of from $7,000,000 to $12,000,000 annually, to be manufactured here. If common sense, without excitement or mania of any sort, shall ever take possession of the minds of our people on the subject of rearing silkworms, every farmer who has been five years on his place will be as sure to have a cocoonery as he will to have a barn. The children and young women of the household will rear the worms, gather and stifle the cocoons, and the town or village filature will reel them. Then instead of sending $12,000,000 abroad for raw silk, and $25,000,000 more for silk goods, we shall export both. Fifty millions of dollars will be less than the value of our raw silk and silk products, raised and made west of the Mississippi in the year A. D. 1900.

Of the other textiles proper, *flax*, *hemp*, *ramie*, *jute*, *cactus fibre*, etc., they are all destined to have a considerable development, and if methods of bleaching equal to those provided by

nature in Ireland, can be invented or discovered, there is no good reason why the culture of flax, ramie, jute, hemp, nettle and cactus fibre, should not increase to an enormous extent. Flax is now cultivated principally for its seed, and the oil obtained from it. The present value of this for the United States is about $5,000,000; that of hemp about $2,000,000, and of the other textiles perhaps $150,000 in all. To what extent these values may be increased within the next twenty years it is impossible to say. We imported in the year 1879 nearly $1,000,000 worth of raw flax, and $1,829,000 of raw hemp; and $14,600,000 worth of manufactures of flax, and $107,000 worth of manufactured hemp, $3,781,037 worth of raw jute, and $1,776,750 worth of manufactured jute. All of these articles and raw material should be produced here, and perhaps they will be, within twenty years.

But we have not yet noticed a crop which ranks third among our great national products, being surpassed only by Indian corn and wheat—the *hay crop*. In 1879 this was estimated by the United States Agricultural Department *at* 35,648,000 tons, having a value of $325,851,280. This crop, in the nature of the case, must increase; the great increase of cattle and sheep will require it, in all the Northern and Middle States and Territories of the Great West, and the magnitude which the dairy interest is assuming, will add to the necessity. Under this general head of hay, all plants cultivated for forage must be included. Much of the hay, in the north especially, is wild, and costs only the labor and expense of the gathering, but this will eventually give way to the cultivated grasses. The value of the hay crop of the Great West in A. D. 1900 will not be less than $700,000,000.

Intimately associated with this crop is the dairy interest, which is now rapidly increasing under the stimulus of a large export demand, a demand which, by good management, may be almost indefinitely enlarged. The exports of butter and cheese in the year ending June 30, 1879, were $18,000,000, and for the coming year they will probably be much greater. It is estimated that 1,500,000,000 pounds of butter are now made in this country, and about 900,000,000 pounds of cheese; 1,000,000,000 gallons of milk are sold, and condensed milk to the extent of about

$6,000,000. The value of these dairy products in the aggregate is about $590,000,000. That the region west of the Mississippi will require in A. D. 1900 not less than $500,000,000 worth of dairy products is absolutely certain, and the export demand may reach another $100,000,000. Three other items close our summary of vegetable production, present and prospective, viz.: 1. *Tobacco*, the crop of which varies in different years, but its value is not far from $22,000,000 annually. The production of this in the Great West will be in the future quite large, as some of the land is admirably adapted for it, and it is regarded as a profitable and desirable crop. We doubt, however, if that region will in A. D. 1900 much exceed the whole present United States crop in quantity, though the quality may be somewhat better. It may be safely estimated at $25,000,000. 2. Sugar and syrup from the sugar-cane, maple and sugar-beet. The value of these products in 1879 was about $18,000,000, and it does not seem to us likely to increase. As the sorghum sugar begins to take possession of the market, the sugar from the cane being in some sense a forced product, and an uncertain crop, will fall off. The sugar maple is not a very abundant forest tree west of the Mississippi, and will not greatly increase its present production of sugar; while the sugar-beet sugar is so dependent upon the soil, and upon rather complicated processes of manufacture, and costs so much more to make than the sorghum, that it cannot add very materially to the aggregate production. We should be loth to allow more than $15,000,000 as the value of these products in A. D. 1900 west of the Mississippi. Adding to these the glucose product, mostly from corn, and we have probably $75,000,000. 3. Hops have been a very uncertain crop, cultivated only in certain localities, and in many instances failing even there. It has been more successful in California than elsewhere in the West, but is so unreliable that it is difficult to estimate its probable prospective value. The crop of 1877 was the best for several years. It was about 23,000,000 pounds, and was valued at about $4,250,000 dollars. That of 1879 would not bring half that amount. It is doubtful if it will ever be worth $3,000,000 west of the Mississippi.

The oil-bearing plants and seeds are largely those which have other claims to be considered than the oil they produce. Yet they ought not to go entirely unnoticed. Cotton-seed oil is in such demand that its production is sure to increase largely. Linseed oil is also in great demand; the oil from colza or rape-seed, and the other vegetable seeds of its class, tar-weed, sesame, etc., is always sure of a market, and the pea-nut or ground-nut is now largely cultivated for its oil. The castor-oil plant (*Ricinus communis* and *sanguinarius*) is largely cultivated in several States for its oil; and we are just beginning in California, Texas, Arizona, and some other States, the cultivation of the olive, mainly for its oil. It is difficult to estimate the amount of all these oils which will be produced beyond the Mississippi twenty years hence with any great definiteness, but probably of them all, $25,000,000 would be a very low valuation.

Let us sum up now in regard to these farm crops other than cereals, and their yield in A. D. 1900.

The Common, or Irish Potato . .	650,000,000	bushels, Value	$325,000,000
Sweet Potatoes	50,000,000	" "	37,500,000
Market-Garden Vegetables of all kinds		"	150,000,000
Orchard Products		"	320,000,000
Textiles—Cotton	10,500,000	bales "	588,000,000
Wool		"	77,000,000
Goat's Hair, Alpaca, and Camel's Hair . . .		"	23,000,000
Silk and Silk Products		"	50,000,000
Flax, Hemp, Jute, etc.		"	30,000,000
Hay and Forage		"	700,000,000
Dairy Products		"	600,000,000
Tobacco		"	25,000,000
Sugar and Syrup, not from Sorghum		"	75,000,000
Hops		"	3,000,000
Oils of Vegetable Production, Cotton-Seed, Linseed, Olive, etc.		"	25,000,000
Total			$3,028,500,000

The *fisheries* of the Great West demand our attention also. The salmon fisheries of the Pacific coast and of the Columbia river have already attained a great magnitude, and but for the artificial replenishing of its waters with this right royal fish, they

would exhaust the supply within ten or fifteen years. In 1878 more than $10,000,000 worth of canned salmon was shipped from the vicinity of the Columbia river, and in 1879 the catch and shipments were fifty per cent. greater than the previous year. Salmon are also brought in large quantities from our great northern Territory of Alaska.

But this vast product from a single fish, greater than all the products of all the fisheries in the United States, in 1870, by twenty-five per cent., by no means exhausts the resources of the fisheries of the Pacific. The seal, sea-otter, sea-lion, and other fisheries of the mammals of the sea, amount to over $3,500,000, while the markets of the Pacific coast swarm with fish of all kinds; and the whale fishery, conducted from Pacific ports, has taken the place of that from the former whaling ports of the Atlantic. The Great Lakes at the Northeast and the coast of Texas and Louisiana on the South are teeming with edible fish.

But far beyond these, in its aggregates, within the next twenty years, will be the fisheries of smaller lakes and rivers from artificial propagation. Every State and Territory of the interior can profit by this. Minnesota claims 7,000 lakes, many of them of considerable size; Dakota, Montana, Oregon, and Washington abound in lakes. California has many, and most of them of great purity. Utah has them both of fresh and salt water, and all the States and Territories have greater or less numbers. Then the rivers, which have their sources and many of them their entire course in this region: the Columbia with its gigantic affluents, the Clarke and Lewis, or Snake; the Missouri, with its scores of affluents, some of them themselves mighty rivers; the Platte, the Kansas, the Arkansas, the Red river of the South, and the Red river of the North; the Brazos, the Colorado, and the Rio Grande of Texas and New Mexico; the great Colorado of the West with its tributaries, the Grand, Green, San Juan and Little Colorado, the Sacramento and San Joaquin of California, and the Gila of Arizona, and the numerous bays and estuaries of the Pacific and Gulf coasts are also teeming with the finny tribes. All these lakes, rivers and estuaries are now being stocked, or have already been supplied with thousands and mil-

lions of young fish of the best kinds; the larger lakes have the lake trout, the land-locked salmon, the white fish, the muskelonge, the black bass, the grayling, and the smaller fry; the streams are replenished with the brook trout, which, in some of them, attains a huge size, while in the streams flowing into the sea, the salmon is introduced, or its waste supplied, the shad, striped bass, white fish, Spanish mackerel, and other fish equally valuable, but not so well known, are introduced in large numbers. The result is likely to be that fish will be plentiful in all parts of the West, and at such prices as to make them in demand for the food of all classes. The fish product of the Great West in A. D. 1900 will not fall below $100,000,000.

We turn next to the live-stock of this vast region. In 1870 the States and Territories west of the Mississippi held, according to the census of that year, live-stock of the value of $347,350,790. In the summer of 1878 the numbers and value of the live-stock of the same region had increased until it was worth, at the very low prices then ruling, $625,314,521, which was divided as follows: Horses, $204,753,432; mules and asses, $45,367,560; milch cows, $92,870,880; oxen and other cattle, $195,237,488; sheep, $39,424,200; swine, $47,160,981. The ratio of increase which had ruled from 1875 to 1878, if continued in 1879 and 1880 (and it has gone much beyond the average of those years), would give for the value of live-stock, in the summer of 1880, in these States and Territories, $706,518,831; a little more than double the value of the live-stock of the same region in 1870. We are warranted in believing that, owing to the extraordinary activity displayed in all parts of that region, in the rearing of horses, mules, cattle, sheep, and goats, and the great care taken to improve the stock, as well as the increased attention paid to the breeding of milch cows, the census of 1890 will show the value of live-stock to be not less than $1,500,000,000, and that of 1900 somewhat more than $3,000,000,000. The greater part of this increase will be in the items of horses and mules, of milch cows, and of cattle for draught and for sale, and of sheep. Swine will increase when the population shall increase, but their increase will not be proportionally as rapid as that of sheep or neat cattle.

It is difficult to estimate what may be the future supply of the *products of the forest.* Under this head are included all the timber, spars, and lumber exported or consumed in our own country, all railroad ties and track beams, all the wood used for fuel and for fencing, clap-boards, laths, shingles, telegraph poles, hoop-poles, shooks, staves, hogsheads, and barrels, every description of wooden ware, the wooden portion of agricultural and other machines, house furniture, the wood used for carriages, cars, wagons, trucks, sleighs and sleds, the consumption for spools, matches, tooth-picks, etc., etc., all barks of trees or shrubs used for tanning purposes, the wood made into paper pulp, all the tar, pitch, turpentine, rosin, and wood spirits, charcoal, crude, pot, and pearl ashes, and wood ashes generally. The timber and lumber production alone was in 1870, in the region west of the Mississippi, of the value of nearly $125,000,000, and since that time it has enormously increased. The extensive forests of Northern Minnesota have furnished logs enough for the immense saw-mills of Minneapolis and the upper waters of the Mississippi and its tributaries, to manufacture into timber, lumber, shingles, and staves for its great flouring mills, and for a wide region of the Northwest; and Washington and Oregon have been increasing, to an almost equal extent, their lumber production. The 40,000 miles of railway has gathered up all the available timber within its reach for railway ties and telegraph poles, for stations, snow-sheds, and signal-posts. The factories, which are turning out so many scores of thousands of agricultural machines and implements every year, are eating up the forest at a fearful rate; the furniture production, though less extensive here than in the East, yet consumes year after year, vast quantities of the harder woods, as well as much pine and cedar. The consumption of the forest trees for fuel has been enormous and wasteful. In the mining regions, charcoal has been largely used instead of mineral coal for smelting and reduction of the metals. The production of small articles of wood, such as spools, matches, tooth-picks, nine-pins, and of paper pulp, from bass wood, etc., etc., has used a far greater amount than is generally supposed. Fencing the farms has also

required vast quantities of timber, and the erection of log-houses, the timbering of mines, tunnels, and shafts which requires in some sections all the available timber for many hundred square miles; the erection of bridges, and the making of corduroy roads, have added to the consumption of the forest till its aggregate, in any year of the past ten, must be enormous. The use of the bark of the hemlocks and oaks for tanning purposes has not hitherto been as great in the West as in the East, but it is increasing, and unless it can be supplied by the wattle, the mezquite, the sumacs, or the hardhacks, it must prove very largely destructive of timber; and on the Pacific coast and in Louisiana and Texas there is a constantly increasing demand for naval stores, tar, pitch, rosin, and turpentine, which will ere long denude the mountains of the pine forests.

In all these ways the products of the forest annually consumed in the region west of the Mississippi cannot have been less than $500,000,000 at any fair valuation, and may have greatly exceeded that sum. Unless the planting of trees goes on much more rapidly than now, in the immediate future, and some means are found of substituting other materials for wood, in many of the purposes for which it is now used; as iron and glass for buildings; glass, metal, or stone for railroad ties; paper made from straw and condensed into a hard wood for furniture; artificial stone or cement for supports of mines; and coal for fuel and smelting purposes, the whole West will be, by the year 1900, a treeless region; but before that time comes, the coming scarcity of forest trees will enhance the price of all the products, and even if the consumption should be no greater than now, its money value would not be less than a thousand million dollars.

The manufacturing industry of this region did not make a comparatively large showing in 1870 with the Eastern States. Of the $4,232,325,442 of reported manufactured products for the preceding year, only $437,232,117, a less amount, probably, by $60,000,000 or $70,000,000 than the existing condition of manufactures there warranted, was set down as the production of the entire Western region, and of this amount, nearly one-half was to

the credit of Missouri alone. At that time only Missouri, California, Iowa, Minnesota, Kansas, and Texas had manufactures exceeding in value $10,000,000. The other States and Territories were new, and had not yet emerged from their almost wholly agricultural condition. Nine years later, Minnesota had manufacturing industries exceeding $75,000,000 in value; Kansas about $95,000,000; Iowa more than $100,000,000; California more than $150,000,000; Texas about $50,000,000; and Missouri over $300,000,000. The newer States and Territories were wheeling into line, and in 1879–80 the total manufacturing interest of this region was over $1,000,000,000.

In the near future, the amount of manufacturing here will exceed that in the East. The water-power, the raw material, the coal, the iron, the cotton, the wool, flax, hemp, jute, etc., the wood, copper, lead, zinc, grain, paper, and paper stock, everything indeed which enters into the composition of any kind of manufactured goods, is at hand. The skilled labor is there also, and if the capital is not now, it soon will be. It is not a rash or hap-hazard prediction, which we make, when we say that the census of A. D. 1900 (the twelfth census) will show that the manufactures of the region west of the Mississippi exceed in annual product $5,000,000,000.

The amount of the commerce of this Western Empire at the end of the next twenty years is not easily predicted. The number of good seaports on the Pacific coast is not as large as on the corresponding extent of the Atlantic, but a few of them are among the best in the world. On the Gulf coast, aside from New Orleans, which hardly belongs to our Western Empire, none of the ports are of the first-class, though several are good for all but the largest vessels. There is also a great extent of river and some lake navigation. The commerce with Eastern Asia, with Australasia, with the Sandwich Islands, with the Northwest Coast, Mexico, Central America, and the west coast of South America is likely to be greatly increased, and from the Gulf ports, Europe, the Mediterranean, Northern Africa, India, and the eastern coast of South America will be readily reached.

The internal and interstate commerce, by coast and river steamers, and by the numberless railroads which gridiron the whole region, will also attain a magnitude almost beyond our conception. On the ocean and coast steamers, the river steamers, and the railroad freight trains, almost the entire yield of our mines, placers and quarries, of the farms and forest products, and all the surplusage of live-stock, as well as the wool and hides, and the flesh of all the slaughtered animals, all the machinery, dry-goods, groceries, hardware, drugs, oils, etc., intended for the consumption of 50,000,000 of people, will be carried. We dare not attempt to reckon up the aggregate of this commerce, lest we should be accused of oriental extravagance of statement; but a summary of the various items of production, which we have demonstrated as probable twenty years hence, will give some idea of what the outgoing commerce of that period may be, and the incoming commercial receipts will be very nearly as much more.

We sum up, then, as follows:

Mining Products and Quarries in A. D. 1900	$5,000,000,000
Cereal Products	4,167,500,000
Root Crops, Textiles, Market Garden, Dairy Products, Hay, Tobacco, etc.	3,028,500,000
Fisheries	100,000,000
Live-Stock	3,000,000,000
Forest Products	1,000,000,000
Manufactures	5,000,000,000
Grand Total	$21,296,000,000

Or more than ten times our present national debt. It is to be remembered that this is only the valuation of the products and crops of a single year; that it does not include either the value of the real or personal estate of the 50,000,000 who will inhabit our Western Empire at that time.

And what shall we say of the population which, twenty years hence, will fill this vast region with life and industrial activity? Remember, it is but *twenty* years, but little more than half a generation; and many of those who are actively engaged in business now will be active and useful then; but who that remembers the

year before the civil war, and the changes through which our nation has passed in twenty years, can fail to realize that even two decades may separate us from an era, which seems to belong to the half-forgotten past, and from circumstances which have entirely changed our condition and character as a nation.

There is very little reason to apprehend either a foreign or a civil war within that time. The magnitude and comparative isolation of our territory prevents our position from being one which menaces any other great power; while our resources are ample to repel any foreign invasion. As to a civil war, there are now no sufficient causes to provoke it. While slavery existed, it was a standing menace against a free government. But, now, there may be temporary discontent, on the part of a single State, from some real or imaginary hardship; while the great mass of States are so bound to each other by a multiplicity of ties, financial, commercial, sanitary, charitable, literary, and religious, that there can be no general movement which would lead to a civil war. Questions like that of the disposition of the Indians, that of the prohibition of polygamy among the Mormons, and that of undenominational public schools, may excite a temporary ripple in the smooth sea of our prosperity, but the calm will soon return. A bitter Presidential contest may produce excitement and apprehension for a time, and some fear of Cæsarism on one hand, or of a revolutionary dictatorship on the other; but the nation is too patriotic to sustain any attempts at unconstitutional rule. Vexed questions of the rights of labor and capital, or of the right to prohibit the migration of particular nationalities to our soil may excite temporary strife and discord, but in the end we shall settle down upon the broad principles of the universal brotherhood of man and the equality of all men before the law.

It would have been better in some respects if our male suffrage had not been quite so nearly universal as it is, but the dangers apprehended from that source are now very nearly obviated. Let us glance, then, at the races and nationalities which will probably make up the 50,000,000 to be found west of the Mississippi in A. D. 1900.

It may, we think, be taken as a settled fact that by the com-

mencement of the twentieth century, the Indian, especially in his nomadic condition, will have ceased to be a disturbing factor in the West. The tribes are diminishing in a very rapid ratio. In 1860, there were somewhat more than 500,000 of them within the limits of the United States. In 1870, the number had dwindled to 383,000. In 1878, there were but 275,000, and the supervisors of the census, in 1880, will hardly report more than 250,000. At this ratio they would be extinct by A. D. 1900. This is hardly probable, but they will be so few as to be of very little importance. There are natural laws which would bring about this result in time, but it must be said that for nearly the whole of the present century the policy of our government has been to hasten it. They have been removed from one district of country, and from one reservation to another, and have been exposed to the frauds of unscrupulous traders, who have plied them with the vilest liquors, and have plundered them of all their property, while, in too many instances, the government agent has stood by and permitted the wrongs, without even protesting against them. Moreover, the government has not observed its treaty provisions, and the Indian, learning only the worst vices of civilization, has come to his death, either by vice, disease, or murder inflicted by the whites.

While we write, a treaty has been negotiated which will, very soon we hope, put an end to the system of large reservations and give to the Indians about 480 acres of land per family in severalty, and pay them an annuity, while the remainder of their reservations is to be put upon the market. This plan, just adopted on the great reservation of the Utes in Colorado, by which more than 11,000,000 acres of their lands are to be offered for sale, will undoubtedly be followed by similar action in regard to the great reservations in Dakota, Wyoming, Montana, Utah, Idaho, Oregon, Washington, Nevada, California, and perhaps Arizona, and the Indian Territory. The measure is, in itself, a good one, but to be of much benefit to the Indians it should have been adopted years ago. The diminution and final extinction of the Indian races will not be materially delayed by it.

We may safely predict, that with the exception of the Indian

Territory, Arizona, New Mexico, Utah and possibly Idaho, Montana, Washington and Dakota, the Indian will, by A. D. 1900, have ceased to be an appreciable element of the population, and even in these Territories, except possibly the Indian Territory, their numbers will be so small as to excite no alarm, and lead to no difficulties. Nearly 200,000,000 acres of land, some of it excellent farming land, and perhaps more containing valuable mineral deposits, will thus be thrown upon the market.

The colored race, which in 1870 numbered in all the States and Territories west of the Mississippi less than 900,000, or only about one-sixth of the whole number in the United States, has since that time increased largely by immigration; and probably at the census of the present year will show 1,400,000 or 1,500,000 in that region. The natural increase in this race is not likely to be large, for in time they too will become extinct, under the pressure of a higher civilization, but the accessions from the East will continue for some years to come. It is doubtful, however, whether there will be more than 3,000,000 or 3,500,000 in the territory west of the Mississippi in A. D. 1900.

The Mexican races, whether Hispano-American or pure Indian, fail to hold their own by the side of our more robust civilization. It is to be hoped, both for our sakes and theirs, that the mania for annexation may not seize our people before that time, and Mexico be brought into the Union, either peacefully or by force—for our sakes, because we have already a sufficient territory, and the accession of a weak nation almost wholly uneducated, and speaking another language than ours, would degrade rather than improve our national character; and for theirs, because they would inevitably be placed in an inferior position, and might be goaded to a resistance which would prove fatal to them. But, for the Mexicans who are residing in the Great West, we can predict no considerable accessions, except from immigration. They are not aggressive, and taking an inferior's position, they will be likely to be kept there.

The Chinese and Japanese are likely to be exceptions to the general law in regard to weaker races. The immigration of the Chinese hitherto has been, with but few exceptions, of the coolie or

peasant class. When a better class come, bringing their families, such a tide of immigration will pour in upon the Pacific coast, as will materially change the situation of affairs there, though not necessarily for the worse. The better classes in China are by no means barbarians, but people of as much refinement and delicacy of manner as can be found anywhere, and in morals vastly the superiors of their persecutors in California.

It is worthy of notice, that wherever the Chinese have emigrated in considerable numbers, they have always in the end become the masters of the country, however intelligent and physically vigorous and powerful the natives might be. This has been the result at Singapore, at Saigon, at Bangkok, and in other parts of Malaysia. They can, if they choose, plant 50,000,000 of Chinese colonists on the Pacific coast and the interior, within the next twenty years; but that will hardly be their policy. If they obtain a foothold they will become largely engaged in commercial transactions, in which they possess great skill, and the peasant class will be in demand for both skilled and unskilled labor. We regard it as altogether probable that the census of 1900 will report not less than 10,000,000 of them west of the Mississippi.

Of the emigrants from Europe, it is probable that the nationalities will prevail in about the following order: Germans, Irish, Scandinavians, English, Scotch and Welch, Italians, Russians, Canadian French, French, Swiss, Spanish, Belgians and Hollanders. There will also be a considerable number of emigrants from the West Indies, and from South America. But the larger proportion of immigrants will be from the States east of the Mississippi, not a few of them originally European emigrants, who are now drifting westward; others, the children of such emigrants, but a fair proportion of the genuine Yankee stock, drawn thither to become farmers, mine-owners, stock-raisers, sheep-masters, or manufacturers. Very many of our best citizens are among these settlers in the Great West, and they will do good service in making it and keeping it patriotic, loyal and pure.

The future of this Western Empire is to be what its citizens

shall make it. With all the advantages of mineral wealth vastly surpassing that of Ormuzd or of Ind; with a soil of such extent and fertility, that it could supply the world with bread, with flocks and herds beyond the dream of the most opulent of the patriarchs of the East, and all the elements of material prosperity in such abundance as to defy description, if its citizens are industrious, enterprising, intelligent, moral, law-abiding, God-fearing men and women, there is in reserve for it a future which not all the dreams of the poets, or the rapt vision of the seers, can describe in too glowing colors—a future which shall make the ancient Paradise a modern reality, and cause men to flock thither, as to a new Eden.

But if industry and enterprise are lacking, if morals are debased, and intelligence wanes; if reverence for law and order is lost, and there comes a time when they do not fear God and keep His commandments; if pride, self-confidence, and fullness of bread, lead to all the vices which ruined the empires of the Old World; all this material wealth and prosperity, all these advantages of situation and production, will only make its downfall the more sudden and terrible. And its swift destruction will call forth a wail of anguish from all the nations of the earth, as much deeper and more distressing, as its position had been grander and more imposing, than that of any of the older empires. Which shall it be? a government of the people, for the people, by the people; a government firm and persistent for liberty and law, for freedom, justice, and right, between man and his fellow-man, and between man and his Creator? or a government without law, without justice, without purity, without right, and without order;—an anarchy, where men's evil passions and corrupt practices, all the arts of the demagogue, all the schemes of the hypocrite, and all the vices of the debauchee are allowed to destroy the nation, without check or restraint?

Rome and Greece, Babylon and Nineveh, Corinth and Ephesus, the most powerful empires and cities of their times, owed their ruin to this uncontrolled spirit of license and misrule, and in modern times, we have seen powerful nations brought to the verge of destruction from the same causes. Let us heed the warning while there is time.

PART II.

IMMIGRATION.

WHO SHOULD GO, AND WHY? THE HOW, WHEN AND WHERE OF EMIGRATION TO THE FAR WEST.

CHAPTER I.

WHO SHOULD MIGRATE TO THIS WESTERN EMPIRE, AND THE REASONS WHY—DESIRABLENESS OF ACCURATE INFORMATION—INTENTIONAL AND UNINTENTIONAL MISREPRESENTATION—WHO SHOULD NOT COME—THE LAND-GRANT RAILWAY COMPANIES, AND THE EMIGRATION SOCIETIES—AGE BEYOND WHICH EMIGRATION IS UNDESIRABLE—OTHER OBSTACLES—AMOUNT OF CAPITAL NECESSARY—THIS VARIES WITH THE OCCUPATION—WHAT ARE NECESSARY EXPENSES—WHY SOME EMIGRANTS ARE DISSATISFIED.

"ARE you thinking of emigrating to that 'Far West' in America, about which we hear so much lately?" asks one neighbor of another in England, in the winter of 1879–1880. "Yes," is the reply. "I am thinking of it very seriously, but I find it hard to come to a decision. All my acquaintance are here; I feel strongly attached to the country and place in which I was born and reared, where I found my good wife, and where my little ones were born. England is very dear to me; and yet I cannot buy an acre, no, nor a rood of ground, even to be buried in; I must be a tenant all my life, and liable to be evicted at the landlord's pleasure. I had, in past years, laid up a little money, but it is fast going, in these past three years of bad crops, low prices, and poor markets, and yet I am paying five pound rent per acre for my place. Then again, my children cannot get on here, and as I belong to the Methodists, they can have no chance unless they go to the church, which I don't like

to have them do. Now, I am told that I can take up a farm of 160 acres in that western country, under what they call the Homestead Act, for less money than I pay rent for one acre here, and excellent land too, and that in five years' time I can have as good a farm as this—yes, and better—all my own, and a steady income of £500 or £600 a year, and good schools and churches, all convenient. When I consider all these things I think I must go, though it will be a sore thing to leave dear old England. How I wish now, that I had some book, or somebody that I knew wouldn't deceive me, to tell me all about the country, just as it is, and enable me to decide what I ought to do."

There are many thousands not only in England, but in Ireland and Scotland, Germany, Sweden and Norway, in Austria and Russia, in Italy and France, who are asking themselves and others the question, whether it is not best to emigrate to this far-off western land, and thus escape from evils, discomforts, and oppressions of all sorts, which have become well-nigh intolerable. And there are scores of thousands more in our own country, who, from one cause or another, are revolving the same question in their own minds, and are sincerely desirous of light in regard to it.

To all such honest inquirers, we propose to give the information which they seek, and we beg leave to assure them at the start, that we have no object in view, except their benefit. We have no interest in any railroad, land grant, colony, mining, farming, stock-raising, or wool-growing company or organization west of the Mississippi river; we do not own a square foot of land west of that river, and do not expect to do so; but we know the country, its advantages and disadvantages, and we propose to state these honestly and fairly. We could obtain the indorsement of all the governors, senators, and representatives of that entire region, to the truthfulness and fairness of our book, if it were needful; but we think that every one who will read it will be satisfied for themselves that it is an honest and trustworthy book.

Having thus avouched the honesty of our purpose, and the

knowledge of the subject which we possess, we will proceed to answer the very important questions, Who should emigrate, and why? The emigration societies, the railroad companies, and the steamship agents, would answer the question very promptly, by saying, "Every one who has the means to reach the West should go;" and they would be greatly in the wrong, and if they were believed, would do much wrong to emigrants by such an answer.

No! *not* every one who has the means to reach there should go; not even every one who has from $1,000 to $10,000 to invest, after reaching the country. The question, "Who should go?" requires a previous consideration of many other questions before it can be rightly answered. There are always many hardships attending emigration; not *so* many now as there were in former days, when the European emigrant took passage across the Atlantic in the steerage of a sailing packet, and was tossed on the waves, with but scant fare and horrible accommodations, for from thirty to sixty, or seventy-five days, and landing at the end of his tedious voyage, at New York, found himself the prey of the landsharks and confidence men, who swarmed around him. He was very fortunate, if he succeeded in making his way by barge and canal boat to Buffalo, and thence by other sailing vessels to distant Ohio, Indiana, or Illinois, and amid the forests, or the wide treeless plains, shaken by chills and fever, reared his rude log-hut, and set out resolutely to make a home and a fortune for his family. That is not so very long ago either. Forty or fifty years ago, the emigrant had to take all these hardships into the account, if he would make his home in the West. It is not thirty-five years, hardly more than thirty, since those who sought homes beyond the Mississippi were obliged to go with their huge wagons—"prairie schooners" they were called—drawn by five, eight, or even twelve yoke of oxen, carrying with them their entire household goods, and travelling for many weeks, eight or ten miles a day, before reaching their new homes.

When we compare the present facilities of travel and settlement with the hard lot of these pioneers of civilization, and the

speed and safety with which our emigrants reach their desired location, and the perils and dangers from Indians, from storms and snows, from hunger and thirst, from the giving out of their cattle, or the prairie fires—perils which marked the whole trail from the Mississippi to the Pacific with the skeletons of their cattle, and, not so rarely as could have been wished, with human bones also—with the present freedom from these dangers and miseries, we are almost inclined to declare that there are now no hardships for emigrants to face. This, however, would not be quite true. To the emigrant from Europe, the ten or twelve days' passage in the steerage of these magnificent ocean steamships, though a vast improvement on the old sailing vessels, is not quite an "earthly paradise," as indeed it could not well be. Most of these steamship lines, also, are in some way connected with some one or more of the emigration companies, which, in turn, have their arrangements with some of the great railway companies, and are under obligations to send their emigrants to particular sections of country, where their lands are situated. Of course, these emigration companies and railroad agents extol their particular section in the highest terms, and cannot say anything too strong in disparagement of every other region. They have no intention, probably, of misrepresenting either their own lands, or the lands in other States or Territories; but human nature must be differently constituted from what it now is, if the emigrant does not find that some things have been overstated, and that the advantages of other localities have been unduly depreciated.

There are two remedies for this difficulty: one, that the emigrant should inform himself thoroughly before making arrangements to come to this country, what will be the best location for him, taking into consideration climate, chances of employment, accessibility to good markets, prices of land, condition of society, advantages of education, etc., etc. His sources of information must be free from all temptation to misrepresentation and self-interest, and they must be from parties who are fully informed of the *present* condition of affairs there, for so rapid are the changes which are taking place in this Great West, that statements which

were perfectly true two years ago, are now very far from the truth. It has been our sole object in the preparation of this work, to make it as perfect a guide to the emigrant as it could be made, one which should be in every respect impartial, and have no interest except that of the emigrant to serve. If the intending emigrant will study such a book faithfully, he will find no difficulty in determining what is the best locality for him, and then can make his arrangements with *that* steamship or emigration company, which will take him directly to his desired location; but he should be careful to make no contract, binding him to purchase land of any emigration company till he has seen it for himself. He can, of course, procure his tickets and transportation at a considerable reduction, if he takes his land from the emigration company, but the extra cost of this will much more than make up the difference, if the land they allot to him should prove undesirable from any cause.

The other way of avoiding the difficulty is this: the emigrant, having by inquiry and study come to a conclusion as to the best location for him, takes passage on a steamer for New York or New Orleans, and thence by rail to the point where he desires to settle, leaving his family, if he has one, behind him, till he can provide a home for them. This will cost him more than to buy his ticket from the emigration company, but if he wants a farm, he can take up his land under the Homestead or Timber-Culture Acts, or pre-empt it, and the cost under either of the former plans will not exceed $25 for 160 acres, and under the latter not over $1.25 per acre with thirty months to pay for it, while that must be very poor land which he can get from the emigration company at anything less than $5 per acre. As soon as he is able he can send for his family, and buying the ticket here it will cost him no more than if he had bought it of the emigration company. But, in whatever way the emigrant secures his land, there are still hardships; his first home will be in all probability a log-cabin, an adobe,* or a sod-house. If he purchases in the northern, or even the central tier of States or Territories, the deep snows, and the consequent embargo on travel, will annoy

* A house built of sun-dried bricks or of clay mortar.

and distress him, as being so different from all his past experience. The climate, too, may, very possibly, affect his health at first; an unusual languor and listlessness may oppress him, the effect of his acclimatization. There will be times when he feels as if he must go back to his European home; as if he could not endure life in a region where everything is so different from the home of his childhood. But if he is brave and resolute these feelings will soon pass away, and when his first crop is harvested and sold, he will look forward hopefully to a better future than he could have had at home.

In general we may lay down these rules in regard to immigration:

1. *Age.* A man who has his fortune to make, or a family to support, should not emigrate from Europe to the West, after he has passed his forty-fifth year. There may be a few exceptions to this, but they are very few. After a man has reached his forty-fifth year, he finds it far more difficult to change all his habits and modes of life and thought, than when he was younger. If he is a farmer, stock-raiser, or sheep-master, or has been a foreman or manager in either of these callings, he will find that it is necessary to learn all his business anew, from the difference in soil, climate, and ways of doing business. A capitalist who has money to invest in these or any other kinds of business, can come and make his investments at any age, when he is able to travel, and examine the property for himself; but we are not making a book for capitalists, but for workingmen.

2. As a general rule an invalid, or a person in feeble health, will not find it advisable to come to the West to become a permanent resident, unless he has sufficient property to insure his support. Some do migrate under these circumstances, especially those whose lungs are affected, and in Minnesota, Dakota, Montana, Colorado, Southern California, New Mexico, Utah, or Washington Territory, find positive benefit; while Arkansas, Texas and Arizona have a good reputation for rheumatic affections. But, in either disease, the beneficial result is contingent upon a permanent residence there. To come away, even after several years, is, in most cases, certain to prove fatal; while a

majority of those who go to these States and Territories for their health, after a brief and temporary improvement, suddenly become worse and die of the disease. The invalid, if he will come, should not stay in the larger towns but resort to the hills, where an open-air life is possible.

3. No man should come who is averse to work, or who expects, by coming, to lead an easier life, for some years at least, than he is leading at home. Since the primeval sentence at the expulsion from Eden, "In the sweat of thy face shalt thou eat bread, until thou return unto the ground," there has been no reprieve from toil, of hand or brain, and there will not be, till the lost Eden returns, which will not be in our day. Industry will reap a better reward here than elsewhere, and the honest toiler may hope, in the later years of life, to enjoy a competence; but it can only be procured by hard and wearisome labor.

4. No man should come whose temper is fickle, and who will give way at the first rebuff and become discouraged, despondent and home-sick. The persevering, earnest, and sanguine worker, who grows stronger under defeats and discouragements, who will not give up, is the man to succeed.

5. No man can come with much hope of success, unless he has a little capital beyond what is necessary to bring him to the West. This is particularly true of a man who has a family. If he brings his family with him, which it is not always wise to do at first, they must have something to live upon till he can receive some return for his labor; and he will need money to purchase his land, break it up, sow it, cultivate it, and reap the harvest. If he attempts to raise stock, or to keep sheep, still more capital will be wanted; if he starts a market-garden, a nursery, or raises flowers for profit, he must still have some capital to start with; if he is a mechanic or a tradesman, he cannot start without some capital. How much he must have will depend very much on what he proposes to do; for what would be sufficient for a mechanic or a market-gardener, might be too little for a farmer, a stock-raiser, or a tradesman.

The safe rule will be, as much as the emigrant can command; but in no case less than $500 after the travelling expenses are

paid; and for a farmer, stock-raiser, sheep-master, miner, or tradesman, not less than $1,000, and as much more as he can honestly command.

If the man has a family, these sums should be doubled. "But," asks the intending emigrant, "isn't it possible to go to the West and settle down with less money than this? With the utmost economy I have not been able to save but £100 in ten years, and it will take at least £25 of it to pay the passage and transportation for myself and family. Must I be cut off from all hope of realizing the object for which I have been saving and working so long?"

No, friend; hope springs eternal in the human breast, so you need not give over hoping; but as to the emigrating, you have just a choice of two alternatives: either to postpone your emigration for two, three, or five years, in the hope of being able to make up the amount you need—a somewhat doubtful expedient in the present depressed condition of the markets and failure of the crops; or, leaving with your family, say £75 of the £100, take the rest and go alone to the West, and seeking employment as a farm-hand, or herder, or shepherd, or miner, secure as soon as possible a homestead farm of 80 or 160 acres, on which the only payments will be from fourteen to twenty-five dollars (£2 16*s.* to £5); get twenty acres of it broken up by changing works, and have it planted to root crops, or sown with wheat; by the second year a sod-house can be built and a crop raised, which will not only pay for further improvements, but leave £20 or £25 to be sent to the family at home. At the end of four or five years, with good management, you can send for them, and welcome them to a home, humble and rude indeed, but your own, and with a fair prospect of improving your condition rapidly. We recommend the latter alternative, because homestead lands, in desirable locations, are becoming daily more scarce, and in two or three years may not be obtainable at all. But to come with a family, with too small a sum to sustain them, and make the necessary outlay for the scanty comforts of the pioneer, until you can receive a return from your crops, is to expose yourself and them to severe suffering, and, perhaps, to

premature death. Farther on we propose to show what can be done with $1,000 by a careful and intelligent emigrant.

6. It is unwise for aged people to come, even if it is with their young and robust children. The hardships of the pioneer life fall with peculiar severity upon the aged; they miss the little comforts and privileges to which they have been for many years accustomed; and the fatigues and exposures they must undergo very often shorten their days, without adding to their happiness.

It is because these precautions have not been heeded, because so many emigrants have come without more means than were just sufficient to carry them to their destination, firmly believing that they could pick up money in the streets, or that they could obtain employment which would be immediately remunerative, that there are so many disappointed and homesick emigrants in the country. Without employment, without money or food, sick from the long voyage and journey, from the change of climate and water, or possibly from some malarious influences to which they have been exposed, they are indeed in a pitiable condition; and though the kind hand is almost invariably stretched out to help them (for the western people are full of kindness and charity) they often become so utterly wretched as to be unmindful of the kindnesses they have received; and even when they have been helped to return to their old homes, they will often denounce the country and those who have aided them in the strongest terms, when the fault has only been with themselves, that they came hither so entirely unprepared for their new life on the frontier. The prudent, energetic emigrant who comes expecting hardships, but prepared to meet them, who does not expect others to do for him what he can do for himself, and who recognizes the necessity of providing for his own support and that of his family until he can receive returns for his labor, will encounter some hardships, but he will rejoice in triumphing over them, and very soon will be in a position to help others.

The emigration societies and the land-grant railroads, though they make such a fair showing, and paint in such glowing colors the prosperity of the emigrants who have come out under their auspices, cannot guarantee success to those emigrants who have

no disposition to help themselves. The railroad companies and the emigration societies also give the emigrant from six to eleven years to pay for their land, but the price is high, and the interest at from seven to ten per cent. adds materially to the price, while the first payment comes hard on a man who has little or no money, and his title is not complete till he has paid for the land, while a default in payment works a forfeiture of his farm, and the loss of most of what he has paid. Meanwhile, if he has no money, how is he and how is his family, if he has one, to be fed before he can raise a crop, or earn money for immediate support? Neither the emigration society nor the railroad company can or will support him. He would have done better to have gone to work for any one who would give him his board and even moderate wages, and if he could secure a farm under the Homestead or Timber-Culture Act, he would at least have no heavy debt to weigh him down, and no ground of anxiety about his own food and raiment.

No industrious, willing, able-bodied man need starve if he reaches the West alone, with but a dollar in his pocket, but he will not accumulate property so rapidly as if he had a little to start with. John Jacob Astor, the founder of the Astor family, once said, that the only difficulty he had in accumulating his vast estate was in earning the first thousand dollars.

We have purposely presented the dark side of the picture to emigrants, because they need to know the worst as well as the best. The rosy and pleasant side is presented to them every day, and they are tempted to believe that there are no shadows till they come into the actual experience of them, and then they find them so dark and gloomy that they are ready to recoil from them, and say, "If we had only known, we would not have come."

But the emigrant who goes to the West with small means should know beforehand that there are awaiting him and his family, if he has one, exposures to severe cold and intense heat; hard beds, perhaps of pine or spruce boughs, or dried leaves on the ground; scanty food at times, with hunger for his only sauce; poor cooking, from the want of proper utensils; clothing

which he would have disdained at his old home; a lack of all the conveniences of life; very possibly at first no schools, no church, no post-office within twenty or thirty miles; a house of one or two rooms built of sods or of logs, with a floor of earth, and upon this humble house, perhaps the summer's sun beats fiercely, and the winter's snows may bury it out of sight. But he should know also that these privations and discomforts will be but temporary; that in, perhaps, four or five years, he will have a pleasant home and farm, with all the comforts of life, and all his own; that school and church, and town-hall and post-office, with perhaps a daily mail, will all have come by that time; that good clothing and the luxuries of choice beds, excellent and toothsome fare, and the music of organ or piano, may gratify his tastes; and knowing these things, he should decide whether the privations of the first few years were worth enduring, for the sake of the comforts and substantial benefits which will probably follow.

There is another view of this subject of emigration to which attention should be directed. For some years past great efforts have been made to direct emigration to other countries than the United States; the Dominion of Canada, Australia, Brazil, Buenos Ayres, Venezuela, Colombia, Peru, and Chili, have sought to attract emigrants to their respective countries. The Dominion and Australia have been moderately successful, for the whole influence of the British Government has been exerted, properly enough, in their favor; but the emigrants to Canada have had much greater hardships to undergo than those to our western country, and very nearly two-thirds of them have eventually crossed the border and located themselves under the Stars and Stripes.* The Australian emigrants have struggled manfully with the trying climate, and the very great hardships which they have had to encounter, but many of them have come into the

* Lately there is much complaint among the emigrants to Manitoba, that by recent Acts of the Colonial Legislature, they cannot secure lands within five miles of the proposed railway to the Pacific coast for less than six dollars per acre, and all homesteading is cut off from that belt, and, further, that by the Act of July last, the homestead grant, however distant from market, is limited to eighty acres, while the United States Government make it 160 acres.

West by way of San Francisco, and the tide of emigration to the United States to-day is more than four times that to Australia. The emigration to the South American States has in most cases proved a complete failure. Liberal as were the offers of the governments, the whole matter was badly organized and managed, and the sufferings of the emigrants became so intolerable that they were glad to escape to their old homes with the loss of everything, being indebted in many cases to the consuls of their respective countries for a free passage homewards. The present rapid influx of emigrants from Europe to the United States, and their strenuous objections to going to any other country, shows conclusively that the experience of sixty years of emigration has convinced the people of Europe that the will fare best here.

CHAPTER II.

THE ROUTES BY WHICH OUR WESTERN EMPIRE IS REACHED—THE NORTHEASTERN REGION—THE CENTRAL REGION—THE SOUTHERN—THE SOUTHWESTERN—THE PACIFIC STATES AND TERRITORIES.

THE immigrant who has valiantly resisted at Hamburg, Bremen, Rotterdam, or Havre, at Southampton, Liverpool, Glasgow, Edinburgh, or Cardiff, the blandishments of the emigration companies, and the glowing representations of the railway companies, and who lands at Castle Garden, New York, unpledged to any company, and under no obligation to take a poor route when there is a better to be had, may well rejoice in his freedom; but he will find himself beset by as hungry a horde of runners and canvassers for all the different routes, as ever drove a poor man to distraction.

If he has made up his mind to what section of the West he will migrate (and he should have done this before leaving home), our advice to him would be to stop over a day at Castle Garden and make choice of the route which will bring him most directly, quickly, and safely to his desired destination. He cannot well do this from the flaming posters placarded there; nor from the

noisy vociferations of the runners; and there is a strong possibility that even some of the officials may have been slightly influenced by interested persons to give the preference to one route or another from motives not altogether disinterested.

Knowing where he wishes to go, and knowing also, as he may, what railway lines will take him thither most surely, directly, with the greatest amount of comfort, and the smallest amount of cost. he can make up his own mind as to his route as well as anybody else can do it for him, and, as all the routes have their real eastern termini at Castle Garden, he can purchase his tickets there and have no further trouble, except occasionally looking out for his meals and his baggage, till he reaches his destination, or the railway terminus nearest to it.

The journey on an emigrant train will be at the best a long and weary one, but if he has a fellow-countryman or shipmate of his own way of thinking, and bound for the same vicinity as himself, the companionship will relieve the journey of some of its tedium for both.

If our immigrant is a farmer, or farm-hand, and desires to establish himself in Iowa, Minnesota, Dakota, Northeastern Montana, or Nebraska, he will probably find it desirable to make Chicago his point of departure for the Northwest. Chicago is distant from New York about 950 miles, the five trunk roads running thither varying from 933 to 975 miles in the length of their lines to it. There is very little room for choice between the Hudson River and New York Central, the Erie, the Pennsylvania Central, and the Baltimore and Ohio roads, all of which run trains through to Chicago. They are all good roads, and give the immigrant as nearly the worth of his money as they can possibly afford. These lines, we believe, now all make close connection with the Chicago and Northwestern lines, which are the connecting lines with the Northern Pacific, and the Minnesota, Iowa, and Dakota Railways. By taking a through ticket, *via* the Chicago and Northwestern, to any point reached by this railway or its connections. he will be insured a passage with as few annoyances as he will find on any route. One precaution he should not fail to take. The number and class of his railway

ticket, and the railroads over which he is to pass, and the numbers and stamps of his baggage checks, should all be noted down in a little memorandum, and he will do well occasionally to see that all his baggage is on board. In case of loss of either baggage or ticket, he will recover damages much more readily if he can tell on which of the affiliated roads it was lost and what were the numbers. He should also have a printed time-table of the roads over which he passes, which will be furnished him for the asking at the office of the railroad on which he is to travel, in Castle Garden. It seems a pity to be obliged to caution a man against his fellow-man, especially when he is a stranger in a strange land; but it is necessary to say, once for all, not only to emigrants from Europe, but to our own people who may be migrating westward, that it is best to be shy of strangers, unless they are introduced to you by those whom you have reason to confide in as honest and trustworthy, and even then it is not necessary or wise to become too confidential with them, to tell them all your family history, to show your money to them, or inform them just the amount you carry about you. It is very imprudent and foolish to engage in any games of chance or skill with strangers, especially in any involving the winning or losing money. If you win, your antagonist has probably lost what he can ill afford to lose; if you lose, as you probably will (for generally, it is only sharpers who propose to play in a public conveyance), you will feel the loss and have occasion at the same time to lament your folly. Never manifest a suspicious disposition in regard to those who are about you. If there is anything you cannot understand, ask the conductor, courteously and pleasantly, and he will generally be courteous in his reply. Do not make yourself conspicuous by loud talking, or a swaggering manner. There are always people on the train who will weigh a man at what he is really worth, not at the value he may set upon himself. Do not judge of people by their dress or their pretensions. You will often find in the West, a millionaire in plain, rough clothing, or an eminent scholar in a dress which might be worn by a tramp; while a gambler, black-leg, or horse-thief may sport his diamonds, or dress in irreproachable taste.

The immigrant who is attracted to Nebraska, Kansas, Colorado, Wyoming, Western or Central Montana, Idaho, Utah, Nevada, or New Mexico, Texas or Arizona does not need to make Chicago his point of departure, unless he chooses to do so. His more direct route will lie through St. Louis; and Omaha, Nebraska, Kansas City, Missouri, St. Joseph, Missouri, or Atchison, Kansas, will be his points of departure. Omaha is the eastern terminus of the Union Pacific and Central Pacific Railways, though recently a part of its traffic has been transferred to Kansas City. St. Joseph is the terminus of the St. Joseph and Denver branch of the Union Pacific, and is otherwise a railroad centre of some importance. Atchison is the eastern terminus of the central branch of the Union Pacific and also of the Atchison, Topeka and Santa Fé Railway, the most enterprising and energetic railway in the Western Empire, but which is now also extended to Kansas City. The last-named place has recently become one of the greatest railway centres west of the Mississippi. It is the most easterly terminus of the Union Pacific, and commands from its position the travel and transportation of the Kansas Pacific, the Denver Pacific, the Atchison, Topeka and Santa Fé, the Utah and Northern; the Missouri, Kansas and Texas; the Houston and Texas Central; the St. Louis and San Francisco, and the Texas Pacific. All these roads but one are now controlled by one man, or rather by a combination, of which he is the head. The immigrant leaving New York by either of the great trunk roads, Erie, New York Central, Pennsylvania Central, or Baltimore and Ohio, will do better as matters now stand, to buy his through tickets *via* the Wabash Railway, which connects directly at Kansas City with all these roads. By either of the other lines, Chicago and Northwestern, or Chicago and Burlington, he will be obliged to change cars and re-check his baggage at Kansas City, Omaha, Atchison or St. Joseph. He may be required to do so on the Atchison, Topeka and Santa Fé, but probably he will not. If the emigrant's destination is to Oregon or Washington, he will still find it best to take this route going by the Union and Central Pacific, and stopping off at Kelton or at Junction, twenty miles east of Sacramento, and going thence by stage and rail to

Oregon or Washington, or continuing on to San Francisco and taking a steamer thence to Portland, Oregon. If the emigrant's destination is to Southern California or Arizona, this route is still the best, taking the Southern Pacific Railway at Lathrop on the Central Pacific, and going by this railway to Southern California, or to any point in Arizona between Yuma and Tucson. The States and Territories on the Pacific can also be reached from New York at about the same expense by steamers to San Francisco, *via* Panama Railroad, and other steamer lines plying from San Francisco to Portland, Oregon, to the Columbia river and Puget Sound, and southward to Los Angeles, San Diego, and up the Gulf of California to Fort Yuma, near the mouth of the Rio Colorado. Very soon, probably within two years at the farthest, all Southern Arizona, Western Texas, and Southern California, will be reached by a much shorter and more direct route through Texas. Those emigrants whose destination is to Missouri, Southeastern Kansas, Arkansas, Indian Territory, Western Louisiana or Texas, will make St. Louis their point of departure, and can go from thence either by Mississippi river steamer to any points below, and by New Orleans steamer to any points on the Texas coast, or by Missouri river steamer to any points in Missouri, Dakota or Montana, lying on that river or on its principal navigable affluents, such as the Dakota, Yellowstone, Jefferson, Gallatin, etc., etc.

If they prefer, however, to continue their journey by rail, they can go from St. Louis by the Cairo and St. Louis, the St. Louis, Iron Mountain and Southern; the Atlantic and Pacific, or the Missouri Pacific with its continuation in the Missouri, Kansas and Texas, and some of its branches, and the Texas Pacific. Or they may take the New Orleans or Galveston steamers from New York and go direct to Louisiana or Texas.

On the railroads the emigrant trains move slowly, being under the necessity of switching off frequently, as the faster trains have the right of way. The emigrant train from Kansas City or Omaha to the Pacific coast, on the Union and Central Pacific Railways, is usually nine or ten days on its journey. The emigrant cars are fairly comfortable, about equal to the third-class cars in Europe. They have no cushions, are warmed by flat-

topped stoves, on which the passengers can heat any food or drinks they need for young children or invalids; have an arrangement by which, by the use of boards furnished by the company, bunks can be made in which, with the aid of coats, blankets and shawls, the passengers can sleep as well as in the steerage of a steamship. The following table, compiled with great care, gives the railroad fares which prevailed in the autumn of 1879:

Destination. States and Territories.	Fares from New York.	Railroad or Steamer Routes, and Points of Departure.	Fares from Kansas City, Mo.	Fares from Omaha, Neb.	Fares from St. Louis or Chicago.
Portland, Oregon	$75.00	via San Francisco & Oregon S. S. Company	$61.44	$55.00	$65.50
Portland, Oregon	100.00	via U. P. R. R. and Stage by Kelton & Umatilla.	85.44	80.00	75.00
Portland, Oregon	108.00	via U. P. R. R. & Stage by junction Redding and Roseburg	93.44	88.00	83.00
Portland, Oregon	75.00	By Pacific Mail to San Francisco, and thence by Steamer to Portland	.....	.....	.....
Fort Benton, Montana	112.50	By Union & Cen. Pacific, and Utah & Nor. R. R.	98.56	98.00	*103.00
Fort Benton, Montana	46.50	By Missouri River	32.56	32.00	37.00
Helena, Montana	97.50	By Union & Cen. Pacific, and Utah & Nor. R. R.	84.00	80.00	88.00
Helena, Montana	61 50	By St. Louis & Missouri River	48.00	46.00	53.00
Helena, Montana	63.50	Later rates by Union Pacific, Utah & Northern R. R.	.....	45.00	55.50
Denver, Colorado	33.56	via St. Louis, Kansas City, and the Atchison, Topeka & Santa Fé R. R.	20.00	25.00	15.55
Pueblo, Colorado	33.56	via St. Louis, Kansas City, and the Atchison, Topeka & Santa Fé R. R.	20.00	25.00	28.00
Colorado Springs, Col.	33.56	via St. Louis, Kansas City, and the Atchison, Topeka & Santa Fé R. R.	20.00	25.00	25.00
Canon City, Colorado	35.56	via St. Louis, Kansas City, and the Atchison, Topeka & Santa Fé R. R.	22.00	27.00	27.00
Alamosa, Colorado	38.56	via St. Louis, Kansas City, and the Atchison, Topeka & Santa Fé R. R.	25.00	30.00	30.00
Del Norte, Colorado	41.56	via St. Louis, Kansas City, and the Atchison, Topeka & Santa Fé R. R.	28.00	33.00	33.00
†Leadville, Colorado	47.56	By Atchison, Topeka & Santa Fé R. R., or by Union Pacific, Colorado Central, and Stage	34.00	39.00	39.00
†Lake City, Colorado	55.56	.....	42.00	47.00	47.00
†Santa Fé, New Mexico	51.81	By Atchison, Topeka & Santa Fé R. R.	38.25	43.25	43.25
Mesilla, New Mexico	98.81	.....	84.75	89.75	89.75
Ojo Caliente, New Mexico	53.56	.....	40.00	45.00	45.00
Cheyenne, Wyoming	40.00	By Union Pacific R. R.	.....	20.00	.....
Emporia, Kansas	16.76	By Atchison, Topeka & Santa Fé R. R.	3.75	1.75	1.75
Wichita, Kansas	17.86	.....	4.80	9.80	9.80
Hutchinson, Kansas	17.41	.....	4.35	9.35	9.35
Great Bend, Kansas	18.46	.....	5.40	10.40	10.40
Kinsley, Kansas	19.41	.....	6.35	11.35	11.35
Dodge City, Kansas	20.11	.....	7.05	12.05	12.05
Ogden, Utah	60.00	By Union Pacific	46.44	40.00	50.00
Salt Lake City, Utah	60.00	By Union Pacific & Utah Narrow Gauge R. R.	48.44	42.00	52.00
Provo, Utah	64.50	" " " " " " "	50.94	44.50	55.00
York, Utah	66.00	.....	52.44	46.00	56.50
San Antonio, Texas	36.90	By St. Louis & Missouri, Kansas & Texas R. R.	30.90	31.00	27.40
Galveston, Texas	33.00	" " " " " " "	.....	.....	23.50
Waco, Texas	29.50	" " " " " " "	.....	.....	20.00
Denison, Texas	25.50	" " " " " " "	.....	.....	16.00
Fort Worth, Texas	27.00	" " " " " " "	.....	.....	17.50
Vinita, Indian Territory	20.00	" " " " " " "	.....	.....	10.50
Fort Smith, Arkansas	28.55	" " " " " " "	.....	.....	19.05
Houston, Texas	30.50	" " " " " " "	.....	.....	21.00
Dallas, Texas	27.50	" " " " " " "	.....	.....	18.00
Deadwood, Black Hills, Dakota	39.50	By U. P., and Stage from Sydney to Deadwood.	.....	25.00	30.00
Deadwood, Black Hills, Dakota	.....	By Northern Pacific, and Stage from Bismarck	.....	.....	.....
Virginia City, Nevada	68.00	By Union and Central Pacific	.....	48.00	.....
Carson, Nevada	67.00	" " "	.....	47.00	.....
Los Angeles, California	75.00	By Union, Central & Southern Pacific	.....	55.00	.....
San Diego, California	86.00	" " " " "	.....	66.00	.....
‡Tucson, Arizona	89.00	" " " " "	.....	69.00	.....

*In March, 1880, the Utah and Northern R. R. was completed to Helena, Montana, and the fares to that town and to Fort Benton, have consequently been reduced somewhat on this route.

†The completion of the railroad to Leadville, Alamosa and Santa Fé, has reduced these fares somewhat.

‡The Southern Pacific is now completed to Tucson, and fares are lower.

CHAPTER III.

How to obtain Land—Government Lands—Prices of Arable or Farming Lands—Purchase at Auction or Private Entry—Pre-emption—The Homestead Sales—Land-Warrants—The Timber-Culture Act—Terms and Mode of Purchase of Timber Lands—Grazing Lands: how Secured.

Having arrived at his destination, the immigrant, if a farmer, or if disposed to invest in arable lands, looks about him, to see how he can best secure a farm. If he is a member of a colony formed in Europe, or in our own Eastern States, or if he comes out under the management of an emigration company, he is spared that trouble. He takes what is allotted to him, whatever its quality, and without any privilege of change; or if he is allowed a voice in the allotment, it must still be in the same tract of land. Not all the immigrants, however, are disposed to come into such an arrangement as this. It is very well in a small colony, where all the colonists are friends and acquaintances, and where the town lots and farming lands are about equally eligible, to unite together in this way, but to be only one of several thousands to whom land is allotted without choice of the party who is to cultivate it, and without the stimulus of individual enterprise, though it may suit foreign colonists, is not much to the taste of our independent and self-reliant American emigrants.

We will suppose, then, that our immigrant, having decided where he desires to locate his farm, proceeds to secure it. There are many ways in which he may do this; some of them depending upon the amount of money he has at command, others upon the locality itself, and the amount and desirableness of the government land in the market. If he has a sufficient capital and proposes to farm his own land, he will perhaps find it advisable to purchase a partially improved farm from some settler who desires to pay off the debts he has incurred and start anew on government land farther west. There are very often such opportunies by which an immigrant, who has some capital, may, for less money than he would have to expend on new and unbroken lands, procure a good farm, with such improvements as may enable him

to enter upon it at once. In all these cases, however, he should carefully examine his title, and see that there are no clouds on it. If, however, there is no such opportunity where he wishes to locate, he will do well to purchase, if he can find it, government land of the best quality, either at auction or by private entry, being careful to select a farm with either a spring or running water on it, and, if it is to be had, one of the alternate sections on or near a railway line, present or immediately prospective. The land, if not near a railway, will be held by the government at $1.25 per acre and the fees, which may bring the price up to $1.33 or $1.35 per acre. If it is within the railroad limit the price will be $2.50 per acre, with the fees, which may bring it up to $2.60. In either case, he will do well if he can afford it to take a quarter-section (160 acres) in this way. If he needs more hereafter he can probably secure it at a less cost.

But it may happen that there has been such active emigration to that neighborhood, that there are no desirable quarter-sections to be had, among these alternate sections along the railroad, and that the remoter lands are, for some reason, not desirable. Or, it may be that there is no railroad in the immediate vicinity, or that the lands have not been surveyed, and so put upon the market. In the first case, he can probably buy the railroad land, paying a little more for it, usually $5 per acre, but receiving a liberal discount for cash payment. In the second case, he may be obliged to pre-empt his land, in which case he will have thirty-three months to pay for it, and a longer time if it is not surveyed, but meantime does not receive a full title; or he can enter it provisionally under the Homestead or the Timber-Culture Act, receiving his full title in five or eight years. Or, he may find some school lands or other State lands in the vicinity, which he may be able to purchase on fair terms; or, at the very worst, if there is no survey, no railroad near, no State or Territorial lands ready for purchase, nothing but a mining settlement just sprung into existence, which will afford him a good market for whatever he can raise, he can "squat" on the land, taking his chance of dispossession, but with pay for his improvements, if the land should prove to be mining land, and filing a pre-emption claim as soon as possible.

The immigrant who has but little money will take a somewhat different course. He will do better to look out for a quarter-section under the Homestead Act, or the Timber-Culture Act, or both, if he needs so much land, and he will find it for his advantage, if there are lands near a railroad, to secure those, taking if he chooses, only half the quantity and thereby saving something on entry fees. His entry fees for eighty acres (an eighth of a section) will be about $14, and if he takes the same quantity under the Timber-Culture Act, it will cost him $14 more; but he obtains his full title only at the end of five years of cultivation (unless he was a soldier in the late war, when the time of service in the war is deducted), and under the Timber-Culture Act, not till the end of eight years, though the tree-planting is extended over the whole time, a certain quantity being planted each year. If there is no opportunity to obtain a desirable farm in this way, the next best mode is by pre-emption, which will give him at least thirty-three months, time for two crops, before he will have to pay for his land. Or failing this, the school lands, which though of slightly higher price are usually sold on time, in seven or ten annual instalments, or he may purchase on long credit, though at a higher price, railroad lands in an eligible location. In order that there may be no possibility of misunderstanding the provisions under which government lands are sold, we give below the acts and interpretations of them, by the United States Land Office, under which the public lands are sold or given to settlers for farming or grazing purposes, and also the laws in regard to timber lands and mining lands. These have been compiled and compared with the reports of the office with great care, and are believed to embody every particular necessary for procuring government lands under all circumstances. We ought to say, that there is very little *government land* eligible for farming purposes in Iowa, Missouri, Eastern Kansas, Eastern Nebraska, or California, and none in Texas, though the State has vast quantities for sale at merely nominal prices. In some of the other States and Territories grazing and timber lands are greatly in excess of those adapted to cultivation. In Minnesota, Dakota, Montana,

Wyoming, Western Nebraska, Western Kansas, Arkansas, Colorado, Oregon and Washington, there are still large quantities of arable lands, and a considerable amount in Utah, Nevada, Idaho, New Mexico, and Arizona, though in all these the grazing and mineral lands largely predominate.

HOW TO OBTAIN GOVERNMENT LANDS.

I. ARABLE LANDS.—The following is compiled from circulars issued by the Commissioner of the General Land Office, and is explicit in reference to the manner of acquiring title to public lands:

There are two classes of public lands—the one class at $1.25 per acre, which is designated as *minimum*, and the other at $2.50 per acre, or *double* minimum.

Title may be acquired by purchase at public sale, or by ordinary "private entry," and in virtue of the pre-emption, homestead, and timber-culture laws.

BY PURCHASE AT PUBLIC SALE.

1. This may be done where lands are "offered" at public auction to the highest bidder.

BY "PRIVATE ENTRY" OR LOCATION.

2. The lands liable to disposal in this manner are those which were offered at public sale, but were not then sold, and which have not since been reserved or otherwise withdrawn from market. In this class of offered and unreserved public lands, the following steps may be taken to acquire title:

CASH PURCHASES.

3. The applicant will present a written application to the register for the district in which the land desired is situated. Thereupon the register will so certify to the receiver, stating the price, and the applicant must then pay the amount of the purchase-money.

The receiver will then issue his receipt for the money paid, and when the proceedings are found regular, a patent or complete title will be issued.

LOCATIONS WITH WARRANTS.

4. Application must be made as in cash cases, but must be accompanied by a warrant duly assigned as the consideration for the land; yet, where the tract is $2.50 per acre, the party, in addition to the surrendered warrant, must pay in *cash* $1.25 per acre, as the warrant is in satisfaction of only so many acres, at $1.25 per acre, or furnish a warrant of such denomination as will, at the legal value of $1.25 per acre, cover the rated price of the land.

The following fees are chargeable by the land officers, and the several amounts must be *paid at the time of location:*

For a 40-acre warrant, 50 cents	each	to the	register	and receiver—total,	$1.00
For a 60-acre warrant, 75 cents	"	"	"	"	1.50
For an 80-acre warrant, $1.00	"	"	"	"	2.00
For a 120-acre warrant, $1.50	"	"	"	"	3.00
For a 160-acre warrant, $2.00	"	"	"	"	4.00

AGRICULTURAL COLLEGE SCRIP.

5. This scrip may be used—

First. In the location of lands at "*private entry*," but when so used is only applicable to lands not mineral, which may be subject to private entry at $1.25 per acre, restricted to a "*quarter-section*," or it may be located on a *part* of a "quarter-section," where such part is taken as in full for a quarter; but it cannot be applied to different subdivisions to make an area equivalent to a quarter-section. The manner of proceeding to acquire title with this class of paper is the same as in cash and warrant cases, the fees to be paid being the same as on warrants.

Second. In payment of pre-emption claims in the same manner and under the same rules and regulations as govern the application to pre-emptions of military land warrants.

Third. In payment for homesteads commuted under section 2301 of the Revised Statutes of the United States.

PRE-EMPTIONS ADMISSIBLE TO THE EXTENT OF ONE QUARTER-SECTION, OR ONE HUNDRED AND SIXTY ACRES.

6. These are admitted under sections 2257 to 2288 of the Re-

vised Statutes of the United States, upon "offered" and "unoffered" lands, and upon any of the unsurveyed lands belonging to the United States. The pre-emption privilege is restricted to the heads of families, widows, or single men over the age of twenty-one, who are citizens of the United States, or who have declared their intention to become citizens, as required by the naturalization laws.

7. The right of pre-emption for one quarter-section, or 160 acres, at the price of $2.50 per acre, to the alternate United States or reserved sections along the line of railroads, is continued by the Revised Statutes.

8. Section 2281 thereof protects the rights of settlers along the line of railroads, where settlement existed prior to withdrawal, and in such cases allows the land to be taken by pre-emptors at $1.25 per acre.

9. Where the tract is "*offered*" land, the party must file his declaratory statement, as to the fact of his settlement, within thirty days from the date of said settlement, and within one year from date of settlement must make proof of his actual residence on, and cultivation of, the tract.

10. Where the tract has been surveyed and *not* offered at public sale, the claimant must file his declaratory statement within three months from date of settlement, and make proof and payment within thirty months after the expiration of the three months allowed for filing his declaratory notice, or in other words, within thirty-three months from date of settlement.

11. Where settlements are made on *unsurveyed* lands, settlers are required, within three months after the date of the receipt at the district land office of the improved plat of the township embracing their claims, to file their declaratory statement, and thereafter to make proof and payment for the tract within thirty months from the expiration of said three months. When two or more settlers on unsurveyed land are found upon survey to be residing upon, or to have valuable improvements upon, the same smallest legal subdivision, they may make joint entry of such tract, and separate entries of the residue of their claims.

12. Should the settler, in either of the aforesaid cases, die

before establishing his claim within the period limited by law, the title may be perfected by the executor, administrator, or one of the heirs, by making the requisite proof of settlement and paying for the land; the legal representatives of the deceased pre-emptor being entitled to make the entry at any time within the period to which the pre-emptor would be entitled if living.

LAWS EXTENDING THE HOMESTEAD PRIVILEGE.

13. The laws extending the homestead privilege, embraced in sections 2289 to 2317 of the Revised Statutes, give to every citizen, and to those who have declared their intention to become citizens, the right to a homestead on *surveyed* lands.

14. To obtain homesteads, the party must make affidavit before the register or receiver that he is over the age of twenty-one, or the head of a family; that he is a citizen of the United States, or has declared his intention to become such; and that the entry is made for his exclusive use and benefit, and for actual settlement and cultivation.

15. Where the applicant has made actual settlement on the land he desires to enter, but is prevented, by good cause, from personal attendance at the district land office, the affidavit may be made before the clerk of the court for the county within which the land is situated.

16. On compliance of the party with the foregoing requirements, the matter will then be entered on the records of the district office, and reported to the General Land Office.

17. An inceptive right is vested in the settler by such proceedings, and upon faithful observance of the law in regard to settlement and cultivation the register will issue his certificate, and make proper returns to the General Land Office as the basis of a patent or complete title for the homestead. In making final proof, it is required that the homestead party shall appear in person at the district land office. But where, from good cause, the *witnesses* of said party cannot attend in person at the district office, their testimony may be taken before any officer authorized by law to administer oaths.

18. Where a homestead settler dies before the consummation

of his claim, the widow, or, in case of her death, the heirs may continue the settlement and cultivation, and obtain title upon requisite proof at the proper time. If the widow proves up, the title passes to her; if she dies before proving up and the heirs make the proof, the title will vest in them. Where both parents die, leaving infant heirs, the homestead may be sold for cash for the benefit of such heirs, and the purchaser will receive title from the United States.

19. The sale of a homestead claim by the settler to another party before completion of title, is not recognized by the General Land Office, but would be *prima facie* evidence of abandonment, and might give cause for cancellation of the claim. A party may relinquish his claim, but on his doing so, the land reverts to the government. Where application is made to contest the validity of a homestead entry on the ground of abandonment, the officers will set apart a day for a hearing, giving all the parties in interest due notice of the time and place of trial. The expenses incident to such contest must be defrayed by the contestant, who must ascertain when notice of cancellation is received, and *then* make formal written application for the tract, which, after cancellation, is open to the *first legal applicant.*

20. As the law allows but one homestead privilege, a settler relinquishing or abandoning his claim cannot thereafter make a second entry; but where, a party having made one entry, it is cancelled as invalid, for some other reason, he is not thereby debarred from entering again. Where an individual has made settlement on a tract and filed his pre-emption declaration therefor, he may change his filing into a homestead, if he continues in good faith to comply with the pre-emption laws until the change is effected.

21. *If the homestead settler does not wish to remain five years on his tract, the law permits him to pay for it with cash or warrants, or agricultural college scrip, upon making proof of settlement and cultivation for a period not less than six months from the date of entry to the time of payment.* This proof of actual settlement and cultivation must be the affidavit of the party, made before the district officers, corroborated by the testimony of two credible witnesses.

22. There is another class of homesteads designated as "adjoining farm homesteads." In these cases the law allows an applicant, *owning* and *residing* on an *original* farm, to enter other land lying contiguous thereto, which shall not, with such farm, exceed in the aggregate 160 acres. In applying for an entry of this class, the party must make affidavit describing the tract which he owns and upon which he resides as his original farm. In making final proof, it is not required that he should prove actual residence on the separate tract entered; but it must appear that he has continued for the period required by law to reside upon and cultivate the original farm tract, and has *bona fide* made use of the entered tract as part of the homestead.

23. *Provisions for the benefit of soldiers and sailors of the late war, their widows and minor orphan children:* Sections 2304, 2305, 2306, 2307, 2308, and 2309 of the Revised Statutes, for the benefit of soldiers and sailors, their widows and minor orphan children, provide:

First. In section 2304, that every soldier and officer of the army, and every seaman, marine, and officer of the navy, who served for not less than ninety days in the army or navy of the United States "during the recent rebellion," and who was honorably discharged, and has remained loyal to the government, may enter, under the provisions of the homestead law, 160 acres of the public lands.

Second. In section 2305, that the time of his service, or the whole term of his enlistment, if the party was discharged on account of wounds or disability incurred in the line of duty, shall be deducted from the period of five years during which the claimant must reside upon and cultivate the entered tract, but the party shall, in every case, reside upon, improve, and cultivate his homestead for a period of at least one year.

Third. That any person entitled to the benefits of section 2304, who had, prior to the 22d of June, 1874, made a homestead entry of less than 160 acres, may enter an additional quantity of land sufficient to make, with the previous entry, 160 acres.

Fourth. That the widow, if unmarried, or in case of her death or marriage, then the minor orphan children, of a person who

would be entitled to the benefits of section 2304, may enter lands under its provisions, with the additional privilege accorded, that if the person died during his term of enlistment, the widow or minor children shall have the benefit of the whole term of enlistment.

Fifth. That any person entitled to the benefit of section 2304 may file his claim for a tract of land through an agent, and shall have six months thereafter within which to make his entry and commence his settlement and improvement upon the land.

24. The following is the course of proceedings for parties to avail themselves of the benefit of these sections of the Revised Statutes in making homestead entries:

First. On the party producing proper proof of his right to do so, immediate entry of the tract desired may be made; but if the party so elect, he may file a declaration to the effect that he claims a specified tract of land as his homestead, and that he takes it for actual settlement and cultivation. Thereafter, at any time within six months, the party may come forward, either in person or by agent having his power of attorney, make his entry of the land, and commence his settlement and improvement.

Second. The claims of widows and minor orphan children may be initiated by declaration as above. Minor orphan children can act only by their duly appointed guardians, who must file certified copies of the powers of guardianship.

Third. Applications for additional entries must be for a quantity which, with the original entry, will not exceed 160 acres. Where the party's first entry has been consummated, the register and receiver will require him to make application and affidavit in the forms prescribed, and to pay the same fee and commissions as in cases of original entry. Then, to complete the transaction, the party will make payment of the usual final commissions on the entered tract, for which the receiver will issue his receipt. In case the party has not made proof on his original homestead entry when he applies for additional land, he will be allowed to make the additional entry on proper application and affidavit as above stated, and paying the usual fee and commissions. Thereafter, when the party shall make final proof on the original entry, he

will be required to pay the final commissions on both entries, when a final receipt will be issued for the money, and thereupon a final certificate issued to call both for the tract in the original entry and the additional tract.

25. The following proof will be required of parties applying for the benefits of these sections, in addition to the prescribed affidavit of the applicant:

First. Certified copy of certificate of discharge, showing when the party enlisted and when he was discharged; or, if this cannot be procured, then the affidavits of two respectable, disinterested witnesses, corroborative of the allegations contained in the prescribed affidavit on these points.

Second. In case of widows, the prescribed evidence of military service of the husband, as above, with affidavit of widowhood.

Third. In case of minor orphan children, in addition to the prescribed evidence of military service of the father, proof of death or marriage of the mother. Evidence of death may be the testimony of two witnesses or certificate of a physician duly attested. Evidence of marriage may be a certified copy of marriage certificate, or of the record of same, or testimony of two witnesses to the marriage ceremony.

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28. *All lands obtained under the homestead laws are exempt from liability for debts contracted prior to the issuing of patent therefor.*

29. For homestead entries on lands in Kansas, fees are to be paid according to the following table:

Acres.	Price per acre.	Commission.		Fees.	Total fees and commissions.
		Payable when entry is made.	Payable when certificate issues.	Payable when entry is made.	
One hundred and sixty....	$1 25	$4 00	$4 00	$10 00	$18 00
Eighty.....	1 25	2 00	2 00	5 00	9 00
Forty.....	1 25	1 00	1 00	5 00	7 00
Eighty	2 50	4 00	4 00	10 00	18 00
Forty.....	2 50	2 00	2 00	5 00	9 00

NOTE.—Where entries are made on $2.50 land by officers, soldiers and sailors, under section 2304 of the Revised Statutes, double the amount of the above commissions must of course be paid—that is, for 160 acres of $2.50 $8 at the date of entry, and $8 upon proving up.

LAWS TO PROMOTE TIMBER CULTURE.

31. The Timber-Culture Act of June 14th, 1878, amendatory of the act of March 13th, 1874 (sections 2464 to 2468 of the Revised Statutes), is to the following effect:

First. The privilege of entry under this act is confined to persons who are heads of families, or over twenty-one years of age, and who are citizens of the United States, or have declared their intention to become such.

Second. The affidavit required for initiating an entry under this act may be made before the register or receiver of the district office for the land district embracing the desired tract, or before some officer authorized to administer oaths in that district, who is required by law to use an official seal.

Third. Not more than 160 acres in any one section can be entered under this act, and no person can make more than one entry thereunder.

Fourth. The ratio of area required to be broken, planted, etc., in all entries under the act of June 14, 1878, is *one-sixteenth* of the land embraced in the entry, except where the entered tract is less than forty acres, in which case it is one-sixteenth of that quantity. The party making an entry of a quarter-section, or 160 acres, is required to break or plow five acres covered thereby during the first year, and five acres in addition during the second year. The five acres broken or plowed during the first year, he is required to cultivate by raising a crop, or otherwise, during the second year, and to plant in timber, seeds, or cuttings, during the third year. The five acres broken or plowed during the second year, he is required to cultivate, by raising a crop or otherwise, during the third year, and to plant in timber, seeds, or cuttings, during the fourth year. The tracts embraced in entries of a less quantity than one-quarter section are required to be broken or plowed, cultivated, and planted in trees, tree seeds or cuttings, during the same periods, and to the same extent, in proportion to their total areas, as are provided for in entries of a quarter-section. Provision is made in the act for an extension of time in case the trees, seeds or cuttings planted

should be destroyed by grasshoppers, or by extreme and unusual drought.

Fifth. If, at the expiration of eight years, or at any time within five years thereafter, the person making the entry, or, if he or she be dead, his or her heirs or legal representatives, shall prove by two credible witnesses the fact of such planting, cultivation, etc., of the said timber for not less than the said period of eight years, he, she or they shall receive a patent for the land embraced in said entry.

Sixth. If at any time after one year from the date of entry, and prior to the issue of a patent therefor, the claimant shall fail to comply with the requirements of this act, or any part thereof, then such land shall become liable to a contest in the manner provided in homestead cases; and upon due proof of such failure the entry shall be cancelled, and the land become again subject to entry under the homestead laws, or by some other person under the provisions of this act.

Seventh. No land acquired under the provisions of this act shall in any event become liable to the satisfaction of any debt or debts contracted prior to the issuing of final certificate therefor.

Eighth. The fees for entries under the act of June 14, 1878, are ten dollars, if the tract applied for is more than eighty acres, and five dollars, if it is eighty acres or less; and the commission of registers and receivers on all entries (irrespective of area) are four dollars (two dollars to each) at the date of entry, and a like sum at the date of final proof.

Ninth. No distinction is made, as to area or the amount of fee and commissions, between minimum and double-minimum lands; a party may enter 160 acres of either on payment of the prescribed fee and commissions.

Tenth. The fifth section of the act entitled "An act in addition to an act to punish crimes against the United States and for other purposes," approved March 3, 1857, shall extend to all oaths, affirmations and affidavits required or authorized by this act.

Eleventh. The parties who have already made entries under

the Timber-Culture Acts of March 3, 1873, and March 13, 1874, of which the act of June 14, 1878, is amendatory, may complete the same by compliance with the requirements of the latter act; that is, they may do so by showing, at the time of making their final proof, that they have had under cultivation, as required by the act of June 14, 1878, an amount of timber sufficient to make the number of acres required thereby, being one-fourth the number required by the former acts.

32. The following regulations are prescribed pursuant to the fifth section of the act of June 14, 1878, viz.:

First. The register and receiver will not restrict entries under this act to one quarter-section only in each section, as was formerly done under the acts to which this is amendatory, but may allow entries to be made of subdivisions of different quarter-sections; provided that each entry shall form a compact body, not exceeding 160 acres, and that not more than that quantity shall be entered in any one section.

Second. When they shall have satisfied themselves that the land applied for is properly subject to an entry, they will require the party to make the prescribed affidavit, and to pay the fee and that part of the commission payable at the date of entry.

Third. When a contest is instituted, as contemplated in third section of the act of June 14, 1878, the contestant will be allowed to make application to enter the land. Should the contest result in the cancellation of the contested entry, the contestant may then perfect his own, but no preference right will be allowed unless application is made by him at date of instituting contest.

Fourth. In all cases under this act it will be required that trees shall be cultivated which shall be of the class included in the term "timber," the cultivation of shrubbery and fruit trees not being sufficient.

PRESENTATION OF APPEALS.

33. Any party aggrieved by the rejection of his claim has a right to appeal from the decision of the register and receiver to the Commissioner of the General Land Office, and from him may still further appeal to the Secretary of the Interior. All

appeals to the Commissioner must be within thirty days from the date of land officer's decision, and all appeals to the Secretary within sixty days after service of notice. If not appealed, the decision is by law made final.

II. Timber and Stone Lands.—The laws of the United States permit the sale of lands unfit for cultivation, but valuable only or chiefly for the timber and stone they contain, and not withdrawn from ordinary sale as mineral lands; but the purchaser must be a citizen of the United States, or have legally declared his intention to become a citizen. The minimum price of such lands is to be two dollars and fifty cents per acre, with the usual fees, and the purchaser from the government is restricted to 160 acres or less.

III. Desert Lands.—By the following act of Congress passed March 3, 1877, entitled, "An act for the sale of desert lands, in certain States and Territories," provision was made for the sale of such lands as could only be made valuable by irrigation:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it shall be lawful for any citizen of the United States, or any person of requisite age "who may be entitled to become a citizen, and who has filed his declaration to become such," and upon payment of twenty-five cents per acre, to file a declaration, under oath, with the register and the receiver of the land district in which any desert land is situated, that he intends to reclaim a tract of desert land, not exceeding one section, by conducting water upon the same within the period of three years thereafter: *Provided, however*, That the right to the use of water by the person so conducting the same on or to any tract of desert land of 640 acres shall depend upon *bona fide* prior appropriation; and such right shall not exceed the amount of water actually appropriated and necessarily used for the purpose of irrigation and reclamation; and all surplus water over and above such actual appropriation and use, together with the water of all lakes, rivers, and other sources of water supply upon the public lands and not navigable, shall remain and be held free for the appropriation and use of the public for irrigation, mining, and manufacturing

purposes subject to existing rights. Said declaration shall describe particularly said section of land if surveyed, and if unsurveyed shall describe the same as nearly as possible without a survey. At any time within the period of three years after filing said declaration, upon making satisfactory proof to the register and receiver of the reclamation of said tract of land in the manner aforesaid, and upon the payment to the receiver of the additional sum of one dollar per acre for a tract of land not exceeding 640 acres to any one person, a patent for the same shall be issued to him: *Provided*, That no person shall be permitted to enter more than one tract of land and not to exceed 640 acres, which shall be in compact form.

SEC. 2. That all lands, exclusive of timber lands and mineral lands, which will not, without irrigation, produce some agricultural crop, shall be deemed desert lands within the meaning of this act, which fact shall be ascertained by proof of two or more credible witnesses under oath, whose affidavits shall be filed in the land office in which said tract of land may be situated.

SEC. 3. That this act shall only apply to and take effect in the States of California, Oregon, and Nevada, and the Territories of Washington, Idaho, Montana, Utah, Wyoming, Arizona, New Mexico, and Dakota, and the determination of what may be considered desert land shall be subject to the decision and regulation of the Commissioner of the General Land Office.

More than 1,000,000 acres of these lands were sold before June 30, 1878, a period of fifteen months after the law took effect.

Provision will probably be made for the entry of these desert lands as homestead lands under the same provisions, as they will in most cases prove valuable as wheat lands or for root crops.

IV. GRAZING LANDS.—Up to 1880 grazing lands could only be purchased, except in Texas, or from the great land-grant railways, on the same terms as other agricultural lands; and, as a consequence, in the thinly settled States and Territories, the greater part of the herds were pastured on the unsold and generally unsurveyed government lands. As these were

gradually encroached upon by the farmers, the stock-raisers had begun to be desirous of purchasing their pasturage lands, which being usually on the mountain slopes were not generally considered arable. The laws in regard to agricultural lands made this almost impossible; but a bill was introduced into Congress at its recent session (1879–1880) which will probably obviate the existing difficulty. It provides for the sale of grazing lands (which are carefully defined) in quantities of eight square miles or less, at nominal rates, with the usual fees.

CHAPTER IV.

MINING AND MINERAL LANDS—THE UNITED STATES LAWS AND REGULATIONS OF THE LAND OFFICE IN REGARD TO TH.M—STATE, TERRITORIAL AND LOCAL RULES OR LAWS.

V. MINING AND MINERAL LANDS.—The United States laws regulating mining lands and mineral resources have been very often modified, but are now reduced to a practical basis; these laws, however, are to some extent modified in their operations by the State mining laws, and the local regulations in the mining districts. They are at this time as follows:

LAWS OF THE UNITED STATES,

RELATIVE TO MINING LANDS AND MINERAL RESOURCES, RESERVED FROM SALE UNDER THE PRE-EMPTION ACTS.

[From Revised Statutes of the United States, being a full text of all laws now in force concerning mining rights.]

CHAPTER 6.—SEC. 2318. In all cases land valuable for minerals shall be reserved from sale except as otherwise expressly directed by law.—*Sec.* 5, *July* 4, 1866.

SEC. 2319. All valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase, by citizens of the United States, and those who have declared their

intention to become such, under regulations prescribed by law, and according to the local customs or rules of miners in the several mining districts, so far as the same are applicable and not inconsistent with the laws of the United States.—*Sec.* 1, *May* 10, 1872.

EXTENT OF CLAIM.

SEC. 2320. Mining claims upon veins or lodes of quartz or other rock in place, bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits heretofore located, shall be governed as to length along the vein or lode by the customs, regulations, and laws in force at the date of their location. A mining claim located after the 10th day of May, 1872, whether located by one or more persons, may equal, but shall not exceed 1,500 feet in length along the vein or lode, but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located. No claim shall extend more than 300 feet on each side of the middle of the vein at the surface, nor shall any claim be limited by any mining regulation, to less than twenty-five feet on each side of the middle of the vein at the surface, except where adverse rights existing on the 10th day of May, 1872, render such limitation necessary. The end lines of each claim shall be parallel to each her.—*Sec.* 2, *May* 10, 1872.

RIGHTS OF CLAIMANTS.

SEC. 2321. Proof of citizenship under this chapter may consist, in the case of an individual, of his own affidavit; in the case of an association of persons unincorporated, of the affidavit of their authorized agent, made on his own knowledge or upon information and belief; and in the case of a corporation organized under the laws of the United States, or of any State or Territory thereof, by the filing of a certified copy of their charter or certificate of incorporation.—*Sec.* 7, *May* 10, 1872.

VEINS—HOW CONTROLLED.

SEC. 2322. The locators of all mining locations heretofore made, or which shall hereafter be made, or any mineral vein, lode, or ledge, situated on the public domain, their heirs, and assigns,

where no adverse claim exists, on the 10th day of May, 1872, so long as they comply with the laws of the United States, and with State, Territorial, and local regulations not in conflict with the laws of the United States governing their possessory title, shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes, and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical lines of such surface locations; but their right of possession to such outside parts of such veins or ledges shall be confined to such portions thereof as lie between vertical planes drawn downward, as above described, through the end lines of their locations, so continued in their own directions that such planes will intersect such exterior parts of such veins or ledges; and nothing in this section shall authorize the locator or possessor of a vein or lode which extends in its downward course beyond the vertical lines of his claim to enter upon the surface of a claim owned or possessed by another.—*Sec.* 3, *May* 10, 1872.

TUNNELLING.

SEC. 2323. Where a tunnel is run for the development of a vein or lode, or for the discovery of mines, the owners of such tunnel shall have the right of possession of all veins or lodes within 3,000 feet from the face of such tunnel on the line thereof not previously known to exist, discovered in such tunnel, to the same extent as if discovered from the surface; and locations on the line of such tunnel of veins or lodes not appearing on the surface, made by other parties after the commencement of the tunnel, and while the same is being prosecuted with reasonable diligence, shall be invalid; but failure to prosecute the work on the tunnel for six months shall be considered as an abandonment of the right to all undiscovered veins on the line of such tunnel.—*Sec.* 4, *May* 10, 1872.

REQUIREMENTS OF LOCATION AND LABOR.

SEC. 2324. The miners of each mining district may make regu-

lations not in conflict with the laws of the United States, or with the laws of the State or Territory in which the district is situated, governing the location, manner of recording, amount of work necessary to hold possession of a mining claim, subject to the following requirements: The location must be distinctly marked on the ground, so that its boundaries can be readily traced. All records of mining claims hereafter made shall contain the name or names of the locators, the date of the location, and such a description of the claim or claims located by reference to some natural object or permanent monument as will identify the claim. On each claim located after the 10th day of May, 1872, and until a patent has been issued therefor, not less than $100 worth of labor shall be performed or improvements made during each year. On all claims located prior to the 10th day of May, 1872, $10 worth of labor shall be performed or improvements made by the 10th day of June, 1874, and each year thereafter, for each 100 feet in length along the vein until a patent has been issued therefor; but where such claims are held in common, such expenditure may be made on any one claim, and upon a failure to comply with these conditions, the claim or mine upon which such failure occurred shall be open to relocation, in the same manner as if no location of the same had ever been made: *Provided*, That the original locators, their heirs, assigns, or legal representatives, have not resumed work upon the claim after failure and before such location. Upon the failure of any one of several co-owners to contribute his proportion of the expenditures required hereby, the co-owners who have performed the labor or made the improvements may, at the expiration of the year, give such delinquent co-owner personal notice in writing or notice by publication in the newspaper published nearest the claim, for at least once a week for ninety days, and if, at the expiration of ninety days after such notice in writing or by publication, such delinquent shall fail or refuse to contribute his proportion of the expenditure required by this section, his interest in the claim shall become the property of his co-owners who have made the required expenditures.—*Sec.* 5, *May* 10, 1872.

HOW TO SECURE PATENT.

SEC. 2325. A patent for any land claimed and located for valuable deposits may be obtained in the following manner: Any person, association, or corporation authorized to locate a claim under this chapter, having claimed and located a piece of land for such purposes, who has or have complied with the terms of this chapter, may file, in the proper land office, an application for a patent, under oath, showing such compliance, together with a plat and field notes of the claim or claims in common, made by or under the direction of the United States Surveyor-General, showing accurately the boundaries of the claim or claims, which shall be distinctly marked by monuments on the ground, and shall post a copy of such plat, together with a notice of such application for a patent, in a conspicuous place on the land embraced in such plat previous to the filing of the application for a patent, and shall file an affidavit of at least two persons, that such notice has been duly posted, and shall file a copy of the notice in such land office, and shall thereupon be entitled to a patent for the land in the manner following: The Register of the land office, upon the filing of such application, plat, field notes, notices, and affidavits, shall publish a notice that such application has been made, for the period of sixty days, in a newspaper to be by him designated as published nearest to such claim; and he shall also post such notice in his office for the same period. The claimant, at the time of filing this application, or at any time thereafter, within the sixty days of publication, shall file with the Register a certificate of the United States Surveyor-General that $500 worth of labor has been expended on improvements made upon the claim by himself or grantors; that the plat is correct, with such further description by such reference to natural objects or permanent monuments as shall identify the claim, and furnish an accurate description, to be incorporated in the patent. At the expiration of sixty days of publication, the claimant shall file his affidavit, showing that the plat and notice have been posted in a conspicuous place on the claim during such period of publication. If no adverse claim shall have been filed with the Register and the Receiver of the proper land office at the expiration of the

sixty days of publication, it shall be assumed that the applicant is entitled to a patent, upon the payment to the proper officer of $5 per acre, and that no adverse claim exists; and thereafter no objection from third parties to the issuance of a patent shall be heard, except it be shown that the applicant has failed to comply with the terms of this chapter.—*Sec.* 6, *May* 10, 1872.

PROVISIONS FOR PLACER CLAIMS.

SEC. 2329. Claims usually called "placers," including all forms of deposits, excepting veins of quartz or other rock in place, shall be subject to entry and patent under like circumstances and conditions, and upon similar proceedings as are provided for vein or lode claims; but where the lands have been previously surveyed by the United States, the entry in its exterior limits shall conform to the legal subdivisions of public lands.—*Sec.* 12, *July* 9, 1870.

SEC. 2330. Legal subdivisions of forty acres may be subdivided into ten-acre tracts, and two or more persons or associations of persons, having contiguous claims of any size, although such claims may be less than ten acres each, may make joint entry thereof, but no location of a placer claim made after the 9th day of July, 1870, shall exceed 160 acres for any one person or association of persons, which location shall conform to the United States surveys; and nothing in this section contained shall defeat or impair any *bona fide* pre-emption or homestead claim upon agricultural lands, or authorize the sale of the improvements of any *bona fide* settler to any purchaser.—*Sec.* 12, *July* 9, 1870.

SEC. 2331. Where placer claims are upon surveyed lands, and conform to legal subdivisions, no further survey or plat shall be required, and all placer mining claims located after the 10th day of May, 1872, shall conform as near as practicable with the United States system of public land surveys and the rectangular subdivisions of such surveys, and no such location shall include more than twenty acres for each individual claimant, but where placer claims cannot be conformed to legal subdivisions, survey and plat shall be made as on unsurveyed lands; and where by

the segregation of mineral land in any legal subdivision a quantity of agricultural land less than forty acres remains, such fractional portion of agricultural land may be entered by any party qualified by law, for homestead or pre-emption purposes.—*Sec.* 10, *May* 10, 1872.

LIMITATIONS AND LIENS.

SEC. 2332. Where such person or association, they and their grantors, have held and worked their claims for a period equal to the time prescribed by the statute of limitations for mining claims of the State or Territory where the same may be situated, evidence of such possession and working of the claim for such period shall be sufficient to establish a right to a patent thereto under this chapter, in the absence of any adverse claim; but nothing in this chapter shall be deemed to impair any lien which may have attached in any way whatever to any mining claim or property thereto attached prior to the issuance of a patent.—*Sec.* 13, *July* 9, 1870.

PLACER AND LODE CLAIMS JOINTLY.

SEC. 2333. Where the same person, association or corporation, is in possession of a placer claim, and also a vein or lode included within the boundaries thereof, application shall be made for a patent for the placer claim, with the statement that it includes such vein or lode; and in such case a patent shall issue for the placer claim, subject to the provisions of this chapter, including such vein or lode, upon the payment of $5 per acre for such vein or lode claim, and twenty-five feet of surface on each side thereof. The remainder of the placer claim, or any placer claim not embracing any vein or lode claim, shall be paid for at the rate of $2.50 per acre, together with all costs of proceedings; and where a vein or lode, such as is described in section 2320 of this act, is known to exist within the boundaries of a placer claim, an application for a patent for such a placer claim which does not include an application for the vein or lode claim, shall be construed as a conclusive declaration that the claimant of the placer claim has no right of possession of the vein or lode claim;

but where the existence of a vein or lode in a placer claim is not known, a patent for the placer claim shall convey all valuable and other mineral deposits within the boundaries thereof.—*Sec.* 11, *May* 10, 1872.

FEES TO SURVEYORS.

SEC. 2334. The Surveyor-General of the United States may appoint in each land district containing mineral lands as many competent surveyors as shall apply for appointment to survey mining claims. The expenses of the survey of vein or lode claims, and the survey and subdivision of placer claims into smaller quantities than 160 acres, together with the cost of publication of notices, shall be paid by the applicants, and they shall be at liberty to obtain the same at the most reasonable rates, and they shall also be at liberty to employ any United States Deputy Surveyor to make the survey. The Commissioner of the General Land Office shall also have power to establish the maximum charges for surveys and publication of notices under this chapter, and in case of excessive charges for publication, he may designate any newspaper published in a land district where mines are situated, for the publication of mining notices in such district, and fix the rates to be charged by such paper; and to the end that the Commissioner may be fully informed on the subject, each applicant shall file with the Register a sworn statement of all charges and fees paid by such applicant for publication and surveys, together with all fees and money paid the Register and Receiver of the land office, which statement shall be transmitted, with the other papers in the case, to the Commissioner of the General Land Office.—*Sec.* 12, *May* 10, 1872.

PROOF OF CLAIMS.

SEC. 2335. All affidavits required to be made under this chapter may be verified before any officer authorized to administer oaths within the land district where the claim may be situated, and all testimony and proofs may be taken before any such officer, and, when duly certified by the officer taking the same, shall have the same force and effect as if taken before the Regis-

ter and Receiver of the land office. In cases of contest as to the mineral or agricultural character of land, the testimony and proofs may be taken as herein provided, on personal notice of at least ten days to the opposing party; or if such party cannot be found, then by publication of at least once a week for thirty days in a newspaper, to be designated by the Register of the land office as published nearest to the location of such land; and the Register shall require proof that such notice has been given. —*Sec.* 13, *May* 10, 1872.

VEINS CROSSING.

SEC. 2336. When two or more veins intersect or cross each other, priority of title shall govern, and such prior location shall be entitled to all ore or mineral contained within the space of intersection; but the subsequent location shall have the right of way through the space of intersection, for the purposes of convenient working of the mine; and, where two or more veins unite, the oldest or prior location shall take the vein below the point of union, including all the space of intersection.—*Sec.* 14, *May* 10, 1872.

SITES FOR MILLS.

SEC. 2337. Where non-mineral land not contiguous to the vein or lode is used or occupied by the proprietor of such vein or lode for mining or milling purposes, such non-adjacent surface-ground may be embraced and included in an application for a patent for such vein or lode, and the same may be patented therewith, subject to the same preliminary requirements as to the survey and notice as are applicable to veins or lodes; but no location hereafter made of such non-adjacent land shall exceed five acres, and payment for the same must be made at the rate as fixed by this chapter for the superfices of the lode. The owner of a quartz-mill or reduction works not owning a mine in connection therewith, may also receive a patent for his mill-site as provided in this section.—*Sec.* 15, *May* 10, 1872.

DRAINAGE, EASEMENTS, ETC.

SEC. 2338. As a condition of sale in the absence of necessary

legislation by Congress, the local Legislature of any State or Territory may provide rules for working mines involving easements, drainage, and other necessary means to their complete development, and those conditions shall be fully expressed in the patent.—*Sec.* 5, *July* 26, 1866.

VESTED WATER RIGHTS.

SEC. 2339. Whenever, by priority of possession, rights to the use of water for mining, agricultural, manufacturing or other purposes, have vested and accrued, and the same are recognized and acknowledged by the local customs, laws and decisions of courts, the possessors and owners of such vested rights shall be maintained and protected in the same; and the right of way for the construction of ditches and canals for the purposes herein specified, is acknowledged and confirmed; but whenever any person in the construction of any ditch or canal, injures or damages the possession of any settler on the public domain, the party committing such injury or damage shall be liable to the party injured for such injury or damage.—*Sec.* 9, *July* 26, 1866.

SEC. 2340. All patents granted, or pre-emption or homesteads allowed, shall be subject to any vested and accrued water rights, or rights to ditches and reservoirs used in connection with such water rights, as may have been acquired under or recognized by the preceding section.—*Sec.* 17, *July* 9, 1870.

HOMESTEADS.

SEC. 2341. Wherever, upon the lands heretofore designated as mineral lands, which have been excluded from survey and sale, there have been homesteads made by citizens of the United States, or persons who have declared their intention to become citizens, which homesteads have been made, improved, and used for agricultural purposes, and upon which there have been no valuable mines of gold, silver, cinnabar or copper discovered, and which are properly agricultural lands, the settlers or owners of such homesteads shall have a right of pre-emption thereto, and shall be entitled to purchase the same at the price of $1.25 per acre, and in quantity not to exceed 160 acres, or they may

avail themselves of the provisions of chapter five of this title, relating to homesteads.—*Sec.* 10, *July* 26, 1866.

AGRICULTURAL LANDS.

SEC. 2342. Upon the survey of the lands described in the preceding section, the Secretary of the Interior may designate and set apart such portions of the same as are clearly agricultural lands, which lands shall thereafter be subject to pre-emption and sale as other public lands, and be subject to all the laws and regulations applicable to the same.—*Sec.* 11, *July* 26, 1866.

IN GENERAL.

SEC. 2343. The President is authorized to establish additional land districts, and to appoint the necessary officers under existing laws wherever he may deem the same necessary for the public convenience in executing the provisions of this chapter.—*Sec.* 7, *July* 26, 1866.

SEC. 2344. Nothing contained in this chapter shall be construed to impair in any way rights or interests in mining property acquired under existing laws.—*Sec.* 17, *July* 9, 1870; *Sec.* 16, *May* 10, 1872.

SEC. 2346. No act passed at the first session of the Thirty-eighth Congress granting lands to States or corporations, to aid in the construction of roads or for other purposes, or to extend the time of grants made prior to the 30th day of January, 1865, shall be so construed as to embrace mineral lands, which in all cases are reserved exclusively to the United States, unless otherwise specially provided in the act or acts making the grant.—*Sec.* 10, *January* 30, 1865.

COAL LANDS.

SEC. 2347. Every person above the age of twenty-one years, who is a citizen of the United States, or who has declared his intention to become such, or any association of persons severally qualified as above, shall, upon application to the Register of the proper land office, have the right to enter, by legal subdivisions, any quantity of vacant coal lands of the United States not otherwise appropriated or reserved by competent authority, not ex-

ceeding 160 acres to each individual person, or 320 acres to such association, upon payment to the Receiver of not less than ten dollars per acre for such lands, where the same shall be situated more than fifteen miles from any completed railroad, and not less than twenty dollars per acre for such lands as shall be within fifteen miles of such road.—*Sec.* 1, *March* 3, 1873.

WHO CAN CLAIM.

SEC. 2348. Any person or association of persons severally qualified as above provided, who have opened and improved, or shall hereafter open and improve, any coal mine or mines upon the public lands, and shall be in actual possession of the same, shall be entitled to a preference right of entry, under the preceding section, of the mines so opened and improved: *Provided*, That when an association of not less than four persons, severally qualified as above provided, shall have expended not less than $5,000 in working and improving any such mine or mines, such association may enter not exceeding 640 acres, including such mining improvements.—*Sec.* 2, *ibid.*

REGISTERING CLAIMS.

SEC. 2349. All claims under the preceding section must be presented to the Register of the proper land district within sixty days after date of actual possession, and the commencement of improvements on the land, by the filing of a declaratory statement therefor; but when the township plat is not on file at the date of such improvements, filing must be made within sixty days from the receipt of such plat at the district office; and where the improvements shall have been made prior to the expiration of three months from the 3d day of March, 1873, sixty days from the expiration of such three months shall be allowed for the filing of a declaratory statement, and no sale under the provisions of this section shall be allowed until the expiration of six months from the 3d day of March, 1873.—*Sec.* 3, *ibid.*

ENTRIES AUTHORIZED.

SEC. 2350. The three preceding sections shall be held to

authorize only one entry by the same person or association of persons; and no association of persons, any member of which shall have taken the benefit of such sections, either as an individual or as a member of any other association, shall enter or hold any other lands under the provisions; and all persons claiming under section 2348, shall be required to prove their respective rights and pay for the lands filed upon within one year from the time prescribed for filing their respective claims; and upon failure to file the proper notice, or to pay for the land within the required period, the same shall be subject to entry by any other qualified applicant.—*Sec.* 4, *ibid.*

CONFLICTING CLAIMS.

SEC. 2351. In case of conflicting claims upon coal lands where the improvement shall be commenced after the 3d day of March, 1873, priority of possession and improvement followed by proper filing and continued good faith, shall determine the preference right to purchase. And also when improvements have already been made prior to the 3d day of March, 1873, division of the land claimed may be made by legal subdivisions, to include as near as may be the valuable improvements of the respective parties. The Commissioner of the General Land Office is authorized to issue all needful rules and regulations for carrying into effect the provisions of this and the four preceding sections.—*Sec.* 5, *ibid.*

SEC. 2352. Nothing in the five preceding sections shall be construed to destroy or impair any rights which may have attached prior to the 3d day of March, 1873, or to authorize the sale of lands valuable for mines of gold, silver or copper.—*Sec.* 6, *ibid.*

THE ACT OF 1874.

An act to amend the act entitled "An act to promote the development of the mining resources of the United States," passed May 10, 1874.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the provisions of the fifth section of the act entitled "An act to promote the development of the mining resources of the United States," passed May 10, 1874, which requires expenditures of labor and

improvements on claims located prior to the passage of said act, are hereby so amended that the time for the first annual expenditure on claims located prior to the passage of said act, shall be extended to the 1st day of January, 1875.—*Approved June 6, 1874.*

THE ACT OF 1875.

An act to amend section two thousand three hundred and twenty-four of the Revised Statutes, relating to the development of the mining resources of the United States.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 2324 of the Revised Statutes be and the same is hereby amended so that where a person or company has or may run a tunnel for the purpose of developing a lode or lodes, owned by said person or company, the money so expended in said tunnel shall be taken and considered as expended on said lode or lodes, whether located prior to or since the passage of said act; and such person or company shall not be required to perform work on the surface of said lode or lodes in order to hold the same as required by said act.—*Approved February* 11, 1875.

To these mining laws should be appended the

RULES OF THE UNITED STATES LAND OFFICE.

(Under the Act of Congress of May 10, 1872, and now in force.)

1. It will be perceived that the first section of said act leaves the mineral lands in the public domain, surveyed and unsurveyed, open to exploration, occupation, and purchase by all citizens of the United States, and all those who have declared their intention to become such.

LODE CLAIMS PREVIOUSLY LOCATED.

2. By an examination of the several sections of the foregoing act it will be seen that the status of lode claims, located *previous* to the date thereof, is not changed with regard to their *extent along the lode or width of surface,* such claims being restricted and governed both as to their *lateral and linear* extent by the State, Territorial, or local laws, customs or regulations which were in

force in their respective districts at the date of such locations, in so far as the same did not conflict with the limitation fixed by the mining statute of July 26, 1866.

ENLARGEMENT OF RIGHTS.

3. Mining rights acquired under such previous locations are, however, enlarged by said act of May 10, 1872, in the following respect, viz.: The locators of all such previously taken veins or lodes, their heirs and assigns, so long as they comply with the laws of Congress, and with State, Territorial, or local regulations not in conflict therewith, governing mining claims, are invested by said act with the exclusive possessory right of all the surface included within the lines of their locations, and of all veins, lodes, or ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extending downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular, in their course downward, as to extend outside the vertical lines of such locations at the surface; it being expressly provided, however, that the right of possession to such outside parts of said veins or ledges shall be confined to such portions thereof as lie between vertical planes drawn downward as aforesaid, through the end lines of their locations, so continued in their own direction, that such planes will intersect such exterior parts of such veins, lodes, or ledges; no right being granted, however, to the claimant of such outside portion of a vein or ledge to enter upon the surface location of another claimant.

LIMITS OF THE LAW.

4. It is to be distinctly understood, however, that the law limits the possessory rights to veins, lodes, or ledges *other* than the one named in the original location, to such as were not *adversely claimed, at the date of said act of May* 10, 1872, and that where such other vein or ledge was so adversely claimed at that date, the right of the party so adversely claiming is in no way impaired by said act.

ANNUAL LABOR.

5. From and after the date of said act of Congress, in order to

hold the possessory title to a mining claim *previously located*, and for which a patent has not been issued, the law requires that *ten dollars* shall be expended annually in labor or improvements on each claim of *one hundred feet* on the course of the vein or lode until a patent shall have been issued therefor; but where a number of such claims are held in common, upon the same vein or lode, the aggregate expenditure that would be necessary to hold all the claims, at the rate of $10 per 100 feet, may be made upon any one claim, a failure to comply with this requirement in any one year subjecting the claim upon which such failure occurred to relocation by other parties, the same as if no previous location thereof had ever been made, unless the claimants under the original location shall have resumed work thereon after such failure, and before such relocation.

FAILURE TO COMPLY WITH THE LAW.

6. Upon the failure of any one of several co-owners of a vein, lode, or ledge which has not been patented, to contribute his proportion of the expenditures necessary to hold the claim, or claims so held in ownership in common, the co-owners who have performed the labor, or made the improvements as required by said act, may, at the expiration of the year, give such delinquent co-owner personal notice in writing, or notice by publication in the newspaper published nearest the claim for at least once a week for ninety days; and if upon the expiration of ninety days after such notice in writing, or upon the expiration of one hundred and eighty days after the first newspaper publication of notice, the delinquent co-owner shall have failed to contribute his proportion to meet such expenditure or improvements, his interest in the claim, by law, passes to his co-owners who have made the expenditures or improvements as aforesaid.

RIGHTS UNDER OLD PATENTS.

7. Rights under patents for veins or lodes heretofore granted under previous legislation of Congress, are enlarged by this act, so as to invest the patentee, his heirs or assigns, with title to all veins, lodes or ledges throughout their entire depth, the

top or apex of which lies within the end and side boundary lines of his claim on the surface as patented, extended downward vertically, although such veins, lodes or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of the claim at the surface. The right to possession to such outside parts of such veins or ledges to be confined to such portions thereof as lie between vertical planes drawn downward through the end lines of the claim at the surface, so continued in their own direction that such planes will intersect such exterior parts of such veins or ledges; it being expressly provided, however, that all veins, lodes or ledges, the top or apex of which lies inside such surface locations, *other* than the one named in the patent, which were *adversely claimed* at the date of said act, are excluded from such conveyance by patent.

FINAL DECISION.

8. Applications for patents for mining claims pending the date of the act of May 10th, 1872, may be prosecuted to final decision in the General Land Office; and where no adverse rights are affected thereby, patents will be issued in pursuance of the provisions of said act.

EFFECT OF ACT OF 1872.

9. From and after the date of said act, any person who is a citizen of the United States, or who has declared his intention to become a citizen, may locate, record and hold a mining claim of *fifteen hundred linear feet* along the course of any mineral vein or lode subject to location; or an association of persons, severally qualified as above, may make joint location of such claim of *fifteen hundred feet*, but in no event can a location of a vein or lode made subsequent to the act exceed fifteen hundred feet along the course thereof, whatever may be the number of persons composing the association.

EXTENT OF SURFACE GROUND.

10. With regard to the extent of surface ground adjoining a

vein or lode, and claimed for the convenient working thereof, the act provides that the lateral extent of locations of veins or lodes made after its passage shall in no case *exceed three hundred feet on each side of the middle of the vein at the surface*, and that no such surface rights shall be limited by any mining regulations to less than twenty-five feet on each side of the middle of the vein at the surface, except where adverse rights existing at the date of said act may render such limitations necessary, the end lines of such claims to be in all cases parallel to each other.

SURFACE RIGHTS.

11. By the foregoing it will be perceived that no lode claim located after the date of said act can exceed a parallelogram fifteen hundred feet in length by six hundred feet in width, but whether surface ground of the width can be taken depends upon the local regulations or State or Territorial laws in force in the several mining districts; and that no such local regulations or State or Territorial laws shall limit a vein or lode claim to less than fifteen hundred feet along the course thereof, whether the location is made by one or more persons, nor can the surface rights be limited to less than fifty feet in width, unless adverse claims existing on the 10th day of May, 1872, render such lateral limitations necessary.

THEIR OWN LAWS.

12. It is provided in said act that the miners of each district may make rules and regulations not in conflict with the laws of the United States, or of the State or Territory in which such districts are respectively situated, governing the location, manner of recording, and amount of work necessary to hold possession of the claim. It likewise requires that the location must be so distinctly marked on the ground that its boundaries may be readily traced. This is a very important matter, and locators cannot exercise too much care in defining their locations at the outset, inasmuch as the law requires that all records of mining locations made subsequent to its passage shall contain the name or names of locators, the date of the location, and such a *de-*

scription of the claim or claims located, by reference to some natural object or permanent monument, as will identify the claim.

RECORDING CLAIMS.

13. The said act declares that no lode claim can be recorded until after the discovery of a vein or lode within the limits of the ground claimed; the object of which provision is evidently to prevent the encumbering of the district mining record with useless locations before sufficient work has been done thereon to determine whether a vein or lode has been really discovered or not.

WHAT CLAIMANT SHOULD DO.

14. The claimant should, therefore, prior to recording his claim, unless the vein can be traced upon the surface, sink a shaft, or run a tunnel or drift to a sufficient depth therein to discover and develop a mineral-bearing vein, lode or crevice; should determine, if possible, the general course of such vein in either direction from the point of discovery, by which direction he will be governed in marking the boundaries of his claim on the surface; and should give the course and distance as nearly as practicable from the discovery shaft on the claim to some permanent, well-known points or objects, such for instance, as stone monuments, blazed trees, the confluence of streams, point of intersection of well-known gulches, ravines or roads, prominent buttes, hills, etc., which may be in the immediate vicinity, and which will serve to perpetuate and fix the *locus* of the claim and render it susceptible of identification from the description thereof given in the record of locations in the district.

NAMES OF ADJOINING CLAIMS.

15. In addition to the foregoing data, the claimant should state the names of adjoining claims, or, if none adjoin, the relative positions of the nearest claims; should drive a post, or erect a monument of stones at each corner of his surface ground, and at the point of discovery, or discovery shaft, should fix a post, stake or board, upon which should be designated the name of

the lode, the name or names of the locators, the number of feet claimed, and in which direction from the point of discovery, it being essential that the location notice filed for record, in addition to the foregoing description, should state whether the entire claim of fifteen hundred feet is taken on one side of the point of discovery, or whether it is partly upon one and partly upon the other side thereof, and in the latter case, how many feet are claimed upon each side of such discovery point.

FILING NOTICE.

16. Within a reasonable time, say twenty days after the location shall have been marked on the ground, notice thereof, accurately describing the claim, in the manner aforesaid, should be filed for record with the proper recorder of the district, who will thereupon issue the usual certificate of location.

HOLDING POSSESSORY RIGHT.

17. In order to hold the possessory right to a claim of fifteen hundred feet of a vein or lode located as aforesaid, the act requires that until a patent shall have been issued therefor, not less than one hundred dollars' worth of labor shall be performed or improvements made thereon during each year, in default of which the claim shall be subject to relocation by any other party having the necessary qualifications, unless the original locator, his heirs, assigns, or legal representatives, have resumed work thereon, after such failure and before such relocation.

IMPORTANCE OF DETAILS.

18. The importance of attending to these details in the manner of location, labor and expenditure, will be more readily perceived when it is understood that a failure to give the subject proper attention may invalidate the claim.

TUNNEL RIGHTS.

19. The fourteenth section of the act provides that where a tunnel is run for the development of a vein or lode, or for the

discovery of mines, the owners of such tunnel shall have the right of possession of all veins or lodes within three thousand feet from the face of such tunnel on the line thereof, not previously known to exist, discovered in such tunnel, to the same extent as if discovered from the surface; and locations on the line of such tunnel of veins or lodes not appearing on the surface, made by other parties after the commencement of the tunnel, and while the same is being prosecuted with reasonable diligence, shall be invalid, but failure to prosecute the work on the tunnel for six months shall be considered as an abandonment of the right to all undiscovered veins or lodes on the line of said tunnel.

EFFECT OF FOURTEENTH SECTION.

20. The effect of this section is simply to give the proprietors of a mining tunnel, run in good faith, the possessory right to 1,500 feet of any blind lodes cut, discovered or intersected by such tunnel, which were not previously known to exist, within 3,000 feet from the face or point of commencement of such tunnel, and to prohibit other parties, after the commencement of the tunnel, from prospecting for and making locations of lodes on the *line thereof* and within said distance of 3,000 feet, unless such lodes appear upon the surface, or were previously known to exist.

CONSTRUCTION OF TERMS.

21. The term "face," as used in said section, is construed and held to mean the first working face formed in the tunnel, and to signify the point at which the tunnel actually enters cover, it being from this point that the 3,000 feet are to be counted, upon which the prospecting is prohibited as aforesaid.

PROPER NOTICE.

22. To avail themselves of the benefit of this provision of law, the proprietors of a mining tunnel will be required, at the time they enter cover, as aforesaid, to give proper notice of their tunnel location, by erecting a substantial post, board or monument, at the face or point of commencement thereof, upon which should be posted a good and sufficient notice, giving the names

of the parties or company claiming the tunnel right, the actual or proposed course or direction of the tunnel, the height and width thereof, and the course and distance from such face or point of commencement to some permanent, well-known objects in the vicinity by which to fix and determine the *locus* in manner heretofore set forth applicable to locations of veins or lodes; and at the time of posting such notice they shall, in order that miners or prospectors may be enabled to determine whether or not they are within the lines of the tunnel, establish the boundary lines thereof by stakes or monuments placed along such lines at proper intervals, to the terminus of 3,000 feet from the face or point of commencement of the tunnel, and the lines so marked will define and govern as to the specific boundaries within which prospecting for lodes not previously known to exist is prohibited, while work on the tunnel is being prosecuted with reasonable diligence.

SWORN STATEMENTS.

23. At the time of posting notice and marking the lines of the tunnel, as aforesaid, a full and correct copy of such notice of location, defining the tunnel claim, must be filed for record with the mining recorder of the district, to which notice must be attached the sworn statement or declaration of the owners, claimants or projectors of such tunnel, setting forth the facts in the case, stating the amount expended by themselves and their predecessors in interest in prosecuting work thereon, the extent of the work performed, and that it is *bona fide* their intention to prosecute work on the tunnel so located and described with reasonable diligence for the development of a vein or lode, or for the discovery of mines, or both, as the case may be.

MISCELLANEOUS.

24. This notice of location must be duly recorded, and with the said sworn statement attached, kept on the recorder's files for future reference.

25. By a compliance with the foregoing, much needless difficulty will be avoided, and the way for the adjustment of

legal rights acquired in virtue of said fourth section of the act will be made much more easy and certain.

26. This office will take particular care that no improper advantage is taken of this provision of law by parties making or professing to make tunnel locations ostensibly for the purpose named in the statute, but really for the purpose of monopolizing the land lying in front of their tunnels to the detriment of the mining interests and to the exclusion of *bona fide* prospectors or miners; but will hold such tunnel claimants to a strict compliance with the terms of the act; and as *reasonable diligence* on their part in prosecuting the work is one of the essential conditions of their implied contract, negligence or want of due diligence will be construed as working a forfeiture of their right to all undiscovered veins on the line of such tunnel.

GOVERNMENT TITLE TO VEIN OR LODE CLAIMS.

27. By the sixth section of said act, authority is given for granting title for mines by patent from the government, to any person, association or corporation having the necessary qualifications as to citizenship, and holding the right of possession to a claim in compliance with law.

CORRECT SURVEYS.

28. The claimant is required in the first place to have a correct survey of his claim made under authority of the Surveyor-General of the State or Territory in which the claim lies; such survey to show with accuracy the exterior surface boundaries of the claim, which boundaries are required to be distinctly marked by monuments on the ground.

POSTING COPY OF PLAT.

29. The claimant is then required to post a copy of the plat of such survey in a conspicuous place upon the claim, together with the notice of his intention to apply for a patent therefor, which notice will give the date of posting, the name of the claimant, the name of the claim, mine or lode, the mining district or county; whether the location is of record, and if so, where

the record may be found; the number of feet claimed along the vein, and the presumed direction thereof; the number of feet claimed on the lode in each direction from the point of discovery, or other well-defined place on the claim; the name or names of adjoining claimants on the same or other lodes, or if none adjoin, the names of the nearest claims, etc.

FIELD NOTES.

30. After posting the said plat and notice upon the premises, the claimant will file with the proper register and receiver a copy of such plat, and the field notes of survey of the claim, accompanied by the affidavit of at least two credible witnesses that such plat and notice are posted conspicuously upon the claim, giving the date and place of such posting; a copy of the notice so posted to be attached to and form a part of said affidavit.

RIGHTS TO THE PREMISES.

31. Attached to the field notes so filed, must be the sworn statement of the claimant that he has the possessory right to the premises therein described, in virtue of a compliance by himself (and by his grantors, if he claims by purchase) with the mining rules, regulations and customs of the mining district, State or Territory in which the claim lies, and with the mining laws of Congress; such sworn statement to narrate briefly, but as clearly as possible, the facts constituting such compliance, the origin of his possession, and the basis of his claim to a patent.

SUPPORT OF AFFIDAVIT.

32. This affidavit should be supported by appropriate evidence from the mining recorder's office, as to his possessory right as follows, viz.: Where he claims to be a locator, a full, true and correct copy of such location should be furnished, as the same appears upon the mining records; such copy to be attested by the seal of the recorder, or, if he has no seal, then he should make oath to the same being correct, as shown by his records. Where the applicant claims as a locator, in company with others, who have since conveyed their interests in the lode to him, a copy

of the original record of location should be filed, together with an abstract of title from the proper recorder, under seal or oath as aforesaid, tracing the co-locator's possessory rights in the claim, to such applicant for patent. Where the applicant claims only as a purchaser for valuable consideration, a copy of the location record must be filed, under seal or upon oath as aforesaid, with an abstract of title certified as above, by the proper recorder, tracing the right of possession by a continuous chain of conveyances, from the original locators to the applicant.

DESTRUCTION OF RECORDS.

33. In the event of the mining records in any case having been destroyed by fire or otherwise lost, affidavit of the fact should be made, and secondary evidence of possessory title will be received, which may consist of the affidavit of the claimant, supported by those of any other parties cognizant of the facts relative to his location, occupancy, possession, improvements, etc.; and in such case of lost records, any deeds, certificates of location or purchase, or other evidence which may be in the claimant's possession, and tend to establish his claim, should be filed.

PUBLISHING NOTICE.

34. Upon the receipt of these papers the register will, at the expense of the claimant, publish a notice of such application for the period of sixty days, in a newspaper published nearest to the claim, and will post a copy of such notice in his office for the same period.

WHAT NOTICE MUST EMBRACE.

35. The notice so published and posted must be as full and complete as possible, and embrace all the data given in the notice posted upon the claim.

36. Too much care cannot be exercised in the preparation of these notices, inasmuch as upon their accuracy and completeness will depend, in a great measure, the regularity and validity of the whole proceeding.

FILING CERTIFICATE.

37. The claimant, either at the time of filing these papers with

the Register or at any time during the sixty days' publication, is required to file a certificate of the Surveyor-General that not less than $500 worth of labor has been expended or improvements made upon the claim by the applicant or his grantors; that the plat filed by the applicant is correct; that the field notes of the survey, as filed, furnish such an accurate description of the claim as will, if incorporated into a patent, serve to fully identify the premises; and that such reference is made therein to natural objects or permanent monuments as will perpetuate and fix the *locus* thereof.

GENERAL INSTRUCTIONS FROM SURVEYOR-GENERAL.

38. It will be the more convenient way to have this certificate indorsed by the Surveyor-General, both upon the plat and field notes of the survey filed by the claimant as aforesaid.

39. After the period of sixty days of newspaper publication has expired, the claimant will file his affidavit, showing that the plat and notice aforesaid remained conspicuously posted upon the claim sought to be patented, during said sixty days' publication.

40. Upon the filing of this affidavit the Register will, if no adverse claim was filed in his office during the period of publication, permit the claimant to pay for the land according to the area given in the plat and field notes of survey aforesaid, at the rate of $5 for each acre and $5 for each fractional part of an acre, the Receiver issuing the usual duplicate receipt therefor; after which the whole matter will be forwarded to the Commissioner of the General Land Office, and a patent issued thereon if found regular.

41. In sending up the papers in the case, the Register must not omit certifying to the fact that the notice was posted in his office for the full period of sixty days, such certificate to state distinctly when such posting was done, and how long continued.

42. The consecutive series of numbers of mineral entries must be continued, whether the same are of lode or placer claims.

43. The Surveyor-General must continue to designate all surveyed mineral claims, as heretofore, by a progressive series of numbers, beginning with lot No. 37 in each township; the claim

to be so designated at date of filing the plat, field notes, etc., in addition to the local designation of the claim; it being required in all cases that the plat and field notes of the survey of a claim must, in addition to the reference to permanent objects in the neighborhood, describe the *locus* of the claim with reference to the lines of public surveys, by a line connecting a corner of a claim with the nearest public corner of the United States surveys, unless said claim be on unsurveyed lands at a remote distance from such public corner; in which latter case the reference by course and distance to permanent objects in the neighborhood will be a sufficient designation by which to fix the *locus* until the public survey shall have been closed upon its boundaries.

ADVERSE CLAIMS.

44. The seventh section of the act provides for adverse claims; fixes the time within which they shall be filed to have legal effect, and prescribes the manner of their adjustment.

45. Said section requires that the adverse claim shall be filed during the period of publication of notice; that it must be on the oath of the adverse claimant; and that it must show the nature, the boundaries, and the extent of the adverse claim.

46. In order that this section of law may be properly carried into effect, the following is communicated for the information of all concerned:

47. An adverse mining claim must be filed with the Register of the same land office with whom the application for patent was filed, or, in his absence, with the Receiver, and within the sixty days' period of newspaper publication of notice.

48. The adverse notice must be duly sworn to before an officer authorized to administer oaths within the land district, or before the Register or Receiver; it will fully set forth the nature and extent of the interference or conflict; whether the adverse party claims as a purchaser for a valuable consideration or as a locator; if the former, the original conveyance, or a duly certified copy thereof, should be furnished; or if the transaction was a mere verbal one, he will narrate the circumstances attending the purchase, the date thereof, and the amount paid, which facts should

be supported by the affidavit of one or more witnesses, if any were present at the time; and if he claims as a locator, he must file a duly certified copy of the location from the office of the proper recorder.

BOUNDARIES AND EXTENT OF CLAIMS.

49. In order that the "*boundaries*" and "*extent*" of the claim may be shown, it will be incumbent upon the adverse claimant to file a plat showing his claim and his relative situation and position with the one against which he claims, so that the extent of the conflict may be the better understood. This plat must be made from an actual survey by a United States deputy surveyor, who will officially certify thereon to its correctness; and in addition, there must be attached to such plat of survey a certificate or sworn statement by the surveyor as to the approximate value of the labor performed or improvements made upon the claim of the adverse party, and the plat must indicate the position of any shafts, tunnels, or other improvements, if any such exist, upon the claim of the party opposing the application.

50. Upon the foregoing being filed within the sixty days as aforesaid, the Register, or in his absence the Receiver, will give notice in writing to *both parties* to the contest that such adverse claim has been filed, informing them that the party who filed the adverse claim will be required within thirty days from the date of such filing to commence proceedings in a court of competent jurisdiction, to determine the question of right of possession, and to prosecute the same with reasonable diligence to final judgment, and that should such adverse claimant fail to do so, his adverse claim will be considered waived, and the application for the patent be allowed to proceed upon its merits.

51. When an adverse claim is filed as aforesaid, the Register or Receiver will indorse upon the same the precise date of filing, and preserve a record of the date of notifications issued thereon: and thereafter all proceedings on the application for patent will be suspended, with the exception of the completion of the publication and posting of notices and plat, and the filing of the necessary proof thereof, until the controversy shall have been adjudicated in court, or the adverse claim waived or withdrawn.

52. The proceedings after rendition of judgment by the court in such case, are so clearly defined by the act itself as to render it unnecessary to enlarge thereon in this place.

PLACER CLAIMS.

53. The tenth section of the act under consideration provides: "That the act entitled 'An act to amend an act granting the right of way to ditch and canal owners over the public lands, and for other purposes,' approved July 9, 1870, shall be and remain in full force, except as to the proceedings to obtain a patent, which shall be similar to the proceeding prescribed by section six and seven of this act for obtaining patents for vein or lode claims; but where said placer claims shall be upon surveyed lands and conform to legal sub-divisions, no further survey or plat shall be required, and all placer mining claims hereafter located shall conform, as nearly as practicable, with the United States system of public land surveys and the rectangular sub-divisions of such surveys, and no such locations shall include more than twenty acres for each individual claimant; but where placer claims cannot be conformed to legal sub-divisions, survey and plat shall be made as on unsurveyed lands," etc.

54. The proceedings for obtaining patents for veins or lodes having already been fully given, it will not be necessary to repeat them here; it being thought that careful attention thereto by applicants and the local officers will enable them to act understandingly in the matter, and make such slight modifications in the notice, or otherwise, as may be necessary in view of the different nature of the two classes of claims; placer claims being fixed, however, at $2.50 per acre, or fractional part of an acre.

55. The twelfth and thirteenth sections of said act of July 9, 1870, read as follows:

. . . . . .

56. It will be observed that that portion of the first proviso to the said twelfth section, which requires placer claims upon surveyed lands to conform to legal sub-divisions, is related by the present statute with regard to claims heretofore located, but that where such claims are located previous to the survey and *do not*

conform to legal sub-divisions, survey, plat, and entry thereof may be made according to the boundaries fixed by local rules, but where such claims *do* conform to legal sub-divisions, the entry may be effected according to such legal sub-divisions without the necessity of further survey or plat.

57. In the second proviso to said twelfth section, authority is given for the sub-division of forty-acre legal sub-divisions into *ten-acre* lots, which is intended for the greater convenience of miners in segregating their claims both from one another and from intervening agricultural lands.

58. It is held, therefore, that under a proper construction of the law, these ten-acre lots in mining districts should be considered and dealt with, to all intents and purposes, as legal subdivisions, and that an applicant having a legal claim which conforms to one or more of these ten-acre lots, either adjoining or cornering, may make entry thereof, after the usual proceedings, without further survey or plat.

59. In cases of this kind, however, the notice given of the application must be very specific and accurate in description, and as the forty-acre tracts may be subdivided into ten-acre lots, either in the form of ten by ten chains or of parallelograms, five by twenty chains, so long as the lines are parallel and at right angles with the lines of public surveys, it will be necessary that the notice and application state specifically what ten-acre lots are sought to be patented, in addition to other data required in the notice.

60. Where the ten-acre subdivision is in the form of a square, it may be described, for instance, as the "S. E. ¼ of the S. W. ¼ of the N. W. ¼," or if in the form of a parallelogram, as aforesaid, it may be described as the "W. ½ of the W. ½ of the S. W. ¼ of the N. W. ¼ (or, the N. ½ of the S. ½ of the N. E. ¼ of the S. E. ¼) of section ———, township ———, range ———," and as the case may be; but, in addition to this description of the land, the notice must give all the other data that is required in a mineral application by which parties may be put on inquiry as to the premises sought to be patented.

61. The proceedings necessary for the adjustment of rights

where a known vein or lode is embraced by a placer claim, are so clearly defined in the eleventh section of the act as to render any particular instructions upon that point at this time unnecessary.

62. When an adverse claim is filed to a placer application, the proceedings are the same as in the case of vein or lode claims already described.

QUANTITY OF PLACER GROUND SUBJECT TO LOCATION.

63. By the twelfth section of the said amendatory act of July 9, 1870, (third proviso,) it is declared "that no location of a placer claim hereafter made shall exceed 160 acres for any one person or association of persons, which location shall conform to the United States surveys," etc.

64. The tenth section of the act of May 10, 1872, provides that "all placer mining claims hereafter located shall conform, as near as practicable, with the United States system of public land surveys, and the rectangular subdivisions of such surveys; and no such locations shall include more than twenty acres for each individual claimant."

65. The foregoing provisions of law are construed to mean that after the 9th day of July, 1870, no location of a placer claim can be made to exceed 160 acres, whatever may be the number of locators associated together, or whatever the local regulations of the district may allow; and that from and after the passage of said act of May 10, 1872, no location made by an individual can exceed twenty acres, and no location made by an association of individuals can exceed 160 acres, which location of 160 acres cannot be made by a less number than eight *bona fide* locators, but that whether as *much* as twenty acres can be located by an individual, or 160 acres by an association, depends entirely upon the mining regulations in force in the respective districts at the date of the location; it being held that such mining regulations are in no way enlarged by said acts of Congress, but remain intact and in full force with regard to the size of locations, in so far as they do not permit locations in excess of the limits fixed by Congress, but that where such regulations permit

locations in excess of the maximums fixed by Congress as aforesaid, they are restricted accordingly.

66. The regulations hereinbefore given as to the manner of making locations on the ground, and placing the same on record, must be observed in the case of placer locations, so far as the same are applicable; the law requiring, however, that where placer claims are upon surveyed public lands, the locations must hereafter be made to conform to legal subdivisions thereof.

67. With regard to the proofs necessary to establish the possessory right to a placer claim, the said thirteenth section of the act of July 9, 1870, provides that "where said person or association, they and their grantors, shall have held and worked their said claims for a period equal to the time prescribed by the statute of limitations for mining claims for the State or Territory where the same may be situated, evidence of such possession and working of the claims for such period shall be sufficient to establish a right to a patent thereto under this act, in the absence of any adverse claim."

68. This provision of law will greatly lessen the burden of proof, more especially in the case of old claims located many years since, the records of which in many cases have been destroyed by fire, or lost in other ways during the lapse of time, but concerning the possessory right to which all controversy or litigation has long been settled.

69. When an applicant desires to make proof of possessory right in accordance with this provision of law, you will not require him to produce evidence of location, copies of conveyance, or abstracts of title, as in other cases, but will require him to furnish a duly certified copy of the statute of limitations for mining claims for the State or Territory, together with his sworn statement, giving a clear and succinct narration of the facts as to the origin of his title, and likewise as to the continuation of his possession of the mining ground covered by this application; the area thereof; the nature and extent of the mining that has been done thereon; whether there has been any opposition to his possession or litigation with regard to his claim, and if so, when the same ceased; whether such cessation was caused by compromise

or by judicial decree; and any additional facts, within the claimant's knowledge, having a direct bearing upon his possession and *bona fides* which he may desire to submit in support of his claim.

70. There should likewise be filed a certificate under seal of the court having jurisdiction of mining cases within the judicial district embracing the claim, that no suit or action of any character whatever, involving the right of possession to any portion of the claim applied for is pending, and that there has been no litigation before said court affecting the title to said claim or any part thereof, for a period equal to the time fixed by the statute of limitations for mining claims in the State or Territory as aforesaid, other than that which has been finally decided in favor of the claimant.

71. The claimant should support his narrative of facts relative to his possession, occupancy, and improvements, by corroborative testimony of any disinterested person or persons of credibility, who may be cognizant of the facts in the case, and are capable of testifying understandingly in the premises.

72. It will be to the advantage of claimants to make their proofs as full and complete as practicable.

DEPUTY SURVEYORS—CHARGES—FEES OF REGISTERS AND RECEIVERS, ETC.

73. The twelfth section of the said act of May 10, 1872, provides for the appointment of surveyors of mineral claims, authorizes the Commissioner of the General Land Office to establish the rates to be charged for surveys and for newspaper publications, prescribes the fees allowed to the local officers for receiving and acting upon applications for mining patents and for adverse claims thereto, etc.

74. The Surveyor-General of the several districts will, in pursuance of said law, appoint in each land district as many competent deputies for the survey of mining claims as may seek such appointment; it being distinctly understood that all expenses of these notices and surveys are to be borne by the mining claimants, and not by the United States; the system of making deposits for mineral surveys, as required by previous instructions,

being hereby revoked as regards field work, the claimant having the option of employing any deputy surveyor within such district to do his work in the field.

75. Without regard to the *platting* of the claim and other *office work* in the Surveyor-General's office, that officer will make an estimate of the cost thereof, which amount the claimant will deposit with any Assistant United States Treasurer, or designated depositary, in favor of the United States Treasurer, to be passed to the credit of the fund created by "individual depositors for surveys of the public lands," and file with the Surveyor-General duplicate certificates of such deposit, in the usual manner.

76. The Surveyor-General will endeavor to appoint mineral deputy surveyors as rapidly as possible, so that one or more may be located in each mining district, for the greater convenience of miners.

77. The usual oath will be required of these deputies and their assistants as to the correctness of each survey executed by them.

78. The law requires that each applicant shall file with the Register and Receiver a sworn statement of all charges and fees paid by him for publication of notice and for survey, together with all fees and moneys paid the Register and Receiver, which sworn statement is required to be transmitted to this office, for the information of the Commissioner.

79. Should it appear that excessive or exorbitant charges have been made by any surveyor or any publisher, prompt action will be taken with the view of correcting the abuse.

80. The fees payable to the Register and Receiver, for filing and acting upon applications for mineral land patents, made under said act of May 10, 1872, are five dollars to each officer, to be paid by the applicant for patent at the time of filing, and the like sum of five dollars is payable to each officer by an adverse claimant at the time of filing his adverse claim.

81. All fees or charges under this act, or the acts of which it is amendatory, may be paid in United States currency.

82. The Register and Receiver will, at the close of each

month, forward to this office an abstract of mining applications filed, and a register of receipts, accompanied with an abstract of mineral lands sold.

83. The fees and purchase-money received by Registers and Receivers must be placed to the credit of the United States in the Receiver's monthly and quarterly account, charging up in the disbursing account the sums to which the Register and Receiver may be respectively entitled as fees and commissions, with limitations in regard to the legal maximum.

84. The thirteenth section of the said act of May 10, 1872, provides that all affidavits required under said act, or the act of which it is amendatory, may be verified before *any* officer authorized to administer oaths within the land district where the claims may be situated, in which case they will have the same force and effect as if taken before the Register or Receiver, and that in cases of contest as to the mineral or agricultural character of land, the testimony and proofs may be taken before any such officer on personal notice of at least ten days to the opposing party, or, if said party cannot be found, then, after publication of notice for at least once a week for thirty days, in a newspaper to be designated by the Register as published nearest to the location of such land, proof of such notice must be made to the Register.

85. The instructions heretofore issued with regard to disproving the mineral character of lands, are accordingly modified so as to allow proof upon *that point* to be taken before any officer authorized to administer oaths within the land district, and that where the residence of the parties who claim the land to be mineral is known, such evidence may be taken without publication, ten days after the mineral claimants or affiants shall have been personally notified of the time and place of such hearing; but in cases where such affiants or claimants cannot be served with personal notice, or where the land applied for is returned as mineral upon the township plat, or where the same is now or may hereafter be suspended for non-mineral proof, by order of this office, then the party who claims the right to enter the land as agricultural will be required, at his own expense, to publish a notice once each week for five consecutive weeks in the news-

paper of largest circulation published in the county in which said land is situated; or, if no newspaper is published within such county, then in a newspaper published in an adjoining county, the newspaper in either case to be designated by the Register, which notice must be clear and specific, embracing the points required in notices under instructions from this office, of March 20, 1872, and must name a day after the last day of publication of said notice, when testimony as to the character of the land will be taken, stating before what magistrate or other officer such hearing will be had, and the place of such hearing.

MILL-SITES.

86. The fifteenth section of said act provides, "That where non-mineral land, not contiguous to the vein or lode, is used or occupied by the proprietor of such vein or lode for mining or milling purposes, such non-adjacent surface-ground may be embraced and included in an application for a patent for such vein or lode, and the same may be patented therewith, subject to the same preliminary requirements as to survey and notice as are applicable under this act to veins or lodes: *Provided*, That no location hereafter made of such non-adjacent land shall exceed five acres, and payment for the same must be made at the same rate as fixed by this act for the superfices of the lode. The owner of the quartz-mill or reduction works, not owning a mine in connection therewith, may also receive a patent for his mill-site as provided in this section.

87. To avail themselves of this provision of law, parties holding the possessory right to a vein or lode, and to a piece of land not contiguous thereto, for mining or milling purposes, not exceeding the quantity allowed for such purposes by the local rules, regulations or customs, the proprietors of such vein or lode may file in the proper land office their application for a patent, under oath, in manner already set forth herein, which application, together with the plat and field notes, may include, embrace and describe, in addition to the vein or lode, such non-contiguous mill-site; and after due proceeding as to notice, etc., a patent will be issued conveying the same as one claim.

88. In making the survey in a case of this kind, the lode claim should be described in the plat and field notes as "Lot No. 37, A," and the mill-site as "Lot No. 37, B," or whatever may be its appropriate numerical designation; the course and distance from a corner of the mill-site to a corner of the lode claim to be invariably given in such plat and field notes, and a copy of the plat and notice of application for patent must be conspicuously posted upon the mill-site as well as upon the vein or lode for the statutory period of sixty days. In making the entry, no separate receipt or certificate need be issued for the mill-site, but the whole area of both lode and mill-site will be embraced in one entry, the price being $5 for each acre and fractional part of an acre embraced by such lode and mill-site claim.

89. In case the owner of a quartz-mill or reduction works is not the owner or claimant of a vein or lode, the law permits him to make application therefor in the same manner prescribed herein for mining claims, and after due notice and proceedings, in the absence of a valid adverse filing, to enter and receive a patent for the mill-site at said price per acre.

90. In every case there must be satisfactory proof that the land claimed as a mill-site is not mineral in character, which proof may, where the matter is unquestioned, consist of the sworn statement of the claimant, supported by that of one or more disinterested persons capable from acquaintance with the land to testify understandingly.

91. The law expressly limits mill-site locations made from and after its passage to five acres, but whether so much as that can be located depends upon the local customs, rules or regulations.

92. The Registers and Receivers will preserve an unbroken consecutive series of numbers for all mineral entries.

PROOF OF CITIZENSHIP OF MINING CLAIMANTS.

93. The proof necessary to establish the citizenship of applicants for mining patents, whether under the present or past enactments, it will be seen by reference to the seventh section of the act under consideration, may consist, in the case of an individual claimant, of his own affidavit of the fact; in the case of

an association of persons not incorporated, of the affidavit of their authorized agent, made on his own knowledge or upon information and belief that the several members of said association are citizens; and in the case of an incorporated company, organized under the laws of the United States, or the laws of any State or Territory of the United States, by the filing of a certified copy of their charter or certificate of incorporation.

94. These affidavits of citizenship may be taken before the Register or Receiver, or any other officer authorized to administer oaths within the district.

STATE AND OTHER LOCAL MINING LAWS.

Repeated allusions are made in these mining laws and rules of the United States Government, to the State and other local laws and regulations, as restricting, or otherwise modifying, the action of the United States laws. With the changes which have been made in the government laws within the last six or eight years, and the perfection they have reached through careful observation of their action, there is far less necessity for these local laws than there was, a few years ago, and we cannot learn that in Utah, Montana, or the Black Hills, any such laws or rules have been established. In California, and in Nevada, almost every county or mining district had its own mining laws; Nevada had also a State law, but California did not. Oregon, Idaho, Colorado, New Mexico, and Arizona, have their State or Territorial laws, the last named Territory, from its peculiar situation, having a somewhat lengthy code. We give below these State, Territorial, and District laws, so far as they are to be obtained, as they are of great importance to the mine-owners, and those who are intending to purchase mining property.

STATUTE OF NEVADA CONCERNING MINING CLAIMS.

The following are the main sections of a statute of the State of Nevada approved February 27, 1866:

SECTION 1. Any six or more persons who are males of the age of twenty-one years and upwards, holding mining claims in any mining district, or who hold mineral lands not

within the boundaries of any established mining district, may form a new mining district embracing said claims, at a meeting of such persons to be called by posting for five days in at least five conspicuous places within the limits of such proposed new district, notices in writing stating the place and time for holding such meeting, describing as near as may be the limits of such proposed new district, and signed by not less than five of such persons. At said meeting all males of the age of twenty-one years and upward holding mining claims, or any interest therein, within said limits, may vote, and by a majority vote determine whether said new mining district shall be established, and its boundaries, which shall be within the limits named in said notices; and thereafter the persons so qualified and holding mining claims in such newly established district shall proceed to select a name therefor and elect a district recorder, who shall be qualified as aforesaid. He shall perform all the duties required of him by law, and shall, within thirty days after qualifying, file and record in his office a record of the proceedings of said meeting. No district formed under the provisions of this act shall be divided by any county line. Mining districts now existing may be continued.

SEC. 22. On and after the second Saturday of July, 1866, all locations of mining claims shall be made in the following manner: On a monument not less than three feet high, firmly established in a conspicuous place on the claim, there shall be placed a plainly-written notice embracing a description of the ground claimed, the date of location, the name of the claim, the name of the company, and the names of the locators, with the number of feet claimed by each, and a copy of said notice, accompanied by a written request for a survey of said claim by the district recorder, shall, within thirty days after the making of such location, be filed in the office of the district recorder of the district in which said claim is located; and in case there be no legally authorized district recorder in and for the district, or the claim be outside of the limits of an organized mining district, then, and in that case, said notice may be filed in the office of the county recorder of the county in which said claim is located; and a

written request for a survey by the county surveyor shall be served upon the county surveyor within a reasonable time thereafter; the county surveyor, or his deputy, shall perform all the duties required of a district recorder by the provisions of this act. He shall keep a record of all his transactions in such cases, and for such services he may charge and receive the same fees allowed by law for his services in like cases. Within thirty days after the making of such location there shall be done on said claim, as assessment work, to hold the same up to and including the day preceding the first Saturday of the then following August, excavation involving the removal of fifty cubic feet of earth or loose material, or five cubic feet of solid rock, for each two hundred feet in the claim; and, as soon as may be thereafter, said district recorder shall survey the same and record the notice of survey as provided in section 14 of this act; and said district recorder shall file and record a certificate in regard to the assessment work, which shall be substantially in the following form:

—— DISTRICT, —— COUNTY, NEVADA, —— DAY OF —— MONTH OF YEAR.

This is to certify that on the ——— claim governed by the ——— company, surveyed on ——— date, there has been done by or on behalf of said company sufficient work to hold said claim up to the first Saturday of August next.

———, *District Recorder.*

SEC. 23. Any person may locate mining claims in favor of others, but no person shall be entitled to hold by location more than two hundred feet of any one ledge, except by virtue of discovery of the same, for which he shall be entitled to hold two hundred feet additional. In the case of locations made as extensions, the location of two hundred feet by virtue of discovery is allowed. No claim shall, in the aggregate, exceed in extent two thousand feet on any one ledge.

SEC. 24. Any location made on a ledge by authority of this act shall be deemed to include all the dips, spurs, angles, and variations of said ledge. The locators of any ledge shall be entitled to hold one hundred feet on each side of it, except

where they would by so doing invade the territory of a claim previously located.

SEC. 31. On the first Saturday of August, 1866, at which time the first assessment year shall begin, this act shall supersede all district mining laws, and thereafter said laws shall be considered as repealed: *Provided*, Any and all rights heretofore acquired under and by virtue of such distinct mining laws shall be determined in accordance with said mining laws existing at the time when said rights were acquired. During the period extending from and including the 1st day of May, 1866, to and including the day immediately preceding the first Saturday of the following August, no claim shall become subject to relocation by reason of the non-performance of assessment work. Locations may be made under this act at any time on and after the second Saturday of July, 1866, at which time the district recorders elected under this act shall, if qualified, enter upon the discharge of their duties, and on and after said second Saturday of July, no location shall be made under district mining laws.

SEC. 32. The doing of assessment work, or the payment of assessment dues, shall not be required in order to hold a claim during any assessment year, if during the year next preceding such assessment year there has been done on said claim, by or on behalf of the claimants thereof, an amount of work costing, at a fair valuation, not less than fifty cents for each foot in said claim; but in all other cases assessment work shall be done or assessment dues shall be paid as provided in this act. Assessment dues shall be paid for every assessment year by the parties holding the claim to the district recorder elected under this act, before the first Saturday of August, commencing the assessment year for which they are paid, except as otherwise provided in this section.

SEC. 33. Except as otherwise provided in section 32, every mining claim located and held under district mining laws, on which, before the 1st day of May, 1866, there has been work done involving the excavation of fifty cubic feet of earth or loose matter, or five cubic feet of solid rock, for each 200 feet in such claim, shall be subject to assessment dues. On every mining

claim located and held under district mining laws, on which such work has not been done before the 1st day of May, 1866, assessment work shall be done on or before the day immediately preceding the first Saturday of August, 1866. The doing of such assessment work or the paying of such assessment dues shall enable the owner of said claim to hold the same for the next ensuing assessment year, commencing on the first Saturday of August, 1866.

SEC. 34. The assessment work done within the thirty days after the location of a claim under this act, as provided in section 22, shall hold the same only up to the beginning of the assessment year following the date of said location, and for such next ensuing assessment year and for every year thereafter, except as provided in section 32 of this act, such claim shall be subject to assessment dues.

SEC. 45. The extraction of gold or other metals from alluvial or diluvial deposits, generally called placer mining, shall be subject to such regulations as the miners in the several mining districts shall adopt.

18.—REGULATIONS OF THE VIRGINIA DISTRICT, NEVADA.

The following are the regulations of the district of Virginia City, Nevada, adopted September 14, 1859:

ARTICLE 1. All quartz claims hereafter located shall be 200 feet on the lead, including all its dips and angles.

ART. 2. All discoverers of new quartz veins shall be entitled to an additional claim for discovery.

ART. 3. All claims shall be designated by stakes and notices at each corner.

ART. 4. All quartz claims shall be worked to the amount of $10 or three days work per month to each claim, and the owner can work to the amount of $40 as soon after the location of the claim as he may elect; which amount being worked shall exempt him from working on said claim for six months thereafter.

ART. 5. All quartz claims shall be known by a name and in sections.

ART. 6. All claims shall be properly recorded within ten days from the time of location.

ART. 7. All claims recorded in the Gold Hill record, and lying in the Virginia district, shall be recorded free of charge in the record of Virginia district, upon the presentation of a certificate from the recorder of the Gold Hill district, certifying that said claims have been duly recorded in said district; and said claims shall be recorded within thirty days after the passage of this article.

ART. 9. Surface and hill claims shall be 100 feet square, and be designated by stakes and notices at each corner.

ART. 10. All ravine and gulch claims shall be 100 feet in length, and in width extend from bank to bank, and be designated by a stake and notice at each end.

ART. 11. All claims shall be worked within ten days after water can be had sufficient to work said claims.

ART. 12. All ravine, gulch, and surface claims shall be recorded within ten days after location.

ART. 13. All claims not worked according to the laws of this district shall be forfeited and subject to relocation.

ART. 14. There shall be a recorder elected, to hold his office for the term of twelve months, who shall be entitled to the sum of fifty cents for each claim located and recorded.

ART. 15. The recorder shall keep a book with all the laws of this district written therein, which shall, at all times, be subject to the inspection of the miners of said district; and he is furthermore required to post in two conspicuous places a copy of the laws of said district.

19.—REGULATIONS OF REESE RIVER DISTRICT, NEVADA.

The following are the regulations of the Reese River District, Nevada:

SECTION 1. The district shall be known as the Reese River Mining District, and shall be bounded as follows, to wit: On the north by a distance of ten miles from the overland telegraph line, on the east by Dry creek, on the south by a distance of ten miles, from the overland telegraph line, and on the west by Edward's creek, where not conflicting with any new districts formed to date.

SEC. 2. There shall be a mining recorder elected on the 1st

day of June next for this district, who shall hold office for one year from the 17th of July next, unless sooner removed by a new election, which can only be done by a written call, signed by at least fifty claim-holders, giving notice of a new election to be held, after said notice shall have been posted and published for at least twenty days in some newspaper published in or nearest this district; and the recorder shall be a resident of this district.

SEC. 3. It shall be the duty of the recorder to keep in a suitable book or books a full and truthful record of the proceedings of all public meetings; to place on record all claims brought to him for that purpose, when such claim shall not interfere with or affect the rights and interests of prior locators, recording the same in the order of their date, for which service he shall receive $1 for each claim recorded. It shall also be the duty of the recorder to keep his books open at all times to the inspection of the public; he shall also have the power to appoint a deputy to act in his stead, for whose official acts he shall be held responsible. It shall also be the duty of the recorder to deliver to his successor in office all books, records, papers, etc., belonging to or pertaining to his office.

SEC. 4. All examinations of the record must be made in the full presence of the recorder or his deputy.

SEC. 5. Notice of a claim of location of mining ground by any individual, or by a company, on file in the recorder's office, shall be deemed equivalent to a record of the same.

SEC. 6. Each claimant shall be entitled to hold by location two hundred feet on any lead in the district, with all the dips, spurs, and angles, offshoots, outcrops, depths, widths, variations, and all the mineral and other valuables therein contained, the discoverer of and locator of a new lead being entitled to one claim extra for discovery.

SEC. 7. The locator of any lead, lode, or ledge in the district shall be entitled to hold on each side of the lead, lode, or ledge located by him or them one hundred feet; but this shall not be construed to mean any distinct or parallel ledge within the two hundred feet other than the one originally located.

SEC. 8. All locations shall be made by a written notice posted

upon the ground, and boundaries described, and all claimants' names posted on the notice.

SEC. 9. Work done on any tunnel, cut, shaft, or drift, in good faith, shall be considered as being done upon the claim owned by such person or company.

SEC. 10. Every claim (whether by individual or company) located shall be recorded within ten days after the date of location.

SEC. 11. All miners locating a mining claim in this district shall place and maintain thereon a good and substantial monument or stake, with a notice thereon of the name of the claim, the names of the locators, date of location, record, and extent of claim. It is hereby requested that owners in claims already located do comply with the requirements of this section.

SEC. 12. The recorder shall go upon the ground with any and all parties desiring to locate claims, and shall be entitled to receive for such service one dollar for each and every name in a location of two hundred feet each.

SEC. 13. It is hereby made the duty of the mining recorder, upon the written application of twenty-five miners, to call a meeting of the miners of the district by giving a notice of twenty days through some newspaper published in the Reese river district, which notice shall state the object of the meeting and the place and time of holding the same.

SEC. 14. The laws of this district passed July 17, 1862, are hereby repealed.

SEC. 15. These laws shall take effect on and after the 4th day of June, 1864.

20.—QUARTZ STATUTE OF THE STATE OF OREGON.

SECTION 1. That any person, or company of persons, establishing a claim on any quartz lead containing gold, silver, copper, tin, or lead, or a claim on a vein of cinnabar, for the purpose of mining the same, shall be allowed to have, hold, and possess the land or vein, with all its dips, spurs, and angles, for the distance of three hundred feet in length, and seventy-five feet in width on each side of such lead or vein.

SEC. 2. To establish a valid claim the discoverer or person

wishing to establish a claim shall post a notice on the lead or vein, with name or names attached, which shall protect the claim or claims for thirty days; and before the expiration of said thirty days he or they shall cause the claim or claims to be recorded as hereinafter provided, and describing, as near as may be, the claim or claims, and their location; but continuous working of said claim or claims shall obviate the necessity of such record. If any claim shall not be worked for twelve consecutive months it shall be forfeited and considered liable to location by any person or persons, unless the owner or owners be absent on account of sickness, or in the service of their country in time of war.

SEC. 3. Any person may hold one claim by location, as hereinafter provided, upon each lead or vein, and as many by purchase as the local laws of the miners in the district where such claims are located may allow; and the discoverer of any new lead or vein, not previously located upon, shall be allowed one additional claim for the discovery thereof. Nothing in this section shall be so construed as to allow any person not the discoverer to locate more than one claim upon any one lead or vein.

SEC. 4. Every person, or company of persons, after establishing such claim or claims, shall, within one year after recording or taking such claim or claims, work or cause to be worked to the amount of fifty dollars for each and every claim, and for each successive year shall do the same amount of work, under penalty of forfeiture of said claim or claims: *Provided*, That any incorporate company owning claims on any lead or vein may be allowed to work upon any one claim the whole amount required as above for all the claims they may own on such lead or vein.

SEC. 5. It shall be the duty of the county clerk of any county, upon the receipt of a notice of a miners' meeting organizing a miners' district in said county, with a description of the boundaries thereof, to record the same in a book to be kept in his office as other county records, to be called a "book of record of mining claims;" and, upon the petition of parties interested, he may appoint a deputy for such district, who shall reside in said district or its vicinity, and shall record all mining claims and

water rights in the order in which they are presented for record; and shall transmit a copy of such record at the end of each month to the county clerk, who shall record the same in the above-mentioned book of record, for which he shall receive one dollar for each and every claim. It shall further be the duty of said county clerk to furnish a copy of this law to his said deputy, who shall keep the same in his office, open at all reasonable times for the inspection of all persons interested therein.

SEC. 6. Miners shall be empowered to make local laws in relation to the possession of water rights, the possession and working of placer claims, and the survey and sale of town lots in mining camps, subject to the laws of the United States.

SEC. 7. That ditches used for mining purposes, and mining flumes permanently affixed to the soil, be and they are hereby declared real estate for all intents and purposes whatever.

SEC. 8. That all laws relative to the sale and transfer of real estate, and the application of the liens of mechanics and laborers therein, be and they are hereby made applicable to said ditches and flumes: *Provided*, That all interests in mining claims known as placer or surface diggings may be granted, sold, and conveyed by bill of sale and delivery of possession as in cases of the sale of personal property: *Provided further*, That the bills of sale or conveyances executed on the sale of any placer or surface mining claim shall be recorded within thirty days after the date of such sale, in the office of the county clerk of the county in which such sale is made, in a book to be kept by the county clerk for that purpose, to be called the record of conveyances of mining claims.

SEC. 9. Mortgages of interests in placer or surface mining claims shall be executed, acknowledged, recorded, and foreclosed as mortgages of chattels.

SEC. 10. The county clerk shall be entitled to a fee of one dollar each for every conveyance or mortgage recorded under the provisions of this act.

21.—QUARTZ STATUTE OF IDAHO.

The following is the statute of Idaho in regard to quartz claims:

SEC. 1. That any person or persons who may hereafter discover any quartz lead or lode shall be entitled to one claim thereon by right of discovery, and one claim each by location.

SEC. 2. That a quartz claim shall consist of two hundred feet in length along the lead or lode by one hundred feet in breadth, covering and including all dips, spurs, and angles within the bounds of said claim, as also the right of drainage, tunnelling, and such other privileges as may be necessary to the working of said claim.

SEC. 3. The locator of any quartz claim on any lead or lode shall, at the time of locating such claim, place a substantial stake, not less than three inches in diameter, at each end of said claim, on which shall be a written notice specifying the name of the locator, the number of feet claimed, together with the year, month, and day when the same was taken.

SEC. 4. All claims shall be recorded in the county recorder's office, within ten days from the time of posting notice thereon: *Provided*, That when the claim located is more than thirty miles distant from the county seat the time shall extend to fifteen days.

SEC. 5. Quartz claims recorded in accordance with the provisions of section 4 of this act shall entitle the person so recording to hold the same to the use of himself, his heirs and assigns: *Provided*, That within six months from and after the date of recording he shall perform, or cause to be performed, thereon work amounting in value to the sum of one hundred dollars.

SEC. 6. Any person or persons holding quartz claims in pursuance of this act shall renew the notice required in section 3 at least once in twelve months, unless such claimant is occupying and working the same.

SEC. 7. The conveyances of quartz claims heretofore made by bills of sale or other instruments of writing, with or without seals, shall be construed in accordance with the local mining rules, regulations, and customs of miners in the several mining districts, and said bills of sale or instruments of writing concerning quartz claims without seals shall be *prima facie* evidence

of sale, as if such conveyance had been made by deed under seal.

SEC. 8. Conveyances of quartz claims shall hereafter require the same formalities and shall be subject to the same rules of construction as the transfer and conveyance of real estate.

SEC. 9. The location and pre-emption of quartz claims heretofore made shall be established and proved when there is a contest before the courts, by the local rules, customs, and regulations of the miners in each mining district where such claim is located, when not in conflict with the laws of the United States or the laws of this Territory.

SEC. 10. This act to take effect and to be in force from and after its approval by the governor.

Approved February 4, 1864.

23.—STATUTE OF ARIZONA.

The following is the statute of Arizona on the registry and government of mines and mineral deposits, with the exception of the sections providing the manner in which the rights of miners shall be enforced by the courts:

SEC. 1. All mining rights on the public lands of the United States, as well as rights acquired by discovery on the lands of private individuals, are possessory in their character only, and such possessory rights shall be limited, regulated, and governed as hereinafter provided.

SEC. 15. Every mining claim or pertenencia is declared to consist of a superficial area of 200 yards square, to be measured so as to include the principal mineral vein or mineral deposits, always having reference to and following the dip of the vein so far as it can or may be worked, with all the earth and minerals therein. But any mining district organized in accordance with the provisions of this chapter may prescribe the dimensions of said mining claim or pertenencia for such district: *Provided*, That in no case the dimensions so prescribed shall exceed the number of yards allowed by this section; *and further provided*, That no such mining district shall diminish the extent of the territorial claim to one pertenencia, as defined in this section.

SEC. 16. Any person discovering or opening a vein or other mineral deposit in this Territory, not actually worked or legally owned by other parties or registered in accordance with this chapter, shall by properly denouncing and registering the same be entitled to claim and hold a possessory right to a tract of land to the extent of two mining claims or pertenencias, including the said vein or mineral deposit, and conforming as nearly as possible to the general direction thereof, each to be measured 200 yards long by 200 yards wide, the direction of the lines to be determined by the person claiming.

SEC. 17. If two or more persons are associated, and have formed a company for the exploration and working of mines, and one or several shall make discoveries of mineral deposits in consequence thereof, said company so engaged in exploration shall be entitled to denounce and register one discovery claim only upon each lode.

SEC. 18. It shall be lawful for the claimants of a mine or mineral lands to locate and take possession of public lands for a mill site and other necessary works connected therewith, which shall not exceed one-quarter section, containing a stream or other water suitable for the purpose. They shall have a right to place a dam or other obstructions on such stream, and to divert its water for the above uses and purposes. They shall, within the time and in the manner prescribed in this chapter for the registration and denouncement of mines, proceed to denounce and register the same with the clerk of the probate court, and they shall be known as auxiliary lands. And if within three years from the day their notice of claim is so recorded they shall expend in fitting the same for a mill, or in placing a mill or reduction works thereon, the sum of $100, they may cause the record of such work to be made and proceedings for confirming their title to be instituted as provided in section 29 of this chapter, with like effect, and receive a certificate of title as thereon provided, conforming as nearly as they can to the requirements of that section. Instead of the work required by section 32 of this chapter they shall use the machinery or other works erected upon said land for mining purposes at least thirty days

in each year. Such claims shall be subject to all the provisions of this chapter which are applicable to mining rights, and may be abandoned and relocated. All rights to auxiliary lands acquired under the laws of any mining district before this act takes effect shall be valid, and the owners of the same, upon complying with the provisions of this section, may take the like proceedings to confirm their titles, with a like effect.

SEC. 19. It shall be the duty of all claimants of mining claims, mineral lands, and auxiliary tracts, to at once define the extent and boundary of them as nearly as possible, by good substantial monuments or other conspicuous marks, in the presence of the recorder of the mining district, or of some witness who shall prove to the satisfaction of the recorder that the same has been done, and to post up a public notice of their claim at the opening of the principal vein, and to have them properly registered and recorded within three months from the time of first claiming them at the office of the mining district recorder according to the provisions of this chapter. Such record shall give a faithful description of the veins, mineral deposits, and tracts of lands, the character and bearing of the veins or deposits, and their connection with natural monuments or conspicuous objects in the vicinity.

SEC. 20. No person shall change his original monuments or boundaries of mineral or other lands, but if a subsequent investigation makes this convenient or necessary, and it can be done without prejudice to other parties, then such change shall take place by the sanction of the judge of the probate court, provided they are properly recorded, and the new boundaries and monuments fixed at once when the original ones are removed.

SEC. 21. All minerals, woods, waters, earths, and vegetation found within the boundaries of any tract of land registered and claimed for mining shall be exclusively used by him or them who are legally entitled to the possession of the land wherein or whereon they are situated, so long as they are used for mining purposes only: *Provided*, That no one shall have the right to prevent transient persons from using the waters along the pub-

lic highways, where they were provided by nature in natural tanks, springs, streams, or otherwise, nor from making such equitable disposition of the waters as the legislature shall prescribe.

SEC. 22. No person shall have the right to impede or inconvenience travelling by fencing up the public roads, filling them up with rubbish, or undermining them so as to endanger their safety, neither shall any one change their established direction without sanction of the proper authorities.

SEC. 23. Whenever two or more persons or parties explore and prospect one and the same vein, and at or about the same time but at different places, and without knowledge of each other, then he or they who shall prove first occupancy shall have the right of first location, taking the principal point of excavation as the centre of their claim or claims on each side along the general direction of such vein or deposit. The other parties shall proceed by the same laws after the others have fixed their boundaries. Should there be left vacant ground between the different parties, then it shall be at the option of the first discoverers so to change their boundaries as shall best suit them, and have them recorded accordingly. Any other parties shall locate in the order of the time of their arrival on the vein or mineral deposit.

SEC. 24. Whenever two or more parties shall select the same mine or mineral deposit for exploration, and the parties first on the ground, knowing the other parties to be at work, shall fail to give warning, either verbally or in writing, of their priority claim on such vein or deposit, then that portion of the mine situated between the main excavations of the two parties shall be equally divided between them, irrespective of the number of members each company may have: *Provided*, That the intervening portions shall not exceed the quantity of land allowed by the provisions of this chapter.

SEC. 25. The laws and proceedings of all mining districts established in this Territory for the denouncement, registration, and regulation of mines, mining claims, mineral lands, and auxiliary lands, prior to the day this act takes effect, are hereby

legalized and declared to be as valid and binding in all courts of law as if enacted by this legislative assembly, to the extent and under the conditions and restrictions herein contained.

I. All rights, claims, and titles to any veins, mineral lands, or mineral deposits, and auxiliary lands, acquired before this act takes effect, under, by virtue of, and in conformity to the laws of said mining districts, are hereby declared to be valid and legal, and shall be respected and enforced in all courts of this Territory, when sustained by the evidence herein provided; but no amount of work done thereon shall be construed to give a perpetual title thereto, but shall give such title only and such rights and privileges as are provided in section 29 of this chapter; and no person who was at the time of the location of his claim an inhabitant of this Territory shall forfeit his claim because he was not a resident also of the mining district in which his said claim was located. And no such right, claim, or title shall be considered as abandoned provided the claimant shall within six months from the day this act takes effect file with the clerk of the probate court of the county in which his claim is situated a brief description of the same, giving the name of the district in which the lode is situated, and of the lode or lodes, and the extent of his claim thereon, with a declaration that he intends to retain and work the same according to law, unless such claim has been forfeited and subject to re-location under the laws of such mining district before this act takes effect.

II. All records and all papers required by the laws of said mining districts to be deposited with the recorders of said districts for record shall be received as evidence of their contents in all courts of this Territory, and shall not be rejected for any defects in their form, when their contents may be understood, but shall be valid to the extent provided by said mining laws, except as hereinbefore restricted: *Provided*, That such records and papers are deposited with or recorded by the clerk of the probate court of the county in which said mining district is located, and within three months from the time this act takes effect; and if said records or papers are lost or mutilated, or if such recorder of a mining district shall neglect or refuse to

deposit the same as aforesaid, an affidavit of their contents made by any person interested therein, or certified or sworn copies thereof, may be so recorded, and shall have the like effect.

III. All conveyances of mines, mining rights, mineral and auxiliary lands made prior to the time this act takes effect shall be valid and binding to pass the title of the grantor thereof, although defective in form and execution, if their contents can be understood, and as such shall be received and regarded in all courts of this Territory: *Provided*, That such conveyances shall be deposited with or recorded by the clerk of the probate court of the county where said mines are situated, within three months from the time this act takes effect, and if lost or mutilated, copies or affidavits of their contents, executed as aforesaid, may be recorded as provided above.

SEC. 26. Every recorder, register, clerk, or other recording officer, of every such mining district, or who has at any time acted as such recording officer, within three months after this act takes effect, shall deposit with the clerk of the probate court of the county in which said district or greater part thereof is situated, all records which he has so kept, and all papers deposited in his hands for record, and papers so made or deposited with his predecessors in said office, which are in his hands as aforesaid, or he shall so deposit certified copies of the same. And such records and other papers shall be securely kept by such clerk, open in office hours to public inspection, and copies of the same duly certified by him shall be received in all courts of justice, and have the same effect as the originals. And any such recorder, register, or other recording officer of each mining district who shall neglect or refuse to comply with the provisions of this section shall be liable in damages to the party injured thereby, and shall be liable to be punished by the judge of probate of the county in which said mining district, or the greater part thereof, is situated, for contempt, by fine not exceeding $5,000 and imprisoned not more than one year, and shall be incapable of holding any such office and mining claim.

SEC. 27. Mining districts now existing may be continued, or new mining districts may be established in the manner and for the purposes hereinafter provided.

I. The recorder of every mining district now existing shall at the same time that he deposits the records of said districts with the clerk of the probate court, as the last preceding section requires, take an oath before the judge of said court that he will faithfully perform the duties of his office until another recorder shall be elected and qualified in his place, which oath shall be recorded by the clerk of the probate court. He shall record in a book to be kept by him for that purpose all notices of claims or rights to veins, mineral deposits, mineral lands, and auxiliary lands which may be left with him to be recorded, and shall note on all papers which may be received by him to be recorded, the time when they were so received by him, and they shall be considered as recorded from that time. He shall, when requested by any such claimant, go with him to his claim and see that the same is measured by metes and bounds, and marked by substantial monuments on the surface of the earth, and shall make a record of the same, and of the time when it was done, and certify it to be correct, or shall make a record and certificate of the same on the evidence of a credible witness, who was present when the same was done, and is cognizant of the facts, and whose name shall be entered on the record. He shall, when requested by any such claimant, go with him to his claim and examine any shaft that may be sunk by him, or tunnels that may be opened to the same, and make measurements of the same, and a record and certificate as aforesaid; and he shall in like manner examine, measure, or estimate, and make and record a certificate of any work which is required by law to be done by a claimant. And the said recording officer shall, quarterly, file with the clerk of the probate court of the county in which said district is located a copy by him certified of all records made by him for the three months last preceding, which shall be duly recorded by said clerk, and a copy of said record duly certified by him shall be evidence of its contents in all courts of this Territory. And such recording officer shall be liable to all the penalties provided in the preceding section if he shall neglect or refuse to perform any of the acts and duties required of him by this section, but shall not be required to perform any such ser-

vice until his fees for the same, to be fixed by the mining districts, are paid him, if he requests it. And if any paper deposited with him for record is required to be recorded by the clerk of the probate court, he shall at the time said paper is so deposited with him take and receive the fee fixed by law for recording such paper by said clerk, and pay the said clerk said fee when he deposits said paper with him to be recorded as aforesaid. All such mining districts may make laws not inconsistent with the laws of the Territory, may elect officers for the government of such districts, and fix their compensation, but all such acts and proceedings shall be recorded, and all records and papers thereof filed with the clerk of the probate court as aforesaid.

II. Any number of persons, not less than twelve, owning mining claims in any mining district, or in any contiguous mining districts, or who have discovered and may wish to denounce a mine or mineral lands, not within the limits of any established mining district, may proceed to make a new mining district at a meeting of persons holding claims in such district so to be established, and of claimants in any districts to be divided or to be included therein. They shall cause a notice in writing, and specifying the limits of said contemplated district, signed by them, to be posted in three conspicuous places in said district, and if any part of an established district is to be included therein, by leaving a copy of said notice with the recorder of said district at least ten days before the day of said meeting. At said meeting all persons holding claims as aforesaid may vote, and may determine by a majority vote of those present whether said new district shall be established, and its limits, but within the boundaries named in the notice for said meeting, and thereupon the persons holding claims in such newly established district shall proceed to select a name, and make laws therefor, and elect a recorder, who shall be qualified as aforesaid, who shall perform all the duties and be subject to all the liabilities provided in this chapter for such officers, and shall file with the clerk of the probate court as aforesaid a record of the proceedings of this and all subsequent meetings at the time and in the manner herein provided.

SEC. 28. It shall be the duty of all claimants of mineral tracts to sink at least one shaft of thirty feet in depth, or to run a tunnel of fifty feet in length, in the body of the vein or in the adjoining rock, so as to test the vein from the surface, for the purpose of ascertaining the character and capacity of such mineral deposit, within the space of one year from the day of first taking possession thereof, and they shall notify the recorder of the mining district that said shaft or other work is completed, and that they intend working the vein or mineral deposit. And the recorder shall examine said work in person, and make and record a certificate of the result of such examination, which shall contain a statement of the condition and quality of the vein or mineral deposit, the amount of labor performed, and a general view of the results obtained. Said report shall be accompanied by three specimens taken from different parts of the work, which said specimens, with a copy of the record so made by him, shall be filed by him within the time required by this act in the office of the clerk of the probate court. And said clerk shall make a record of the same. Such specimens shall be numbered and described by him, and be preserved for the use of the mineralogical professorship of the University of Arizona.

SEC. 29. The judge of the probate court, at any time within thirty days after the record made by the clerk of said court, as provided in the preceding section, upon complaint in writing made to him by such claimants, describing fully their claims, stating the labor performed by them, and the certificate thereof, and that the registration of the same has been made as required by law, and requesting that their title thereto may be confirmed, shall cause a summons, under the seal of his court, to be issued, requiring all persons interested to appear at a day named therein, and which shall not be less than sixty days from the day the same was issued, and show cause why the title of such complainants and claimants should not be confirmed, a copy of which complaint and summons, duly attested by the clerk of the probate court, shall be published twice in the territorial newspaper, and be kept posted in the office of said clerk from the

day of issuing the same to the return day thereof; and if no person shall appear on such return day to contest the right of the claimants to such claims, the judge of probate shall examine all the records filed in the office of his clerk relating to such claims, and if he finds that the said claimants have in all respects complied with the provisions of this chapter, he shall make a decree in substance that the complainants have complied with the laws of this Territory relating to the denouncement and registration of mines, have acquired a perfect title to their claims (describing the same) until the 1st day of January, A. D. 1868, and forever after unless abandoned by them. And the said clerk shall give the said claimant a copy of such decree, under the seal of the court, which shall be conclusive evidence of title in any proceedings relating to such claims, until they are abandoned. And unless the persons adversely interested and contesting the title of the complainants shall appear on the day named in said complaint, and proceed as hereinafter provided, they shall be forever barred from contesting the title of said complainants to such claims. And if the contestants shall so appear they shall on that day or some day to be fixed by said judge proceed to file an answer, setting forth their claim and case, and the proceedings shall then be conducted in conformity to the provisions of this chapter and the code of civil practice. And whenever a final decree is made thereon, determining the title to said claim or mine, by said judge, or by any other court on appeal, the said judge shall cause a record to be made in the office of his clerk of such decree, and a certified copy thereof may be made as aforesaid, with the like effect. And any claimants of mineral lands who before this act takes effect have in any way or under any law acquired a title to such mineral lands, after filing with the clerk of the court their evidence of title and description of claim as required by this chapter, may cause an examination of the shaft sunk by them or other work done by them to be made as aforesaid, and take the like proceedings for the confirmation of their titles, with the same effect: *Provided*, This section shall not apply except when the complainants are in possession of such mine or mining rights, claiming title thereto.

SEC. 30. By reason of the Indian wars and unsettled condition of the country, the time within which a shaft is required to be sunk, or other labor performed on a claim, shall not commence until two years from the day this act takes effect, and all the provisions of this chapter relating thereto are suspended for that time; but any claimant may sink a shaft or do such other labor, and at any time after the record of their claims with the probate court, and thereupon institute proceedings to confirm their titles, and be entitled to all the rights and privileges provided for in this chapter.

SEC. 31. No single person or company shall be compelled to sink shafts or make other improvements on more than one of the tracts of land claimed by him or them for the same vein or mineral deposit; and any number of claimants on the same vein or mineral deposit, who may unite for said purpose, shall be allowed to concentrate labor, capital, and energy to any one single point which to him or them shall be the best suited to ascertain to the best advantage the general character, quality, and capacity of that particular vein or mineral deposit, and may take the like proceedings to confirm their titles.

SEC. 32. After the work required by section 28 of this chapter has been performed, and the record thereof made as therein provided, two years shall be allowed the claimants of mineral lands to develop the same, and procure machinery and provide for working the same; and during that time the same shall not be considered abandoned, although no work be done thereon: *Provided*, That in such an event, they shall annually, and before the 1st day of June in each year, file with the clerk of the probate court an affidavit signed by them that they have not abandoned such claims, but intend, in good faith, to work them; and said term of two years shall not commence until the 1st day of January, A. D. 1868. And after the expiration of said term of two years, it shall be obligatory upon claimants to such mineral lands to hold actual possession of them and work the vein, which obligation shall be considered as complied with by doing at least thirty days' work thereon in each year; but if such claimants are prevented from working such vein by the hostility of Indians or other good cause,

rendering said working difficult or dangerous, they may, by authority of the judge of probate first obtained, be relieved from performing labor thereon from time to time, but for not more than one year at any one time, during the continuance of such cause.

SEC. 33. Any person who may discover a mineral vein or deposit as aforesaid, which is not included within a mining district, or which may be in a mining district in which there is no legally authorized recorder, may acquire title thereto, and to auxiliary lands, by giving notice as aforesaid, and recording the same with the clerk of the probate court of the county in which the same is situated, and may take the same proceedings, with the like effect, with the clerk of the probate court that are required to be taken with the recorder of a mining district.

SEC. 34. Discoverers of mines on lands in the legal ownership or possession of others, and not public lands, before doing the work of sinking the shaft required by section 28 of this chapter, shall pay to such parties such compensation for the use of the same as may be awarded by the judge of probate upon complaint of either party, or shall give bond to such parties for payment of the same, and sureties to be approved by said judge; and whenever it becomes necessary or advantageous to construct tunnels for the purpose of drainage, ventilation, or the better hauling of ores or other subterraneous products or mining materials, it shall be lawful for any party or parties to construct such tunnel or drift through all private and public property: *Provided*, That all damages arising from such subterranean works to the other parties, to be determined as provided above, shall be paid by the parties for whose benefit such tunnelling is done, to be paid before such work is commenced, or security given to the satisfaction of the judge of probate for the payment of the same; but no damages shall be paid on public lands when claims for such lands shall be set up after such tunnel shall have been projected or actually in process of construction: *Provided*, That the lapse of time between projection and actual work shall not exceed ninety days, and that the tunnelling parties give timely notice of their project to any new claimant of the so affected ground.

SEC. 35. Whenever such tunnel as mentioned in the preceding section shall intersect or traverse mineral deposits, or run along lodes claimed and held by other parties, then it shall be at the option of the owners of such other mineral deposits either to pay one-half of the expense of excavation for the distance that such tunnel runs through their mineral deposits, and secure the whole of the ores excavated, or to divide the ores with the tunnelling parties, the latter paying all expenses of excavation; or, it shall be optional with either party to abandon all claim to the ores excavated.

SEC. 36. If, in the construction of such subterranean works, new veins or deposits are encountered in ground not claimed or owned by other parties, they shall become the property of the party for whom such tunnel is constructed, and shall be denounced and registered as is required of new mines, and shall be governed by the same laws as are prescribed in this chapter.

SEC. 37. Any claimant or claimants not complying with any of the foregoing conditions and obligations, shall forfeit all right to any such recorded or unrecorded claims to mineral and auxiliary tracts; and it shall not be lawful for him or them to register such claims anew within a period of three years after such forfeiture. All such tracts shall be free for working and registry to any but those excepted in this section.

SEC. 38. All veins and mineral deposits situated on public lands, which have not been worked and occupied from the time of the acquisition of the Territory by the United States up to the time of the passage of this chapter, except as herein provided, shall be considered as abandoned and subject to registry and denouncement.

SEC. 39. All veins and mineral deposits that have been or may be abandoned hereafter shall, in all cases and respects, be governed by the laws regulating the opening and working of new veins and deposits, as prescribed in this chapter.

SEC. 40. Whenever any mine, vein, or mineral deposit shall have been abandoned or forfeited in accordance with the provisions of this chapter, and registered anew by other parties, it shall be obligatory upon such parties to give the former owners warning

thereof, so as to remove from the tract, within the space of three months, anything he or they may think valuable or useful. Such warning shall be given in the nearest newspaper published in the Territory, and by posting it at three of the most conspicuous places in the county where the mine is situated. Three months after the expiration of such warning, any and all buildings, furnaces, arrastras, metals, and every other species of property which may still remain on the ground of such mine, vein, or mineral deposit shall become the undisputed property of the new claimant, without compensation of any kind to any person whatever.

SEC. 41. Any person taking possession of or entering upon a mining claim or auxiliary lands, registered according to the provisions of this chapter, and before it is abandoned, shall be ousted therefrom in a summary manner by the order of the probate judge, and the malfeaser shall be adjudged to pay all damages and costs consequent thereon.

SEC. 51. It shall be the duty of persons who may discover and claim mining rights or mineral lands, at the same time that they may define the boundary of their claim or claims to any lode or mine as required by the provisions of this chapter, to lay off and define the boundary of one pertenencia, as required by the provisions of this chapter, adjoining their claim or claims, which shall be the property of the Territory of Arizona. And at the same time that they present their notice of claim or claims to be recorded by the recorder of the mining district, they shall also present to such recorder the claim of said Territory. And, if said discoverers and claimants shall neglect or refuse to present to such recorder the claim of said Territory as aforesaid, they shall forever forfeit all claim to the mine or ledge so discovered by them. Any recording officer recording the claim or claims of such discoverers and claimants, when the claim of said Territory is not filed therewith as aforesaid, shall be subject to all the penalties provided in section 26 of this chapter. Such claim shall be recorded as provided in this chapter for like claims, but no work shall be required to be done thereon, nor shall it be considered to be abandoned so long as it is the property of the Territory; and if sold, the

time within which the purchaser shall be required to work said claim shall commence from the day of sale, except when the time is suspended as before provided. Every clerk of the probate court, as soon as he records the said claim, shall send a copy of his record to the treasurer of the Territory, and no fees shall be charged by any recording officer in any matter relating to said claim. And the Territorial treasurer may, at any time after six months from the day he receives such record as aforesaid, and at such time and place as in his opinion will be most for the interest of the Territory, cause such claim to be sold at auction to the highest bidder; but every such sale shall be at least twice advertised in the Territorial newspaper, and be held at his office, or the office of the clerk of the probate court, or the recorder of the mining district of the county where the claim is situated. And the treasurer is authorized to make a deed of the same to the purchaser in the name of the Territory; and the amount received by him shall be added by him to any fund now or hereafter provided for the protection of the people of the Territory of Arizona against hostile Indians, and be expended as provided by law. And after all such expenses as are incurred by the Territorial authorities for the purpose of destroying or bringing into subjection all hostile Indian tribes in this Territory are liquidated, then all remaining or accruing funds, out of all or any sales of Territorial mining claims, shall be applied as a sinking fund for school purposes.

SEC. 52. The extraction of gold from alluvial and diluvial deposits, generally termed placer mining, shall not be considered mining proper, and shall not entitle persons occupied in it to the provisions of this chapter, nor shall any previous section of this chapter be so construed as to refer to the extraction of gold from the above-mentioned deposits.

SEC. 53. This chapter shall be in force and take effect from and after the 1st day of January, A. D. 1865.

MINING LAWS OF COLORADO.

AN ACT CONCERNING MINES.

Be it enacted by the Council and House of Representatives of Colorado:

EXTENT OF LODE CLAIM.

SECTION 1. The length of any lode claim hereafter located may equal but not exceed 1,500 feet along the vein.

DIMENSIONS.

SEC. 2. The width of lode claims hereafter located in Gilpin, Clear Creek, Boulder and Summit counties, shall be seventy-five feet on each side of the centre of the vein or crevice; and in all other counties the width of the same shall be 150 feet on each side of the centre of the vein or crevice: *Provided*, That hereafter any county may, at any general election, determine on a greater width, not exceeding 300 feet on each side of the centre of the vein or lode, by a majority of the legal votes cast at said election; and any county, by such vote at such election, may determine upon a less width than above specified.

CERTIFICATE OF LOCATION.

SEC. 3. The discoverer of a lode shall, within three months from the date of discovery, record his claim in the office of the recorder of the county in which such lode is situated by a location certificate, which shall contain: 1st, the name of the lode; 2d, the name of the locator; 3d, the date of location; 4th, the number of feet in length claimed on each side of the centre of the discovery shaft; 5th, the general course of the lode as near as may be.

WHEN VOID.

SEC. 4. Any location certificate of a lode claim which shall not contain the name of the lode, the name of the locator, the date of location, the number of lineal feet claimed on each side of the discovery shaft, the general course of the lode, and such description as shall identify the claim with reasonable certainty, shall be void.

DISCOVERY SHAFT.

SEC. 5. Before filing such location certificate the discoverer

shall locate his claim by first sinking a discovery shaft upon the lode to the depth of at least ten feet from the lowest part of the rim of such shaft at the surface, or deeper, if necessary to show a well-defined crevice. *Second*, by posting at the point of discovery on the surface, a plain sign or notice containing the name of the lode, the name of the locator, and the date of discovery. *Third*, by marking the surface boundaries of the claim.

STAKING.

SEC. 6. Such surface boundaries shall be marked by six substantial posts, hewed or marked on the side or sides which are in toward the claim, and sunk in the ground, to wit: One at each corner and one at the centre of each side line. Where it is practically impossible on account of bed-rock or precipitous ground to sink such posts, they may be placed in a pile of stones.

OPEN CUTS, ETC.

SEC. 7. Any open cut, cross cut or tunnel which shall cut a lode at the depth of ten feet below the surface, shall hold such lode the same as if a discovery shaft were sunk thereon, or an adit of at least ten feet along the lode, from the point where the lode may be in any manner discovered, shall be equivalent to a discovery shaft.

TIME.

SEC. 8. The discoverer shall have sixty days from the time of uncovering or disclosing a lode to sink a discovery shaft thereon.

CONSTRUCTION OF CERTIFICATE.

SEC. 9. The location or location certificate of any lode claim shall be construed to include all surface ground within the surface lines thereof and all lodes and ledges throughout their entire depth, the top or apex of which lies inside of such lines extended downward, vertically, with such parts of all lodes or ledges as continue to dip beyond the side lines of the claim, but shall not include any portion of such lodes or ledges beyond the end lines of the claim, or at the end lines continued, whether by dip or otherwise, or beyond the side lines in any other manner than by the dip of the lode.

CANNOT BE FOLLOWED.

SEC. 10. If the top or apex of a lode in its longitudinal course extends beyond the exterior lines of the claim at any point on the surface, or as extended vertically downward, such lode may not be followed in its longitudinal course beyond the point where it is intersected by the exterior lines.

RIGHT OF WAY AND RIGHT OF SURFACE.

SEC. 11. All mining claims now located, or which may hereafter be located, shall be subject to the right of way of any ditch or flume for mining purposes, or any tramway or pack-trail, whether now in use or which may be hereafter laid out across any such location: *Provided always*, That such right of way shall not be exercised against any location duly made and recorded and not abandoned prior to the establishment of the ditch or flume, tramway, or pack-trail, without consent of the owner, except by condemnation, as in case of land taken for public highways. Parol consent to the location of any such easement, accompanied by the completion of the same over the claim, shall be sufficient without writings. *And provided further*, That such ditch or flume shall be so constructed that the water from such ditch or flume shall not injure vested rights by flooding or otherwise.

SEC. 12. When the right to mine is in any case separate from the ownership or right of occupancy to the surface, the owner or rightful occupant of the surface may demand satisfactory security from the miner, and if it be refused, may enjoin such miner from working until such security is given. The order for injunction shall fix the amount of the bond.

RE-LOCATION OF CLAIMS

SEC. 13. If at any time the locator of any mining claim heretofore or hereafter located, or his assigns, shall apprehend that his original certificate was defective, erroneous, or that the requirements of the law had not been complied with before filing; or shall be desirous of changing his surface boundaries; or of taking in any part of an overlapping claim which has been abandoned; or in case the original certificate was made prior to the

passage of this law, and he shall be desirous of securing the benefits of this act, such locator or his assigns may file an additional certificate, subject to the provisions of this act: *Provided*, That such relocation does not interfere with the existing rights of others, at the time of such relocation; and no such relocation, or the record thereof, shall preclude the claimant or claimants from proving any such title or titles as he or they may have held under previous location.

PROOF OF DEVELOPMENT.

SEC. 14. The amount of work done, or improvements made during each year, shall be that prescribed by the laws of the United States.

FORM OF AFFIDAVIT.

SEC. 15. Within six months after any set time, or annual period herein allowed for the performance of labor or making improvements upon any lode claim, the person on whose behalf such outlay was made, or some person for him, shall make and record an affidavit in substance as follows:

STATE OF COLORADO, } ss.
COUNTY OF..... }

Before me, the subscriber, personally appeared..... .....who, being duly sworn, saith that at least.....dollars' worth of work or improvements were performed or made upon [here describe the claim or part of claim] situate in.....mining district, county of.....State of Colorado. Such expenditure was made by or at the expense of..... owners of said claim, for the purpose of said claim.

[Jurat.] .....(Signature.)

And such signature shall be *prima facie* evidence of the performance of such labor.

WORKING OVER OLD CLAIMS.

SEC. 16. The relocation of abandoned lode claims shall be by sinking a new discovery shaft and fixing new boundaries in the same manner as if it were the location of a new claim; or the relocator may sink the original discovery shaft ten feet deeper than it was at the time of abandonment, and erect new or adopt the old boundaries, renewing the posts if removed or destroyed. In either case a new location-stake shall be erected. In any

case, whether the whole or part of an abandoned claim is taken, the location certificate may state that the whole or any part of the new location is located as abandoned property.

RECORD FOR CLAIM.

SEC. 17. No location certificate shall claim more than one location, whether the location be made by one or several locators. And if it purport to claim more than one location, it shall be absolutely void, except as to the first location therein described. And if they are described together, so that it cannot be told which location is first described, the certificate shall be void as to all.

SEC. 18. All acts or parts of acts in conflict with this act are hereby repealed.

SEC. 19. This act shall be in force from and after June 15, 1874.

Approved February 13, 1874.

SUPPLEMENTARY ACT.

Be it enacted by the Council and House of Representatives of Colorado:

JURISDICTION OF AUTHORITIES.

SEC. 1. In all actions pending in any district court of this Territory, wherein the title or right of possession to any mining claim shall be in dispute, the said court, or the judge thereof, may, upon application of any of the parties to such suit, enter an order for the underground as well as the surface survey of such part of the property in dispute as may be necessary to a just determination of the question involved. Such order shall designate some competent surveyor, not related to any of the parties to such suit, or in anywise interested in the result of the same; and upon the application of the party adverse to such application, the court may also appoint some competent surveyor, to be selected by such adverse applicant, whose duty it shall be to attend upon such survey, and observe the method of making the same; said second survey to be at the cost of the party asking therefor. It shall also be lawful in such order to specify the names of witnesses named by either party, not exceeding three on each side, to examine such property, who shall here-

upon be allowed to enter into such property and examine the same; said court, or the judge thereof, may also cause the removal of any rock, debris, or other obstacle in any of the drifts or shafts of said property, when such removal is shown to be necessary to a just determination of the questions involved: *Provided, however*, That no such order shall be made for survey and inspection, except in open court or in chambers, upon notice of application for such order of at least six days, and not then except by agreement of parties or upon the affidavit of two or more persons that such survey and inspection is necessary to the just determination of the suit, which affidavits shall state the facts in such case, and wherein the necessity for survey exists; nor shall such order be made unless it appears that the party asking therefor has been refused the privilege of survey and inspection by the adverse party.

WRITS RESTORING POSSESSION.

SEC. 2. The said district courts of this State, or any judge thereof, sitting in chancery, shall have, in addition to the power already possessed, power to issue writs of injunction for affirmative relief, having the force and effect of a writ of restitution, restoring any person or persons to the possession of any mining property from which he or they may have been ousted, by force and violence, or by fraud, or from which they are kept out of possession by threats, or whenever such possession was taken from him or them by entry of the adverse party on Sunday or a legal holiday, or while the party in possession was temporarily absent therefrom. The granting of such writ to extend only to the right of possession under the facts of the case in respect to the manner in which the possession was obtained, leaving the parties to their legal rights on all other questions as though no such writ had issued.

PENALTIES FOLLOWING UNLAWFUL ENTRY.

SEC. 3. In all cases where two or more persons shall associate themselves together for the purpose of obtaining the possession of any lode, gulch or placer claim, then in the actual possession of another, by force and violence, or threats of violence, or by

stealth, and shall proceed to carry out such purpose by making threats against the party or parties in possession, or who shall enter upon such lode or mining claim for the purpose aforesaid, or who shall enter upon or into any lode, gulch, placer claim, quartz-mill or other mining property, or not being upon such property, but within hearing of the same, shall make any threats, or make use of any language, signs or gestures, calculated to intimidate any person or persons at work on said property from continuing to work thereon or therein, or to intimidate others from engaging to work thereon or therein, every such person so offending shall, on conviction thereof, be fined in a sum not to exceed $250, and be imprisoned in the county jail not less than thirty days nor more than six months; such fine to be discharged either by payment or by confinement in said jail until such fine is discharged at the rate of $2.50 per day. On trials under this section, proof of a common purpose of two or more persons to obtain possession of property, as aforesaid, or to intimidate laborers as above set forth, accompanied or followed by any of the acts above specified by any of them, shall be sufficient evidence to convict any one committing such acts, although the parties may not be associated together at the time of committing the same.

FORCE OR VIOLENCE.

SEC. 4. If any person or persons shall associate and agree to enter or attempt to enter by force of numbers, and the terror such numbers are calculated to inspire, or by force and violence, or by threats of violence against any person or persons in the actual possession of any lode, gulch or placer claim, and upon such entry or attempted entry, any person or persons shall be killed, said persons, and all and each of them so entering or attempting to enter, shall be deemed guilty of murder in the first degree, and punished accordingly. Upon the trial of such cases, any person or parties cognizant of such entry, or attempted entry, who shall be present, aiding, assisting, or in anywise encouraging such entry, or attempted entry, shall be deemed a principal in the commission of said offence.

SEC. 5. This act shall take effect and be in force from and after its passage.

Approved February 13, 1874.

THE ACT OF 1877.

An Act to provide for the Drainage of Mines, and to regulate the Liabilities of Miners, Mine-Owners and Mill-Men in certain cases, and to repeal all Territorial acts on the subject.

Be it enacted by the General Assembly of the State of Colorado:

DRAINAGE.

1830.—SEC. 1. Whenever contiguous or adjacent mines upon the same or upon separate lodes have a common ingress of water, or from subterraneous communication of the water have a common drainage, it shall be the duty of the owners, lessees or occupants of each mine so related to provide for their proportionate share of the drainage thereof.

PENALTY FOR NON-COMPLIANCE.

1831.—SEC. 2. Any parties so related failing to provide as aforesaid for the drainage of the mines owned or occupied by them, thereby imposing an unjust burden upon neighboring mines, whether owned or occupied by them, shall pay respectively to those performing the work of drainage their proportion of the actual and necessary cost and expense of doing such drainage, to be recovered by an action in any court of competent jurisdiction.

COMMON INTERESTS.

1832.—SEC. 3. It shall be lawful for all mining corporations or companies, and all individuals engaged in mining, who have thus a common interest in draining such mines, to unite for the purpose of effecting the same, under such common name and upon such terms and conditions as may be agreed upon; and every such association having filed a certificate of incorporation, as provided by law, shall be deemed a corporation, with all the rights, incidents and liabilities of a body corporate, so far as the same may be applicable.

SUBJECT TO ACTION.

1833.—SEC. 4. Failing to mutually agree, as indicated in the preceding section for drainage jointly, one or more of the said

parties may undertake the work of drainage, after giving reasonable notice; and should the remaining parties then fail, neglect or refuse to unite in equitable arrangements for doing the work, or sharing the expense thereof, they shall be subject to an action therefor as already specified, to be enforced in any court of competent jurisdiction.

ACTION TO RECOVER.

1834.—SEC. 5. When an action is commenced to recover the cost and expenses for draining a lode or mine, it shall be lawful for the plaintiff to apply to the court, if in session, or to the judge thereof in vacation, for an order to inspect and examine the lodes or mines claimed to have been drained by the plaintiff; or some one for him shall make affidavit that such inspection or examination is necessary for the proper preparation of the case for trial; and the court or judge shall grant an order for the underground inspection and examination of the lode or mines described in the petition. Such order shall designate the number of persons, not exceeding three, besides the plaintiff or his representative, to examine and inspect such lode and mines, and take the measurement thereof, relating to the amount of water drained from the lode or mine, or the number of fathoms of ground mined and worked out of the lode or mines claimed to have been drained, the cost of such examination and inspection to be borne by the party applying therefor. The court or judge shall have power to cause the removal of any rock, debris, or other obstacles in any lode or vein, when such removal is shown to be necessary to a just determination of the question involved: *Provided*, That no such order for inspection and examination shall be made, except in open court or at chambers, upon notice of application for such order of at least three days, and not then except by agreement of parties, nor unless it appears that the plaintiff has been refused the privilege of making the inspection and examination by the defendant or defendants, or his or their agent.

WATER RIGHTS.

1835.—SEC. 6. That hereafter, when any person or persons, or corporation, shall be engaged in mining or milling, and in the

prosecution of such business shall hoist or raise water from mines or natural channels, and the same shall flow away from the premises of such persons or corporations, to any natural channel or gulch, the same shall be considered beyond the control of the party so hoisting or raising the same, and may be taken and used by other parties the same as that of natural water-courses.

1836.—SEC. 7. After any such water shall have been so raised, and the same shall have flown into any such natural channel, gulch or draw, the party so hoisting or raising the same shall only be liable for injury caused thereby, in the same manner as riparian owners along natural water-courses.

EXPLANATORY.

1837.—SEC. 8. The provisions of this act shall not be construed to apply to incipient or undeveloped mines, but to those only which shall have been opened, and shall clearly derive a benefit from being drained.

EVIDENCE.

1838.—SEC. 9. In trial of cases arising under this act the court shall admit evidence of the normal stand or position of the water while at rest in an idle mine, also the observed prevalence of a common water-level or a standing water-line in the same or separate lodes; also the effect, if any, the elevating or depressing the water by natural or mechanical means in any given lode has upon elevating or depressing the water in the same, contiguous or separate lodes or mines; also the effect which draining or ceasing to drain any given lode or mine had upon the water in the same, or contiguous or separate lodes or mines, and all other evidence which tends to prove the common ingress or subterraneous communication of water into the same lode or mine, or contiguous or separate lodes or mines.

Approved March 16, 1877.

TAXES.

Section 3, Article 10, of the Constitution of the State of Colorado, reads as follows:

"All taxes shall be uniform upon the same class of subjects

within the territorial limits of the authority levying the tax, and shall be levied and collected under general laws, which shall prescribe such regulations as shall secure a just valuation for taxation of all property, real and personal: *Provided*, That mines and mining claims bearing gold, silver, and other precious metals, (except the net proceeds and surface improvements thereof,) shall be exempt from taxation for the period of ten years from the date of the adoption of this constitution, and thereafter may be taxed as provided by law. Ditches, canals, and flumes owned and used by individuals or corporations for irrigating lands owned by such individuals or corporations, or the individual members thereof, shall not be separately taxed, so long as they shall be owned and used exclusively for such purpose."

MINING LAWS OF NEW MEXICO.

An Act to Regulate the Manner of Locating Mining Claims, and for Other Purposes.

CONTENTS.

Be it enacted by the Legislative Assembly of the Territory of New Mexico:

SEC. 1. That any person or persons desiring to locate a mining claim upon a vein or lode of quartz or other rock in place—bearing gold, silver, cinnabar, lead, tin, copper or other valuable deposit, must distinctly mark the location on the ground so that its boundaries may be readily traced; and post in some conspicuous place on such location, a notice in writing, stating thereon the name or names of the locator or locators, his or their intention to locate the mining claim, giving a description thereof by reference to such natural object or permanent monu-

ment as will identify the claim; and also within three months after posting such notice, cause to be recorded a copy thereof in the office of the recorder of the county in which the notice is posted; and it is provided that no other record of such notice shall be necessary.

SEC. 2. In order to carry out the intent of the preceding section, it is hereby made the duty of the probate judges of the several counties of this Territory, and they are hereby required to provide, at the expense of their respective counties, such book or books as may be necessary and suitable in which to enter the record hereinbefore provided for. The fees for recording such notices shall be ten cents for every one hundred words.

SEC. 3. That in estimating the worth of labor required to be performed upon any mining claim, to hold the same by the laws of the United States, in the regulation of mines, the value of a day's labor is hereby fixed at the sum of four dollars: *Provided, however*, That in the sense of this statute, eight hours of labor actually performed upon the mining claim shall constitute a day's labor.

SEC. 4. All locations heretofore made in good faith, to which there shall be no adverse claims, the certificate of which locations have been or may be filed for record and recorded in the recorder's office of the county where the location is made, within six months after the passage of this act, are hereby confirmed and made valid. But where there may appear to be any such adverse claim, the said location shall be held to be the property of the person having the superior title or claim, according to the laws in force at the time of the making of the said locations.

SEC. 5. An action of ejectment will lie for the recovery of the possession of a mining claim, as well as of any real estate, where the party suing has been wrongfully ousted from the possession thereof, and the possession wrongfully detained.

SEC. 6. That "an act concerning mining claims," approved January 18th, 1865, and an act amendatory thereof, approved January 3d, 1866; also, an act entitled an act to amend certain acts concerning mining claims in the Territory of New Mexico, approved January 1st, 1872; be and the same are hereby

repealed: *Provided*, That no locations completed or commenced under said acts shall be invalidated, or in anywise affected, by such repeal.

SEC. 7. That this act shall take effect and be in full force from and after its passage.

Approved January 11, 1876.

CHAPTER V.

STATE AND TERRITORIAL LANDS—AGRICULTURAL COLLEGE, UNIVERSITY, AND SCHOOL LANDS—THE QUANTITY, PRICES, AND TERMS OF PURCHASE—OTHER STATE LANDS—LANDS GRANTED TO BENEVOLENT INSTITUTIONS—DESERT AND SWAMP LANDS—THE TEXAS LAND SYSTEM—RAILROAD LANDS.

EMIGRANTS to Minnesota, Iowa, Missouri, Kansas, Arkansas, Nevada, or California, may find that some of the lands held by the State are more eligibly situated, or for one reason or another more desirable, than the government lands, while the prices are so moderate as not to be beyond their reach. What are these State lands? They are:

1. The *public school lands*, which, in all the newer States and Territories, are two sections, the sixteenth and thirty-sixth, 1,280 acres in each township, which has been surveyed in these States and Territories. These are often very valuable lands. They are usually sold for from $4 to $6 per acre, payable with interest at seven, eight, or ten per cent., in ten annual instalments. By selecting those which have a stream flowing through them, or a spring, the purchaser may often become the owner of a very valuable property. The quantity of these lands is from 2,500,000 to 5,000,000 acres.

2. *University and Agricultural College Lands or Scrip for them.*—Congress has granted a quantity of lands, usually about 46,000 acres, or the privilege of locating that quantity of land on any government lands, usually in the State or Territory, to each new State and Territory, for the founding and maintenance of a State or Territorial University. These lands are located by

State or Territorial officers, and do not always rate quite as high as the school lands, though they may be as valuable. They are sold at present, in most of the States and Territories, at from $3 to $6 per acre. The Agricultural College lands or scrip are granted only to the States, under the law of 1862. The grant is of 30,000 acres for each Senator and Representative in Congress when the grant is made; the scrip issued for it having the privilege of location in any State or Territory where there are government lands unsold. This land scrip of the various States is often in the market, and is purchasable at various rates, from $2 to $5 per acre. There are also grants from Congress of lands for the building of State prisons, for insane hospitals, institutions for deaf mutes, blind and idiotic children, etc. Some of the States have also received from Congress grants of swamp and overflowed lands, and of desert lands, which had been long in the market without selling. Some of these lands are of excellent quality, and with slight expense for drainage or irrigation will be very productive.

There are also bounty land warrants capable of location on any government lands, the scrip for which was granted to soldiers of the war of 1812, the Florida war, Mexican war, or the late civil war. These, which usually realized to the original owners but about fifty or sixty cents per acre, are now held at from $3 to $4.50 per acre, but, for some purposes, are well worth the money.

In California, New Mexico, and Arizona there are lands yet held under Mexican titles, sometimes of great extent, but these are, for the most part, pasturage lands. There is always a liability to a conflict of titles in relation to these, and therefore they are less desirable than government lands in which the title is absolute and without a flaw on which to base a litigation.

When the Republic of Texas was annexed to the United States and became the State of Texas, her public lands were not given up to the United States Government, as all the other public lands had been, but were retained by the State for the purposes of education, internal improvements, etc. From the proceeds of these lands the State has built several railroads, has laid the foundation for a very large school fund, and endowed a university, asylums,

etc. The school fund now amounts to $3,500,000, and when the school lands are all sold will probably approach $18,000,000. The Land Commissioner of the State gives the following account of the three methods by which the public lands are furnished to settlers at prices below those of most of the other States and Territories. It should be understood, however, that not all of these lands are of the best quality:

"Persons desiring to secure homes in Texas can do so either (1) by settlement under the homestead donation law, (2) by locating a certificate, or (3) by purchase from the State of common school, university or asylum lands.

"Under the first mode, every head of a family who has no other homestead can acquire title to 160 acres, and each single person of eighteen years of age can secure eighty acres, by settling on the same and occupying and improving it for three consecutive years. Application must be made to the surveyor of the county in which the party desires to settle. The fees for surveying and returning field notes to the general land office are from $10 to $15. After three years' occupancy, proof of which fact must be made, patent will issue to the settler or his vendor. Patent fee, $5.

"Under the second mode, land certificates or warrants can be located upon any vacant and unappropriated public land. These certificates are of two characters, viz.: 'Straights' and 'alternates.' The 'straights' are those issued to early settlers as headrights or for service in the Texas revolution, and to some railroad and ditch companies, and are located without any reservation for public schools. These certificates are worth from fifteen cents to thirty-five cents per acre, according to quantity —the largest bringing the lowest figure. 'Alternates' are issued to railroads and other works of internal improvements, and require the survey of double the amount of land called for by the certificate. This is divided in two equal parts, one-half of which patents to the owner, and the remainder is reserved for common schools. These certificates can be bought for about ten cents per acre.

"The State does not sell any certificates, and they can only be

bought from the persons or corporations to whom they were issued. Under either of the above modes first-class land must not be expected in the older and settled counties, but must be sought in the west and northwest.

"By the third mode, viz., purchase, choice homes may be secured. Within the settled and organized counties of the State there are about 12,800,000 acres of common school lands, 219,000 acres of university, and 407,615 acres of asylum lands. These are all for sale on ten years' time; the university and asylum lands to actual settlers in tracts of 80 to 160 acres, at a minimum price of $1.50 per acre; the common school lands in tracts of 160 acres to three sections, or 1,920 acres, at a minimum of $1 per acre. These lands are among the finest in the State, and are to be found in almost every organized county. Application for purchase must be made to the county surveyor, in whose office will be found a map and general description of the lands of his county."

We come next to railroad lands. The great enterprises which were proposed for opening highways from the Mississippi to the Pacific coast, and for encouraging the settlement of lands far beyond the frontiers, were too vast to be undertaken by private corporations without government aid in some shape. When, in the midst of our civil war, it became desirable to initiate a system of railways, which should connect the Mississippi valley with the Pacific coast, it was found necessary not only to grant lands along the line, alternate sections, to a width of ten miles on each side of the track or road-bed, but, as these lands could not be made readily available, the government loaned its credit, issuing bonds to the amount of $54,700,000, and taking bonds of the roads in return. On these bonds the United States government has paid interest beyond what has been repaid, to the amount of more than $26,000,000. Similar aid was subsequently granted in the way of bonds, though in smaller amounts, to the Kansas Pacific, the Western Pacific, and the Sioux City and Pacific Railroads to the amount of nearly $10,000,000 more, and interest to the amount of $4,500,000 has been paid on these bonds by the government, so that these roads have been furnished with

bonds and interest by the United States to the amount of over $96,000,000, besides the land-grants, which amounted on the Union and Central Pacific and their branches to about 9,018,000 acres.

But the grants of land for aid in railroad construction were, by no means, confined to these roads which received bonds; other roads projected because of the success of the first transcontinental railway, made their plans and surveys with termini on the Pacific coast, and demanded both land and bonds, and received the former, but not the latter. The Northern Pacific was the largest and boldest of these enterprises, and as deserving as any one of them. It proposed to extend its line from Duluth, on Lake Superior, to the mouth of the Columbia river, with several branches, its general course being between the 45th and 47th parallels. It has a land-grant of about 6,000,000 acres, in alternate sections, on both sides of its road-bed, and is now operating more than 800 miles of its road.

In general, it may be said, that all the railroads in Minnesota, Dakota, Iowa, Missouri, Nebraska, Kansas, Arkansas, Colorado, New Mexico, Utah, Nevada, Arizona, California, Oregon, Washington, and Idaho are land-grant railroads, either as branches of the great trunk roads, or by direct grant under their own corporate titles. After the Union and Central Pacific and the Northern Pacific, the most important of these are the Chicago and Northwestern and its branches and leased roads, the Wabash and its connections, the Burlington and Missouri River, the Kansas Pacific, the Denver Pacific, the Atchison, Topeka and Santa Fé, with its branches and extensions, the Denver and Rio Grande, the Missouri, Kansas and Texas, the St. Louis, Iron Mountain and Southern, the Memphis and Little Rock, and the Little Rock and Fort Smith, the Texas Pacific, the Southern Pacific, the Western Pacific, the Atlantic and Pacific, the St. Louis and San Francisco, the Oregon Central, and the Oregon and California, the Utah Central, Utah Southern, and the Utah and Northern. The Texas railroads are also land-grant railroads, but obtain their lands within that State from the State itself, and not from the National Government. These roads have, in all,

not far from 35,000,000 acres already patented to them, and nearly as much more yet to come when surveyed and when their lines are completed.

Each road has its schedule of prices, its plan of payment by instalments, and its rate of interest for its lands. The prices for the lands on the line of the same road vary according to their location, their distance from markets, the character of the land, and the length of the credit given.

It is perhaps sufficient to say in regard to the States and Territories east of the Rocky Mountains, except in Texas, that the railroads sell their lands at prices ranging from $2 or $2.50 to $10 or $12 per acre, according to the location, distance from markets and from neighbors, quality of soil, necessity of irrigation, and general productiveness. They usually have schedules of terms, according to the length of credit given on the lands; thus, at eleven years' credit, a first payment of from ten to twenty-five per cent., with interest in advance on the remainder, and interest annually in advance; the second payment on the principal being on the third or fourth year, and subsequently annual payments of principal and interest until the whole is paid up. Generally, in these long credits, the price per acre is about ten per cent. more than on shorter credits. A contract to give a deed is issued about the third year, but no warranty deed is given till the last payment has been made. They have also schedules for six years, for three years, or some of them for two, and for cash; in these, the price is ten per cent. lower than in the first, the interest is not paid till it has accrued, and there are other small discounts. Where cash is paid in full at the time of purchase, a discount of twenty-five per cent. is made by some roads and thirty-three and one-third per cent. by others. Timber lands are held at a higher price than prairie lands, varying, however, in different States and Territories. A purchaser can buy on these terms 640 acres in one piece or less, as he pleases. He may buy more than this quantity if he chooses, but the government or *even* sections (the railroad lands are all *odd* sections) surround this on all sides, so that his lands will be a mile apart, unless he can buy the government section between, which he

may do if it is not taken up by pre-emption, or purchase, or bounty land-warrants, or altogether. The government does not sell or pre-empt its lands (except desert lands) in greater quantities than 160 acres, but it will take bounty land-warrants or agricultural college scrip for them at the rate of $1.25 per acre, its price being for these lands within railroad limits $2.50 per acre, so that a warrant for 160 acres will buy but 80 acres of these lands.

Most of the roads, in their circular to immigrants, present a schedule like the following, which, though taken from the Atchison, Topeka and Santa Fé Railway, substantially represents them all, except in its discount for a full cash payment, which is thirty-three and one-third, while most of the others are but twenty-five per cent.

TERMS OF SALE.

ELEVEN YEARS' CREDIT.

Terms No. 1—Is on eleven years' credit, with seven per cent. interest. The first payment at date of purchase is one-tenth of the principal and seven per cent. interest on the remainder. At the end of the first and second year, only the interest at seven per cent. is paid; the third year and each year thereafter, one-tenth of the principal is paid with seven per cent. annual interest on the balance until the whole is paid.

EXAMPLE.

160 acres, at $5 an acre, bought April 1, 1879, the payments would be as follows:

Date of Payments.	Principal.	Interest.	Total.
April 1, 1879, (date of purchase)	$80 00	$50 40	$130 40
April 1, 1880	....	50 40	50 40
April 1, 1881	....	50 40	50 40
April 1, 1882	80 00	44 80	124 80
April 1, 1883	80 00	39 20	119 20
April 1, 1884	80 00	33 60	113 60
April 1, 1885	80 00	28 00	108 00
April 1, 1886	80 00	22 40	102 40
April 1, 1887	80 00	16 80	96 80
April 1, 1888	80 00	11 20	91 20
April 1, 1889	80 00	5 60	85 60
April 1, 1890	80 00	....	80 00
Total of payments at end of 11 years	$800 00	$352 80	$1,152 80

SIX YEARS' CREDIT.

20 per cent. discount.

Terms No. 2—Is on six years' credit, with seven per cent. interest. The first payment at date of purchase is one-sixth of the principal and seven per cent. interest on the remainder. The second payment at the end of the first year is only interest. Afterwards one-sixth of the principal is paid and seven per cent. annual interest on the remainder until the whole is paid. We make a discount from the appraised price of TWENTY per cent., and the payments will come as per

EXAMPLE.

160 acres, at $5 an acre, bought April 1, 1879, would amount to $800. Twenty per cent. off would reduce it to $640, and the payments would be as follows:

Date of Payments.	Principal.	Interest.	Total.
April 1, 1879, (date of purchase)	$106 67	$37 33	$144 00
April 1, 1880	. . . .	37 33	37 33
April 1, 1881	106 67	29 86	136 53
April 1, 1882	106 67	22 39	129 06
April 1, 1883	106 67	14 93	121 60
April 1, 1884	106 66	7 46	114 12
April 1, 1885	106 66	. . . . .	106 66
Total of payments at end of 6 years . .	$640 00	$149 30	$789 30

TWO YEARS' CREDIT.

30 per cent. discount.

Terms No. 3—Three payments. In consideration of the purchaser's paying one-third of the principal at time of purchase, with ten per cent. interest on the remainder, and the balance in two annual payments, we make a discount from the appraised price of THIRTY per cent., and the payments will come as per

EXAMPLE.

160 acres, at $5 an acre, bought April 1, 1879, would amount to $800. Thirty per cent. off would reduce it to $560, and the payments would be as follows:

Date of Payments.	Principal.	Interest.	Total.
April 1, 1879	$186 67	$37 33	$224 00
April 1, 1880	186 67	18 67	205 34
April 1, 1881	186 66	. . . . .	186 66
Total of payments at end of 2 years . .	$560 00	$56 00	$616 00

CASH PURCHASE.

33⅓ per cent. discount.

Terms No. 4.—This is a sale where the whole amount of purchase money is paid down and deed given. For cash, we make a discount of thirty-three and one-third per cent. from the appraised price.

EXAMPLE.

April 1, 1879, 160 acres, at $5 per acre	$800 00	
Cash discount of 33⅓ per cent. off	266 67	
Total amount of payment		$533 33

or less than half the amount at eleven years' credit.

If payments are all made in advance of maturity and deed taken, purchasers on long credit will be allowed a liberal discount.

PRICE AND LOCATION OF THE COMPANY'S LANDS IN KANSAS.

Counties.	Acres.	Price, per acre.
Wabaunsee	11,688.94	$3 50 to 5 50
Morris	27,069.13	2 50 to 6 50
Chase	123,650.50	2 50 to 9 00
Marion	90,422.87	4 00 to 9 00
Butler	38,746.02	5 00 to 9 00
Harvey	44,961.54	5 00 to 10 00
Sedgwick	42,566.41	5 00 to 10 00
McPherson	29,837.59	5 00 to 7 50
Reno	202,038.77	4 00 to 8 00
Rice	86,467.10	3 00 to 8 00
Barton	196,013.43	3 00 to 7 00
Rush	57,403.67	3 00 to 6 00
Pawnee	127,858.52	3 00 to 7 00
Edwards	91,716.63	3 00 to 6 00
Ford	95,721.10	4 00 to 8 00
Pratt	12,612.04	2 00 to 4 00
Hodgeman	74,099.55	4 00 to 8 00

The Northern Pacific Railroad makes its prices, especially in Dakota and Montana, including the fertile valley of the Red river of the North, and the excellent lands of Northern Montana, somewhat lower, ranging from $2.50 to $8.50 on credits of six years, or will take its own preferred stock at par in payment, a privilege which three or five years ago was equivalent

to seventy-five per cent. discount, but this stock has now appreciated, though still quoted at fifty-four to fifty-six. The immigrant on this, and we believe on all the Minnesota and Dakota railroads, receives also material reductions of fare for himself and family, and specially low rates of freight for the transportation of his household goods, live-stock, and farming implements, and this, whether he buys the company's lands or government land. The freights of grain and other produce on this road going eastward are also very low. The rates of interest on Minnesota and Northern Pacific Railroad lands are seven per cent.; on the Iowa Railroad lands they are only six per cent., but on the long credits the price of the lands are advanced ten per cent.

In Texas the prices of railroad lands are considerably cheaper, ranging from $2 to $5 per acre on long time, and seldom exceeding $2 when they are paid for in two or three years. In the northwest counties, where there is so much drought that the lands are only suitable for grazing, they can be bought at lower prices than these, especially if taken in large quantities.

West of the Rocky Mountains, on the Union Pacific, Central, Western, and Southern Pacific and their branches and connections, prices are higher, and terms (there being little or no competition) are more rigorously enforced. The following extract from the latest circular of these roads explains itself. Some of these lands are well worth the price asked for them; others are nearly worthless; but as the buyer is requested to select for himself, and the company refuses to make selections or take any risk, there is no ground for complaint:

No Sale Before Patent.—The general rule of the company is to sell no land before a patent has been issued to the company. This protects the purchaser against the danger of getting a bad title, and the company against the suspicion of taking advantage of the ignorant.

Railroad Title.—The company holds under a patent direct from the Federal Government, and its title is thus free from the dangers that beset all titles that have passed through a number of individuals. No suit will be instituted against the railroad title on account of minor heirs, undivided interests, defective

acknowledgments, or those common flaws to be found in a long succession of conveyances.

Settlement Before Patent.—The company invites settlers to go on the lands before patents are issued or the road is completed; and intends, in such cases, to sell to them in preference to any other applicants, and at prices based upon the value of the land without the improvements put upon it by the settlers. It makes no definite contract with any individual upon this basis, but it treats all fairly. It will not sell to somebody else, merely because the latter offers a higher price. It will not sell to any one land that may be required by it for railroad purposes, such as places for depots, stations, etc., or for town sites. Any person desiring to settle upon vacant railroad land, after survey and before it is patented, should address a letter to the Land Agent of the company, requesting a copy of a blank application for the purchase of land. The following is a copy of one of these applications as filled in, the words and figures here enclosed in brackets occupying spaces which are blank in the printed form, and which the applicant should fill in to suit his own case:

APPLICATION. SOUTHERN PACIFIC RAILROAD COMPANY. LAND DEPARTMENT.

[BAKERSFIELD, Nov. 1st, 1876.]

The undersigned hereby applies to purchase the [northwest quarter] of section [6] of township [30 south] range [25 east] [Mount Diablo] base and meridian, in [Kern] County, California, containing [160] acres.

Residence [2 miles south of Bakersfield].

Post-office address [Bakersfield, Kern County, California].

JOHN SMITH.

The value of the application depends entirely upon the care and correctness with which the blanks are filled in. If the numbers are wrong, or if the signature cannot be read, or if the post-office address is not given with entire clearness, the applicant must not blame anybody but himself if the application does not benefit him. Every letter in the signature should be so plain that there can be no mistake about it. A scratch may be intelligible to a personal friend, who, knowing from whom to expect a letter, and what to expect in it, may understand that which would be illegible to others. Five minutes of extra time

is all that is necessary for getting the application right. The address given should be the permanent address, where the applicant can be reached at any time; and if, after giving it, he should move, he should then send his new address, mentioning in his letter the township and range of the land for which he has applied, so that the new address can be put with the application, which is filed according to the township and range in which it is situated. If he wants several pieces of land in the same township, he should include all in one application; if he wants land in different townships, then there should be a different application for each township.

The Land Agent will send a receipt for the application, and if then the applicant will, without unreasonable delay, permanently occupy and cultivate the land, he can expect to have preference over all other applicants; but his claim will not be entitled to any consideration if he does not show his good faith by occupation and cultivation, or improvement. The company will give a preference to settlers over speculators.

If the settler goes upon the land before survey, he should describe it as nearly as possible, and so soon as the survey is made, send the description to the Land Agent.

An application for land confers no vested right or privilege on the applicant. It is merely a notice that he wishes to buy.

The filing of an application does not carry with it the right or permission to cut wood or timber from the lands of the company, except for fire-wood for the domestic uses of the actual occupants of the tract applied for, or for fencing and improving it.

Applicants, or other persons, who shall be detected in cutting wood or timber on railroad lands, except for the purposes above specified, or in selling or carrying it away, will be prosecuted with the utmost severity of the law.

Land Policy of Company.—The policy of the company has always been, and is now, to encourage the settlement of its lands in small tracts, by persons who will live on and cultivate them. To this end settlers are invited to make applications to buy and to occupy and put to use the vacant lands until such time as they shall be ready for sale. If the settler desires to buy, the company

gives him the first privilege of purchase at the fixed price, which, in every case, shall only be the value of the land, without regard to the improvements. It must be understood that the application of a speculator, or of a person who does not improve or occupy the land, will not, although received first, take precedence or priority of that of the settler whose application may, perhaps, be filed last of all. The actual settler, in good faith, will be preferred always, and the land will be sold to him as against every other applicant. The company also wishes it to be known that a mere application to buy land, unaccompanied by actual improvement or settlement, confers no right or privilege which should prevent an actual settler from taking it, if vacant, into possession, and cultivating and improving it.

When there are two or more applicants for the same tract of land, an adjudication of their respective claims will be made by the Land Agent, upon due notice given to the parties, and the right to buy, at the graded price, will be awarded to the applicant who shall be deemed to have the most equitable claim. Should the applicants, or either of them, pay no attention to the notice, or fail to be present in person, or by representative, at the time and place mentioned in it, they shall be considered to have abandoned their applications, and all right or claim to purchase; and the land will then, at the option of the railroad company, be open for purchase by any person to whom the company may choose to sell.

Careful regard is paid to the requirements of the law in every particular, so as to protect the officers of the company against complaints for the past and distrust for the future. The cultivation of confidence is necessary for the company.

No deed will be made until the entire price shall have been paid.

Payment in Coin.—All sales are made for gold coin, which may be paid in person, or sent by express, or by a banker's check on a bank in San Francisco. The company does not deal in exchange, or take any risk of loss in transmission. The collection of orders upon business men in San Francisco, or of checks upon city banks drawn by farmers or country merchants, is often

attended with much delay and vexation, and therefore such orders or checks will not be received; but a check drawn by any solvent country bank upon a San Francisco bank, with which it has funds, is good. No paper is made out until after payment. No contract is made to accept work of any kind as payment. If the purchaser is in the employment of the company, he should get his money and come with it to the Land Office. It is useless for him to bother with offers to grade, cut wood, or do something in compensation for land. The departments have separate accounts.

The company does not give free transportation to persons who wish to examine or buy, or who have bought land. Nor after purchase does it carry their building material, furniture or cattle, free. In this as in other respects, the land and transportation departments of the company manage their business on the cash basis and on separate accounts.

Prices.—The lands are not uniform in price, but are offered at various figures from $2.50 upwards per acre; usually land covered with tall timber is held at $5 per acre, and that with pine at $10. Most is for sale at from $2.50 to $5. It is impossible to give the prices by sections or minor subdivisions in this pamphlet. Special inquiry must be made as to each piece. The purchaser must pay for the acknowledgment of the three signatures to the deed—the law now allows one dollar for each signature—and he must pay for recording, usually about $2.50 for each deed.

Grading Lands.—When lands are ready to be sold, the company sends a man well acquainted with the quality of soil and skilled in determining the kind of agricultural product to which it is best adapted, as also in determining its true market value, to look at the various sections and tracts. After personal examination, he grades the land as being first, second or third quality of farming, vineyard, timber or grazing land, and reports the value of each piece. His report is examined, and, if found correct, a price is established. The price is generally that of unimproved land of the same quality in the immediate vicinity at the time of the grading. In ascertaining the value, any improve-

ments that a settler or other person may have on the land will not be taken into consideration, neither will the price of the land be increased in consequence of them. Further, there is but one price—that fixed by the company—and land will be sold at that rate to those who in equity have the best right to buy, even if others should offer more per acre than the amount asked. Settlers are thus assured that, in addition to being accorded the first privilege of purchase at the graded price, they will also be protected in their improvements.

When Time Allowed.—Land is sold on contract allowing time for payment of a part of the purchase money—if the tract be eighty acres or more and if it have no timber. If it be less than eighty acres, or if it be covered with timber, no sale will be made except upon full payment of cash before the execution of any paper. The rule of the company is to make no contracts for sale of land before the patent for it has been received.

Terms of Time Sales.—All contracts for the sale of land on time are made in uniform manner. The terms are the same in every case. The purchaser must pay one-fifth of the price and also interest for one year on the balance before he can get a contract; he must then pay the interest in advance at the beginning of each subsequent year, till the fifth year is up, and then pay his principal and take his deed. No instalments are accepted, but if his interest is not delinquent he can at any time pay the principal and get his deed. This system protects the company against complication of accounts, gives the purchaser an abundance of time for making payments, and enables him to select his own day within five years for closing up the transaction. As stated, payment in full of the purchase money can be made at any time, but after interest has been paid, no part of it will be refunded. This is done in order to avoid confusion in keeping the accounts. The purchaser can draw interest on his money in a savings bank till the end of the year, if he sees fit.

No longer credit than five years is allowed in any case.

In many cases in which purchases have been made on credit, the buyers have made enough from the crops of a single year to pay for the land.

Let us suppose that the purchaser takes 160 acres at $5 per acre, under contract dated January 1st, 1877. The total price is $800. If he wants to buy on time, he must pay in advance one-fifth of the principal, $160, and $64 as interest at 10 per cent. on the $640 of the remainder, or $224 in all, cash, on the day when the contract is made. Then he must pay $64 interest on the 1st of January, 1878, and as much more on the same days in 1879, 1880 and 1881; and on the 1st of January, 1882, he must pay the $640 remainder of the principal, and then he is entitled to his deed.

On land sold under contract the purchaser must cut no wood save for domestic purposes, or for fencing the tract bought, until he has made his last payment. All contracts may be assigned by the purchaser.

When the contract is made, the purchaser must from that date see that the land is assessed to him, and must pay all the taxes and assessments of every kind levied on the land for public purposes.

Kind of Deed.—The company gives what is known as a bargain and sale deed, the form customary in California. It warrants to the purchaser that he gets the entire title acquired by the company from the Federal government, and is signed by the president and secretary of the company and two trustees.

Select for Yourself.—No officer of the railroad selects land for another person, nor could such selection be made without exposing the company to vexatious complaints. Everybody who intends to buy should, if possible, visit and examine the land, for nobody knows so well what he wants, or at least nobody can safely assume the responsibility of deciding for him.

Rent.—The company will lease its vacant grazing or agricultural lands by the year, or for a term of years, but reserves the right of selling its grazing lands so leased at any time, or its agricultural lands at the end of any crop year, repaying to the lessee a share of the rent money proportioned exactly to the area sold, the time of the sale and the duration of the lease. The lessee must not cut any timber except for firewood for domestic purposes. The conditions are distinctly stated in the lease.

The rent must always be paid in coin, and in advance.

Railroad Lands.—Lands granted by Mexico, lands which have been sold by the United States, or pre-empted or taken by homestead, in accordance with law, before the railroad title attached, and lands which have been reserved as mineral, are not "vacant Federal lands" as that term is used here, and do not pass to the company.

The lands given to the Southern Pacific Railroad Company by Congress, extend from San José, by way of Gilroy, Hollister, San Benito Pass, Huron, Goshen, Tehachapi Pass, Los Angeles and San Gorgonio Pass, to Fort Yuma, and also from Tehachapi Pass, eastward to the Needles, on the Colorado river.

The San Francisco and San José Railroad has been incorporated with the Southern Pacific Railroad, having been constructed on part of the route before the bill granting the franchise and land to the latter road was passed.

The land-grant from San José to Fort Yuma is 690 miles long, and covers all the unreserved odd sections within thirty miles of the road on each side. It would not take more than twenty miles from the road if all had been unreserved; but portions of Santa Clara, Santa Cruz, Monterey, San Benito, Ventura, Los Angeles and San Bernardino and other counties were held under Mexican grant or were otherwise reserved from the company, which will not get the full 12,800 acres for each mile, even by going to the full distance of thirty miles from the road.

The railroad grant on the section between San José and Tres Pinos, fifty-one miles long, covers nearly all of Santa Clara and Santa Cruz counties, parts of Merced, Fresno and Monterey, and small portions of Alameda, San Joaquin and Stanislaus. Most of these lands, however, were previously covered with Mexican grants, or were otherwise legally occupied, and the company has little land for sale in those counties, and most of that little is in the mountains, and at present difficult of access.

It should be understood that the railroad companies, except perhaps in Texas, have no mining lands to sell. These are all

carefully reserved by the United States government, and where land which had been patented to them, proved to be mineral or mining land, before they had sold it, the government claimed it and has given them other lands in the place of it.

The mining laws and regulations, which we have given in full in a previous chapter, explain fully the only methods of procuring mining lands direct from the government. There is nothing to prevent an immigrant from buying an interest in a mine, and in the land in which or under which it is situated, from those who hold it, but an interest in a mine is not necessarily an interest in the land above it. A bill now before Congress provides that land may be sold in tracts containing eight square miles or less, for grazing purposes, subject to the condition that if a mine passes underneath it, the rights of the miners shall not be prejudiced by this occupancy of the surface.

We have alluded in previous chapters to the opportunities which are often offered to buy partially improved farms and cattle or sheep ranches. This opportunity occurs so frequently that the immigrant who has two or three thousand dollars of capital will often find it better to purchase one of these farms, than to take up new land by any of the methods offered in this chapter. It is not at all to the discredit of the fertility, climate, or productiveness of any of these States or Territories that so many farms should be for sale. The causes which lead to it are usually these: a man with very little capital has taken up a farm or sheep or cattle ranche, either by pre-emption or under the Homestead or Timber-Culture Acts, or has bought of the railroad lands, and being perhaps not a good manager, or having a large family and meeting with misfortunes in his crops, finds himself in debt, and unable to extricate himself and keep his farm. Perhaps he has bought too much land, and the cost of breaking it up and his annual payments on it swallow up all he can make, and he becomes discouraged. He will find that if he mortgages his land, the interest will eat up the whole value of the farm, and, being sold out under foreclosure, he has nothing left, and has to hire himself out as a laborer. If he can sell the farm, the payments yet to be made can be met by the purchaser, and though

he receives less than he has expended in money and labor upon the land, yet he is out of debt and can move on to the frontier where, taking a farm under the Homestead Act or Timber-Culture Act, and building a sod house, he can have a better chance to retrieve his fortunes. Meanwhile, the immigrant who buys finds the land ready broken for crops, and perhaps the crops for the season sown, so that within four or six months he can, if the season is favorable, realize from his crop nearly what the farm has cost him.

These farms can generally be bought at a reasonable price, because there are so many in the market. They should not be bought at a high price for two reasons: first, that in most regions there is some uncertainty about the crop from drought, grasshoppers, Colorado beetles, worms, or excess of rain; and second, that the first crop, especially of grain or roots and tubers, is usually larger than those which succeed it.

By caution in buying, the immigrant will generally do well, and by careful and thorough cultivation he may find his partially improved farm a source of great wealth.

CHAPTER VI.

FARMING LIFE—THE AMOUNT OF CAPITAL NEEDED—MANAGEMENT OF A FARM AT THE WEST—THE BEST FARMING REGIONS—WHAT CROPS ARE BEST—HOW FARMING CAN BE MADE MOST PROFITABLE.

HAVING in previous chapters shown the immigrant how to reach the West, how to select his land or location, and the various methods by which he may become the owner and possessor of a farm or other landed estate, we are now ready to assist him in settling upon his land and making his first crops. In the case of immigrants from Europe this is particularly necessary; for though it is very possible that the immigrant may, in his own country, and under the circumstances existing there, be as good a farmer as can be found, yet the circumstances here are so different in the character of the soil, the climate and sea-

sons, the amount of rain-fall, and the crops most in demand, that he will find that he has much of his business to learn anew.

The first thing to be decided is, what description of crops he would prefer to cultivate, and this point should be settled before he sets out for the West, whether his previous home had been in Europe or in the Atlantic States. If he desires to raise the small grains, and perhaps root crops, he must still decide whether he will grow winter or spring wheat and rye. For spring wheat and the other small grains, as well as for root crops, there is no region so good as Minnesota, Dakota, Montana, and perhaps Iowa and Southern Dakota, east of the Rocky Mountains, and Washington and Oregon west of those mountains.* The spring wheat of Montana surpasses that of any other part of the world. In an average season it weighs sixty-nine pounds to the bushel, sixty pounds being the standard, and with ordinary care in cultivation thirty-five to forty bushels to the acre, many entire crops exceeding this large yield. Dakota and Minnesota and Oregon and Washington Territory are not far behind. Iowa grows some winter wheat, though the spring wheat largely predominates; but, probably on account of less thorough cultivation, neither the yield nor the weight are equal to those of the northernmost tier of States and Territories. There is one other reason alleged for the excellence of the grain crops of this northern region, which includes the fertile valley of the Red river of the North; it is that the surface frost thaws very early in the spring, but that at the depth of three and one-half or four inches the earth is still frozen, and that when the seed is sown this deeper frost, thawing gradually, keeps the roots of the grain moist and develops them more moderately and surely than can be done in any other way.

There is this further advantage in regard to Northern Minnesota, Dakota, and Eastern Montana, that the crops can be quickly and cheaply marketed over the Northern Pacific and its

* For all this northern region *spring* wheat is a very certain crop, *winter* wheat an exceedingly uncertain one. During the long and severe frosts, the roots of the winter wheat are frozen, or winter-killed, and in many instances it does not recover its vitality. Some winter wheat is sown in Minnesota, Northern Dakota, and more in Iowa, but it proves very nearly a failure, while the spring wheat yields from twenty-one to forty bushels, or even more, to the acre.

branches, and that they can be sent to Europe direct, and will ordinarily bring largely remunerative prices there. Root crops of all kinds yield enormously over the whole of this region. The immigrant who wishes to preserve this abundant productiveness of his lands, should do two or three things which very many of the farmers there do not do; he should plow deeply; the soil is from five to ten feet, or even more, in depth, and will yield continuous large crops, if the ground is plowed to a depth of from eighteen inches to two and a half feet, but this should be done in the fall, and with a thorough harrowing, in the spring the soil will be in fine condition for a crop. He should rotate his crops, not after the five years' plan adopted in England and on the continent, but, perhaps, one year of grain, one of root crops, and one of clover, Alfalfa, Hungarian grass or millet, thus allowing the constituents withdrawn from the soil to be replaced. He should also keep horses and mules for his work, oxen and cows, sheep and swine, and though it is a general matter of belief with the settlers on these new lands that they need no manuring, he will not find his crops at all diminished, if he uses upon his lands all the manure, liquid as well as solid, produced by his animals, and he can consume a part of his crops at home, and turn them into products which will pay him better than to sell them direct.

If our immigrant prefers to raise winter wheat, Indian corn, sorghum (though the early varieties of the sorghum will do well almost to the Canada border, while the latter and larger varieties yield more bountifully in the central belt), he will find Southern Iowa, Missouri, Nebraska, Kansas and Wyoming his best region east of the Rocky Mountains, and Northern and Central California, some districts of Nevada, Utah and Western Colorado, west of these mountains. Here, too, most of the root crops, and many special crops, such as the castor-oil bean, pearl millet, Egyptian rice corn, sweet potatoes, alfalfa, and Hungarian grass do well. Especially can we commend Kansas and Nebraska and Eastern Colorado for the winter wheat and Indian corn crops, among the States and Territories east of the Rocky Mountains. But we must caution immigrants, even in these States, that they should not press forward beyond the line of

general advance in their settlement of these farming lands. That line is moving westward at about the rate of fifteen miles a year in Kansas and Nebraska, but it is not well for the immigrant to go to the front at first, for these reasons: As we go westward from the Missouri river to the foot-hills of the Rocky Mountains, the amount of rainfall diminishes, and there is danger of drought, which would be fatal to corn, though the wheat, ripening earlier, might not be so much affected by it. The rainfall is increasing as the line of cultivation moves westward, because the spring rains are absorbed where the hard surface or crust has been broken; but where the soil has been beaten solid for hundreds of years under the hoofs of millions of buffalo, all the rain which falls either runs off or is speedily evaporated. The deeply-plowed lands drink in the rain, and the vegetation which springs up gathers the moisture from dew and showers and suffers it to be more slowly evaporated and return in rain. We know, that taking one year with another, the rainfall which ten years ago, on these unbroken lands, west of the 98th meridian, was only 10.5 or 11 inches annually, has steadily increased, till in 1879 it was 17 or 17.5 inches. Even with this amount some of the crops would be the better for irrigation; but with the prospect of an increasing rainfall each year the settler can bide his time. Two things can be said in regard to the danger from drought in this region of very moderate rainfall: first, that though the amount of rain is perhaps somewhat less than could be desired, it always falls just at the right time to help the crops, and is not so violent or copious as to uproot or injure them; second, in the valley of the Upper Arkansas, where much of this land is situated, there is a remarkable provision of nature to prevent injury to plants and grains; the river and its branches, though fed in the spring by mountain torrents, never overflows its banks, but its valley, which is alluvial, is underlaid at a depth of eight or ten feet by a close, solid clay, and the water spreads out and flows under the surface of this loam and above the clay, saturating the loam with moisture. The soil of this valley retains its moisture even when there is no rain for three months or more, and the crops do not suffer from drought. The valley

of the Platte, in Nebraska, is somewhat similarly protected from drought. With the increasing rainfall that portion of these States east of the meridian of 99° west from Greenwich, is not now in any great danger from drought; while the lands west of that meridian which are cultivated can generally, at moderate expense, be provided with irrigating canals. In Eastern Colorado the lands are still more elevated than in Kansas, ranging from 5,000 to 6,500 or 7,000 feet above the sea. Portions of this land are too high for corn crops to be raised with certainty, as the cool nights and somewhat early frosts may prevent its ripening; but most of it will, when irrigated, yield most astonishing crops of corn, wheat, oats, and potatoes.

The immigrant who does not come as a member of a colony, or under the direction of an emigration company, will hardly find it advisable to farm lands requiring irrigation unless he has a considerable capital to invest. The first cost of irrigating canals or ditches is considerable for a single individual, and can better be borne by a colony, where there are a considerable number to use the water thus obtained. Still, where a man has sufficient capital to take up a square mile (640 acres) of the so-called desert land, which can now be purchased by the payment of $160 down and $640 more at the end of three years, construct his irrigating ditch, which may cost him from $1,000 to $3,000, according to location, stock his farm and break up one-half of his land, which will cost him $2,000 more, or $2,500 with his cabin and corrals, he can rely with considerable certainty upon gathering crops from this 320 acres under cultivation before the expiration of the three years from the time of taking the land, of a net value of not less than $25,000 on an outlay of not more than $7,500 or $8,000 at the outside, and he will have his land clear and his irrigating canals ready for further operations. Some farmers on these lands have done much better than this.* The advantage of irrigation is that the crop is always certain. If the

* In Northern Colorado, California, and perhaps some of the other States and Territories, land and irrigation companies have been formed, often with English capital, which buy large tracts of land, construct irrigating canals, sometimes of fifty or sixty miles in length, and sell the land with the guaranty of water for irrigation at from $13 to $15 per acre. Many purchasers have found this plan profitable.

rainfall is greater than usual, less irrigation is required; if it is less than usual, more water can be turned on, and these lands which, when watered, are the richest and most fertile in the West, respond with a great crop every year.

Of course irrigation does not entirely preclude the dangers from the insect pests, the Rocky Mountain locust or grasshopper, and the Colorado beetle or potato bug; but it is a partial preventive to the ravages of both, and the farmers of those regions have learned how to prevent serious evils from their depredations, by early and deeper plowing, ditches, fire-pits, and the protection of the grouse or prairie hens from indiscriminate slaughter.

The enterprising farmer will find farming greatly facilitated, when his land is once broken, by the use of agricultural machinery and improved methods of cultivation. We cannot urge upon him too strongly the necessity of deeper plowing than is generally practised, and thorough harrowing and cultivation. For these purposes, and especially on prairie lands, he will find it wise, if he can, to procure the best kind of gang-plows, and those which will turn the deepest furrows, the best harrows, cultivators and horse-hoes. And having procured good agricultural machines, he must take good care of them, not exposing them to the weather to rust and crack and fall to pieces when not in use.

If the farmer keeps as much stock as he should, say for a farm of 160 acres or twice that quantity, a pair of stout, strong and serviceable horses, a pair of good mules, one or two yoke of oxen (better two than one), two or three good milch cows and half a dozen pigs, and cultivates ten or twenty acres in forage grasses, such as Alfalfa, Hungarian grass, millet or Egyptian rice-corn, he will, if he manages well, accumulate manures which will restore to the soil the elements which his wheat, barley, oats and corn have taken from it, and though his neighbors may laugh at him for doing so, his enormous crops will show that he is wise in putting his fertilizers on even prairie soils.

But to return to the new agricultural machines: The grains and root crops are sown so much better and so much more rapidly by the use of some of the drills or seed-sowers, and the

REAPING—A PRAIRIE HOMESTEAD—THRESHING.

farmer who uses them has so much more opportunity to diversify his crops, and make those accurate experiments in regard to improved seeding and the cultivation of new crops, as well as to employ profitably his teams in work for others, that they very soon pay for themselves. He must not, however, forget that his crops need careful cultivation, and that weeds grow in the West as well as in the East. His Indian corn, his sorghum and his root crops, as well as most special crops he may cultivate, will need, certainly two or three times in the season, careful cultivation with the horse-hoe. His fruit trees and small fruits will yield much better for being carefully cared for, and the insect pests destroyed before they have had time to destroy the fruit or foliage of the trees. If he cultivates hops, pea-nuts, beans, broom-corn, tobacco, castor beans, sweet potatoes, flax, hemp, jute, or any other special crop, on a moderate scale, devoting a few acres to them, he will find that all, or nearly all, of these crops exhaust the soil and require, for success, the free use of the manures he has been accumulating; and as rich soil is almost invariably a weedy soil, he will require for these crops a more earnest and constant conflict with weeds than with most others.

Very early, in this middle belt of States and Territories, does the harvest commence. The hay crop is not so important here as in the East, and not so important as it will be a few years hence. If the farmer has any considerable crop of the small grains he must of course use the harvester in gathering them—his own, if he can possibly afford to buy one; if not, a hired machine. Threshing machines, with all the attachments for winnowing, assorting and sacking the grain, are very often owned by men who go from farm to farm, and thresh and sack the grain. The eye of the master should be on all these operations to avoid waste and carelessness, and to see to it that all the grain is gathered, threshed and delivered.

In harvesting the corn and sorghum crops, the practice is very general, now, of gathering the ears of corn first and then cutting and stripping the stalks, the leaves being cured for fodder, and the stalks bound and sent immediately to the sugar mill, the heads of the sorghum and rice-corn being cut off after they are

bundled;* when the corn or sorghum seeds are just ripe and not too hard, the stalks yield the largest quantity of crystallizable sugar.

The husking and shelling of the corn, both now performed by machinery, the digging of the potatoes, also effected by a machine, the gathering of the other root crops and fruit, make the farmer's life in these early autumn days a very busy one. No sooner is the ground freed from the crops of the season than the autumnal plowing, especially for winter grains, commences. In these regions more attention should be paid to a rotation of crops than is generally practised. It may not be feasible or desirable to attempt the five years' rotation which is recommended by the best English farmers—but root crops should succeed grain, and clover or the forage grasses the root crops, and even on the best soils, deep plowing, a moderate use of manures, or the occasional plowing in of a green crop will be found to yield ample returns in the crops which follow.

It is a fact which should be carefully considered by all intelligent farmers, that even on these new lands, each year of cultivation of the cereals produces a smaller yield to the acre. Montana and Dakota now boast their thirty or thirty-five bushels of wheat to the acre, but Minnesota and Kansas, even with their large amount of new lands, do not average quite twenty-one bushels; while Iowa and Missouri, with lands somewhat longer cultivated, cannot report more than from eleven to fifteen bushels; and Arkansas, with her careless culture, produces an average of but six bushels. This falling off in the yield per acre of the wheat crop is equally marked in the States east of the Mississippi—Ohio, Indiana, and Illinois. Michigan is, at present, an exception, because her lands are newer.

The reason of this rapidly diminishing yield is not mysterious or inexplicable. The soil of the prairies is only scratched to a depth of three or four inches; there is no rotation of crops; both the grain and the straw are removed from the soil; except,

* The seeds or heads of both the sorghum and the rice-corn, aside from their value for sowing the next season, are nearly or quite equal to corn as food for animals, either whole or ground, and are eagerly sought for by them.

that in some sections, the latter is burned, either to get rid of it or as fuel for the steam-threshers and other implements, and the alkalies and earths thus taken from the soil, and not returned to it in any way, impoverish it. The remedies are deep plowing, restoration to the soil of what the crops have taken from it, and a rotation of crops. The great Dalrymple farms of north-eastern Dakota, ten years hence under the present mode of cultivation, will not yield ten bushels of wheat to the acre. There is no excuse for thus wasting the goodly heritage which the Almighty has bestowed upon us.

On one other point there is need of improvement, viz.: in the quantity of grain sown to the acre. Under the old system of sowing it broadcast, there was great waste; two bushels or two and a-half of seed-wheat was regarded as the smallest amount which should be used in sowing an acre. The new method of drilling the wheat has materially reduced the quantity deemed necessary, but it is still too large In Minnesota and Kansas eighty to eighty-five pounds of seed, equal to forty or forty-three quarts, per acre, is the usual allowance. Yet, there is no statement connected with agriculture, and especially with the cultivation of the cereals, more capable of absolute mathematical demonstration than this, that the quantity of seed now used is about five times larger than is necessary. The seed, whether of wheat, barley, or oats, should be carefully selected, the finest and largest ears being culled, and those from seed which has shown the most disposition to tiller or expand, so as to produce the greatest number of stalks from one seed; and the ground being thoroughly harrowed and pulverized, the seed should be drilled in at the distance of ten inches apart each way (twelve inches apart if they can be sown the last of August or the first of September); the amount of seed being dependent upon the date of sowing of the winter grains. The earlier the sowing, the smaller the amount of seed required; the more perfect and extensive the tillering, the better the resistance to the winter's cold, and the earlier and larger the crop. This is no idle theory, but the result of twenty years' careful experiment by Major F. F. Hallett, of Manor Farm, Kemptown, England, one of the most successful wheat-growers

of that country. By a careful selection, running through a long series of years, Major Hallett succeeded in producing and exhibited to the British Association from a single grain of the ordinary red wheat, plants which produced ninety-four stems, each crowned with its ear of wheat, and from a single ear of this wheat 124 grains, or a total production of over 10,000 grains from one.* This extraordinary result is not reached by any increase in the amount of manures (all wheat land is manured in England, and the ordinary crop is about thirty-four bushels to the acre), or by any new process of tillage, but by the careful selection of the best and most productive seed, now known both in England and this country as "Hallett's pedigree wheat," early sowing, and the sowing of the grains at a distance of twelve by twelve inches apart. By these means Major Hallett, sowing his wheat the last week in August, and sowing but five pints to the acre, was able to obtain a yield of seventy bushels to the acre, in extensive wheat fields, for a series of years. He states that for every week of delay after the middle of September there should be an addition of from three to four quarts of seed, but every week's delay increases the danger of winter-killing, diminishes the amount of tillering, and the probable quantity of the crop per acre. Wheat sown about the first of September comes up in seven days; about the first of October, in fourteen days; the first of November, in twenty-one days; the first of December, not under twenty-eight days. These figures would be rather exceeded than diminished in the West.

We recapitulate: the essentials to great success in the raising of cereals in the West are: deep plowing; the restoration to the soil of the elements taken from it, either by manuring, plowing in of green crops, or the turning up of a new stratum of soil; rotation of crops; in the cultivation of winter grains, a very careful selection of the best and most productive seed; early sowing, not later than the first of September; and sowing by drill, each grain being ten or twelve inches distant from each other, to give

*This result of increasing the production by tillering was not confined to wheat, for Major Hallett exhibited to the British Association at the same meeting a plant of barley from a single grain with 110 stems, and a plant of oats from a single grain with 87 stems.

it opportunity to tiller. The seed per acre thus sown should not exceed from six to eight quarts to the acre, and the yield should be more than double what it now is, and should not diminish from year to year.

Some western farmers may say that it is of no use to increase the production of grain, for the market is often glutted, and the prices are not remunerative. The folly of such a position is easily demonstrated, for in the first place, the market is not glutted with the best quality of grain, it is only the poorer qualities which are salable only at low prices; there may be a fluctuation in prices in different years, but the best grain is not raised at a loss in any year. In the next place, suppose that it is not desirable to increase the quantity of grain raised, is it not easier and every way better to raise 6,000 bushels from 100 acres, than the same quantity from 300 acres? If your farm consists of 320 acres, and you can raise 6,000 bushels of wheat from 100 acres, can you not put the other 220 acres in oats, barley, Indian corn, sorghum, or root crops, and thus realize triple profits on your land? Even if wheat is down to eighty-five cents a bushel, as it was two or three years ago, doesn't it pay better to realize $51 an acre from it with the same labor than to realize only $17?

Our cereal crops are so important to our national wealth and prosperity, that we have felt justified in devoting considerable space to the consideration of the methods by which their production per acre can be greatly increased, and we believe that our readers will appreciate our labors in this direction.

Let us now turn to the immigrant farmer who has decided to try farming in the milder and more tropical southern belt of States and Territories. He seeks a home in Arkansas, Western Louisiana, Texas, New Mexico, Arizona, or Southern California. If he comes from Europe he finds a climate and crops to which he has hitherto been wholly unaccustomed. This is also true of immigrants from Illinois or the Ohio valley, in our own country; but a large proportion of the American immigrants into Arkansas, Texas, etc., are from the Southern Atlantic and Gulf States, where the climate, crops, etc., do not essentially differ from those of Texas and the States and Territories adjacent. The farmer

who migrates to this region can have a much wider choice of crops than the northern farmer; whether he can or will find his labor better remunerated remains to be proved. Arkansas, Texas, and Southern California are the three sections in this region in one of which the farmer will be most likely to settle, for Louisiana is not sufficiently healthy for settlers from a northern climate, and Arizona and New Mexico, as well as Northwest Texas, have too little rain-fall to be attractive to farmers generally.

It is not indispensable if an emigrant settles in Arkansas or Texas, that he should devote himself exclusively to the culture of cotton, or indeed that he should grow it at all. Much less should he reason that because rice and cane-sugar are produced there he must necessarily cultivate those crops.

These States have lands adapted to a great variety of crops, and when all the circumstances are taken into account, perhaps one crop is as profitable as another. If the emigrant selects his farm in any of the coast counties, he will find the land somewhat high priced, but he can raise sea-island or long staple cotton, and if he cultivates his crop skilfully he ought to make at least a bale to the acre of this valuable product; or he can grow rice or sugar cane, though for the latter he will require a large capital for his sugar works. The middling, or short staple cotton, can be grown here, though not so profitably as fifty or sixty miles north, as the land is too valuable; nor is this land well adapted to wheat, but all the subtropical fruits as well as most of those of more temperate climates, and most of the root crops can be cultivated with great profit from the early date at which they ripen. Two crops of sweet or Irish potatoes can be raised in the long season, and the first will be at least six weeks earlier than in the vicinity of St. Louis. Strawberries, raspberries, peaches, grapes, plums, as well as bananas, olives, figs, oranges, lemons, guavas and all market garden vegetables grow luxuriantly, and are all from six to eight weeks earlier than in the North. The trade in these articles of produce, between the coast counties of Texas and St. Louis and Chicago, is large and constantly increasing.

If the emigrant prefers a farm seventy or eighty miles back from the coast, he is in Eastern Texas in the "timber country," where he can engage if he chooses in the lumber business with a good opportunity to make money; and the land here is fair for cotton, excellent for corn, and yields moderate crops of wheat. In Central Texas, at this distance from the coast he will find the best cotton lands in the State, and if he will give his undivided attention to his crop he can raise two bales of cotton to the acre; but he must not let the weeds overrun it, nor the worms destroy it.* The easy-going planters around him will not set him a good example in these respects. Their shallow plowing without manure, their scant and slovenly cultivation, and careless picking, yields from half to three-fifths of a bale to the acre, and with an indolence born, or at least nurtured by the protracted heat of the long season, they are content with this result; and it is no more than fair to say that our energetic immigrant, after a few years' experience of the enervating influence of the climate, will very possibly fall into the same careless ways.

A hundred miles or more north from the Gulf coast, in Northeastern and Central Texas, is a good region for the cultivation of the cereals. Indian corn grows well and yields fairly everywhere in Texas, except in the arid lands in the northwest of the State: but the lands of which we are now speaking yield good crops of wheat, oats, barley and millet as well as corn. Texas is not, however, one of the great cereal-producing States. Her wheat crop is not more than sufficient in ordinary years for the consumption of her own people. A moderate amount of flour and wheat (2,212 barrels of the former and 4,614 bushels of the latter in 1879) are exported, but the importation of wheat is more than twenty times, and of flour about twelve times as much. There is no good and sufficient reason why, in these more elevated lands, where the heat is not so enervating, the quantity of all the cereals annually produced should not be ten or twenty

* A Mr. S. C. White, of Jasper, Texas, claims to have discovered and have practised for seventeen years a method by which his growing cotton is rendered perfectly *worm-proof*, and offers all an opportunity of testing his process. The discovery, if it proves to be one, will be invaluable for the cotton crop.

times what it is; corn is a crop so admirably adapted to these lands, and the demand for it at New Orleans on the one side, and throughout Arizona on the other, as well as the large home market, should make this a favorite crop with the immigrants. The production of wheat, barley and oats also might easily be increased almost indefinitely.

Good corn land is also good land for sorghum, and both can be planted in February, and if two crops are not produced from the same fields in a year, as they might be, of the earlier varieties, it is entirely practicable to have the sorghum planted at different times, so as to have the juice extracted from the stalks and boiled down into syrup in those months when other labor is not driving. Another very important consideration in favor of this mode of cultivation is that the leaves and seeds make an excellent fodder for milch cows, as well as other cattle, when the heat of summer has dried the grasses. The millets yield a large amount of forage and almost as much sugar as the sorghum.

Root crops also yield largely in this region of Texas, and there is the great advantage that the best qualities of Irish potatoes as well as sweet potatoes can be ripened so early as to be put in the Northern markets full six weeks earlier than those grown in Illinois or Iowa, and so bring a better price. It is claimed, and we presume correctly, that of both kinds of potatoes two crops can be raised on the same land every year. Of other miscellaneous products named in the consideration of the productions of the central belt, all can be produced with equal advantage here by proper care and good farming, and the crops will be largely remunerative. But Texas lands, especially after several years' cropping, and mere scratching the surface with a light plow, will not yield large crops without deep plowing and thorough, not lavish, manuring. It may as well be said here as anywhere that, except in the cotton and grain region of Central Texas, the soil though fair is not of the first class, and will very soon run down without careful cultivation and a moderate use of fertilizers. Fortunately, some of the best of these, after farm-yard manures, plaster of Paris, some of the marls, and alkaline earths, salt, etc., are easily accessible in the neighborhood of most of

the farms, while guano, fish guano, and the natural and artificial phosphates can be purchased at a moderate price. The soil does not leach, and fertilizers are retained for a considerable time, so that often the second crop after their application is better than the first.

The other portions of the State, as well as part of Southwestern Texas, are better adapted to grazing than to cultivation; still, much of these could be cultivated and would yield large crops if they were irrigated; most of the region of Northwestern Texas is capable of successful irrigation, either from the Pecos or the Rio Grande or their affluents, or where these cannot supply water, by artesian wells, and thus irrigated, it would prove the most productive land in the State. But irrigation costs money, and, while the State has so much unimproved land of moderate fertility for sale at such low prices, it is not probable that the lands which require irrigation will be taken up except in rare instances.

Arkansas has little or no land adapted to rice or cane sugar crops; but her cotton lands in the Mississippi, Red, Arkansas, and White river bottoms, and her corn lands on the higher levels, are very productive. Arkansas is awakening from the lethargy which has so long bound her, and though she has as yet but few immigrants, industrious and enterprising men would find her lands on many accounts desirable. Race and slavery antipathies are dying out; the new school laws are being put in operation with great success; the lands are rich and cheap, and markets generally accessible. The days of careless and slovenly tillage of the soil are fast passing away. Twenty thousand enterprising, clear-headed, and skilful farmers, intelligent and upright in character, could almost revolutionize the State and make it a region which would be as desirable a home for immigrants as any other of the Western States. But the twenty thousand should come in groups of considerable size, and plant villages or settlements, which may become models to rouse a spirit of emulation on the part of those already there.

The farming lands of Arizona mostly lie along the Gila and its tributaries, though there are some good lands farther north which are irrigated. The Rio Colorado and its affluents, the Colorado

Chiquito, Flax river, and in the northeast the San Juan, run through cañons so deep as to drain very effectually the moisture from the *mesas* or table lands. Still, irrigation is possible on many of these lands, and would make them very productive, while the occasional protracted storms, might by cultivation, be made to give place to a larger and more equally distributed rainfall. The mineral wealth of Arizona will call a population thither sufficient to make irrigation practicable, and then as in former ages, this region will show its thriving farms, its beautiful villages, and its populous cities. In the central part of the territory, not far from Prescott, the Maricopis Indians raise large crops of wheat of such excellence that it commands the highest price in San Francisco, in competition with the best California wheat.

Southern California is the garden of the State. Vast crops of wheat and barley are grown here, and the vineyards, olive-yards, and plantations of pomegranates, almonds, Madeira nuts, etc., give the country an almost tropical appearance. Cotton does not succeed so well as other crops here on account of the long dry season.

The climate is delightful, and is regarded as particularly beneficial to those suffering from pulmonary diseases if they come before the disease has progressed too far. Although much of the land is taken up in very extensive ranches, there are still, especially along the route of the Southern Pacific Railway, many desirable farming lands, both of the government and the railway grants.

CHAPTER VII.

WESTERN FARMING CONTINUED—WHAT CAPITAL IS NECESSARY FOR A COMFORTABLE BEGINNING ON A NEW FARM AT THE WEST—A LARGER AMOUNT NEEDED IN SOME STATES OR TERRITORIES THAN IN OTHERS—ADVICE TO THOSE WHO ARE UNABLE AT FIRST TO BUY AND STOCK A FARM—INCIDENTS OF FARM-LIFE—RENTING LAND UNADVISABLE—GREAT FARMS OBJECTIONABLE—THE HOMESTEAD AND OTHER EXEMPTIONS IN THE DIFFERENT STATES.

IN a former chapter we have referred briefly to the amount of capital needed for successful farming; but we cannot too strongly impress upon the mind of the immigrant, the necessity of a moderate capital, if he proposes to own and develop a farm at once.

It is possible for an immigrant to bring his family, unless it is a very large one, and most of his children too young to work effectively, to any of the newer districts of Dakota, Montana, Nebraska and perhaps Kansas and Minnesota, or to Washington Territory or Oregon, if after reaching his destination he has $1,000, but he can only do this by securing his land under the Homestead or Timber-Culture Acts, or pre-empting it, or buying on long credit of a railroad company, emigration company or school lands of the State, which are usually sold payable in ten annual instalments. Even then it will in all probability be a very severe struggle for him for the first four or five years, especially if there should be any bad years, from a long and severe winter, a very late spring, drought, grasshoppers or other insect plagues. In Texas or Arkansas he may do better as the land is cheaper, but the cheap lands are generally less productive, and a large part of Texas suffers from occasional droughts.

The following statement of "what can be done with $1,000 by an industrious, energetic farmer in the Arkansas Valley in Kansas," is put forth by the Land Department of the Atchison, Topeka and Santa Fé Railway. It is nearer the truth than any statement we have seen published by any railroad or emigration company, but it is rather highly colored, nevertheless. This was published in the autumn of 1879, and there may be, even in so short a time, some changes in the prices. It should be said also

that these lands are not more fertile than other lands in Kansas and elsewhere, and are occasionally subject to drought. The programme as there laid down, if the emigrant has but the $1,000, requires incessant and very severe labor, and the margin, which leaves nothing for furniture, is much too meagre for the support of a family for fifteen months or more, and will require some other sources of income or the incurring of indebtedness. But here is the statement:

"First payment on 160 acres of railroad land, on six years' time, at the rate of $4.80 per acre, will be $172.80; house of two rooms and small kitchen, $250; team and harness, $180; breaking-plough, $22; harrow, $10; cow, $30; interest payment on land one year from purchase, $44.80; total, $709.60—leaving a balance of $290.40 for seed and support of family until crop can be raised. Nearly every family coming to Kansas to make a home have more or less furniture, farming implements, etc., which they can rarely sell to advantage. By inquiring of our nearest agent, they can ascertain the cost of chartering a car to destination, or rate per 100 pounds, and if the amount they will sacrifice on the sale of their goods is greater than the cost of transporting it to their new home, they can readily see it will pay to bring these things along, and they will find them very useful, if money with which to lay in a new supply is scarce.

"The cost of starting on a new farm in a new country of course depends largely on the size of the family, and the economy, energy and perseverance of the farmer, but no man with a family should come to the Arkansas valley with less than $1,000 to start with. For a man of limited means, it is most advisable to come in the early spring, say in February or March. A week or two will get his house up, and his family settled, and then he is ready for business. No time is wasted in clearing the land of stumps and stones; it lies all ready for the plow, entirely free from either, and the farmer commences at once turning over the sod. In a few weeks enough sod will be broken to enable him to put in a fair crop of barley, rye or broom corn; the latter does well on sod, and is one of the best paying crops in the State. Enough vegetables can be raised for family use the first year.

A few hogs and chickens kept through the summer will, when added to the spring crops and vegetables, carry an industrious and economical family through to the following spring. If ready cash is scarce the first year, work can generally be had for a team in the neighborhood, and by this means a hard-working man can earn a little now and then, to carry him along while making his own improvements, until his first crop has matured.

"After the spring crops have been put in the ground, enough new ground can be broken during the summer, which, when added to that already in spring crops, will enable him to put in at least fifty acres of fall wheat. He will not be able to buy a grain drill of his own the first year, but he can secure the use of one from a neighboring farmer, and pay for its use by a day or two's work with his team. In harvesting his wheat, in June following, the same course will have to be pursued as in drilling, *i. e.*, by exchanging labor. This wheat crop, when harvested and marketed, gives him the ready money with which to meet current expenses, make necessary additions to his stock of implements, improvements on his farm, and provide enough for the next payment on his land.

"This makes two crops raised from the same land within fifteen months from the time of his commencement on his new farm. The quick returns that can be secured in so short a time, is what makes it possible for men with limited means, but with industrious habits, to secure a farm and home of their own.

"After harvesting his first crop of wheat, the farmer begins to realize the reward of his toil. Each year adds to the number of acres cultivated, and to the productiveness of the farm, and the occupant is usually able, by the third year, to pay up on his land and take a deed. By this time, by dint of hard work, frugality and some self-denial, he has made himself a comfortable home, all his own, and nearly all paid for from the products of his farm, which will in a few years become valuable in consequence of the rapid growth of the country—yet it was secured, and a start made on it, including cost of house, stock, implements, etc., with a capital of less than $1,000. If the farmer is a man of taste, he will at the end of five years have his farm all

surrounded and divided by a beautiful Osage orange hedge fence, and groves of forest trees, fruit-bearing orchards, small fruits of all kinds, and flowers and ornamental shade trees will surround his home. All these improvements, that in the Eastern States would have required a heavy outlay of money and many years of time, are here secured in a very short time at a nominal cost.

"The new settler is not obliged to spend any money in fencing his farm. The herd-law protects his fields, and he can devote all his time to the breaking of sod and growing of crops. Fences can be grown with Osage orange that will turn stock in four years, and costing only the farmer's own labor in caring for them.

"If the settler can find on the alternate sections of the lands along the railroad, any desirable lands as yet unsold, he can pre-empt 160 acres for very small fees, to be paid for at the end of thirty-three months, for $2.50 per acre, the sum of $400 and some fees to the amount of $20 or $25, or he can take up 80 acres in Homestead and 80 more under the Timber-Culture Act; the fees for both being about $30 or $36, but he will not obtain a clear title under from five to eight years. By securing his land by one of these methods his payments will at first not exceed $30 or $36, and so he will have from $136 to $142 more for the support of his family, making his entire sum $425 to $431 for their support for fifteen or oftener twenty months, aside from what vegetables and other produce he can raise in that time. From this small sum must be deducted what he has to pay for furniture or the freight of it if he has brought it with him, and also probably for pigs and poultry, though a part of this can come out of the item of interest payment on land one year from purchase, $44.80."

We think it might be possible for an energetic, industrious farmer, who is a good manager, to live with his family, and plow, sow, and stock his farm on $1,000, till he can realize from his crops, if he pre-empts his land, or secures it under the Homestead or Timber-Culture Act; but buying railroad land, even on six years' time, it would be impossible, unless he had other

sources of income, or overworked himself and his team. The item of "$250 for house of two rooms and small kitchen," might be diminished by living in a sod-house or a dug-out, but this is not pleasant.

With an additional $500 many of the difficulties would be avoided. Care and economy would still be necessary, and there would be many privations and inconveniences to be endured, but if he is not visited by drought, grasshoppers, or other insect or animal pests, and neither the cattle disease, nor cyclones, nor prairie fires visit him during the first three years after his immigration, he may, at the end of that time, have a good farm all his own, and within two years more be so situated as to enjoy life, though only on condition of hard and steady labor.

The disasters to which we have alluded, though sufficiently distressing at any time, are peculiarly severe and ruinous when they fall upon a farmer who is just looking forward to harvesting his first full crop. In a few days, perhaps in a few hours, his crops of grain and of vegetables are swept away and not a vestige of them left; or under the blaze of a summer's sun, untempered by clouds or rain, his arid fields have failed to yield a harvest; or the insect and rodent tribes, banded together for the destruction of his crops, have destroyed alike what is above and what is under the surface; or more terrible still, the prairie fire rushes irresistibly over cabin, hay-ricks, and stacks of grain, scarce permitting himself and family to escape, scorched and blistered, from their burning home; or, once more, the swift moving storm plowing through the young and thriving village, involves scores or hundreds in a common disaster; houses, barns, churches, forest trees, the growing grain or the gathered crops, are alike torn and scattered to the four winds of heaven, and it is much, if many lives, but an hour before joyous and full of hope and activity, are not also destroyed. Disasters by flood are infrequent in the West, though they sometimes occur along the upper affluents of the Mississippi and the tributaries of the Missouri.

Yet, while these disasters visit the western settler only at

irregular and sometimes distant intervals, and cannot always be guarded against by any known precaution, their possibility is to be taken into the account, as a drawback upon what might otherwise be a perilous prosperity, and as the farmer attains a better position, he will do well to seek, if he can, to become the owner of a second farm (not falling into the error of trying to hold too much land) differently located, and, if possible, adapted to a different kind of culture. If his first is a grain farm, his second may be devoted to root crops, or sorghum, or forage grasses, or to some of the specialties already noticed; if the first is on a prairie or in a valley, the second may be on a hill-side, in the timber, or at least by the banks of a stream, or he may gradually work into the rearing of cattle or sheep, or horses or mules. The cyclone or the prairie fire may spare one if the other is swept as with the besom of destruction; or if the grasshopper or locust, the weevil or the cutworm, the caterpillar, or the gopher and mole destroy his grain or root crops on one farm, there may be something left on the other. The young man with but little capital, but with no one dependent upon him, can, of course, commence farming with a small sum, but he will find his account, after purchasing or securing his land, and breaking it up and sowing his crop, in hiring out to some farmer in the vicinity, and working his way up to competence, in five or six years. At the end of that time he may be the owner of a good farm and farm-buildings, mainly the result of his own labor during those years.

To those possessing somewhat larger means, say $4,000 or $5,000, a better plan is to buy a partially improved farm, from some of those settlers who are constantly disposed to obey the policeman's injunction, and "move on." In many instances these settlers have either pre-empted their lands, secured them under the Homestead Act, or bought of the railroad companies, and in either case, have become embarrassed from some cause, and unable to make the desired payments, and so they are disposed to sell out, and moving to the extreme frontier try again. Some of this class have thus moved on, by successive stages, from Eastern Iowa or Missouri to the frontier of Kansas, Nebraska,

Dakota, or even into Montana, Wyoming, or Utah. If their land is a homestead claim, it is worth only the improvements, as they have no title, and leaving it before the five years are up, the fee simple reverts to the United States government, and can be entered anew, either as a homestead, or by pre-emption, or purchase at government price. If pre-empted by the original settler there is probably a sum due to perfect the title. The purchaser should see to it that there are no liens on the property for taxes or judgments, but that his title is perfectly free from cloud. Generally, a purchase of this kind can be made for considerably less than it has cost, at the ordinary price of labor. The cabin and other buildings will probably be poor or indifferent, and there may be no fences, or very imperfect ones, but this is not of much consequence, as the herd law, in most of the States and Territories, protects the settlers' crops, and better buildings are not expensive; but, on the other hand, a considerable portion of the land has been broken by the plow and harrowed, and has yielded one, two, or three crops, and there may be a growing crop on it at the time. The first crop, with the superficial plowing so generally practised, is generally the best one, but the purchaser can, and will if he is wise, put in his plow for his next crop "beam deep," and turn up fresh and virgin soil for a more plentiful harvest.

A farm of 160 acres, conveniently situated, and near a railroad or navigable river, may be purchased in this way with clear title, cabin, sheds for stock, eighty acres under cultivation, and with perhaps a growing crop, the necessary live-stock, wagons, harness (the latter a little the worse for wear), and plows, hoes, rakes, and other agricultural implements, though hardly much agricultural machinery, in Dakota, Western Nebraska, Western Kansas, Colorado, Wyoming, or Montana, or in Oregon or Washington Territory for $800 or $1,000. In Minnesota, Missouri, Eastern Nebraska, or Eastern Kansas, or in California, and probably in Texas, it would cost about twice as much, but the buildings and fences would be better.

There are two courses, either of which the man who has a family and has but little more than money enough to take him

and them to their destination may choose; for without the $1,000 or $1,500 he cannot buy a farm, nor support his family on it while waiting for his first or second crop, even if the land were given him outright.

He may rent a farm with a cabin and the land broken, agreeing to give half the first full crop for the rent the first year, and $1 to $1.50 per acre thereafter, but he must still have money to buy his furniture, agricultural implements, and necessary live-stock, and to support his family till his first crop comes in. This will require at least $450, and that amount is more than he probably has.

Or he can hire out his own services to some large farmer, and those of such members of his family as are able to work, and securing a homestead claim, erect his humble cabin, and after four or five years of hard work, he may succeed in getting his farm clear of debt, but not well stocked, nor very well cultivated. The privations he and his family must undergo before he reaches this point, and indeed for two or three years after, will be very painful and severe, but in the end, perhaps, they will feel paid for their sacrifices.

Hard as this life is, for so long a time, it is much better than renting a farm, and yet very many are to be found who are anxious to rent lands. Indeed, so much are farms in demand for rent, that as we have noticed elsewhere, Englishmen of fixed incomes, retired army or navy officers, clergymen, and retired civil officers have come to this country in very considerable numbers, purchased railroad and other new lands, hired them broken with the plow, erected cheap cabins, and rented them, deriving a much better interest for their money from the rental, than they could realize in England. In many instances these foreign purchasers become the possessors of large tracts of land, and thus lay the foundation for a landed aristocracy in the future.

Renting farms is not a good practice in our Western Empire. It is not wise for those who hire the farms, and it will in the end prove injurious to the owners if they settle in the vicinity of their lands. The policy of our government and of our

institutions is to have the land held in small parcels, not more than 160 acres, by as many holders as possible, one requisite being that these landholders shall be citizens of the United States or have declared their intention to become such. One result of these settlements with small farms is the speedy establishment of schools, churches, newspapers, and all the appliances of an intelligent, high and pure civilization.

The rented lands, especially with absentee landlords, contribute nothing to this. The farmer who rents his farm of a wealthy landlord is not, except in States where a poll-tax is exacted, a tax-payer, and has no special interest in the promotion of schools or general intelligence; the building up of a village, and the improvement of the moral character of the community, and its subordination to law, are matters which do not concern him. His only object is to get as much from his farm as possible, and spend as little on it as is consistent with that object; for renting as practised in the West tends to demoralize a man and to bring out his greed, selfishness and meanness, and indeed all his worst traits.

We have already referred briefly to the evils attendant on farming on a large scale; but we cannot speak too strongly in reprobation of it in its effect on the future welfare of those portions of the West where it prevails. California has suffered the most from these overgrown farms or ranches, and Texas and Colorado have also been materially hindered in their growth by them, and now Western Minnesota, Northern Dakota and Montana, are in danger of injury from the same tendency to own vast tracts of farming lands.

The Northern Pacific Railway, after its disaster of 1873, disposed of its lands already patented to it at $2 to $2.50 per acre and received its preferred stock and its bonds at par in payment. As these were for a time held at very low prices, several men of large wealth who knew the value of these lands took the opportunity of procuring large tracts, paying for them in bonds and stock, and thus secured immense properties at from twenty to twenty-five cents per acre. These lands have been generally sown in wheat and other easily cultivated crops, and 25,000 to 35,000 acres in wheat has been a not unusual crop on

some of these great farms, and some of the wheat-fields of Southern California have been very nearly as large. This brings in a large revenue to the proprietors, $200,000 or $300,000 annually for the present, but the objections to it are these:

1. The soil is not properly tilled; the plowing is of the shallowest, merely scratching the ground; the same crop is sown on each field year after year, and the yield per acre diminishes every year. The grain is all sent away, the straw and refuse burned in large heaps. Nothing is left to feed the soil or replace what is taken from it.

2. There are no villages, no schools, no trade built up, nothing to encourage, and everything to discourage permanent settlement. The proprietor chooses to cultivate his own land, and desires no neighboring small landholders.

3. This mode of cultivation encourages tramps and wandering farm laborers, and discourages families and homes Each division of the great farm has its superintendent, who has his headquarters during the farming season in his division, with excellent stables for his numerous horses and sheds for the agricultural machinery. There are rude temporary cabins where the travelling laborers sleep at night well packed together, and a large cabin where the cooking is done for the entire division. The men who come from all quarters are hired by the day or week, and dismissed as soon as their work is done. The superintendent and foremen are in the saddle all day through the plowing, harrowing, sowing and harvesting and threshing, overseeing their workmen and dismissing them at once if they are not thoroughly efficient. When the work is completed, the men are sent off without a word, and their future welfare is not a matter of consideration with any of the employers, who do not even know the names of their men.

4. These vast farms, often comprising two, three, or four townships, are utterly opposed to the genius of our institutions, and prevent that healthy growth of population, manufactures, mechanism, and the industrial progress which has made our country what it is. Even the machinery, the horses, the provisions are purchased in large distant cities. Small farms with

flourishing villages close at hand, a thrifty trade, manufactures struggling into existence, and the hearty feeling of good-will on the part of all the inhabitants of the neighborhood, the desire "to live and let live," furnish a much better basis for a new and enterprising State, than these overgrown estates in which are developed the worst features of large proprietorship, without any of its redeeming traits.

Most of the States and Territories have homestead exemption laws which protect the struggling and impecunious young farmer from the danger of attachment of his farm, or house, or household goods, by summary process. Some of the States have probably gone too far in these exemption laws, and have opened the way for cunning and unprincipled men to defraud their creditors easily; but, as a general rule, these laws are not abused. It is a question with many wise political economists whether it would not be better to abolish all stay laws, and all laws for the collection of debts, and make credits depend solely upon the character of the purchaser. Were this rule tried, we think there might be some men who would find it difficult to obtain much credit.

We give the Homestead Exemption law of Minnesota as a fair average of these laws throughout the West. Kansas, Nebraska, and Dakota exempt 160 acres instead of eighty, while Iowa exempts but forty; Arizona, California, Idaho, and Texas exempt homestead or dwelling to an amount not exceeding $5,000, and furniture, books, tools, live-stock to a limited amount besides. Other States and Territories vary in amount from $1,000 to $2,500 or $3,000 on the homestead, with other exemptions.

The following are the provisions of the Minnesota law:

"That a homestead consisting of any quantity of land, not exceeding eighty acres, and the dwelling-house thereon and its appurtenances, to be selected by the owner thereof, and not included in any incorporated town, city, or village, or instead thereof, at the option of the owner, a quantity of land not exceeding in amount one lot, being within an incorporated town, city, or village, and the dwelling-house thereon and its appurtenances,

owned and occupied by any resident of this State, shall not be subject to attachment, levy, or sale, upon any execution or any other process issuing out of any court within this State. This section shall be deemed and construed to exempt such homestead in the manner aforesaid during the time it shall be occupied by the widow or minor child or children of any deceased person who was, when living, entitled to the benefits of this act."

The same law provides, in addition, that furniture shall be exempt to the amount of $500; animals, with food, and farming utensils, $300; provisions, tools, the books or instruments of professional men, etc., $400.

CHAPTER VIII.

THE IMMIGRANT AS A CATTLE-BREEDER AND STOCK-RAISER—METHODS OF STOCK-BREEDING IN DIFFERENT STATES AND TERRITORIES—THE TEXAS CATTLE RANCHE—THE RANCHE IN CALIFORNIA, COLORADO, WYOMING, MONTANA—CATTLE-BREEDING IN NEW MEXICO, UTAH, ARIZONA—IN WASHINGTON, OREGON, NEVADA, AND IDAHO—MINNESOTA, DAKOTA, NEBRASKA, KANSAS, MISSOURI, AND ARKANSAS AS CATTLE-BREEDING STATES—LANDS BEST ADAPTED TO THIS PURSUIT—DIFFERENT METHODS ADVISABLE IN DIFFERENT SECTIONS—SCENES IN A CATTLE-RANCHE—"THE BULLS OF TRINITY"—THE COW-BOYS OR HERDERS: THEIR CARE OF THEIR HERDS—THEIR ISOLATED, HALF-SAVAGE LIFE—ROUNDING UP—BRANDING—THE CAPITAL NECESSARY FOR SUCCESS—HOW A POOR MAN CAN ACQUIRE A CATTLE-RANCHE IN TIME—STATISTICS OF THE COST OF A MODERATELY LARGE RANCHE.

OUR immigrant, like the sons of Jacob, has "had his trade or occupation about cattle from his youth until now," and he desires in migrating to this Western Empire to continue in the business with which he is familiar; or he has heard wonderful tales of the great success and wealth gained in cattle-farming, and he believes that a similar success is within his reach, if he follows the business. This latter view of the case is one more likely to be entertained by one who emigrates from one of our Eastern States than by a European, for our Yankee is a universal genius and believes himself capable of doing anything and everything which any man has ever done—and generally, it must be acknowledged,

CATTLE DRIVERS ROUNDING A HERD.

he is successful in what he undertakes—while the European immigrant generally prefers to follow the particular line of business to which he has been trained.

How, or under what circumstances, can the immigrant go into the business of stock-raising as it is conducted here, with a fair prospect of success? There are several other questions to be answered before we can reply definitely to this. These questions are: 1. Where does he propose to establish his cattle farm? 2. What amount of capital has he? 3. Has he any personal acquaintance with the business? 4. Is he informed as to the methods used in stock-raising? 5. Is he qualified to take the management of a large cattle-ranche owned by a joint-stock company and conduct it successfully?

A cattle-ranche or cattle-farm in Texas is one thing; one in Colorado, or Montana, or Wyoming is quite another. If our immigrant proposes to start a cattle-farm in Texas, he will require less capital than for such an enterprise farther north; for his cattle will cost less money, he need not buy much land, certainly not at the beginning, his buildings can be fewer and less costly, he has no occasion for barns or shelter corrals, his herders or cow-boys will be mainly Mexicans, and their wages will be lower, and aside from the expense of rounding up and branding his cattle, with a herder for each 1,000 or 1,500 head, they will take care of themselves, and he need not see them oftener than once a year.

To counterbalance these advantages, however, the general run of Texas stock is decidedly inferior in quality; they are long-horned, not of large size, very wild, and do not take on flesh readily. They cost less when two or three years old, and when ready for market bring a lower price, both alive and as beef carcasses. The cattle from Kansas, Colorado, Wyoming and particularly from Montana, are larger, of better breeds, not wild, fat readily and will bring much higher price both alive and as dressed beef. They require somewhat more care, and a more intelligent class of herders, and should have some preparation made for shelter and for fodder during the wintry weather, but do not always get it. The cost of rearing steers, in the large way, in Texas is only

about forty to fifty cents per head per annum; in the central and northern tiers of States and Territories, it ranges from 60 cents to $1.10; but this difference is more than made up in their greater market value. As to the capital required, this depends, even in Texas, very much upon the ability or inability of the stock-raiser to buy and fence his land. Land is very cheap in Texas; grazing lands can be bought for from 10 cents to $1 per acre—but from 3,000 to 5,000 acres are required for 1,000 head of cattle, and the fencing of this from $1,500 to $2,500, the fence being at first a single board and a barbed wire—which will be sufficient to turn cattle. If the stock-raiser prefers to pasture on the range he must have for 1,000 cattle at least six herdsmen, whose wages will be from $1,200 to $1,500 and their cabins and keeping.

Eight hundred cows, each with a calf, will cost about $10,000, and it will be best to invest not less than $2,000 more in Durham or Holstein bulls in order to improve the breed. The house, stable and pens, even of the rudest kind, will cost $1,000, and the horses, saddles, wagons and supplies not less than $1,000 more. If the immigrant buys and fences his land, he will have to invest from $18,500 to $21,500 at the start. If he buys no land except a homestead and pastures on the unimproved lands, he will be able to get along with about $4,500 less, say from $14,000 to $17,000 in all.

For three years the returns will be small. The stock-raiser will keep his heifer calves, and sell a few of his steers when they are a year old, though it pays better to keep them till they are two or three years old. His stock will be improving in quality every year, and at the end of three years he will have a mixed herd of 1,200 to 1,500 head, and can thereafter, unless his herd should be attacked by cattle plague or some other disease, sell off every year from $6,000 to $8,000 worth of cattle and yet increase his herd each year; but he will have to buy his land and fence it, if he has not already done so, and increase the number of his employés.

But, says the immigrant, can I not start in the business of cattle-raising with less than $15,000 or $20,000? Yes, if you are a single man, and have decided to settle in Texas. You may begin

with a small grazing farm, 500 acres or more, and purchase but 100 cows and calves and attend to these yourself, milking a part of your cows, making some butter and keeping a dozen or twenty pigs. But even with this small beginning, you cannot start on much less than $4,500 to $5,000. There are other methods by which an immigrant with a still smaller capital may succeed in stock-raising in other States and Territories, but in Texas intimate association with the rough herders would be too unpleasant to be endured by most men, and there are few or no joint-stock companies which would employ a foreign manager on their great ranches. It might be possible to commence, as some of the present "cattle kings" in that State did, twenty-five or thirty years ago, with little or no capital, but times and circumstances are changed, and there are not now so many stray cattle without owners who can claim them, as there were in war times. The business was not then organized or systematized, and wages as well as cattle are much higher than they were then. There are very few instances in Texas where the large stock-raisers make any account of the milk. Most of them buy their butter or go without it. In Kansas, even where the herds of cattle are moderately large, a part of the cows are kept for their milk, and dairying is often carried on in connection with stock-raising. Here a man may begin with a few cows and calves and gradually build up a cattle-ranche and dairy-farm at the same time. On the frontier it is still possible to raise stock without owning an acre of land, or at most only a homestead claim. In Eastern and Northern Colorado and in Wyoming, many of the cattle-ranches are on a large scale, and while their proprietors (in some instances joint-stock companies) purchase considerable tracts of land, they also avail themselves largely of the unimproved and unsurveyed Government lands. Even the great Hermosillo Ranche, now owned by the Colorado Cattle Company, besides its 91,000 acres of purchased lands, pastures nearly 500,000 acres more of unsurveyed lands on the adjacent mountain slopes. As a rule, stock-raising in Colorado only pays well when conducted on a large scale. The great parks, as well as the mountain slopes, afford fine pasturage, and Colorado beef has the highest reputation.

The man who attempts to start a cattle-ranche with less than 1,000 head, and with a capital of less than $20,000 or $25,000, will hardly find it profitable. And while this is the lowest limit, $100,000, $200,000, or even $500,000 can be invested with great advantage and profit in the business. We have spoken of the joint-stock companies for stock-raising. Persons of moderate capital, but who have money which can lie for two or three years without much return, in the hope of an ample one after that time, may find this a desirable mode of investment. It is not difficult for men who have been accustomed to the care of cattle, and who have a little capital of their own, to obtain a situation on these large ranches, where purchasing and branding a few cattle, they can have them pastured free on the ranche, and securing for themselves a quarter or half section of land, can, by degrees, erect the necessary cabins and corrals, break up their land, and sow it with forage grasses or root crops, and keeping up two or three of their cows, they have their own butter and milk, fat some pigs, and at the end of, say, five years, have a fair stock of cattle to start their own ranche, and if the location has been well selected, with abundant water, they can probably secure, when needed, sufficient land to pasture their stock, at very moderate prices. The herder's life is, however, a very lonely one, and a man who has a family will find it very distressing to him and them, to lead a life of such isolation and with so few comforts. There is indeed a prospect of a moderate competence in the future, but that future seems so far off, and meanwhile his children, if he has any, are growing up without opportunities of education, and without the refining influences of social life.

Cattle-ranches of large extent cannot exist in the immediate vicinity of large villages; they require too much room; some of them occupy an entire county, and except the necessary dwellings and offices at the home of the proprietor, where there may be also a post-office, there will be in the whole county no settlement aside from the isolated cabins of the herders, and, of course, neither schools nor churches.

The life of the herder is not without its perils, and those more serious than are usually supposed. These perils are of various

kinds: where, as in Texas, California, and New Mexico the cattle are largely of the long-horned, half-wild Mexican breeds, the bulls and steers are dangerous, especially when the herder or any one else meets them in large numbers, and when excited by thirst or rage.

The poet-novelist, Bret Harte, has immortalized in his "Gabriel Conroy," "the bulls of the Blessed Trinity," a ranche of Southern California. Arthur Poinsett, one of his heroes, and a lawyer, visits the proprietress of the ranche, Donna Dolores, on business, and while waiting for her answer to his propositions, wanders out upon the grazing lands on foot, and suddenly finds vast herds of the bulls and steers of the ranche coming toward him from all directions. They are not ferocious or fierce; they will even retreat for a little distance when he faces them resolutely, but meantime others are coming up at his back; he is surrounded, and by a stolid but determined herd, who will trample him under foot, without rage or excitement. There is apparently no hope. But just at the crisis of his fate, he is rescued by the lady who, mounted on a powerful horse, rides directly at the oncoming herds, and causes them to swerve on either side, and saves him, though he had already fallen, in terror and despair. The Colorado herds are fiercer and stronger than these Texan and California bulls, but perhaps not so wild. If the herder is well mounted, he is not in much danger, except in rounding up time, when the excited animals, worried by pursuit, will sometimes turn upon their pursuer, and unless the lasso is quickly and deftly flung, and both horse and rider are wary and alert, will gore and toss them to death in a moment.

But this peril from the herd itself is by no means the only danger to which the herder is exposed. West of the divide or highest summit of the Rocky Mountains, the grizzly bear roams monarch among the beasts of prey, and has a decided appetite for fresh beef. If he is very hungry, he will pull down a steer or cow, even in the presence of the herder. He is said to be terrified by the yells of the herders, but, when ravenous, he will not hesitate to attack men as well as beasts, and his great muscular power, his terrible claws, and his remarkable vitality, render him

a most formidable antagonist. It is very dangerous to attack him single-handed. The cougar or panther, and the jaguar or American tiger, are also ready to prey upon the herd, whenever they can approach it from some rocky shelter or leafy covert, and if wounded are desperate and dangerous foes to encounter.

Ordinarily, as we have said, except in the most elevated pasture lands of Colorado, the amount of snow and the severity of the cold is not sufficient to render it necessary to corral and feed the cattle, and they run at large, browsing the native buffalo and gama grass, and, though rather thin in the spring, they fatten rapidly in the spring, and in the early summer are almost too fat to be driven any considerable distance. But, at intervals of eight or ten years, there come winters of great severity; deep snows occur every week; the streams are frozen, and even the bunch grass, which rises stiff and strong, from two and a-half feet to three feet above the soil, cannot reach above the level of the snows, and the cattle are liable to starve.

The prudent stock-raiser has made provision for such seasons; his wild hay is stacked near the corrals, and groves of evergreens shelter the stock from the driving storms; where the herds are so large that they cannot all be under cover, such protection as is possible is afforded them, and especially is a supply of water secured to them by artificial lakes, artesian wells, troughs and pools fed by hydraulic rams or by windmill-pumps. But unfortunately the number of prudent stock-raisers is not very large, and there is a terrible destruction of cattle. During this period the labors of the herder are very severe. In the fierce, driving storms he must be constantly in the saddle, endeavoring to bring the terrified and excited herd under his care, into safer and more sheltered positions; as the snows grow deeper and the trail more difficult to find, the cattle, wild with fright, plunge to one side or the other, and are at once buried in the drifts, and the herder must plunge in after them till sometimes the horse and rider are too weary to regain the track and both sink down and perish. On such occasions these rude, rough men often manifest a heroism and fidelity to the interests of their employers, an unflinching courage, which goes to certain

death, with a spirit worthy of the noblest of the martyrs of ancient or modern times; nameless heroes, whose faithful service and unflinching self-sacrifice shall yet be found recorded in the archives of heaven.

When the sun has again resumed his sway, and the winter snows are melted, the gray wolf, the coyote and the vultures have their abundant feasts off the carcasses of the dead cattle, and before mid-summer their bones lie, bleached and white, on all the hills.

In Montana, and to some extent in Washington and Oregon, the business of stock-raising has fallen into good hands. Most of the ranches are large, they are carried on by joint-stock companies, limited, or by a partnership with a large capital, and employing the best men to be found as managers. The cattle are of high grade and are larger, fatter, and more tender of flesh than those of any other region of the West. The excellent and nutritious bunch-grass and the white sage bush after frost, have much to do with this peculiar excellence of the Montana beeves.

Some of the largest ranches there have shelter, and wild rice or other hay for their cattle when the winter is severe; but in many of the valleys where the snow does not lie deep and the bunch-grass is tall and stiff, they are not sheltered, but keep out all winter and do not ordinarily lose much flesh. In the spring and summer the only complaint in regard to Montana cattle is that they are too fat. They can be exported to England by way of the Northern Pacific and Duluth without special fattening and at a very large profit.

In California there are but few of the old Mexican-Spanish ranches left. A better race of cattle have taken the place of the long-horned, raw-boned, lean Mexican cattle, and the proprietors of large herds are not now the dignified, rather pompous, but easy-going hidalgos of thirty-five or forty years ago, but wide-awake, keen-eyed Americans, Germans or Englishmen, whose cattle can boast of a pedigree in the herd-book, and whose object is to make fortunes out of the cattle trade. The number of cattle raised in California, though large, is not much in excess of the local and inter-state demand, and beeves are not shipped

thence to other countries to any great extent. They number probably about 1,800,000 head, of which about one-third are milch cows, and dairy-farming is rapidly increasing in importance. The character of the stock is very high, and some of the best imported cattle on this continent are to be found in California. Both the bulls and cows are in demand in the States and Territories east of the State, for stocking new ranches.

Kansas and Nebraska, especially the former, have been more famous in the past for pasturing and fattening Texas cattle driven thither for that purpose, and shipping them when fattened over their railways to the East, than for the management of large herds of their own; but this practice is less prevalent now than some years ago, as the Texas cattle are now fattened to a considerable extent at home, and shipped either as live-stock by steamer to Europe, or slaughtered and sent packed in refrigerating rooms on the steamers to Europe or to New York. Kansas has now nearly 1,300,000 head of cattle, of which about one-third are milch cows, and Nebraska about 700,000 in the same proportions, while Texas with her 7,000,000 of cattle has not over 800,000 milch cows. The western half of both Kansas and Nebraska is well adapted to stock-raising, and with the facilities for shipping their stock to market over nine or ten nearly parallel railways, the business can be conducted with large profit. Iowa and Missouri have each nearly 2,500,000 head of cattle, of which in Iowa more than 800,000 are milch cows, and in Missouri about 675,000.

Wyoming has large and increasing herds, and is probably somewhat better adapted to cattle than to sheep. Besides her own extensive ranges of pasture, the Wyoming stock-raisers have for some years driven large herds into the North Park of Colorado, where the pasturage is excellent.

Utah and Nevada have some good grazing lands, and are turning attention to cattle-raising, and the number of herds, though small, is increasing. New Mexico is peculiarly adapted to sheep-culture, but, though dry, is also a good region for cattle, as are also portions of Arizona. In the lofty *mesas* or table-lands from which still more lofty spires and peaks lift their heads

into the region of perpetual snow, the melting snows form lakes and pools whose waters can be made to irrigate the lands below, and these lands, 6,000, 7,000 and even 9,000 feet above the sea, furnish excellent grazing for cattle.

In all those States and Territories where there are large herds which pasture upon the unsurveyed government or State lands, being turned out, as the phrase is, upon the range, they mingle with other herds and stray away often many miles. The herders do what they can to keep them together; but there is a necessity once a year for a "*round up*," which, if the herd is very large, may last two or three weeks. This is a great occasion for the herders and the cattle men, of whom a considerable number are employed as extra hands. These are all experts in horsemanship and in the use of the lasso or lariat, and they have need of all their skill very often. In Texas, New Mexico, the Indian Territory, Arizona, and formerly in Southern California, where the cattle were very wild, the herders, after gathering the herds together from over a wide circuit, rode into the crowded masses of cattle and lassoed every steer or cow which had the brand of their employer upon it and drew them out into a herd by themselves. The calves followed their dams, and each herd was guarded and separated from the other till they could be driven to their corrals or their own particular herding-ground. Occasionally a bull, bullock, or steer, or a cow unaccustomed to this rude treatment, and afraid her calf was to be taken from her, would show fight, and, with head lowered, would attempt to gore or toss the horse or his rider, from whose unerring aim the instrument of torture had been flung, but the horses trained to their work were too active and alert to be in much danger, and both they and their riders enjoyed the sport.

The herd being thus separated from the herds of other owners, two other important duties remained to be performed; the calves were to be branded, which was effected by driving them with the cows through a passage so narrow that but one animal could pass through at a time, and at the narrowest part of the passage the brander, his branding-iron heated to redness in a blazing pile of logs at his back, pressed it down upon the back of the

calf. Every proprietor has his own peculiar brand, which is recorded in the county records.

The next thing to be done is to select the three or four-year old steers to be sent to market, and, if any of the cows and calves are to be sold, they also are withdrawn from the herd. The selection of these animals for sale is easy or difficult, according to the degree of wildness which they manifest; sometimes they are readily and easily culled out, but at other times the lasso is required, and there is a protracted struggle, before a refractory steer will take his place where he belongs.

Where, as in Kansas, Nebraska, Minnesota, Iowa, and to some extent in Montana and California, dairy-farming is connected with stock-raising, and the herds are much smaller, it is possible for a man who is thoroughly conversant with the business to conduct a good stock and dairy farm, beginning, we will say, with forty or fifty cows and two or three bulls, with as many yearling or two-year old steers as he can find pasture for, with a capital at first of not more than $6,000. For this purpose he should buy a quarter-section, pre-empt another, take another under the Homestead Act, and another still under the Timber-Culture Act, if on the plains, looking out for the springs, and if he makes a wise selection he will have the land between the springs for a free range for some years. He will need to put considerable money into fixtures for a dairy farm, to select his cows from Alderney and Jersey grades if he can find them; if not, Ayrshires or Holsteins; and he should have at least one Alderney and perhaps one Holstein bull.

He should sow forage grasses largely and keep his dairy cows near the homestead, feeding them freely as the pastures become dry. He will be able to sell his steers at the end of one or two years if in good condition for a very large profit, and well-made butter and cheese always commands high prices throughout these States and Territories.

An industrious and skilful dairy farmer beginning in this moderate way can, in ten years, have as large a dairy as he will wish to manage, and sell every year from $3,000 to $6,000 worth of choice stock without impairing the value of his herd, and within

that time he can buy all the land he needs to pasture, and, having it under fence, he need employ no herders, and with his other farming can raise good crops of grain and increase his production every year.

Except as we have indicated in previous pages, however, there is very little opportunity for a man with little or no capital to engage in stock-farming with any reasonable prospect of profit. If he is an expert in the management of cattle he may obtain a situation as manager on one of the joint-stock ranches, and, under a plan recently tried in Montana, he will eventually become wealthy. This plan, as described by Mr. Zimri L. White, is as follows: one or several capitalists purchase a herd of cattle of as good quality as possible and put them in charge of a manager in whom they have confidence; he finds a suitable range and undertakes the payment of all the expenses of corrals, cabins, wages of herders, the hay provision, etc. (the range is free, being on unsurveyed lands). The capitalists retain their title in the original herd, but the manager makes sales from the increase of the stock, and if he chooses may buy from the proceeds yearling or two-year old steers to fat and sell at the end of one or two years. When he has paid back to the investors the sum they originally put in, he becomes the owner of one-third of the herd and of the business, and receives thereafter one-third of the net profits after paying the expenses. In ten years' time a man whose abilities and integrity qualify him for the position can become wealthy.

CHAPTER IX.

SHEEP-FARMING AND WOOL-GROWING—THE BEST REGIONS AND THE BEST BREEDS—THE MOST DIRECT ROUTES THITHER—THE METHODS OF SHEEP-FARMING IN OUR WESTERN EMPIRE—CAPITAL REQUIRED IN DIFFERENT SECTIONS—THE SHEPHERDS—ANTAGONISM OF THE HERDERS AND SHEPHERDS—IMPROVING THE BREEDS—WINTERING THE SHEEP—WATER IN ABUNDANCE A NECESSITY—DESTRUCTION OF THE HERDS FROM THIRST—SNOWING UNDER—FATAL EFFECTS OF A SEVERE NORTHER—THE SHEPHERD'S LIFE MORE ISOLATED AND WITH LESS EXCITEMENT THAN THAT OF THE HERDER OR COW-BOY—ITS RISKS AND DANGERS—HOW TO BUY AND STOCK A SHEEP-RANCHE—THE AMOUNT OF CAPITAL NECESSARY—THE COST AND THE PROFITS—THE ENEMIES OF THE SHEEP—HOW A POOR MAN CAN BECOME A SHEEP-MASTER.

THE increasing attention which has been given within the past ten or twenty years to sheep-farming in Great Britain, as well as on the continent, and the fact that in the Australian colonies, the South African colonies, and the Dominion of Canada, it is one of the chief branches of agricultural industry, will almost necessarily inspire in the minds of emigrants from Great Britain or the continent of Europe the desire to engage in it here. In Europe sheep-farming, except on a very small scale, cannot be conducted by any but wealthy proprietors. The land, especially in the United Kingdom, is in few hands, and is so valuable that a sufficiency of it for a large sheep-farm is beyond the means of the small farmer. Sheep-pastures, which rent at from $8 to $25 per acre, are certainly beyond the reach of men of small means, especially if they reckon as they do in Colorado, in their lavish way, that they need to have a range of five acres to a sheep, in order to change their flocks from one pasture to another.

The large and constantly increasing importation of sheep and mutton for food purposes into Great Britain from Australia, Canada, South Africa, and the United States, reduces the price of mutton there so low that the farmers cannot raise sheep for their flesh, and the vast increase in the production of wool, and the marked appreciation in its quality in the United States and Canada, as well as in other countries, keeps down the price of that staple.

SHEEP-SHEARING.

Let us then consider whether the immigrant coming to the West from any part of Europe, or from our own Atlantic States, with a small capital can enter upon sheep-farming with any fair prospect of success; and if so, in what region it will be best for him to locate, and what breeds of sheep he will find it most profitable to rear.

Let us say, at the commencement of this discussion, that to the man who has not at least $2,000 at his command, profitable sheep-farming, except as an employé of others, is well-nigh impossible; and even with that much capital, it is only practicable in a very few of the States or Territories, and with a much smaller flock than would suit the ambition of most of our sheep-masters. For starting on a small scale, Kansas, Texas, and Colorado have some great advantages and some disadvantages. Perhaps Kansas is, on the whole, the best for these small sheep-farms. Texas has cheaper land and more free range, but Kansas has enough for all present necessities. The Texas sheep are yet so largely of the Mexican breeds, that they yield but three or four pounds of wool at a shearing; the Kansas sheep have been improved till they will average over five pounds, perhaps nearly six, and their wool commands a somewhat better price in the market. The Texas sheep are subject to the scab, which gives them great torture, and sometimes kills them; they suffer somewhat also from foot-rot, though not nearly as much as some years ago. In Kansas there is no foot-rot, and very little of the scab.

But, perhaps, the best testimony we can have from either State is that furnished by the simple testimony of practical wool-growers, who give their account of their success without any motive to make out a case worse or better than the facts will warrant. These statements will be far more satisfactory to the intending immigrant who desires to become a sheep-master, than any theoretical estimates which can be figured out, because they are what has been accomplished by men of average skill as wool-growers, and men perhaps no more skillful than those who desire to engage in the business. In Texas, with its vast flocks of sheep (about 7,000,000 the present year), the sheep-masters do not encourage small sheep-farms, because they are apt to be in the

way of their great free-ranges, and, as they allege, on account of the greater profit and advantage of handling them in large flocks; but it is well to note what these sheep-masters say of the business. Col. John James, a sheep-master for thirty years, and occupying an extensive tract west of San Antonio, writes that that region known as Western Texas is well adapted for Merino sheep. "We have not tried fairly," he says, "to raise the finer and heavier mutton sheep. We know they do not herd well, or as well as the Merinos, and a great deal of expense is saved by being able to run them in large flocks. The finer-wooled sheep pay the best. We know no other disease among them except the scab,* which is not hard to cure, nor is the expense heavy to do so. We think that the scab will not originate in that country if the sheep are properly cared for and kept out of dirty pens. We have now an excellent scab law, and that disease will be so generally controlled that we will not hear much of it from this time forward. We run our sheep in flocks of from 1,000 to 1,500, generally as high as the last named figure, and we use Mexicans for shepherds, and pay them $12 a month, and rations which cost about $6 a month more. The cost of living on a ranche may be rated somewhat as to the taste and habits of each ranchero. If persons can economize labor, the outlay for food is not a serious item. Meat is abundant and cheap, and is generally produced on the ranche. The people live generally upon fresh meat—cattle, hogs, mutton, chickens, and game. Coffee, sugar, and flour cost higher than where there are railroads. Corn is either raised on the ranche, or purchased at about $1 per bushel, and there are mills within reach to grind it.

"Sheep and cattle men care very little for farming, their attention in the spring of the year being devoted to their stock, which then requires more attention than at other times.

"We do not pen our flocks at night; our shepherds sleep out on the ridges at night with the sheep—the flocks, at night, being near to each other for mutual protection; nor do we put up any feed for winter use. The grasses and other food they get, upon

* Perhaps not in that vicinity, but in the lower lands of Texas the foot-rot has been fearfully prevalent among the sheep. As the lands are drained this disease disappears.

an average, are as good in January as in June. Nor do we have any shelter for them during stormy weather, except what we find in the ranges in the way of thickets and undergrowth—the object then being to break off the force of the wind.

"Our grasses, we think, are as nutritious and valuable as the best cultivated grasses. But the grasses are not all that sheep require. Herbs, shrubs, *nopal*, and saline grasses and plants, contribute more to fatten these animals than the grasses. These last named are peculiar to that country, and which we Americans know the names of, in some instances, by the designation given to them by Mexicans in their own language, but not otherwise.

"The climate in the sheep country referred to is generally warm, but very healthful—being tempered by the breezes from the Gulf in summer, while our coldest weather comes as northers —sometimes wet, but oftener dry. For a considerable part of the year the atmosphere has but little moisture in it, and this is one of the reasons why it is so good a sheep country. Often in the best ranges the sheep have to be driven two or four miles to water; and this is another reason why the sheep thrive so well, for sheep do not require much water. In the hottest weather, water once a day is plenty for them, and they do better so than when water is abundant in their ranges, for they will drink it when it is better that they should not. It is true that a dry climate is the best for sheep.

"It is doing well to raise 800 lambs a year old from 1,000 ewes. Probably 900 will be born, and generally nearly all raised. The Merino sheep seldom brings more than one lamb. Shearing is done in May. A good hand at that work will shear and tie up fifty fleeces in a day. If the labor is employed off the ranche, the cost of shearing, tying up the wool and sacking it, is five cents a fleece. We do not wash our sheep, and we sell our wool at San Antonio.

"The fleeces taken from the fine Merinos are the heaviest, the Mexican sheep furnish the lightest fleece. My flock this year averaged four pounds only.* Our wethers are sold as fast

*This amount of fleece, or weight of mutton, would hardly satisfy the more enterprising wool-growers of Kansas and the States farther north or northwest.

as they mature, say in the winter preceding the clip; therefore they are four years old. Such was the case the present year, and these animals produced the most wool.

"The heaviest fleece we sheared from a ram, raised at home, gave over seventeen pounds. Good wethers give from six to ten pounds for the year's growth.

"Sheep kept in smaller flocks give more wool than when kept in large flocks, but not enough to compensate for the extra expense.

"There are plenty of four-year-old mutton sheep upon the ranchos now, in Uvalde and Frio counties, which will net sixty pounds, and will yield twenty pounds of tallow, and this is a good weight for Merino sheep to reach.

"When a wool-grower has sheep enough to supply a flock master, say five thousand head or more, fifty cents a year will keep and care for each sheep, including taxes and other expenditures, and will also enable a man to procure and pay more reliable labor than we have now.

"The business suits single men better at the present time, but upon the general occupation of the country, that difficulty will be less felt.

"Lands for sheep have been purchased generally during the past year at about fifty cents per acre, but values are increasing.

"Wool-growers may begin upon a small tract of land, but the time is at hand when they will be required to own or rent the land they graze upon. All prudent wool-growers buy lands adjoining to them as fast as their means will permit them to do so.

"It is true that this business will be an important one in this country. I think it will be second only to the great cotton interests of Texas, but it will take time to get the breeding stock to occupy the country. Sheep for breeding purposes can be got from Mexico, but they are very indifferent in quality and size, and wool very coarse; otherwise they have to come from the Western States.

"By selling our mutton in January or February, when animals for food are often on the decline in more northern counties, and

generally so in other parts of Texas, we are enabled to get fair prices, which compensates us for the distance we are from our market; this we will call the first crop. The second crop is the wool which comes into market about the first of May, and I regard each crop as more certain than by cultivating the soil."

The policy of the Kansas people is, on the contrary, to encourage sheep-farming on a small scale, and generally in connection with the culture of crops of grain, roots, etc. There are very few of the larger class of sheep-ranches in Kansas, no county in the State reporting 18,000 sheep in 1879, yet the aggregate of the State was about 312,000 that year; and is rapidly increasing. The experience of these small sheep-farmers, most of them cultivating the soil also, and as their several reports show, managing their little flocks carefully and prudently, cannot fail to be interesting and instructive to those who wish to follow their example. We have selected from a mass of about 150 returns to the inquiries of the late excellent Secretary of the Kansas State Board of Agriculture, contained in his Quarterly Report for December 31st, 1879 (really published in February, 1880), six reports, one from the extreme east of the State, one from the West, where the sheep range is the still unbroken prairie with its tufts of buffalo grass, one from the Northern Central, and one from the Southern Central or Arkansas Valley part of the State, and two from the central belt of counties. Each one tells his own story frankly and honestly, and none of them seem to have invested more than from $1,000 to $2,000 in their enterprise at first, yet their success has been very fair for the capital invested, and is likely to be still better in the future, as the cultivated, or as they call them, "tame" grasses, take the place of the wild ones.

T. McIntosh, Oskaloosa, Jefferson County.—"Have raised sheep here nine years; had some experience in Iowa. Own 200 head now. Original stock obtained in this State. Long-wooled breeds, such as Cotswolds and Leicesters, are best for both wool and mutton. My ewes average about a lamb a piece. Average weight of fleece from my sheep is a trifle less than seven pounds. Sell mutton at home for three cents. Sold wool in 1879 for

twenty-two cents. Long, fine wool most profitable. Wethers may be kept until three or four years old; ewes until seven. Lose from two to three per cent. of my flock annually by natural causes; dogs kill about two per cent.; wolves this year got three per cent. My sheep run on prairie in summer; kept in a dog-proof corral at night. Turn them on tame pasture towards fall, and when this begins to fail commence feeding prairie hay, millet or clover, increasing the hay until they have all they will eat. As cold weather comes on, feed a little corn, gradually increasing quantity until they get an ear apiece each day; give corn morning and night, and all the hay they will eat clean; salt twice a week in summer, and once in winter. Last year I had 148 sheep, worth $333—sold wool for $203.28; mutton, $31.50 = $234.78; and have now 208 head, worth $600. Dogs and wolves are great drawbacks here to success in raising sheep."

A. J. Uhl, Douglass, Butler County.—"Have been for thirteen years raising sheep in Kansas; previously had experience in Illinois and Texas. Find Kansas has much drier climate, not so much mud; sheep-lots and corrals can be kept in much better condition; no fear of foot-rot, unless shipped in with stock from abroad; much larger percentage of lambs can be raised on account of dry weather at dropping time, which, with me, is in March and April. In Texas, grass dried too soon, and winter feed cost too much. My flock came originally from Michigan; have owned same stock for eighteen years; in that time had rams from Vermont, Illinois and Missouri. All seemed to do well, from whatever section they came, with proper care. Many bring sheep to Kansas late in fall, thin in flesh, half feed them, then attribute failure to *acclimation*. I think good feed and proper care all the acclimation needed in Kansas. Have at present 478 in my flock; 1,000 may be successfully kept in one flock. I consider Cotswold ewes, bred to Merino rams, best cross for wool; for mutton, Southdowns preferable. My experience is, however, that mutton alone will not pay; for both wool and mutton, cross from Cotswolds and Merinos best. I raise eighty-five per cent. of all lambs dropped. My average weight of fleece, in 1879, seventeen and a quarter pounds. Sell my mut-

ton in Wichita at $3.40 per 100 pounds, gross. Price of ewes, culled, $5; wethers, $4. My wool for 1879 brought twenty cents per pound. Most profitable grade of wool, in my opinion, cross of Merinos and Cotswolds. Six years about as long as profitable to keep sheep. My loss from natural causes about five per cent.; none from disease, wolves or dogs; sheep herded during day, at night kept in corral. Put my sheep on prairie as soon as grass is high enough in spring, and keep there till fall, then turn into corn-field; when that is eaten, feed shock-corn remainder of winter. Have owned sheep twenty-one years; they have always been profitable; some years have made ninety per cent., and with exception of one or two years, never less than fifty per cent. on the investment. Do not think it best to keep goats with sheep. Greatest drawback to success, *dogs*. They are a great nuisance, and should be heavily taxed."

A. B. Boylan, Lakin, Kearney County, in the extreme west of the State.—"Have been in the sheep business in Kansas three years. My flock now numbers 500; 1,000 may be successfully kept in one flock. Original stock of ewes came from New Mexico, rams from Kansas; rams from the East do not do well here first season; Missouri ewes must be acclimated. Colorado half-bred ewes bred to pure Merino bucks are most profitable for both wool and mutton. Annual increase in my flock, seventy per cent.; Mexican sheep are most prolific. Fleeces from my sheep average four and a quarter pounds. Kansas City is our market for mutton. Ewes are worth $2; wethers, $1.75 to $2. Sold clip of 1879 at 25½ cents. Sheep can be kept with profit till four years old. My losses from natural causes, about five per cent. per annum; have lost no sheep by disease or dogs; wolves have killed fifteen head in three years. During summer my sheep range the prairie, and are corraled at night; in winter, are on the prairie except during storms, when they are kept under sheds; if the storm lasts more than from six to ten hours, they are fed with hay; have never had grain, and at no time have consumed ten pounds of hay per head during winter. Original stock cost $350; have sold wool and mutton to the amount of $530.40, and have on hand 512 sheep worth $2 each,

or $1,024. Goats are advantageous to lead sheep; there are eight in my flock, that lead the sheep out in the morning and back at night. I see no drawback to successful sheep-culture here; if sheep are sheltered from storms, and not allowed to get chilled, there is no fear of disease."

J. L. Grinnell, Peabody, Marion County.—"Have raised sheep here four years; was never in the business elsewhere. Have 500 now; ewes from Iowa, bucks from Missouri. They do better second year than first. For wool, a cross of Merino and Cotswold is most profitable; for mutton, Southdown, or cross of Southdown and Cotswold; and this last is also preferable for both wool and mutton. Increase in my flock was 108 lambs from 100 ewes. Cotswolds are most prolific. Average weight of fleece from my sheep, six and a quarter pounds. Only local market for mutton; price, $3 per head. Delaine or combing-wool most profitable. Pays to keep wethers until four years old for wool, rather than to sell younger for mutton; good breeding ewes should be kept until exhausted. Losses from natural causes, about three per cent. per annum; none by disease or wolves; dogs killed this year about one and a half per cent. My flock is herded by day and corraled at night during summer; in winter, kept in yards with good sheds; on fair days, allowed to range in stalk-fields.

Original cost of flock	$750
Original cost of bucks	200
Lost by dogs	220
Lost by other causes	300
Total	$1,470
Value of wool sold	$1,340
Value of mutton sold	273
Present value of flock	1,600
Total	$3,213

Drawbacks are want of tame grass for fall pasture, and dogs.

Joseph Hostetter, Glasco, Cloud County.—"Have been raising sheep for six years in Kansas; previously handled sheep in Fayette county, Pennsylvania. Some of the advantages Kansas

possesses over Pennsylvania are: less expense in handling, cheaper feed and pasture, a drier and more healthy climate, and shorter winters. Have now 650; obtained my rams in Pennsylvania and Wisconsin; ewes I bought in Kansas—the stock coming originally from Ohio. For wool I deem the American Merino most profitable; do not know what breed or cross would be most profitable for mutton; have always raised for wool, mutton being a secondary object; for both wool and mutton, should prefer a cross from Cotswold ewes with Merino rams. Average annual increase of my flock, about ninety per cent. of number of ewes. Maximum weight of fleece twenty-five pounds, minimum two, average eight pounds ten ounces. Kansas City is our market for mutton. Price of ewes ranges from $2.50 to $4; wethers, $2 to $2.50. My clip of 1879 sold for twenty-two and a quarter cents per pound. Most profitable grade of wool, long Merino. Keep my wethers for wool till they are four years old; good ewes may be kept profitably till they die. Losses in my flock from natural causes are about one per cent. annually, and some from all other causes. My sheep are herded through the summer; during middle of hot days, keep them in the shade; allow plenty of water and salt, and corral at night. During winter feed all the prairie hay they will eat, and a bushel of corn to each 100 head per day; also range them on the stalk fields and on prairie, in good weather; have good warm sheds in the corral, which are always open to them; never shut them up except during bad storms and at lambing-time. Sheep eat about one and a half tons of hay per 100 head each month. Cost and profit of my flock last season was as follows:

490 head, at $3, (190 ewes)	$1,470 00
Interest 1 year, at 10 per cent.	147 00
Herding 7 months, at $5	35 00
700 bushels corn, at 15 cents	105 00
35 tones hay, at $2	70 00
Shearing, 5 cents per head	25 00
Loss, 5 head, at $3	15 00
Total	$1,867 00

Spring of 1879, 650 head at $3	$1,950 00
Wool, 4,191 lbs., at 22½ cents	932 50
Total	$2,882 50
Profit	$1,015 50

"Being too poor to buy sheep is the only drawback I know of to successful sheep husbandry in Kansas. From my experience, I find that where a farmer takes good care of his sheep, it always proves a success, and I think it is to-day the best paying business in the country."

H. Mathies, Halstead, Harvey County.—"Have had five years' experience in sheep-culture here, and some years in Central Iowa. Points in favor of Kansas for sheep-raising are, mild, dry climate, less cold rains in lambing-time, great variety of rich grass, longer time for grazing, and less feed required. My flock numbers 750; original stock came from Illinois and Missouri; prefer Kansas sheep. Merinos are most profitable for wool; for mutton, Cotswolds crossed with Southdown; for both wool and mutton, Merino ewes crossed with Cotswold bucks. Fleeces from my flock average five pounds. Ewes are worth $2.50 to $3. Sold wool of 1879 for twenty-five cents. Most profitable wool is from long-wooled Merinos. Should never sell wethers before maturity. Sheep may be profitably kept till five or six years old. No losses from other than natural causes, about three per cent. annually. My flock is herded, and corraled at night. During summer are kept on open prairie; watered once a day. Have salt in a trough in corral at all times. Have a good shed, open to south, in winter; feed about five bushels of corn a day; sometimes feed straw, but usually hay, giving all they will eat; in nice weather, often turn them on the prairie.

"The flock has cost about $1,068; expenses, $302; total, $1,370; receipts to date, $2,315; present value of flock, $2,085; total, $4,400. Deduct cost, $1,370; net income, $3,030. Want of shade in summer, and carelessness on the part of owners, are the drawbacks to successful sheep husbandry.

"A practice prevails in some parts of the State by which a farmer who has a flock of sheep, but who prefers to give his

attention to the cultivation of the soil, rents his flock to another sheep-master, who manages it as skilfully as he knows how, selling off the older and lower grade ewes and wethers, and makes up their number from the increase of the flock, shears and sells the wool and gives to the owner of the flock one-half of the proceeds of the sales and wool, and one-half of the lambs after the losses and sales are made good. By this plan it is said that the owner of the flock realizes about thirty per cent. on his investment."

But it is true, as Colonel James says, that the proportional profit from large flocks is greater than from small ones, and this profit increases in almost a geometrical ratio, when the flock reaches its tens of thousands. In illustration of this we give statements thoroughly verified of two sheep-ranches or farms of more than 2,000 sheep, the first that of Mr. G. H. Wadsworth, of Pawnee county, in Southwest Kansas, south of the Arkansas river, as furnished by him with illustrations of buildings, corrals, etc., to the Kansas State Board of Agriculture; and the other a sheep-farm in Colorado, started in 1875 by a Mr. G., formerly of Geneva, N. Y., as reported by Mr. W. H. Coleman in the *Christian Union*, of May 19, 1880.

"In March, 1876, Mr. G. H. Wadsworth took up under the Homestead and Timber-Culture Acts 320 acres of government land, situated eleven miles south of the Arkansas river, in Pawnee county, and the same distance from Larned, the county-seat. The first improvement on the land was the building of a stable, consisting of six posts covered with straw, sided up with rough lumber, with sod wall on the outside. This house was used by the men breaking prairie and opening up the farm, during the summer. In August of the same year, Mr. Wadsworth moved his family to his farm. In October, he brought his flock, 2,085 head in all, and turned on the range. Before winter set in Mr. Wadsworth had built two sheep-sheds, each one hundred and twenty-eight feet long by twenty-nine feet wide, one running east and west, cornering with the other running north and south, forming two sides of a square pointing to the northwest and open to the southeast. A light portable fence running around

the open sides of this square completed the corral. A stable was also built, measuring fourteen by thirty-two feet, and connecting with the south end of the shed running north and south. At the same time a well was dug, thirty feet deep, and a wind-mill put up, with a capacity for raising water for 10,000 sheep. In 1877, Mr. Wadsworth built his present residence at a cost of about $1,500; and in 1879, a granary large enough to hold 2,500 bushels of wheat, with shed for farming implements and two buggies, twenty-four by thirty-two feet, at a cost of $100. The roof was thatched with broom-corn, and fastened with wire. There are no fences on the farm except the portable one around the corral, the herd law being in force in the county. On the right are two sheds, one hundred and twenty-eight by twenty-nine feet each, which cost, including corral, $525, the lumber used costing $30 per thousand feet. On the south, and connecting with the shed running north and south, is the stable, fourteen by thirty-two feet, which cost $20. Next south is the sod shanty, the first home, which cost $75. Farther south is the granary and tool-shed already mentioned, while back of this is the new home. The wind-mill cost $50; the well underneath, $20. Near the wind-mill is a reservoir made of two-inch plank, five by sixteen, and three feet deep, supplying four troughs, each sixteen feet long and one foot wide; ample to water 4,000 sheep; cost $35. Near the well are appliances for dipping. The boiler is eighteen inches deep, thirty inches wide, and eight feet long, with plank sides and galvanized iron bottom, in a clay and partly excavated furnace; the smoke-stack is ten-inch stove-pipe—total cost, $7. The dipping-vat is built of two-inch pine, and is sixteen inches wide, five feet deep, and twelve feet long at the top. The end farthest from the dripping-platform is perpendicular, but the end nearest the platform slopes from the upper edge inward, for six feet, or to the middle of the vat, forming at once the end and the bottom of one-half of it. On this slope are nailed cross-slats, to give the sheep a foothold to walk out. It leads to the dripping-platform, an ascending inclined plane, sixteen feet long by ten feet wide, divided by a fence supporting a cut-gate at the lower end, and at the upper end a gate for each

division. The floor is made of matched stuff, with half-inch strips covering the joints. Over these, and crossways, are nailed inch strips, to give the sheep a foothold. The half-inch strips make the floor water-tight, make a clear run-way under the cross-slats for the drip, and guide it back to the vat. When one division of the platform is filled with drying sheep, the cut-gate is swung so as to shut them in and open the lower end of the other division. When this is nearly filled, the upper gate of the first division is opened, and the sheep are driven out by way of the descending platform, making room to gather in a fresh lot from the vat while those in the other division are dripping. These steps are repeated until all are dipped, thereby economizing time and fluid.

"The portable corral fence is so arranged that the pen from which the sheep are taken to the vat holds only 100 sheep at a time, and connects by a gate with a larger pen capable of holding 1,000. The liquor used for dipping is made of tobacco, fifty pounds, sulphur two pounds, and arsenic one pound, for each 100 sheep; cost, $2.30. The liquor is prepared the day previous to dipping, when the large reservoir from the well is brought into use. The liquor is boiled and run off into this reservoir. On dipping-day the liquor is run back into the boiler, again heated, and gradually fed into the vat as needed—since it is much more effective when used warm. Cost of vat, $10.50, dipping-platform, $6, and boiler, $7; cost of apparatus complete, $23.50, with which four men can dip 3,000 sheep in one day. The sub-ranche is six miles from the farm—its improvements consisting of shepherds' sod house, $50; well, wind-mill, and watering-troughs, $100; with sheds and corral for 2,000 sheep, $400; total, $550.

Mr. Wadsworth furnishes the following statement of receipts and expenditures for the three years he has been engaged in the sheep business on his present farm:

COST OF RANCHE.

Shepherds' house	$75 00
Sheds and corral	525 00
Windmill, well, and watering-troughs	105 00

Dipping-vats, boiler, etc.	$23 50
Incidentals	50 00
Total	$778 50

The land on which the ranche is located was homesteaded, and cost the usual government fees. Operations commenced October 1, 1876, with 1,000 ewes, 1,062 wethers and lambs, and 23 bucks—2,085 head in all.

Receipts and expenses for the year ending October 1, 1877:

EXPENSES.		RECEIPTS.	
Two shepherds	$600 00	Wool sold	$1,950 00
Shearing	150 00	Ewes sold	1,250 00
Dipping	85 00	Wethers and bucks sold	225 50
Grain	210 00		
Hay	200 00		
23 sheep, died	57 50		
15 sheep, killed by wolves and dogs	37 50		
Total	$1,340 00	Total	$3,425 50

For year ending October 1, 1878:

EXPENSES.		RECEIPTS.	
Two shepherds	$600 00	Wool sold	$2,150 00
Grain	175 00	Ewes sold	1,375 00
Hay	140 00	Wethers and bucks sold	762 50
Shearing	150 00		
Dipping	85 00		
14 sheep, died	35 00		
13 sheep, killed by wolves and dogs	32 50		
Total	$1,217 50	Total	$4,287 50

For year ending October 1, 1879:

EXPENSES.		RECEIPTS.	
Two shepherds	$600 00	Wool sold	$1,800 00
Grain	120 00	Ewes and wethers	1,750 00
Hay	125 00		
Shearing, dipping, etc.	300 00		
16 sheep, died	40 00		
Total	$1,185 00	Total	$3,550 00

For these three years the total expenses are $3,742.50, total receipts, $11,263, leaving a net cash profit of $7,420.50 on original investment of $4,948.50. The original flock was worth $2 each, or $4,170 in all. From this he has graded up a flock of 2,200, all young and in fine condition, valued at $3 each, or $6,600 in all. This gives an additional profit of $2,430. The entire original stock of ewes and wethers has been disposed of by the ordinary sales, so that only young and well-graded sheep now remain.

Mr. Wadsworth combines general farming with sheep-raising. In addition to the 320 acres secured from the government, he has bought 480 more, at a cost of $1,400.

In 1877, he had twenty acres in wheat, yielding 400 bushels; in 1878, he had 130 acres in wheat, yielding 3,000 bushels; in 1879, he had 75 acres in wheat, yielding 858 bushels. And now he has growing seventy-five acres of wheat and forty acres of rye. The wheat has pastured the sheep every winter, much to the benefit of both.

The items of hay and grain in the statements of expenses were not bought, but raised on the farm, and the charge against the sheep account is placed to the credit of the former account. Millet, rye, and wheat straw, with corn sown thick, cut green and cured, are used as the principal winter feed, about one ton of fodder being required for every 100 sheep.

Mr. Coleman's narrative of the Colorado sheep-ranche is as follows:

In the fall of 1874, G., a young man of consumptive tendencies, after several years of office work in Geneva, N.Y., and elsewhere, found his health steadily failing, and was led to spend the winter in Colorado. He rapidly improved during his stay there, and by spring had decided to remain and engage in sheep-farming. He entered eighty acres under the homestead law, in El Paso county, about twenty-five miles from Colorado Springs, and stocked it with 1,250 long-wooled Mexican sheep, at $2 delivered, and twenty-five Merino bucks from the east at $25 each. He was industrious and a good manager, and now, at the end of five

years, he has eighteen ranches,* 6,000 sheep, and occupies 100 square miles of land. The slender, delicate young man has grown rugged and robust, and weighs 184 pounds. From letters and conversations I propose to briefly outline the character of a Colorado sheep-farm.

A ranche or ranch is a definite term for a spring of water and some rude buildings, and an indefinite amount of grazing land. These springs are found at various points on the plains, mostly in ravines, and several miles apart, and the owner is entitled, by mutual consent of the farmers, to graze the land on either side half way to the next spring. It is an object therefore to buy as many springs and as little land as possible. In securing new ranches, G. would enter them in his herdsmen's names, and then buy of them at a low figure. The spring is literally the main-spring of sheep-farming, as the land is valueless without water, and wells have been sunk 600 and 800 feet without obtaining water. There is neither dew nor rain except for a brief time in spring. The water is carefully used, being pumped into reservoirs, and the sheep watered from troughs.

The native grass is thin and wiry, and grows in bunches six or eight inches high. Once eaten off it does not renew itself in the same season. The sheep are pastured all the year round, and hay is fed only when the grass is buried in snow. The range needed for each sheep is five acres, as frequent shifting is necessary.

The buildings are a pitch-pine cabin for the ranchmen, and a corral or sheep-pen, 100 by 150 feet square, and enclosed by a tight board-fence six feet high. It has no roof, as experience shows that sheep in covered pens are often smothered by snow-drifts. When exposed to a storm the sheep pack together and keep warm. After the pasturage at one ranche is exhausted the furniture of the cabin, the pump, and the troughs are carried to the ranche that is next used.

The ranchmen are often intelligent Eastern men, who have

* In most of the Western States and Territories the *ranche* or *ranch* is the name applied to the entire sheep or cattle-farm, and these sections of it, to which the sheep are moved for new pasture, are called *sub-ranches*, or, as in Australia, *stations*.

come to Colorado for their health. They get about $20 per month and board. Two usually occupy the same cabin for company, and each man is to take care of about 2,000 sheep. They do most of their cooking at night, after the day's work is over, so as to start out at sunrise, and be with the sheep during the day. Contrary to the common idea, they do not ride, but go afoot, and seldom use dogs—if the owner knows it. Their provisions are brought to them at regular intervals, and are chiefly canned fruits and flour. They get their meat from the flock. So great is the consumption of baking-powder (which is a costly article) that G. finally bought it by the barrel, and issued regular (diluted) rations.

The work of the herdmen is monotonous. The sheep are to be driven and watched by day, and watered and corraled at night, and that is about all there is to it, most of the time. Sundays are the same as other days, and the ranchman soon forgets the days of the week. At night he plays cards, or, if he has books and papers, which is rare, he reads. G. takes pains to save papers and distribute them in rotation to his men. During storms the sheep are held in the corral for several days, but are then driven out, even if the storm has not abated, and from the wind-swept spots they get a bite. Every day they are counted in a rough way, by counting up all the black sheep, whose number is known, and once a week they are separately counted by passing them through a narrow passage into the corral. By the use of a swing-gate the sheep can be diverted to either part of the corral, when it is desired to separate any grade or class of sheep. There is a steady leakage in a large flock, and when counted they are always three or four short.

The lambing time is arranged to come in May, to avoid the rains of March and April. The percentage of loss is usually small in a well-managed herd. Two years ago 2,225 ewes raised 2,006 lambs. One hundred and thirty-eight were dropped in one day, and in ten days 1,100. Up to January 13, 1878, only two sheep and three lambs were lost out of 4,700. But the following winter was very severe, and the lambing of 1879 was reduced to an average of fifty to fifty-five per cent. G.'s was sixty-eight per

cent., and he lost 175 lambs. The clip of wool was also reduced. When 1,000 sheep and 1,000 lambs are turned into the corral there is a tremendous bleating until the lambs and their mothers get together. A long, narrow pen, with divisions holding one sheep each, is used for the sheep without lambs. A motherless lamb is given to each one, and they are kept together until the lamb is owned—usually two days. The bottom boards of the pen are nailed on the *outside* of the posts, so that the lambs can slip under when in danger of being lain on. The lambs are weaned the first of October, and taken to another ranche.

Shearing is usually done in June, but G. waits till July, both to gain in weight of fleece (a sheep sometimes gains a pound of wool-weight in a hot week), and to get help at a lower figure than he could when everybody was shearing. The work is done by Mexicans, who come north for the purpose. They get five cents per sheep, and shear fifty to one hundred per day, using shears with very long blades. The sheep are not washed. A Mexican sheep shears thirty cents' worth of wool, a grade sheep one dollar's worth. G.'s shearing is done by twelve men in two weeks. As fast as the fleeces are delivered to the tyer the shearer receives a ticket, and at the close of the shearing two or three men are usually found to hold all the tickets. The Mexicans are great gamblers, and contrive to lose their earnings before they are in hand. Each fleece is put in a box with four strings, and tied, then put in large sacks holding 500 or 600 pounds each. These are drawn to market by a "bull team;" either three wagons fastened together and drawn by twelve yoke of oxen, or one wagon drawn by seven yoke. G.'s clip of 1878 was 18,000 pounds, which cost two cents by rail to Boston, and netted there twenty cents per pound. It can, however, be sold to good advantage at Colorado Springs, and the clip of 1879, 20,000 pounds, G. "pooled" with a neighbor who had 30,000 pounds, and by careful watching of the market, with weekly telegrams from an Eastern wool-house, the lot was sold for twenty-four and a-half, when others were getting twenty and twenty-two cents. El Paso county wool is rated two or three cents higher than other wools, but the cold weather of the previous winter reduced the clip an average of one pound per head.

Diseases do not trouble sheep as at the East. Foot-rot disappears, the climate is so dry. Scab is cured by a strong tobacco wash, made in a vat through which the sheep are driven, and up an incline plane, which saves the drip. Ticks are killed by it also. The losses in sheep-farming are caused by insufficient shelter, poor feeding and nursing, and the inroads of rattlesnakes and wolves.

A summary of G.'s investment is as follows:

1,250 ewes bought in 1875 at $2		$2,500 00
Merino rams		1,000 00
		3,500 00
Five years' sale of wool	$12,500 00	
1,000 old Mexicans and others sold	2,500 00	
		15,000 00
Value of present herd		15,000 00

He raised 2,000 lambs in 1879, and will have 2,500 ewes in 1880. He proposes when his flock of 6,000 is increased to 10,000, to send the surplus lambs in the fall to Western Kansas, where corn is cheapest, feed till spring, and ship to Chicago, where they will bring $4.50 per head; $2.50 will cover expenses. But the Leadville excitement is opening a home market, which may change this plan. A neighbor sold 775 wethers for $3,100 ($4 each), hay and grain being scarce this winter, and G. was offered the same price for 500 three-year olds, but declined it.

We have already (in Part I.) given an account of those great sheep-farms where the flocks number 30,000, 50,000 or even 80,000 head, and the profits are reckoned by tens of thousands of dollars annually. The men who own these great properties must have begun, or would now find it necessary to begin, with from $15,000 to $50,000 or more, of capital; and many who have come to the West from Europe with more than the latter sum have, after two or three years' experiments with sheep-farming, been sold out by the sheriff, and in some instances have been obliged to seek employment as shepherds, perhaps on the same ranche where they had once been proprietors. The counties of El Paso, Pueblo, Huerfano, Frémont, Las Animas and Bent, in Colorado, have many stories to tell of these young men who

played the Grand Seignior on so large a scale, and would come into Colorado Springs or Pueblo, driving their four-in-hands and spending several days at a time in reckless dissipation. Neglecting their business, they were constantly fleeced by sharpers, till their capital was all expended, and they were often too far down in the scale of social demoralization, to retrace their steps and regain their lost manhood. No man can succeed either in stock-raising, sheep-farming or general agriculture, who does not give his whole thoughts and attention to his business. There are duties which must be performed by subordinates, but unless the eye of the master is constantly over them, and he understands when they perform their duties properly, and exercises proper discipline and authority, besides performing his own special duties, there will be neglect and heavy losses. One of the class of wealthy proprietors in Colorado, and one of the best of them, for he did, to some extent, superintend his sheep-farm, had directed, in the autumn of 1877, sheds to be built for the protection of his sheep from the severe snow storms which once in eight or ten years visit that region, and also ordered the gathering of a quantity of wild hay for them. But his orders were disregarded, and in March, 1878, his flock, or at least a section of it, of over 1,000 sheep, were caught, and they, and the Mexican shepherd who tended them, followed each other over the brink of a deep gulch, and fell over into the gulch and were lost. Late in the spring the melting of the snow uncovered, in that Big Corral Gulch, the bodies of a thousand sheep or more, and among them, amid evidences of his struggle to save his sheep, lay also the body of the faithful Mexican shepherd. It was not in Palestine alone that it could be said, "the good shepherd giveth his life for his sheep."

There can be no question, that to the wool-grower whose only object is to realize a fortune speedily in sheep-farming, New Mexico offers the greatest inducements. The climate is pleasant, though dry; there is not much agreeable society, and very little enterprise among the inhabitants, it is true, the old Spanish forms and formalities and the iron yoke of Jesuitism oppress and impoverish the people, but emigrants from other lands and

from the Eastern States are cordially received, and both the mining and stock-raising interests are being developed with considerable rapidity. The present Chief-Justice of the Territory, Hon. L. Bradford Prince, says that "sheep-raising is the most important industry in the Territory; the region for sheep-farms extends from the head-waters of the Canadian river in the extreme east to the San Juan country in the far northwest. The sheep of New Mexico are already counted by the million, but there is abundant room for new enterprises both as to number and quality. To commence the business properly requires a capital of $5,000, which will buy 2,000 sheep and provide for all necessary expenses until a regular income is derived from the flock. No business can be safer, surer or more healthful; but, like all others, it requires work and attention; and if any one thinks that sheep-raising is to be conducted profitably by living in town and having flocks roaming the prairies under irresponsible herdsmen, without personal attention, he had better remain at the East."

The native sheep of New Mexico is a descendant of the Spanish Merinos, brought there 340 years ago, and has degenerated from its early type, but when bred with pure improved Spanish Merino bucks it is capable of becoming in the third or fourth generation a most valuable sheep for wool, and the wool product is there much more valuable than the mutton product. The flock doubles every year under good management; it is said to be capable of demonstration that sheep can be well kept, throughout the year, at a cost not exceeding fifteen cents the head, and that the yield of wool, beginning with two pounds for each ewe and two and a half for each wether, can be increased in five years by careful breeding to five and six pounds per head, and the quality of the wool so much improved that it will bring from twenty to twenty-eight cents per pound. In other Territories and States it is said, that the Mexican ewe, especially the improved ewe, which is the product of a cross with other and larger breeds, seldom or never bears twins; but in New Mexico twin lambs are so common that their number fully makes up for any losses in the flock, and it is an underestimate to reckon the

annual increase of the flock at one hundred per cent. of the ewes. As the mutton is of no particular account in New Mexico, the whole profit turning upon the wool, the young wethers at two years old are exchanged, after shearing, for more ewes to increase the stock of wool-producers. A sheep-farmer, in three years' time, beginning with a flock of 5,000 ewes and 100 bucks, will have 18,000 sheep and lambs, and will shear from 40,000 to 50,000 pounds of wool, and in five years he will shear 40,000 sheep and obtain 120,000 pounds of wool or more. In New Mexico, while the rainfall is scanty, the snow and rain on the mountains fill the streams, and the facilities for irrigation and for preserving the water in reservoirs are generally good. Sheep thrive better in a dry than in a wet country, and they require water but once a day, and this they can have without difficulty. Artesian wells generally succeed well on the plains in this Territory.

There are no diseases here to which sheep are liable, and the few destroyed by wild animals are the principal losses. The corrals are usually of adobe or sun-dried bricks, and can easily be made, where they are not already, proof against wild animals. Neither the jaguar nor the grizzly bear are found in New Mexico, and the cougar or panther and gray wolf are not abundant. The brown or cinnamon and the black bear seldom attack sheep when in care of a shepherd, and never in a corral, and the coyotes are too cowardly to attack any except the sick, lame, or wounded. No provision for sheep in the winter is necessary in New Mexico. There are no heavy snows there, except high up in the mountains, and the floods which sometimes pour down such torrents of water into the Rio Grande and its tributaries, are either skilfully turned into the reservoirs for irrigation, or are drank up by the thirsty sands of the river beds.

The railways which already traverse, or will soon cross the Territory in different directions, the Atchison, Topeka and Santa Fé and its branches, the Denver and Rio Grande, the St. Louis and San Francisco, and perhaps also the Atlantic and Pacific, or a branch of the Texas Pacific, will make New Mexico convenient of access, and enable her to send her products to market on favorable terms.

California is favorably situated for sheep-farming, especially Southern California, but the higher price of her lands, and the fact that so large a portion of them are arable, renders the business somewhat less profitable than in New Mexico, though she has a better market for wool in San Francisco, and more encouragement to grade her flocks up to the best quality of both felting and combing-wools, and higher inducements to raise sheep for mutton, as well as for wool. The California flocks number nearly 8,000,000 sheep, and include some of the best breeds to be found on this continent both for wool and mutton. In Southern California the flocks are driven to the hills in the summer and return when the autumnal rains have started the new grass on the foot-hills and on the plains. Alfalfa, Hungarian grass, and the millets are raised largely for forage for the best breeds of sheep, and their use tends to produce the uniformly fine fibre so characteristic of the best grades of California wool.

The sheep-farming of Montana, Idaho, Washington, and Oregon, as well as that of Dakota and Minnesota, differs from that of the States and Territories farther south mainly in the necessity for more ample provision for shelter and fodder for winter, and the greater length of the winter season. The flocks in most of these States and Territories (Oregon only excepted) are seldom very large; the aggregate sheep of the other five States and Territories probably aggregating not much over 2,000,000, while Oregon alone has about 1,500,000. Eventually probably Washington, Montana, Dakota, and perhaps Idaho will be found to be well adapted to the raising of fine wooled sheep. Utah, also, is a good sheep country, though there is in some parts of the Territory a lack of water.

Wyoming is better adapted to cattle than sheep, and Nevada will probably raise a larger proportion of cattle than sheep, though perhaps not very large numbers of either.

To recapitulate: we believe for the sheep-farmer who has but a very moderate capital, say not more than $2,500 or $3,000, New Mexico offers the best opportunity, and Kansas and Nebraska the next best; for those with somewhat larger capital, from $5,000 to $15,000, Colorado, Southern California or Texas,

if they wish to avoid building shelters and gathering fodder. Oregon, Montana, Dakota, and perhaps Utah, if they are not averse to these precautions. Those having a larger amount of capital can do well in Texas, better, perhaps, in California, and still better in Colorado or New Mexico; while, if they choose to make the provision for wintering their sheep, Wyoming, Montana or Dakota afford excellent opportunities for conducting sheep-ranches of the largest kind and with excellent profits. For mutton sheep and lambs, which will, at the same time, yield large fleeces of combing-wools, the succulent pastures of Montana and Dakota afford the best feeding grounds, and they also furnish grasses which make the fibre of the Merino wool long, even and fine.

We give here a few brief descriptions of the different breeds of sheep most popular throughout the West, for which we are indebted to the late Hon. Alfred Gray, Secretary of the Kansas State Board of Agriculture.

The Merino is a fine white-wool sheep, of a dark, greasy appearance, medium size, snug build, body shortish, round and thick, good quarters, legs short, stout and woolly, ears short, cheeks and forehead to the eyes thickly covered with wool, skin wrinkled or in folds, weight 100 to 180 pounds, fleece twelve to twenty-nine pounds, wool two to three inches long. The rams have curled and convoluted horns. It is classed as a wool sheep.

History.—The Merino originated in Spain, in the first century. It is a cross between the Tarantine, of Southern Italy, and the best native sheep of Spain, and was introduced into the United States in 1800. In Spain, this breed was driven from the south northward every spring, 400 miles, and back in the fall; each journey was made in six weeks. The name, Merino, is a modified form of the name of the special officer in charge of this highly valued breed.

The Southdown is a whitish, coarse, short-wool, hornless sheep, medium size, fine form, well-balanced proportions, hind-quarters square and full, thighs massive, breast broad, fore-quarters well developed, legs short and trim, face and legs dark-brown or black and without wool. Yearlings yield seventy-five

to eighty pounds, dressed weight. Average weight of fleece about six pounds. Its wool makes flannel and soft goods. It is classed as a mutton sheep.

History.—The Southdown is an English breed, developed by carefully inbreeding common sheep inhabiting the hilly portions of Southern England from its earliest history. The improvement began about one hundred years ago. The name of the breed is taken from the low chalk hills or downs of Southern England, where it was developed.

THE HAMPSHIREDOWN is a whitish, coarse, medium-wool, hornless sheep, good size, much resembling the Southdown, but larger, and with longer and coarser wool. Yearlings weigh eighty to a hundred pounds, and yield a fleece of six to seven pounds. It is a mutton sheep.

History.—The Hampshiredown originated in England about seventy years ago, in a cross between a pure Southdown and a white-faced horned sheep of that district, from the "downs" of which section it derives its name.

THE LEICESTER is a white, medium, coarse, long-wool sheep, of large size, square and angular build, long, slender, clean head and ears. Eyes and facial bones about the eyes prominent, hind-quarters tapering toward the tail, legs good length, slender and clean. Yearlings dress 100 pounds and at two years 150 pounds. Full grown have reached 380 pounds, live weight. Average weight of fleece seven to eight pounds. It is a mutton sheep.

History.—This breed was developed in England over 100 years ago by a Mr. Bakewell, from the common sheep of Leicestershire, from which district it derives its name. The method of breeding was kept secret. They were introduced into the United States by General Washington.

THE LINCOLN is a white, coarse, long-wool, hornless sheep, surpassing all other breeds in weight of body and length of wool. It has dressed ninety-six and a quarter pounds to the quarter. Two year-olds dress 120 to 160 pounds, and yield a fleece of ten to fourteen pounds washed wool, measuring nine inches and over in length—used for worsteds. It is a mutton sheep.

History.—The Lincoln originated in England less than 100 years ago, as a cross between a Leicester and a common breed now extinct, but then inhabiting the low, alluvial and rich herbaged flats of Lincolnshire, from which it takes its name and where it best flourishes.

THE COTSWOLD is a white, coarse long-wool, hornless sheep, large size, long bodied, broadening from shoulders to rump, head well tapered from ears to nose, finely proportioned, and covered to between the eyes with a thick forelock of wool, ears long and well formed, legs good length, well shaped and clean. Weight of yearlings about 120 pounds; full grown have dressed 344 pounds. Weight of fleece about eight pounds. Wool sometimes nine inches long, and widely used for woollens. It is a mutton and wool sheep.

History.—The Cotswold originated in England less than 100 years ago, as a cross between a Leicester and descendants of common sheep imported from Spain in the twelfth century. Its name comes from the cots or huts built in the hilly wolds or fields where it was developed and established.

OXFORDDOWN is a whitish, coarse, long-wool, hornless sheep of medium size, round bodied and short legged, face and legs dark, a Cotswold-shaped head and thick-set and somewhat curly fleece of eight to nine pounds of wool five to seven inches long, used for worsteds. At fourteen months it dresses eighty to eighty-eight pounds. A mutton and wool sheep.

History.—The Oxforddown originated in Oxfordshire, England, since 1830, whence its name. It is a cross between a Cotswold ram and a Hampshiredown ewe, followed by careful inbreeding.

CHEVIOT is a white, coarse, medium-wool, hornless mountain sheep of medium size, long bodied, hind-quarters and saddle full and heavy, fore-quarters light, face strong featured and massive, head and legs generally white, but sometimes dun or speckled. At three years they dress eighty pounds. The fleece yields about five pounds, and is used for Scotch tweed and cheviot cloth. It is a mutton and wool sheep.

History.—The Cheviot is a cross between a Lincoln and a breed of common sheep found in the hilly parts of the Scottish

lowlands, believed to be descended from common sheep of Spain, cast ashore here in 1588, from wrecks of the Spanish Armada.

THE IMPROVED KENTUCKY is a white, coarse, long-wool, hornless sheep, heavy bodied and heavy fleeced, resembling the Cotswold, but the quality of its wool, midway between the Leicester and Cotswold, distinguishes it. It is a mutton and wool sheep.

History.—The Improved Kentucky is an American breed originating in Frankfort, Kentucky, about forty years ago. It came from successful crosses, as follows: Beginning with local, common ewes and a Merino ram, the issue was crossed with a Leicester ram, this with a Southdown ram, this with a ram one-quarter Southdown and three-quarters Cotswold, this twice successively with Cotswold rams, this with an Oxforddown ram, and this with a mixed Cotswold, Oxforddown and Leicester ram, followed by careful inbreeding.

THE CARAMAN OR FAT-TAILED SHEEP is a white, short, soft-wool sheep, of different varieties and sizes, but readily identified by its remarkable tail, which weighs from fifteen to twenty and in some instances 50 pounds; the fat being used by some in place of butter.

History.—The Caraman is a native sheep, found in portions of Asia and Africa, and by some is regarded as a separate group. Those now in the United States are from recent importations from Karamania, in Asia Minor.

THE ANGORA GOAT is of a grayish white, about as large as a medium-sized sheep, has a square build, a straight back, hog-shaped head, lifted ears, large, long, wavy horns rooted close together on top of the head, and spreading at once latterly and pointing a little backward, a tuft of long, coarse hair under the chin, clean, trim legs, and undercoat of short, coarse hair, and an outer one of long, curly, soft and silky hair, termed mohair. Both coats are used, and together weigh about two and a half pounds.

History.—The Angora goat is an improved variety of a common goat, native of the district about Angora, in Asia Minor. It was imported into this country about fifteen years ago.

THE CASHMERE GOAT is generally of a grayish white, built

much like a sheep, is of medium size, back near the hips a little crowning, ears long, wide and drooping, no tuft under the chin, small horns, sometimes spiral, shooting out near each other from top of the head, erect or slightly spreading and pointing a little backward, a long, heavy outer coat of coarse hair and an under coat of soft, silky, fluffy wool, weighing about one-half pound, and used for Cashmere shawls.

History.—The Cashmere goat is a noble species of the goat, inhabiting the high table-lands of Cashmere, Thibet and Mongolia, in Central Asia. It was imported into the United States about fifteen years ago.

Diseases of Sheep.—It is perhaps desirable to add here a brief description of the diseases to which sheep are liable, especially as it is as true now as it was twenty years ago, that the diseases to which sheep are liable in this country are very different from those which affect them in Europe. The late Hon. Henry S. Randall, in his valuable treatise on Sheep Husbandry, published in 1860, and subsequent writers on diseases of sheep, have called attention to this fact. It is true, also, that diseases which prevail in one section may be entirely unknown in another. Thus the foot-rot has prevailed extensively in Texas, and to some extent in Southern California and Southern Kansas; but is entirely unknown in the Northern States, and Territories of Washington, Oregon, Montana, Dakota and Minnesota, and very infrequent in the middle belt of States and Territories. The scab is found everywhere, but is now treated successfully. Worms in the head are not common in the West; though they kill many sheep in England and some in the Atlantic States. Inflammation of the lungs is less common than in England, but does occur.

Mr. Frank D. Curtis, of Charlton, Saratoga county, New York, one of the most intelligent, accomplished and successful of our American sheep-masters, has described so briefly and so well the greater part of the known American diseases of sheep, that we cannot do better than to give to our readers his essay, only supplementing it with two or three western diseases, which he has failed to notice.

Sheep are very delicate animals to treat when diseased. They are easily discouraged, and when sick lose their appetite and rapidly become enfeebled. It is by far the wisest course for every shepherd to study carefully the habits of sheep and their nature, and to endeavor, as far as possible, to regulate their diet according to their natural wants, and to do nothing to shock them either by terror or abrupt changes in their management. They will not bear sudden changes of food, sudden chills, or sudden changes of extreme heat and cold. Regularity in feeding and evenness in temperature are essential pre-requisites to their healthful condition. They will not endure wet, neither will they thrive on low, marshy ground. The different breeds have somewhat different characteristics, and they are not all alike easily affected with the same diseases, as, for instance, fine-wooled sheep having flatter feet, with closer connection between the hoofs, are more liable to foot-rot than the coarser-wooled varieties, with more upright feet and wider space between the bisections. The latter, however, on account of their open and distended nostrils (they have larger lungs and require more space for the circulation of air into the respiratory organs), are much more liable to the attacks of the gad-fly (*Œstrus ovis*) than the smaller breeds with more contracted nostrils. The fine-wooled are much more hardy in our changeable American climates than the coarser-wooled breeds, hence precautionary management in regard to climatic influences and carefulness in diet are not so necessary, as they are not so subject to colds and stomach disorders, colics, etc. There are several infectious diseases which prevail among sheep. The two oldest and most common in America are foot-rot and scab. There are also other parasitical disorders which infest the internal organs of sheep. The latter have been far more destructive in foreign countries than in this. They have prevailed disastrously in England, South America, and Australia. We shall speak of internal parasites (*entozoa*) under the head of parasites, with such subdivisions of the subject as apply to the various forms and indications of the disorder as manifested in this country, and of external parasites (*epizoa*) under the appropriate names of scab and ticks.

PARASITES.—The most ancient and disastrous of the maladies caused by the development of worms in the body is the *liver-rot*, which is caused by the presence of sucking worms, like leeches, which are developed in the liver. These worms or flukes possess the power of self-impregnation, and are propagated by eggs, of which they produce immense numbers. These eggs are carried along with the bile into the stomach, and so passed out with the excrement of the sheep. They are supposed to be hatched in stagnant water, in which they develop into a form of mullusks. But as the disease (*liver-rot*) is almost unknown in the United States, and especially in the West, we will not take time or space to fully describe it.

There is another worm which is developed in the lungs and bronchial tubes of sheep. These worms cause the "pale disease" in lambs, which has been so fatal in many sections of this country. The worm is akin to the gape-worm in chickens, and is a species of *Strongylus*, a slender, thread-like worm. They are supposed to be breathed into the lungs or taken into the mouth while feeding, from whence they make their way through the trachea into the air-passages, in which they produce such derangement in aëration or the purification of the blood as to cause irritation and violent coughing. The important functions of the blood being interrupted, paleness of the skin and debility of the body soon follow, and result in the death of the animal. The disease is more prevalent or fatal among lambs than among sheep.

As soon as a lamb is attacked a poor appetite ensues, which helps to reduce the strength. Such penetrating medicines as turpentine, sulphur, and assafœtida may be given, which, through absorption, will reach the lungs, and in the earlier stages of the disease may effect a cure. In order to allow free and full absorption, no food should be given for several hours afterward, nor for a few hours before. Twenty grains of assafœtida and a half teaspoon of spirits of turpentine are all that should be administered at one dose to a lamb. One-third more may be given to a full-grown sheep. This may be followed by a tablespoonful of sulphur daily, mixed with molasses. As the appetite is capricious and feeble, in order to keep up the strength gruels

should be poured down. The turpentine and assafœtida may be mixed with a tablespoonful of linseed or castor oil. Infected sheep should be kept by themselves, and well ones should not be allowed to run in the same pasture, nor upon ground where the manure of diseased sheep has been spread. There are, besides the above, parasites (*hydatids*) or worms in the bladder and in the intestines. The latter, when prevalent among lambs, are fatal. The first symptoms of their prevalence is a falling off in condition and mild diarrhœa. The worm is a species of tape-worm, and is swallowed by the sheep in an embryo form, and may have been dropped by a dog or other animal. Emaciation rapidly follows. The excrement is soft and mixed with mucus, and by close observation worms may be observed in it. As soon as the presence of the disease is apparent, a dose of turpentine should be given, from one-half to one ounce, according to the size of the sheep. This may be mixed with an ounce or two of linseed or castor oil, and should be given every three days for two weeks, or until no worms are voided. Nourishing gruels should be given during the time of treatment. The purgative will have better effect if the animal is required to fast a few hours before and after administering the dose. Copperas will not cure the disease. When given in small quantities it acts as an astringent and keeps the worms in the body, and when given in large quantities it is an active poison. The same dose of turpentine and linseed oil is the best remedy for parasites in the bladder and kidneys.

Worms in the head are not so common in this country as in England, owing to the fact that so large a proportion of our sheep are of the smaller breeds. The gadfly (*Œstrus ovis*) in the summer months deposits its eggs, with a sting, in the nostrils of sheep. At the season of the year when this fly is active, sheep stand huddled together with their noses inward and close to the ground to avoid being stung. After being hatched the grub crawls up the nostrils and feeds on the mucus until it reaches the upper passages, where it remains until it arrives at maturity, and then passes out of the nostrils to the ground, where it ultimately develops into a fly. Sometimes they penetrate to

the brain, causing the sheep to lose its appetite and die a lingering and painful death. We have known them to pine away, scarcely eating anything for weeks—simply breathing—until they die of starvation, or were killed to put them out of their misery. There is no remedy except in the first stages of the disease, when the maggots are passing up the nostrils. This may be known by violent shaking of the head, sneezing, and running around. Tobacco-smoke blown up the nostrils at this time, or the smoke of a small quantity of burning sulphur, may cause them to lose their hold on the membranes, when the sheep will cast them out. Some people pour spirits of turpentine into the nostrils. They lay the sheep upon its back so that the liquid will run into the head; but this is a dangerous and cruel practice. In the first stages, in the hands of a skilful person, it is possible to open the passages of the head and remove the maggots, without permanent injury to the animal. Smearing the noses of sheep in July and August with tar, two or three times a week, will, to some extent, prevent the attacks of the gadfly.

Scab.—The worst form of external parasites is the *Acarus scabiei*. This insect is a mite in size and attaches itself to the skin, into which it burrows. It multiplies rapidly and cuts off the connection of the cuticle from its attachments to the body, when it becomes dry and hard, and the wool is loosened and falls out. Its presence can easily be determined, as the sheep is uneasy and inclined to rub itself against any convenient thing. Unless they are destroyed, the whole body will soon be covered, causing great distress to the sheep and entire loss of the fleece. They will also be conveyed to other sheep, and eventually spread through the whole flock. One female will produce thousands of insects in a few days. The proper cure is to dip the animal in a solution of sulphur and tobacco, in the proportions of four parts of tobacco and ten of sulphur to a gallon of water. The stems of tobacco will answer every purpose, if thoroughly steeped. The sulphur may be stirred in the liquid. Patches of loose skin and wool should be removed before the sheep are immersed. The liquid should be as warm as the hand will bear, and time should

be given for it to penetrate every part. After dipping, the animal should be left in the yard until dry, when it would be well to smear all the raw and denuded portions of the body with coal-tar, heated sufficiently to flow freely. The coal-tar will assist in healing, and protect the sore places, adding very much to the comfort of the sheep.

SHEEP-TICKS.—These insects (*Melophagus ovinus*) prey upon the surface of the body and torture the sheep greatly by piercing the skin and sucking the blood. It propagates rapidly, and is so voracious that it soon depletes the sheep of needed blood and causes them to become poor and weak. Their presence may be known by the rough, loose, and dangling appearance of the fleece, the locks of which are torn out by rubbing in order to get rid of the pain caused by the bite of the ticks. The most effectual remedy is to dip the sheep in a strong decoction of tobacco. The numbers may also be reduced by dusting snuff or powdered tobacco in the wool. After shearing, the ticks leave the old sheep and fasten to the lambs. The latter should be dipped immediately, and again after the lapse of three weeks. In this way a flock may be rid of ticks, which are a costly and torturing nuisance.

FOOT-ROT.—This disease is contagious, and may be produced by allowing sheep to run on low, wet ground. It is an ulceration upon the heels and between the toes, which excrete fetid matter. It is most common in the fore feet, and may be known by lameness. Lameness, however, does not always proceed from this cause, but may be produced by foul feet or from inflammation of the interdigital canal, which opens at the bottom of the foot. When this canal or duct is closed by any foreign substance, inflammation will ensue. The prompt removal of the obstacle and the probing and cleansing of the duct will generally effect a cure. When there is ulceration, there must be prompt and effective treatment. Canker of the foot, which shows itself by spongy or fungous sprouts at the bottom, can be cured by the same treatment as for foot-rot. The hoofs should be pared away so as to expose the bottom of the ulcers, when the whole foot, and especially the ulcerous portion, should be thoroughly

smeared with an ointment of powdered blue vitriol, one pound; verdigris, half a pound; linseed oil, one pint; tar, one quart. This combination makes a salve which will adhere to the foot. Carbolic acid reduced (five parts of water to one of acid) would be an effective remedy, and would also be the best cure for canker of the foot. Healthy sheep should never be allowed in a pasture where those affected with foot-rot have run until a winter's frosts have intervened, which will destroy the virus. Incipient foot-root caused by feeding on wet ground may be checked without difficulty by prompt applications of blue vitriol in liquid form, or by diluted carbolic acid; but when the disease becomes thoroughly ulcerous, several applications of the remedies recommended are necessary to effect a perfect cure.

Constipation.—We have known fatal constipation, accompanied with fever, to prevail in the spring of the year following a long and severe winter, during which fodder became so scarce as to compel farmers to turn out their sheep before the fresh grass had started. The sheep ate of the dry and frost-bitten grass so heartily as to cause it to become clogged in the rumen, producing constipation in whole flocks. In some neighborhoods it was so general that it was supposed a contagious disorder had broken out among them. A number died before the cause was discovered. Purgatives, together with restraining the sheep from feeding in the fields, soon restored the flocks to their normal condition.

Colics.—These troubles are caused by costiveness or flatulence, which also causes stretches (lying on the ground and rolling about), the latter being more of a symptom than a disease. A change of food in this case, as well as in the opposite case of scours, is the first thing to be done. Injections of warm water and soap, or linseed oil, followed with an ounce of the latter or of castor oil, or four ounces of Epsom salts, given by the mouth, is the first remedy in cases of costiveness or colic. Powdered sulphur and salt should be frequently given as correctives and aids in digestion. Abrupt changes from dry to succulent food are dangerous, and should never be made on an empty stomach, as these animals, like cattle, are equally subject to bloat, and

with them it is more rapid in its results. A change from dry feed to green, without an admixture of dry feed following, has produced fatal colic even when the pasture was stinted.

DIARRHŒA AND SCOURS.—The former disorder is very common to lambs while sucking and during the first winter. Unless checked, diarrhœa will soon run into the more serious condition of scours, and rapidly deplete the tender animal of needed strength. A teaspoonful of laudanum and a tablespoonful of strong ginger tea will often check diarrhœa, but if it should not, there must be given a tablespoonful of castor oil, followed by astringents.

INFLAMMATION OF THE LUNGS.—Sheep are not apt to be affected with lung diseases, as, under ordinary circumstances, nature has provided them with ample protection, but when exposed they will sometimes have severe inflammation of the lungs. We had a valuable ram die within twenty-fours with pneumonia, which was caused by being left tied in the wind after having been washed for exhibition at a fair. We have had Leicester sheep which, for a whole year, were afflicted with consumption, and manifested perfect symptoms of this debilitating disorder. Where symptoms of inflammation of the lungs are apparent, the animal should immediately be bled and given a purgative. After this, doses of tartar emetic may be added, one grain to each every few hours, with flaxseed tea. If it is possible, a counter-irritation should be made upon the chest. The nostrils must be kept clear and clean.

SNUFFLES AND SNORING.—The stoppage of the nostrils with mucous secretions, which may be caused by a slight cold, or by dust or some other foreign substance irritating the lining membranes, is of frequent occurrence, but may be obviated by sponging out the nostrils with some soothing lotion. Snoring may be produced by a more serious cause, such as tumors or abscesses in the throat or in the cavity of the chest. When they are discernible, they may be treated according to their character. Catarrh is frequent with sheep exposed to the changes of the weather, or when wintered in close and badly ventilated stables. Local treatment, such as sponging the nostrils or inhaling the

fumes of burning tar, will usually clean out the nostrils and afford relief.

Poisons.—Sheep will eat almost every plant that grows, which makes them valuable in keeping a farm free from foul stuff. On this account they are often poisoned by eating laurel, Saint John's wort, and other poisonous herbs. The effects are sometimes confined to the stomach, producing a derangement which may be corrected by mild doses of cathartics. The lips and mouth are often made sore by eating poisonous plants, especially Saint John's wort, which sometimes makes the mouth so sore that the sheep cannot eat. In all such cases aperient medicines should be administered, and the lips and mouth dressed with a healing ointment. A change of pasture is also essential to get rid of the cause.

Abortion.—On account of the timid nature of sheep they are easily frightened, and when roughly handled or chased by dogs they are apt to abort. Dysentery and other acute derangements of the stomach will sometimes produce this same disorder, hence abrupt changes in diet should be avoided, and a mixture of dry and green food given through the winter. Roots are very essential to the good health of sheep. Salt and water should always be accessible, as sheep desire to drink often and but little at a time. If these sanitary recommendations are carefully carried out, sickness among sheep will be very much lessened, especially in the severe forms of abortion or other disturbances of the uterus.

The *black-leg* is a disease which has affected lambs in various parts of the country. Its character seems uncertain, though generally believed to be connected with disease of the lungs. The legs seem to become powerless and the flesh turns black. The disease generally proves fatal in a short time. It may be the same known as lung-worm in other sections, but this is doubtful.

Some attempts at medication have proved beneficial in delaying the fatal termination, while others have apparently hastened it. As a general rule, the administration of anti-septics and stimulants, such as diluted carbolic acid, powdered charcoal,

minute doses of sulphate of iron (copperas) and cayenne pepper seems to be indicated, though when the disease is fairly developed, it is doubtful whether any medication will prevent a fatal termination. The disease is not contagious, though it may be epidemic in certain localities.

The disease described by Mr. W. B. Shaw, of Beverly, N. Y., in the following paragraph, as *paper-skin*, seems to be identical with what Mr. Curtis calls "the pale disease" in lambs.

Lambs in this locality have been scourged for several years past with a disease called "paper-skin," which seems to be worse in wet than in dry seasons. It is not uncommon to lose an entire flock by the disease. It attacks the lambs at the age of from three to five months, and those in good flesh are as liable to it as those that are in poor condition. When attacked, they become very pale and weak, apparently almost entirely bloodless. The stomach contains small red worms, and frequently, in addition, the animal will be found to have tape-worm.

We have no knowledge of the cause of the lung-worm—a name given for the want of a better, perhaps. It affects young sheep in a greater degree and to a greater extent than matured animals. The worm is a small white one, and is found in considerable numbers in the lungs, or in the tubes connecting the windpipe with the lungs. The disease is less frequent than either of those named above, but the fatality is greater in comparison with the number affected. The symptoms are weakness, failure to eat, loss of flesh, and a cough. This disease is but little understood by the wool-grower.

Stricana or strichina is perhaps a very incorrect name for another disease affecting sheep. It is caused by a very small worm, so minute indeed, that it cannot be seen without the aid of a magnifying glass. It is believed to cause the sheep to pick or bite the wool from its sides, flank, and other parts, until the fleece becomes more or less ragged and wasted. The skin becomes rough and shows symptoms of disease. It is not contagious, but attacks sheep of all ages. It is more damaging in flocks that have been closely bred "in and in" for many years; indeed, this is the case with most diseases. As both a

preventative and cure, wood and cob ashes with salt are used with partial success. We have seen sheep in Vermont and Massachusetts badly affected with this disease as well as in our own State.

The sheep in the more Northern States and Territories of the Great West, are as a rule less subject to disease than those of the Southern States and Territories. This is probably due to the absence of marshy and moist lands, the purer and more elevated atmosphere, the great range of pasturage and the absence or rarity of those insect and vegetable pests which produce and promote disease among these harmless animals.

CHAPTER X.

OTHER FARM ANIMALS—BREEDING SWINE—SWINE HUSBANDRY LESS POPULAR IN THE GREAT WEST THAN EAST OF THE MISSISSIPPI—THE STATES AND TERRITORIES MOST LARGELY ENGAGED IN IT—THE BEST BREEDS—MODES OF MANAGEMENT—THE MARGIN OF PROFIT IN THE BUSINESS—DISEASES TO WHICH SWINE ARE LIABLE—BREEDING OF HORSES, ASSES, AND MULES FOR THE MARKET—THIS PURSUIT VERY PROFITABLE—DOGS—THE SHEPHERD DOG—DOGS FOR HUNTING—THE GREYHOUND; DIFFERENT VARIETIES—POINTERS, SETTERS, BULL-DOGS, COACH-DOGS, TERRIERS—MONGREL HUNTING DOGS—INDIAN CUR-DOGS—CROSSES BETWEEN DOGS AND WOLVES—WORTHLESS DOGS VERY DESTRUCTIVE OF SHEEP.

THE whole of "Our Western Empire" reported, at the close of 1879, but a little more than 12,000,000 swine, only about one-third of the whole number in the United States. Iowa had nearly 3,000,000, one-fourth of the whole number, and Missouri another fourth. Of the other half, Texas had a little more than 2,000,000, or one-third; Kansas and Arkansas respectively 1,300,000 and 1,200,000, and the remainder were divided among the other States and Territories; those on the Pacific slope having the smallest numbers. Beyond the Rocky Mountains, rearing swine is not a favorite pursuit with the farmers, partly perhaps because the climate and seasons are not so well adapted to the animal, and partly because there is more difficulty in protecting a herd of

swine from the attacks of wild animals, and from other thieves, than sheep or neat-cattle. Sheep are easily driven or led, but the swine seems to have inherited the perversity of his ancestors, and persistently seeks to go in the very direction that he should not. There are, however, hogs and hogs; some breeds are quiet, gentle, and well-behaved, while others, lank, lean and long-limbed, will spring over a fence as nimbly as a shepherd's dog, and though fleet of foot, and of evil and pugnacious temper, possess few or no good qualities to counterbalance these objectionable ones. The Southern swine are not, as a rule, of the best breeds, though there have been great efforts made of late in Texas to improve the stock, and with a commendable degree of success. Iowa is, after Illinois, the largest raiser of swine in the Union, and in that State, Missouri and Kansas, which follow after in the numbers of their swine (the three States having about 7,000,000, worth about $42,000,000), great efforts have been made to raise only the best stock.

In these States, long experience has led the best farmers to prefer two or three breeds, and their crosses. In Kansas, and we think in Iowa and Missouri, these breeds are the Poland-China, especially as improved by D. M. Megie; the Berkshire, either the English or the improved large Berkshire; various crosses of these two, some preferring the Berkshire and others the Poland-China boar with the sow of the other breed, and the Chester White, either pure or crossed with the Berkshire. A very few cling to the Essex and Suffolk breeds, but the number of these, as well as the advocates of the pure Chester Whites, are decreasing every year. The general opinion seems to be that the Poland-Chinas make the largest and most quiet hogs, and give the best return for the money expended on them, and give the largest litter, but are rather too large in bone, and require a great amount of feeding. The Berkshires have smaller bones, and their meat is in the right place to make fine hams and shoulders, and their flesh is very fine-grained. They are the best for the farmer's own packing, but do not weigh as much at a year or a year and a-half old as the Poland-Chinas, and do not have as large a litter as the Poland-Chinas. It is universally agreed that

the crosses of these breeds make altogether the best animals for market. These crosses should weigh at one year old, when fattened, from 350 to 450 pounds, and at eighteen or twenty months from 650 to 700 pounds. With corn at twenty cents a bushel, and some pasture, and proper treatment, pork can be made in Central and Western Kansas at from $2 to $2.25 per 100 pounds, and it will bring from $2.87 to $3.50 per hundred, live weight. Most of the diseases, to which swine are subject, can be prevented much more easily than they can be cured, and the sensible and judicious swine-breeder will find that, by avoiding crowding, damp and filthy pens or wallows, by occasional changes of pasture, and the use of green food, and mashes when the dry food is too constipating, it will be possible to ward off disease, and to have a perfectly healthy herd of swine. The various forms of worms which infest swine—the tape-worm, the trichina, and the round worms—are, to a considerable extent, the result of gross and foul feeding, and of filthy and close pens. The hog is not an uncleanly animal if he has the opportunity to be clean.

The great losses sustained, for some years past, by those engaged in rearing swine, from the disease variously known as Hog-Cholera, Swine-Plague and Hog-Fever (losses amounting in 1877 to more than $12,000,000), led the *United States Agricultural Department* at Washington to make, in 1878, a very thorough investigation of the disease, including its history, symptoms, causes, diagnosis, prognosis, post-mortem appearances, preventive measures and treatment. The investigation was confided to four of the most eminent veterinary surgeons in the United States—Drs. H. J. Detmers of Chicago, James Law of Ithaca, N. Y., D. W. Voyles of New Albany, Ind., and D. E. Salmon of Swannanoa, N. C.—each of whom spent months in the investigation, pursuing it independently of all the others, and without conference with them. The results of these investigations were published in a very valuable volume in the autumn of 1879, with numerous colored plates of the appearances of the lungs, stomach and intestines, and tables and records of the conclusions to which they came. These reports are so able and exhaustive, and of so high and conclusive authority, that we be-

lieve we are doing a valuable service to the farmers of the United States, and especially of the West, in giving a brief summary of the results of their researches. They will serve, at least, to show that the only safeguard against the disease lies in measures of prevention and precaution, which every farmer engaged in raising swine should adopt; that great pains should be taken to keep swine in a perfectly healthy and vigorous condition, and that their pens and troughs, as well as the swine themselves, *should be kept clean;* that close inbreeding is wrong, as weakening the constitutions of the animals and rendering them more liable to disease; and that where the disease appears, the infected herd should be kept isolated, thorough disinfection practised daily, and all diseased hogs killed at once, and either buried very deeply or burned, so as to prevent the spread of the infection; that the owners of the slaughtered hogs should be repaid two-thirds of their value, if they will report the cases immediately on the outbreak of the disease and follow directions; that all hauling of diseased or dead hogs along public roads or by railroad trains, or in any way exposing other herds to infection, should be prohibited under heavy penalties, and all communication of the infection by fodder, running water or the clothing of swineherds or others, should be prevented; and the lots on which these diseased herds or animals have been penned even for a single night, should be disinfected, and plowed deeply to prevent the spread of infection.

But we can perhaps best benefit our farming friends by giving summaries of these reports in the very words of the veterinary surgeons; and, first, of the

DESCRIPTION OF THE DISEASE.

The disease, though popularly called *Hog-Cholera*, has really no resemblance to cholera or to malignant pustule. It has somewhat more resemblance to the pleuro-pneumonia which has proved so destructive of cattle; but is not identical with that disease. It is undoubtedly contagious and infectious, and the experiments and researches of these veterinary surgeons, many times repeated and under a great variety of circumstances,

together with their post-mortem examinations, have proved that it can be transmitted, by inoculation and by devouring portions of the flesh of diseased animals, to other swine, and to rabbits, sheep, and dogs as well, and produces the same symptoms and as often the same fatal termination, as where it is communicated by ordinary contact. The veterinarians are agreed in these points, that it is produced by the transmission of a specific germ, a *bacillus* as some of them call it, into the stomach or circulation, and that this germ is propagated with inconceivable rapidity and may promote diseased action in any organ or set of organs, the lungs, liver, stomach, bowels, lymphatics, kidneys, muscles, nerves or brain, but that the lungs and the lymphatic glands are *always* affected, and the other organs and tissues, one or more of them *often*. The best name for it is *Swine-Plague* or *Hog-Fever*. The disease does not *originate* from filth, crowding, and improper or heating food, but when it has been once communicated to any member of a herd of swine, its propagation is greatly accelerated, and its mortality hastened and aggravated by impure and unwholesome surroundings.

SYMPTOMS AND DIAGNOSIS.

The disease is ushered in by a cold shivering, lasting from a few minutes to several hours, frequent sneezing and more or less coughing. The temperature of the body is increased, and though it is a difficult matter to ascertain the exact temperature without a struggle which will, of itself, increase the temperature, yet enough seems to have been ascertained to make it certain that it ranges between two or three and ten or twelve degrees above the normal or healthy temperature. There is also at first a partial, and soon a total loss of appetite; a rough and somewhat staring appearance of the coat of hair; a drooping of the ears (characteristic); loss of vivacity; attempts to vomit (in some cases); a tendency to root in the bedding and to lie down in a dark and quiet corner; a dull look of the eyes, which not seldom become dim and injected; swelling of the head (observed in several cases); eruptions on the ears and on other parts of the body (quite frequent); bleeding from the nose (in a few

cases); swelling of the eyelids and partial or total blindness (in five or six cases); dizziness or apparent pressure on the brain; accelerated and frequently laborious breathing; more or less constipation, or in some cases, diarrhœa; a gaunt appearance of the flanks; a pumping motion of the same at each breath; rapid emaciation; a vitiated appetite for dung, dirt and saline substances; increased thirst (sometimes); accumulation of mucus in the corners of the eyes (very often at an early stage of the disease); more or less copious discharges from the nose, etc. The peculiar offensive and fetid smell of the exhalations and of the excrements may be considered as characteristic of the disease. This odor is so penetrating as to announce its presence, especially if the herd of swine is a large one, at a distance of half a mile, or even farther, if the wind is favorable. If the animals are inclined to be costive, the dung is usually grayish or brownish black, and hard; if diarrhœa is present, the fæces are semi-fluid, and of a grayish green color, and contain in some cases an admixture of blood. In a large number of cases the more tender portions of the skin on the lower surface of the body, between the hind legs, behind the ears, and even on the nose and on the neck, exhibit numerous larger or smaller red spots, or (sometimes) a uniform redness (Red Soldier of the English). Toward a fatal termination of the disease this redness changes frequently to purple. A physical exploration of the thorax reveals, if pleuritis is existing, frequently a plain rubbing sound. As the morbid process progresses the movements of the sick animal become weaker and slower; the gait becomes staggering and undecided; the steps made are short, as if the animal was unable to advance its legs without pain; sometimes lameness, especially in a hind leg (not very often), and sometimes great weakness in the hind quarters, or partial paralysis (oftener) make their appearance. The head, if the animal is on its legs, seems to be too heavy to be carried, and is kept in a drooping position with the nose almost touching the ground; but as a general rule the diseased animals are usually found lying down in a dark and quiet corner with the nose hid in the bedding. If a fatal termination is approaching, a very fetid diarrhœa (usually

one or two days before death) takes the place of the previous costiveness; the voice becomes very peculiar, grows very faint and hoarse; the sick animal manifests a great indifference to its surroundings, and to what is going on; emaciation and general debility increase very fast; the skin (especially if the disease has been of long duration) becomes wrinkled, hard, dry, parchment-like, and very unclean; a cold, clammy sweat breaks out (observed several times, once as early as forty-eight hours before death), and death ensues either under convulsions (comparatively rare), or gradually and without any struggle. A peculiar symptom, which, however, has been observed only once, in a litter of nine pigs, about a week old, at the beginning, or in the first stage of the disease, may here be mentioned. It consisted in a peculiar and constant twitching of all voluntary muscles. All nine pigs died, and I am sorry that I had no opportunity to make any *post-mortem* examination.

In some cases numerous eruptions (ulcerous nodules) appeared on the tender skin on the lower surface of the body between the legs and behind the ears, and in a few cases whole pieces of skin (in one case as large as a man's hand) were destroyed by the morbid process, sloughed off, and left behind a raw, ulcerous surface. In another case a part of the lower lip, of the gums, and of the lower jaw-bone had undergone ulcerous destruction.

Wherever pigs or hogs had been ringed, the wounds thus made showed a great tendency to ulcerate. In several cases the morbid process had caused sufficient ulcerous destruction to form an opening directly into the nasal cavities large enough to enable the animal to breathe through, instead of through the nostrils, which had become nearly closed by swelling and by exudations and morbid products adhering to their borders.

In those few cases in which the disease has not a fatal termination the symptoms gradually disappear, coughing becomes more frequent and easier; the discharges from the nose, for a day or two, become copious, but soon diminish, and finally cease altogether; appetite returns, and becomes normal; the offensive smell of the excrements disappears; sores or ulcers that may happen

to exist, show a tendency to heal; the animal becomes more lively, and gains, though slowly, in flesh and strength; but some difficulty of breathing, and a short, somewhat hoarse, hacking cough remains for a long time.

The diagnosis, or distinctive symptoms of the disease, are thus detailed by Dr. Detmers:

"The diagnosis is very easy, especially if swine-plague is known to be prevailing in the neighborhood, or has already made its appearance in the herd, and if the fact that many animals are attacked at once, or within a short time and in rapid succession, are taken into consideration. As symptoms of special diagnostic value, scarcely ever absent in any case, may be mentioned the drooping of the ears and of the head; more or less coughing; the dull look of the eyes; the staring appearance of the coat of hair; the partial or total want of appetite for food; the vitiated appetite for excrements; the rapid emaciation; the great debility; the weak and undecided, frequently staggering, gait; the great indifference to surroundings; the tendency to lie down in a dark corner, and to hide the nose, or even the whole head in the bedding, and particularly the specific, offensive smell, and the peculiar color of the excrements. This symptom is always present, at least in an advanced stage of the disease, no matter whether constipation or diarrhœa is existing. As other characteristic symptoms, though not present in every animal, deserve to be mentioned: frequent sneezing; bleeding from the nose; swelling of the eyelids; accumulation of mucus in the inner canthi of the eyes; attempts to vomit, or real vomiting; accelerated and difficult breathing; thumping or spasmodic contraction of the abdominal muscles (flanks) at each breath, and a peculiar, faint and hoarse voice in the last stages of the disease."

The PROGNOSIS or probable result of the disease is decidedly unfavorable, but is the more so the younger the animals or the larger the herd. Among pigs less than three months old the mortality may be set down as from ninety to one hundred per cent.; among animals three to six or seven months old the same is from seventy-five to ninety per cent.; while among older animals that have been well kept and are in good condition, and

naturally strong and vigorous, the mortality sometimes may not exceed twenty-five per cent., but may, on an average, reach forty to fifty per cent. The prognosis is comparatively favorable only in those few cases in which the morbid process is not very violent; in which the seat of the disease is confined to the respiratory organs and to the skin; in which any thumping or pumping motion of the flanks is absent; and in which the patient is, naturally, a strong, vigorous animal, not too young and in a good condition; further, in which but a few, not more than two or three, animals are kept in the same pen or sty, and receive nothing but clean, uncontaminated food and pure water for drinking, and in which a frequent and thorough cleaning of the sty or pen prevents any consumption of excrements.

The duration of the disease varies according to the violence and the seat of the morbid process, the age and the constitution of the patient, and the treatment and keeping in general. Where the morbid process is violent, where its principal seat is in one of the most vital organs—in the heart, for instance—where a large number of animals are kept together in one sty or pen, where sties and pens are very dirty, or where the sick animals are very young, the disease frequently becomes fatal in a day or two, and sometimes even within twenty-four hours. On the other hand, where the morbid process is not very violent or extensive, where the heart, for instance, is not seriously affected, and where the patients are naturally strong and vigorous, and well kept in every respect, it usually takes from one to three weeks to cause death. If the termination is not a fatal one, the convalescence, at any rate, requires an equal and probably a much longer time. A perfect recovery seldom occurs; in most cases some lasting disorders—morbid changes which can be repaired but slowly or not at all—remain behind, and interfere more or less with the growth and fattening of the animal.

From a pecuniary standpoint, it makes but little difference to the owner whether a pig affected with this plague recovers or dies, because those which do survive usually make very poor returns for the food consumed, unless the attack has been a very mild one.

We have already spoken of the contagious and infectious character of the disease, and of its propagation by means of the diffusion of germs. These germs, though of a very low order of structure, are propagated in the stomach, intestines, or blood of the swine with extraordinary rapidity. They are believed to be a species of the *Bacteria*, the family name of these yeast or destructive germs. Dr. Detmers and some others have given this particular species the name of *Bacillus Suis*, or "little *Bacteria* of the swine." How it enters the stomach, bowels, or blood of the swine is a question which has been very carefully investigated. It was at first believed that these germs (which are very minute) were dried and reduced to powder by the action of the sun and wind, and so taken up by the wind, and carried to a distance when they were inhaled and taken into the lungs by the swine, and thus affected the system of the animal.

This theory is now exploded, for very good reasons. The inhalation of these germs does not seem to be attended with injurious effects; and the present belief of veterinary surgeons, as well as of intelligent swine-farmers, is that while these germs are taken up by the air and carried to a considerable distance, they are deposited upon the grass by the dew, or by light rains, or fall into streams or creeks and impregnate the water, so that those swine which feed upon the grass or drink the water thus charged with *bacilli* take the germs into their stomachs, and not only become infected themselves but infect others. Dr. Detmers says: "I have not been able to learn of any herd remaining exempted after the disease had once made its appearance in the immediate neighborhood, unless the animals constituting the herd were free from any external lesions (sores, wounds, or the like), were watered from a well, fed with clean food, and shut up during the night and in the morning till the dew had disappeared from the grass, either in a bare yard not containing any old straw stacks, or in sties or pens. Animals allowed to run out on a pasture, or on grass, clover, or stubble-fields at all times of the day, and animals that had external sores or wounds, contracted the disease sooner or later in every instance where the plague made its appearance in the neighborhood. Further, the

plague, at least during the summer or while a south wind was prevailing, seemed to have a special tendency to spread from south to north. If the history of swine-plague is inquired into, it will probably be found that that tendency has been prevailing every year. This year, for instance, the disease made its appearance, as I have been informed, for the first time, in Wisconsin. These facts, of course, could not fail to be suggestive. So I conceived the idea that the contagious or infectious principle, abundant in the excretions of the diseased animals, might rise in the air in daytime, be carried off a certain distance by winds, and come down again during the night with the dew. That such might be the case appeared to be possible, because the excrements of hogs, if exposed to the influence of sunlight, heat, rain, and wind, are soon ground to powder (partially at least), which is fine enough to be raised into the air and to be carried off by winds. Moreover, as the bacillus-germs, which, I have no doubt, must be looked upon as the infectious principle, are so exceedingly small, it appears to be possible and even probable that they are carried up into the air by the aqueous vapors arising from evaporating urine and moisture contained in the excrements, and from other evaporating fluids (small pools of water), which may have become polluted with the excretions of sick hogs. To ascertain the facts, I collected dew from the herbage of a hog-lot occupied by diseased animals, and also from the grass of an adjoining pasture, and on examining the same under the microscope I found the identical *bacilli* and bacillus-germs invariably found in the blood, other fluids, and morbid tissues of swine affected with the plague. Consequently, I have come to the conclusion that the bacillus-germs rise into the air during the day, are carried from one place to another by the wind, and are introduced into the organism of the animal either by eating herbage (grass, clover, etc.), or old straw covered with dew, or by entering wounds and being absorbed by the veins and lymphatics. There is, however, still another way by which the contagious or infectious principle is conveyed from one place to another. It is by means of running water. It has been observed that wherever swine-plague pre-

vailed among hogs that had access to running water (as small creeks, streamlets, etc.), that all the hogs and pigs which had access to the creek or streamlet below contracted the disease, usually within a short time, while all the animals which had access above remained exempted, unless they became infected by other means."

Dr. Detmers thinks that this infection is not carried through the air to a greater distance than a mile, and perhaps not so far, but that the infection travels in this way with the prevailing direction of the winds.

"One thing," says Dr. Detmers, "I am sure of, and that is that an exclusive corn diet, as has been asserted by several agricultural writers, wallowing in dirt and nastiness, starvation, in-and-in breeding, etc., although by no means calculated to promote health or to invigorate the animal organism, cannot constitute the cause and cannot produce a solitary case of swine-plague, unless the infectious principles (the *bacilli* and their germs) are present. If they are, then, of course, dirt and nastiness, consumption of unclean food and of dirty water, facilitate an infection, and warmth and moisture, pregnant with organic substances, or organic substances in a state of decay, are undoubtedly well calculated to preserve the bacillus-germs and to develop the *bacilli*."

The propagation of these germs by inoculation in healthy pigs, and also in rabbits, sheep, and young dogs, and the development of the swine-plague with all its characteristic symptoms and its fatal result, tried so many times by all these veterinary surgeons, demonstrates conclusively that the *bacilli* germs were the specific sources of the contagion.

PREVENTIVE MEASURES.

Dr. Detmers expresses very clearly and forcibly the measures which these four veterinary surgeons agree in recommending. "If any transportation of, or traffic in, diseased and dead swine is effectually prohibited by proper laws, a spreading of the swine-plague on a large scale will be impossible, and its ravages will remain limited to localities where the disease-germs have not

been destroyed, but have been preserved till they find sufficient food again. In order to prevent such a local spreading, two remedies may be resorted to. The one is a radical one, and consists in destroying every sick hog or pig immediately, wherever the disease makes its appearance, and in disinfecting the infected premises by such means as are the most effective and the most practicable. If this is done, and if healthy hogs are kept away from such a locality, say for one month after the diseased animals have been destroyed, and the sties, pens, etc., disinfected with chloride of lime or carbolic acid, and the yards plowed, etc., the disease will be stamped out. I know that this is a violent way of dealing with the plague, but in the end it may prove to be by far the cheapest. The other remedy is more of a palliative character, and may be substituted if swine-plague, as is now the case, is prevailing almost everywhere, or in cases in which the radical measures are considered as too severe and too sweeping. It consists in a perfect isolation of every diseased herd, not only during the actual existence of the plague but for some time, say one month, after the occurrence of the last case of sickness, and after the sties and pens have been thoroughly cleaned and disinfected with carbolic acid or other disinfectants of equal efficiency, and the yards, etc., plowed. Old straw-stacks, etc., must be burned, or rapidly converted into manure. It is also very essential that diseased animals are not allowed any access to running water, streamlets or creeks accessible to other healthy swine. Those healthy hogs and pigs which are within the possible influence of the contagious or infectious principle, perhaps on the same farm or in the immediate neighborhood of a diseased herd, must be protected by special means. For these, I think, it will be best to make movable pens, say eight feet square, of common fence-boards (eleven fence-boards will make a pen); put two animals in each pen; place the latter, if possible, on high and dry ground, but by no means in an old hog-lot, on a manure-heap, or near a slough, and move each pen every noon to a new place, until after all danger has passed. If this is done the animals will not be compelled to eat their food soiled with excrements, and as dry earth is a good disinfectant, an in-

fection, very likely, will not take place. Besides this, the troughs must always be cleaned before water or food is put in, and the water for drinking must be fresh and pure, or be drawn from a good well immediately before it is poured into the troughs. Water from ponds, or that which has been exposed in any way or manner to a contamination with the infectious principle, must not be used. If all this is complied with, and the disease notwithstanding should make its appearance and attack one or another of the animals thus kept, very likely it will remain confined to that one pen.

"If the hogs or pigs cannot be treated in that way, it will be advisable to keep every one shut up in its pen, or in a bare yard, from sundown until the dew next morning has disappeared from the grass, and to allow neither sick hogs nor pigs, nor other animals, nor even persons, who have been near or in contact with animals affected with swine plague, to come near the animals intended to be protected. That good ventilation and general cleanliness constitute valuable auxiliary measures of prevention may not need any mentioning. The worst thing that possibly can be done, if swine-plague is prevailing in the neighborhood, is to shelter the hogs and pigs under or in an old straw or hay stack, because nothing is more apt to absorb the contagious or infectious principle, and to preserve it longer or more effectively than old straw, hay, or manure-heaps composed mostly of hay or straw. It is even probable that the contagion of swine-plague, like that of some other contagious diseases, if absorbed by, or clinging to, old straw or hay, etc., will remain effective and a source of spreading the disease for months, and maybe for a year.

"Therapeutically but little can be done to prevent an outbreak of swine-plague. Where it is sufficient to destroy the infectious principle outside of the animal organism, carbolic acid is effective, and, therefore, a good disinfectant; but where the contagious or infectious principle has already entered the animal organism its value is doubtful. Still, wherever there is cause to suspect that the food or the water for drinking may have become contaminated with the contagion of swine-plague, it will be ad-

visable to give every morning and evening some carbolic acid, say about ten drops for each animal weighing from 120 to 150 pounds, in the water for drinking; and wherever there is reason to suspect that the infectious principle may be floating in the air, it will be advisable to treat every wound or scratch a hog or pig may happen to have immediately with diluted carbolic acid. During a time, or in a neighborhood in which swine-plague is prevailing, care should be taken neither to ring nor to castrate any hog or pig, because every wound, no matter how small, is apt to become a port of entry for the infectious principle, and the very smallest amount of the latter is sufficient to produce the disease."

"Still, all these minor measures and precautions will avail but little unless a dissemination of the infectious principle, or disease-germs, is made impossible. 1. Any transportation of dead, sick, or infected swine, and even of hogs or pigs that have been the least exposed to the contagion, or may possibly constitute the bearers of the same, must be effectively prohibited. 2. Every one who loses a hog or pig by swine-plague must be compelled by law to bury the same immediately, or as soon as it is dead, at least four feet deep, or else to cremate the carcass at once, so that the contagious or infectious principle may be thoroughly destroyed, and not be carried by dogs, wolves, rats, crows, etc., to other places."

Another thing may yet be mentioned, which, if properly executed, will at least aid very materially in preventing the disease; that is, to give all food either in clean troughs, or if corn in the ear is fed, to throw it on a wooden platform which can be swept clean before each feeding.

TREATMENT.

"If the cause and the nature of the morbid process and the character and the importance of the morbid changes are taken into proper consideration, it cannot be expected that a therapeutic treatment will be of much avail in a fully developed case of swine-plague. 'Specific' remedies, such as are advertised in column advertisements in certain newspapers, and warranted to be infallible, or to cure every case, can do no good whatever.

They are a downright fraud, and serve only to draw the money out of the pockets of the despairing farmer, who is ready to catch at any straw. No cure has ever been found for glanders, anthrax, and cattle-plague, diseases that have been known for more than two thousand years, and that have been investigated again and again by the most learned veterinarians and the best practitioners of Europe, and there is to-day not even a prospect that a treatment will ever be discovered to which those diseases, once fully developed, will yield. Neither is there any prospect or probability that fully developed swine-plague will ever yield to treatment. It is true that the *bacilli suis* and their germs can be killed or destroyed if outside of the animal organism, or within reach, on the surface of the animal's body. Almost any known disinfectant—carbolic acid, thymic acid, chloride of lime, creosote, and a great many others—will destroy them. But the *bacilli* and their germs are not on the surface of the body, except in such parts of the skin and accessible mucous membranes (conjunctiva and gums) as may happen to have become affected by the morbid process. They are inside of the organism, and not only in every part and tissue morbidly affected, in every morbid product, and in every lymphatic gland, but they are also in every drop of blood and in every particle of a drop of blood circulating in the whole organism. Who, I would like to ask, will have the audacity to assert that he is able to destroy those *bacilli* and their germs without disturbing the economy of the animal organism to such an extent as to cause the immediate death of the animal? But even if means should be found by which these *bacilli* and their germs can be destroyed without serious injury to the animal, a destruction of the same will not be sufficient to effect a cure. Important morbid changes must be repaired; extensive embolism is existing in some very vital organs; a rapid, proliferous growth of morbid cells has set in; some of the intestines (cæcum and colon) may have become perforated; exudations have been deposited in the lungs, in the thoracic cavity, in the pericardium, and in the abdominal cavity; the heart itself may have been morbidly changed, and every lymphatic gland in the whole organism become diseased. How, I would like to know, will those quacks

who advertise their 'sure cure' and their high-sounding 'specifics" to swindle the farmer out of his hard-earned dollars and cents—how, I ask, will those quacks restore, repair, stop, and reduce all those morbid changes?

"Still, I do not wish to say that a rational treatment can do no good; on the contrary, it may in many cases avert the worst and most fatal morbid changes, and may thereby aid nature considerably in effecting a recovery in all those cases in which the disease presents itself in a mild form, and in which very dangerous or irreparable morbid changes have not yet taken place. A good dietetical treatment, however, including a strict observance of sanitary principles, is of much more importance than the use of medicines. In the first place, the sick animals, if possible, should be kept one by one in separate pens. The latter, if movable—movable ones, perhaps six to eight feet square and without a floor, are preferable—ought to be moved once a day, at noon, or after the dew has disappeared from the grass; if the pens are not movable, they must be kept scrupulously clean, because a pig affected with swine-plague has a vitiated appetite, and eats its own excrements and those of others, and, as those excrements contain innumerable *bacilli* and their germs, will add thereby fuel to the flame; in other words, will increase the extent and the malignancy of the morbid process by introducing into the organism more and more of the infectious principle. The food given ought to be clean, of the very best quality and easy of digestion, and the water for drinking must be clean and fresh, be supplied three times a day in a clean trough, and be drawn each time, if possible, from a deep well. Water from ponds and water that has been standing in open vessels, and that may possibly have become contaminated with the infectious principle, should not be used. If the diseased animal has any wounds or lesions, they must be washed or dressed from one to three times a day with diluted carbolic acid or other equally effective disinfectants."

Dr. Detmers experimented with carbolic acid—ten drops for each hundred pounds of live weight of the hogs, administered three times a day in the water given the hogs for drinking. Two of the nine on which it was tried, survived, but did not com-

pletely recover, and were not in good condition for fattening a month later. About this percentage recover with or without treatment. Of experiments with other medicines, he says, and his experience was almost exactly that of the others:

"The principal medicines tried were carbolic acid, bisulphite of soda, thymol, salicylic acid, white hellebore or *veratrum album*, as an emetic, alcohol, and sulphate of iron, and it has been found that neither of them possesses any special curative value. In a few cases in which most of the lesions were external, applications of very much diluted thymol or thymic acid produced apparently good results; the animals recovered, but might have recovered at any rate. Diluted carbolic acid has been used for the same purpose and with the same results. An emetic of white hellebore or *veratrum album* was given to some shoats (about eight or nine months old, and property of Dr. Hall, at Savoy), in the first stage of the disease, and seems to have arrested the morbid process immediately; at least the shoats recovered. In other more developed cases, it did no good whatever. Bisulphite of soda, salicylic acid, and carbolic acid were used quite extensively, but no good results plainly due to the influence of those drugs have been observed in any case in which the disease had fully developed, either by myself or by others. Sulphate of iron has proved to be decidedly injurious. Mr. Bassett used it quite persistently for forty-five nice shoats. Forty-three of them died, one recovered from a slight attack—it had external lesions, which were treated with carbolic acid—and one remained exempted. To bleed sick hogs, in some places a customary practice among farmers against all ailments of swine, has had invariably the very worst consequences, and accelerated a fatal termination. A great many farmers in the neighborhood of Champaign have used several kinds of 'specifics' and 'sure cure' nostrums, but none of them are inclined to talk about the results obtained, and so it must be supposed that the latter have remained invisible.

"A case which I should have related, deserves to be noticed. Mr. Crews had forty-odd hogs, of which he had lost ten or twelve, and was losing at the rate of two to four a day. I

advised him to separate those apparently yet healthy, or but slightly affected, from the very sick ones; to put the former in a separate yard, not accessible to the others; to feed them clean food; to water them three times a day from a well, and to give to each animal, two or three times a day, about ten drops of carbolic acid in their drinking water. He did so, and saved every one he separated (fourteen in number), while all others, with the exception of two animals which died later, died within a short time."

Dr. Salmon had made many experiments in the treatment of the disease with bisulphite of soda, salicylic acid, bichromate of potassa, and bromide of ammonia. These were all administered at an early stage of the disease. The first two mitigated the symptoms somewhat, but in most instances the fatal result followed. The last two did not produce any appreciable result. Dr. Law recommends the following measures to arrest and extirpate the disease: Without entering at this time into all the details of the necessary restrictive measures, the following may be especially mentioned: 1. The appointment of a local authority and inspector to carry out the measures for the suppression of the disease. 2. The injunction on all having the ownership or care of hogs, and upon all who may be called upon to advise concerning the same, or to treat them, to make known to such local authority all cases of real or suspected hog-fever, under a penalty for every neglect of such injunction. 3. The obligation of the local authority, under advice of a competent veterinary inspector, to see to the destruction of all pigs suffering from the plague, their deep burial in a secluded place, and the thorough disinfection of the premises, utensils, and persons. 4. The thorough seclusion of all domestic animals that have been in contact with the sick pigs, and in the case of sheep and rabbits the destruction of the sick when this shall appear necessary. 5. Unless, where all the pigs in the infected herd have been destroyed, the remainder should be placed on a register and examined daily by the inspector, so that the sick may be taken out and slaughtered on the appearance of the first signs of illness. 6. Sheep and rabbits that have been in contact with the

sick herd should also be registered, and any removal of such should be prohibited until one month after the last sick animal shall have been disposed of. 7. All animals and birds, wild and tame, and all persons except those employed in the work, should be most carefully excluded from infected premises until these have been disinfected and can be considered safe. 8. The losses sustained by the necessary slaughter of hogs should be made good to the owner to the extent of not more than two-thirds of the real value as assessed by competent and disinterested parties. 9. Such reimbursement should be forfeited when an owner fails to notify the proper authorities of the existence of the disease, or to assist in carrying out the measures necessary for its suppression. 10. A register should be drawn up of all pigs present on farms within a given area around the infected herd—say, one mile—and no removal of such animals should be allowed until the disease has been definitely suppressed, unless such removal is made by special license granted by the local authority after they have assured themselves by the examination of an expert that the animals to be moved are sound and out of a healthy herd. 11. Railroad and shipping agents at adjoining stations should be forbidden to ship pigs, excepting under license of the local authority, until the plague has been suppressed in the district. 12. When infected pigs have been sent by rail, boat, or other mode of conveyance, measures should be taken to insure the thorough disinfection of such cars or conveyances, as well as the banks, docks, yards, and other places in or on which the diseased animals may have been turned.

Other measures would be essential in particular localities. Thus in the many places where the hogs are turned out as street scavengers, and meet from all different localities, such liberty should be put a stop to whenever the disease appears in the district, and all hogs found at large should be rendered liable to summary seizure and destruction.

The great difficulty of putting in practice the means necessary to the extirpation of the disease will be found to consist in the lack of veterinary experts. No one but the accomplished veterinarian can be relied on to distinguish between the different

communicable and destructive diseases of swine, and to adopt the measures necessary to their suppression in the different cases. In illustration I need only to recall the numerous reports in which what is supposed to be hog-cholera has been found to depend on *lung-worms*, on any one of the four different kinds of *intestinal round-worms*, on the *lard-worms*, on *embryo tape-worms*, on *malignant anthrax*, on *pneumonia*, or on *erysipelas*. To class all these as one and apply to all the same suppressive measures would be a simple waste of the public money, but to distinguish them and apply the proper antidote to each over a wide extent of territory would demand a number of experts whom it would be no easy matter to find. This state of things is the natural result of a persistent neglect of veterinary sanitary science and medicine as a factor in the national well-being, and must for a time prove a heavy incubus on all concerted efforts to restrict and stamp out our animal plagues. It will retard success under the best devised system, and will sometimes lead to losses that might have been saved, yet if an earnest and prolonged effort is made, the obstacle should not be an insuperable one, and the United States should be purged not of this plague only, but of all those animal pestilences which at present threaten our future well-being.

The rearing and breeding of swine is conducted in connection with other farming, and often, and perhaps most profitably, on dairy farms. Where the swine can have good pasture and plenty of buttermilk, or sour milk with their food, they thrive well. Where there are large herds of swine, if the farmer raises also large crops of corn, or the Egyptian rice-corn, he can fatten his swine very cheaply.

The business of rearing swine either for sale or for breeding purposes, or for pork, is, aside from the risks of epidemic diseases, very profitable. A man with a farm of a half-section, 320 acres, well in hand, sixty acres of it in corn, or thirty in corn and thirty in rice-corn, and a dairy herd of thirty to fifty cows, can begin operations with, say, thirty young sows of the Poland-China or improved Berkshire breed, and three or four boars of the alternate breed, a total outlay of not much over $200; may

count upon two litters a year (the best times are in March and September), and an increase for the two litters of fourteen to each sow, and may market the next year 350 fat hogs weighing an average of over 400 pounds each, at $3.50 to $4 per hundred pounds' live weight, at the lowest price netting him $4,900, and have enough left to give him at the end of the ensuing year a herd of 800 to 1,000, and his grass and corn being consumed on his farm its value is enhanced thereby (if he is a good manager) to nearly double its previous value.

We give a few reports of swine-farming in Kansas as a typical State in this industry, from the farmers themselves, as exhibiting their methods of breeding and the best way of making swine-farming profitable.

F. D. Coburn, Pomona, Franklin County, Kansas.—"Thirteen years' experience breeding swine in Kansas; improved Berkshires present stock; a few of my reasons for preferring this breed are: their flesh is the highest quality of pork, they have great vitality, strong digestive and assimilative powers, will attain heavier weight, yet can be readily fattened at any age, sows are unequaled for prolificacy, are good sucklers and careful mothers, have wonderful uniformity in color, marking, and most valuable points of a good hog. A first-class Berkshire should be glossy black, white strip in face, feet and tip of tail white, body deep and moderately long, straight back, hams thick and full, legs straight, short, and strong, face short, wide between eyes, neck short and thick, jowl heavy, indicating quick, easy feeder, ears moderately small, slightly inclined forward, tail small, hair fine and thick, skin fine and pliable. Berkshire boars crossed on Poland-China sows make best pork hog in the world. Use my boars first at from seven to ten months old; sows, at from eight to twelve months old; two litters a year are not too many, with facilities for giving proper care; have them come early in April and early in September; first two and a-half or three months of a pig's life should be in temperate weather. At one year old, my hogs, in good order, weigh 300 to 400 pounds. Being without pastures, I grow special green crops for them in summer, particularly sweet corn, to be cut and fed in stalk; use some

milk, with ground rye, wheat bran, shorts, and other stuffs, which make an agreeable and healthful variety; crowding, or very warm sleeping-places, I avoid. Don't consider it profitable to cook feed, with corn at twenty cents per bushel, but with wind or other cheap power, it would often be profitable to grind and soak for forty-eight hours before feeding. Summer pasture necessary; the hog is emphatically a grass-eater; red clover and blue-grass best. No disease among my hogs; try to raise stock with robust constitutions; don't confine to exclusive corn diet 365 days in the year; don't let them crowd in large numbers; give them my personal attention, and have had no occasion to curse my luck or the hog-cholera; principal causes of disease, mean class of hogs, kept in a mean way, by negligent farmers. Experience has proven to me that good pork, at a cost of two cents per pound, brings more than corn at twenty cents per bushel. Sold pork in 1879 for $3.25 to $4 per 100 pounds, live weight. This State presents no obstacles to success in this branch of farm industry; lack of success and profit is with the man who practises false economy, by using year after year runty, ill-favored animals as sires, instead of pure-bred boars, of any breed, that would improve the value of their stock from fifty to 100 per cent. by the first cross; lack of clover, blue-grass and artichoke pastures, pure water and shade; the idea prevails that 'any fool can raise hogs,' hence no care in studying new breeds and methods."

Linscott Bros., Holton, Jackson County, Eastern Kansas.—"Twenty years' experience; now raising pure-bred Poland-China; they are more quiet, sows make better mothers, are better sucklers, more prolific, pigs never get mangy, easily fattened at nine months old; if desirable to keep longer, will continue growing till thirty months old; when fattened, have less waste, bring higher prices; best grass hog; will make two pounds of meat on grass to one of any other breed; grass meat being cheapest meat made, this is a great advantage. Marks of pure-bred, in color, nearly black, some white, occasionally sandy spots, long body, deep sides, heavy hams, short legs, when fattened, should 'roll a cob,' rather large ears, drooped, rather short head, slightly dished face, has more meat back of shoulders than other

breeds; when well-fattened will have meat clear down to hocks. Poland sow with Berkshire boar, best cross for pork hog, among pure-bred, but we prefer pure Polands. Use boars first time not under eight months old, sows not sooner than eight, rather at twelve months old; old sows may have two litters; young ones, one litter a year, and that in May or June; if I raised two litters, April one, and October one. Average increase, eight pigs per litter. Our hogs at one year old, in good order, weigh 350 to 500 pounds; at two years old, 600 to 900 pounds. Have lost none by disease in five years. Let sows run on grass; feed soaked corn and slop of equal parts, bran and ship-stuff; those we wish to turn in fall, keep feeding on same until corn is dented in fall, then take off grass, put up, and feed corn; for breeding, wean at eight weeks old; let run on grass, with less amount of slop-feed than pork pigs; put sows, when dry, on clover, without grain, until frost. Never let boar run with sows; stand him, only serving once. Summer pasture absolutely necessary for profitable pork-raising; clover and blue-grass best. Have had no prevailing disease among our hogs in Kansas—seven years. Sold pork in 1879 at four cents per pound, live weight. Well-fattened hogs should weigh 400 pounds or over, at one year old."

E. M. Prindle, Marena, Hodgeman County, Western Kansas.—"Two years' experience breeding swine; pure Berkshire present stock; think they mature earlier, fatten with less feed, endure close confinement, or can get their own living better than any other breed. Best cross among pure-breds for pork, Berkshire with Poland. Have bred males at eight months, but it is too young; sows at eight months, and not oftener than three times in two years; have litters come in April and May. At one year old my hogs weigh 250 to 300 pounds. No disease among them; too close confinement in uncleanly enclosures is likely to produce sickness. Don't think it profitable to grind and cook feed, with corn at twenty cents per bushel. Summer pasture good, but not necessary. Costs not over two cents per pound to grow pork in Kansas, with corn at twenty cents per bushel. In 1879 pork brought four cents per pound, live weight. For a fat hog, at one year old, 300 to 350 pounds is good weight."

J. M. Johnson, Harveyville, Wapaunsee County, Eastern Kansas.—"Twenty years' experience breeding swine; now raising pure-bred Poland-China: prefer them, because of their gentle, quiet dispositions, large size, early fattening qualities, non-liability to disease, compared with a white hog; body good length, short legs, broad, straight back, deep, full sides, full square hams, heavy shoulders, drooping ears, not too large, short head, wide between eyes. Best cross for pork among pure-breds, Poland and Berkshire. First breed boars at nine months old; sows, at same age, twice a year; have litters come in March and September. In good condition, at one year old, my hogs weigh 375 to 400 pounds. Thus far, in Kansas, have kept them confined, having no pasture fenced; keep breeding sows separate from other hogs; have corn and rye ground to make swill; feed dry corn. One year ago quite a number of farmers tried boilers, but found no profit in it. Not necessary to have summer pasture to make a good hog, but less expensive; red clover best. Never had any disease among hogs in this neighborhood. Costs about two cents per pound to grow pork in Kansas, counting corn at twenty cents per bushel. Average price received for 1879 pork, $3.37 per 100 pounds, live weight. At a year old, a well-fattened hog ought to weigh 400 pounds. No drawbacks to success here; but when corn is high, there is no money in feeding and raising hogs in close pens."

A. S. Sutton, Vesper, Lincoln County, Central Kansas.—"In 1875, I raised twelve pigs from two sows, one a Poland China, the other a good grade; have used pure Berkshire males on above sows and offspring; have tried no other kind, having been very successful with these; in 1876, had the two old sows and six young sows of the 1875 pigs; raised and sold 100 pigs that summer, and increased my herd some; in 1877, sold fewer pigs, but began to fatten them; sold that year, in pigs, shoats, and fat hogs, over 100, and had at the highest on hand 200; in 1878, fattened and sold 100; sold fifty or more young ones, and had at times 300; in 1879, fattened about 100; sold over 100 shoats, weighing over 100 pounds each, fifty or more pigs and sows; had as high as 400 at one time; now have 200. Berkshire is a

fine-haired, black hog, some white in face, white feet, small, erect ears, round, symmetrical body, and short legs. Think Berkshire on our Western stock produces as good results as any other, making a beautiful, easily-kept hog. In my large herd, don't use boars first younger than one year, and have used same ones two years, but think one year preferable; can't keep my sows separate; should be one year old at time of first litter; breed them twice a year; they will begin to farrow April 15th this year, and continue till next November; when I had fewer, had litters come in March and September; saves labor and feed to have them come, as much as possible, in the growing season of the year, and a larger percentage of pigs can be saved. Stock hogs, at a year old, weigh 200 pounds; fat ones, 300 pounds and upwards. Have had no disease; think close, foul pens a fruitful source of it. Since getting a large number, am compelled to put each sow in pen by herself, just before pigging time, and keep them there till pigs are three or four weeks old, then put several together in a small field or yard, with shelter and pasture; also have a yard with fence open sufficiently to let pigs through, so as to feed them extra; have a three-acre lot, with water and shelter, for fattening purposes; balance run in a sixty-acre field of prairie with horses, cattle, etc.; water and straw sheds for shelter; feed corn twice a day; have had 400 together, but stronger ones are apt to cheat younger ones out of their feed. Don't think it necessary to grind and cook feed; pasture is necessary for health as well as for feed; have so far used only prairie grass. Pork at three cents per pound, live weight, will leave a margin for profit. Received $2.62½, $3.40 and $3.62½ per 100 pounds for 1879 pork. I know of no drawbacks to success in this branch of farm production in Kansas."

M. B. Keagy, Wellington, Sumner County, Southern Kansas.—"Ten years' experience breeding swine; pure-bred Berkshires present stock; prefer them because I have had best success with them; will make as much, if not more, pork, under one year old, as any other; think they care more for their pigs, and make better sucklers; best hog to follow cattle, active when quite fat, and not liable to cholera. A pure-bred should be black, with white

on face, feet, and tip of tail, very short head, good length of body, large hams, stand wide apart on front feet, nearly straight on back and belly from head to tail, short in legs. My experience is, that Poland-China and Berkshire make best cross among pure-breds for pork. Consider one year old best age to first breed boars; sows, at from nine to twelve months; have best luck with two litters a year, in March and September. At one year old, in good condition, mine weigh about 350 pounds. Average increase, about seven pigs to a sow. Have had no disease among my swine; confinement and poor treatment causes it. Have not bred more than five to eight sows per year, and when I find a good mother, think it best to keep her four or five years; have fed on corn mostly, as we have but little tame grass here; let run along creek part of time; don't think best to confine them; by all means, separate males from females as soon as weaned. Have ground and cooked feed, with profit, when pigs were small and learning to eat. Consider summer pasture necessary to obtain best results; clover best of any I have tried. Think cost of growing pork in Kansas is about two cents per pound, counting corn at twenty cents per bushel. Sold 1879 pork at three and a half cents per pound, live weight. Weight of a well-fattened year-old hog should be about 400 pounds. Many farmers confine too much; seem to think anything good enough for a hog; I think them a nice animal, if they have an opportunity."

The breeding of horses, asses and mules for the market is a profitable business, but is not prosecuted on a large scale except in Texas, California, Oregon, Iowa, Missouri, Kansas, and, recently, Colorado. The greater number of the Texas horses are of two kinds, the Mustang—the wild and half wild descendants of Barbary horses or Spanish horses, brought over here by the early Spanish conquerors; they have degenerated in size, and are of fitful and vicious temper, but tough, wiry and sure-footed, with great powers of endurance—and the Indian pony, a descendant from English and French horses, also half wild and tough, but possessing perhaps less powers of endurance, and a better temper than the Mustang. A cross of these gives a very serviceable horse, though not entirely free from vices.

There are, both here and in California, where the mustang is very common, many horses thoroughbred and of the best blood, as well as grades from the most renowned English, French and American stocks, and there are those who are largely engaged in rearing and breeding these very fine animals. It is claimed, and probably with truth, that some of the finest horses on this continent are owned in California, Colorado and Texas. But very little of these finer strains of blood is to be found in the droves, sometimes consisting of 10,000 or 20,000 horses, which are intended to supply the needs of the tens of thousands who want one, or a dozen, or a hundred horses for work. The mustangs, Indian ponies, and the cross between the two go by the general name of broncho throughout the West, just as the name of "Canuck" is given to all the Canadian horses at the East. Without the broncho (notwithstanding all his bad habits) the western settler, and especially the large farmer or the ranche-owner, would hardly be able to exist, and the Indian certainly would not. The shepherd follows his flock on foot, but the *vaquero* or herder, the cow-boy, as this western herdman delights to call himself, would be utterly bereft of all his importance if he could not exhibit his skill and horsemanship by careering about on his broncho. The stages or Concord coaches, which in such numbers traverse all parts of the Rocky Mountains to which the railways have not yet penetrated, are all drawn by bronchos, and all the relays are from the same stock. At every station, also, of all the railways, there are numerous conveyances, Concord coaches, buggies, lumber-wagons, buckboards, and often the more pretentious carriage, to which, in the absence of blooded stock, there are attached from one to four or six of these mountain horses.

But while the "broncho" has great labors to perform, and often with scanty and indifferent fare, his humble, patient, and much-enduring congener, the "burro," has a still harder time of it. Every sort of long-eared animal, except the mule, from the stately Spanish or Maltese ass down to the gentle little donkey bestridden by the young tyrant in knickerbockers, goes by the name of "burro," and its office is to bear burdens. Over the

passes of the Great Divide, nine, ten and eleven thousand feet above the sea, passes never tracked by a wheel, and only penetrable by the sure-footed ass during the four summer months, the patient little donkey picks his way, bearing a heavy load of concentrated ore, or panniers of "canned vittles," or perhaps furniture or grain, which could not by any other mode reach the mining camps far up in the mountain gulches.

Strange that an animal so gentle, meek and patient, should, by the mingling of a nobler strain of blood with its own, give birth to a progeny so thoroughly perverse and refractory, yet so indispensable on account of its hardiness and strength as the mule. This contrary, obstinate, sulky brute, whose intelligence seems to be wholly concentrated on the best mode of accomplishing the greatest amount of mischief and destruction, is nevertheless invaluable in all the western lands. He commands a price at least fifty per cent. higher than that of a horse of the same grade; and is universally employed in hauling ore, timber, miners' supplies, groceries, dry-goods, furniture, hardware, etc., etc. Unlike the burro, the primary function of the mule is not to cross the "Divides" on mountain trails, but to draw over the roads, good or bad (generally the latter), those huge wagons with their loads of from two to four tons. A mule-team may consist of four, six or eight mules. But there are pack-mules also, which bear on their backs heavy loads, fastened to them with all the packer's skill, and which, if well bound with the skilful but complicated diamond hitch,* will resist the determined and desperate efforts of the mule to rid himself of it. But woe to the packer who, in his zeal to display his skill, comes within

* This is a peculiar fastening of the ropes which bind the pack on the mule's back, and the ability to execute it successfully is regarded as one of the highest attainments among the mountaineers. It is related of one of Professor Hayden's corps, that at one time he was separated from his companions and fell into a camp of packers and mule-drivers. His new companions looked with contempt upon the delicate and apparently frail youth, and began to badger him. "You are nothing but a tender-foot," they said; "what business have you up here, among men that have been in the mountains for years? You had better go home to your Yankee friends and let them take care of you. We don't need any 'tender-feet' up here." "I may be a tender-foot," replied the young man, quietly, "probably I am; but I can put the diamond hitch on a mule's pack with any of you." "Can you?" asked his tormentors, in astonishment. "Then you are welcome to the best we have in camp."

reach of the heels of this vicious brute; he will find it looking most demurely, but without the slightest warning those legs will lash out with lightning speed, and whosoever and whatsoever is within their reach, will feel that they possess all the hardness and elasticity of steel, and will not desire to repeat the experiment.

The rearing and breeding of mules is not a very expensive business. It is only necessary to have the male parent of large size and of good proportions; the mother may be a mare of almost any breed; even the Indian ponies or the mustangs answer the purpose. The mule colts are much hardier and tougher than the horse colts, and feed upon anything which comes in their way, shavings, sage-brush, weeds, buffalo grass or anything else. They bring a high price because the demand is always greater than the supply. There is probably no agricultural business which will return surer and more liberal profits, upon a moderate outlay, than this. We regret that we are unable to give figures, but the horse and mule-breeders, if not a close corporation, are at least close-mouthed, and will not, as the slang phrase goes, give themselves away.

Our record of domestic animals and their relations to the farmer, stock-raiser, or sheep-master would not be complete without a notice of THE DOG. Nowhere is it more true than in the Great West, that "there are dogs and dogs." From the shepherd-dog or colly, which rivals man in point of intelligence, or the graceful and fleet grey-hound, whether of English, Danish or Italian breed, to the base cur-dogs which are always found around an Indian camp, base, sneaking, half-starved brutes, half wolf or coyote, the descent is almost infinite. The sheep-farmers complain bitterly of the ravages of these cur-dogs (and sometimes, it is to be feared, of the better sorts) among their flocks, and often in their haste and anger, demand that all dogs shall be slaughtered or banished from the State, not even excepting the collies, which, with rare exceptions, are the best friends of the sheep; but while it is to be wished that they might succeed in destroying all the mongrels and curs, we cannot desire the destruction of the more beautiful and intelligent canines who are not destroyers of sheep or cattle.

The shepherd-dog is truly the companion of his master, listens to and understands every word spoken in his hearing, and is so faithful in guarding his woolly flock that he will sacrifice his own life for their preservation. We may be told that sometimes even these dogs have proved unfaithful to the trust confided to them, and have killed the sheep they were set to protect. This may be true in very rare instances, but have there been no cases where men, honored and trusted, have proven false to their trusts? If so, why visit on a poor dog the punishment due to man, with his superior intelligence?

In those parts of the West where game is still plentiful, hunting dogs are in great demand, and there are many kennels of superior breeds. The hunters in Kansas, Colorado, Wyoming, Montana, Dakota and on the Pacific slope, have many fine dogs adapted to the great variety of game found there. The pointers and setters for feathered game, are of excellent quality, and the stag-hounds, employed for hunting the deer and elk, are not surpassed anywhere. The fox-hounds and wolf-dogs are not always quite so good, but answer a tolerable purpose. Very few of the most plucky dogs like to attack the grizzly bear, for a single blow of its powerful claws kills them. They are not in so much fear of the black or cinnamon bears, and often render efficient aid to the hunters in bringing them down. The whole tribe of cur-dogs, Indian dogs, mongrels, and crosses on the coyote or the gray wolf are a nuisance, and kill more sheep than the coyotes or gray wolves, ten times over. The laws for the destruction of these pests are very strict and severe, but it is difficult to carry them into effect. Where there are Indian camps there are sure to be scores of these wretched dogs, mangy, ugly, and half-starved, but the Indian values them very highly, and some of the savage tribes offer them as sacrifices at the burial of their dead braves, while others, when hard pressed, cook and eat them. Most of them seem to be on excellent terms with the coyotes, the most despicable of all the carrion hunters of the wolf tribe, and it is not always easy to distinguish which is dog and which coyote.

We have alluded, incidentally, more than once to the rearing

of poultry, as a pursuit to be followed in connection with a grain-farm, a market-garden, or even a laborer's "little patch" of land. There is hardly any crop which a farmer will find more profitable, in the small way, to help out his income, than a crop of chickens.

We do not recommend the breeding of fancy fowls, which most people find unprofitable. Neither would we advise the establishment of a chicken factory. These are well enough in their way and are probably sometimes the sources of a large revenue; but they require capital, experience and skill. But every farmer can have fifty or a hundred hens; the barn-yard variety is the best if crossed with Brahma, Houdan or Hamburg, Black Spanish or Plymouth Rock males. If the children want a brood of Bantams, indulge them. The outlay is inconsiderable, and the fresh eggs and the chickens pay a large profit. Take these examples:

RAISING POULTRY IN IOWA.—Mrs. D. W. Gage, near Ames, Iowa, raised in 1871, 600 chickens, of which about 150 were Brahmas and Houdans, the rest being half-blood. One Brahma cock, nine months old, weighed 11¾ pounds. The poultry brought at Ames 6 cents per pound, live weight, while pork brought $3.20 per hundred. Mrs. Gage states that she can raise poultry as cheaply as she can pork, weight for weight, and generally sell for twice as much. As to her method of rearing, for three or four days after hatching, the chickens were fed with hard-boiled eggs and cheese-curd, after which they received mush made from corn-meal and wheat. Mrs. Gage recommends willows planted close as a shelter for fowls; the leaves also afford them an agreeable food. She finds the Brahmas profitable for market, but for the home-table prefers Houdans.

Mr. Arthur P. Ford, of Charleston, S. C., an experienced fowl-raiser, thus records his experience in the extreme South, which will be of interest in those States and Territories south of the thirty-fifth parallel:

"BREEDS.—The best breeds suitable to our climate are the Game, Black Hamburg, Spanish, Dominique, and the common Barn-yard, and also crosses between the Brahma and any of the

foregoing. The large thoroughbred Asiatics do not thrive south of the thirty-fifth parallel of latitude; the climate is too warm for them; they may live two or three years, but their progeny invariably degenerates. This is now a very generally accepted fact among those who have had experience in raising fowls in the South for actual profit. The dark colors are the hardiest, and in every way the most remunerative. Light-colored fowls are generally delicate, and nearly always inferior layers and setters. Persons forming a stock from any of the six varieties named should be careful to select the dark colors. White fowls are very pretty for the fancier, but they are an injudicious investment for the ordinary poultry-raiser in the South.

"Houses.—Fowls should in all cases, wherever practicable, be allowed to sleep on trees for the eight months from 1st March to 1st November; they enjoy the privilege very much, and are always healthy; whereas when sleeping in houses during this warm period they will be constantly liable to all the diseases that appertain to their kind. When the cold weather comes on they should be put into the house at night, as they will not lay well during the winter if exposed to the cold rain and ice. The house should be placed upon the highest part of the grounds assigned to the fowls, in order to secure thorough drainage. It should be built of inch boards, placed two inches apart, to afford good ventilation; the roof should be close, the floor covered with dry, loose sand, and the roost made of two-inch laths, and slipped between the openings, in order that they may be withdrawn frequently and cleansed with kerosene oil. The house should contain nothing whatever except the roosts; no nests or boxes should be allowed in it; and it should be whitewashed at least twice during the winter, and the floor frequently cleansed and supplied with fresh loose sand.

"Lice.—Red lice will infest a fowl-house, even during the winter, in the South, and will be principally found on the under sides of the roosts, in small mahogany-colored patches. These lice infallibly cause sore heads, swelled eyes, and the dangerous disease known to fanciers as roup; they are instantly killed, however, by applications of kerosene oil; and for this purpose the

roosts should be withdrawn and oiled at least every three weeks. When fowls have sore heads, caused by these lice, they will die, unless promptly taken in hand. A simple but infallible cure is to grease their heads daily for three or four days with olive-oil, and make them sleep on the trees in the open air. The large white lice will never be found on fowls that sleep on trees during the spring and summer months; but if allowed to occupy a house, these lice cannot be escaped, and the fowls will show their presence by appearing droopy, and having colorless combs and gills, and unless they are relieved they will die.

"WATER.—Pure, clean drinking-water is absolutely essential to the health of all poultry; impure water is a prolific source of cholera in summer, and of roup in winter. During the cold weather a little red pepper put into the drinking-water of fowls will be found beneficial. This is a good tonic, and warms up the hens and induces them to lay. Another excellent provision is to place at the bottom of the vessel of water a piece of assafœtida, which impregnates the drink with its tonic qualities and is very wholesome. Fowls drink but little water at a time, but they drink very often; and in the course of the day consume a surprisingly large quantity of it.

"FOOD.—The food should be varied occasionally from hard grain, to flour or meal mixed with a little water, and should be fed to them principally in the afternoon, in order that they may have a supply for quiet digestion during the night. During the winter months fowls require more food than they do at other times, for they are unable to obtain insects, and the cold weather renders more food actually necessary. If fowls are fed well during the cold weather, they will lay well; but they will not lay during the winter without an abundant supply of food. Chandlers' scraps, or oil-cake, that can be obtained at all soap-factories at two cents per pound, will be found very valuable food, given two or three times a week, but if fed too freely it will scour the fowls, as it is very greasy. An abundance of green food, fresh grass, etc., is absolutely indispensable during the summer, and should also be given the fowls during the winter whenever practicable.

"RANGE.—A dry range is essential; fowls will not thrive in damp localities or on dirty premises. They should never be allowed access to rotted manure heaps, as the ammonia generated by such heaps always causes sore eyes and, if continued, death. There is a very great difference between an ordinary stable, or cow-yard, and a compost heap; in the former the fowls obtain much food without risk, but in the latter the food obtained is always at the cost of disease.

"SETTING HENS.—Hens should never be set between 1st May and 1st September, as the small lice will become troublesome during the warm weather; and the young chicks will not thrive. They may be set advantageously at any time between September and May; but the chicks will require much care and protection if hatched during the cold winter months. The hardiest chicks and most easily raised are those hatched during the months of February and March. Only the eggs of the finest, healthiest hens should be set, and particularly those from the best layers; but eggs from hens that have had attacks of roup should never be set, as the constitutions of such hens are always weakened by this disease, and the chickens will be liable to similar attacks. It is certain that only strong, healthy hens can lay eggs that will produce strong, healthy chickens. The nests should always be made on the ground, so that the eggs can obtain the natural amount of moisture essential to hatching; and never under any circumstances should hens be allowed to set or even to lay in the fowl-house. They should be taken carefully from the nests once daily, and given corn and water; but when hatching has actually commenced they should be let most rigidly alone.

"CHICKENS.—The young chickens should be kept in coops for at least one month after being hatched, or many of them will be lost by injuries and various accidents. A little meat, finely chopped up and fed to them occasionally, will be found of great advantage. Only the largest, best formed should be kept for stock, and the inferior should be sold or eaten.

"PROFITS.—A stock of three cocks and twenty-seven hens will be found very manageable and remunerative by any family in the

country, and will yield an abundance of eggs and chickens for consumption and sale annually. The profits of keeping fowls in a practicable, ordinary way may be demonstrated by the following statement, calculated for a period of two years:

"DEBTOR.

To 30 heads of fowls, at 75 cents per pair	$11 25
To allow 8 to die in two years and be replaced at 75 cents per pair	3 00
To 48 bushels of feed, at 50 cents	24 00
Fowl-house	5 00
46 dozen eggs for setting, at 15 cents	6 90
Balance of profit in two years	88 85
	$139 00

"CREDITOR.

By 277 dozen eggs, at 15 cents	$41 55
By 506 chickens hatched, less 100 died, say, 406 raised, at 20 cents	81 20
By manure saved in two years	5 00
By 30 head of fowls, at 75 cents per pair	11 25
	$139 00

"Thus, thirty heads of fowls will pay a clear profit of $88.85 in two years, or an average of $1.48 each annually. Good specimens of the breeds named will produce annually about sixty to seventy eggs each. The settings should average thirteen, and of these about eleven will hatch. The extension of poultry-raising should in every way be encouraged, as it increases the supply of good food at a very reduced cost."

Turkeys are also a source of profit near villages and large towns. Where land is plenty, as at the West, it pays well to give poultry a tolerably wide range, accustoming them to come home at night to roost and be fed. They will make havoc with the grasshoppers and locusts, and prevent losses from these pests. They fatten easily, although they require care when they are young. They always command a good price, and as Mrs. Gage says of the fowls, it costs no more, pound for pound, to raise them than it does pork, and they will bring three or four times the price.

Ducks and geese are also profitable where there is water. The latter especially have a triple value, for their eggs, their flesh and their feathers, which are plucked from the living bird, once or twice a year. This is a large business now in some parts of Texas, and is conducted on an extended scale. Pigeons are easily raised, especially in the vicinity of towns; they are very prolific, and the young pigeons or squabs command high prices.

The raising of poultry in the West is attended with some risks, as they have many enemies. Foxes, coyotes, raccoons, weasels, ground-hogs, and other four-footed marauders, and the whole tribe of hawks, owls and vultures, are ready to pounce upon the helpless fowls.

But a still more formidable enemy is the so-called "chicken cholera," a disease which has made sad havoc in the poultry-yards of all parts of the country. Many farmers have lost hundreds of fowls, and where a flock are attacked from twenty-five to ninety per cent. die. Ducks, geese and turkeys are as subject to it as hens and chickens. The disease is contagious and goes through an entire flock when one or two are affected. The symptoms are: at first, the fowl begins to mope around, sometimes seeming to have a full crop, but oftener an empty one; it will not eat, but drinks often, and seems to be very thirsty; the comb and wattles become a dark red, nearly a black color; the droppings are at first of a pale green color, then dark green and yellow, but grow thinner, clearer and more liquid with each evacuation, till utterly weakened and prostrate, in the course of from twelve to forty-eight hours the fowl dies, usually with great appearance of agony. Many times they will use their last remaining strength to crawl or flutter away under bushes or a fence to die. The liver is always found to be diseased. They sometimes have an appearance of fatness, but this is due to dropsical effusion. The discharges and the flesh of the fowls have a most offensive odor.

That the cause of this disease, like that of the so-called "hog cholera," was a germ or organism of a contagious nature, and capable of the most rapid propagation, was discovered in France

by M. Moritz, of Upper Alsatia, and M. Toussaint, of Alfort, French veterinary surgeons, in 1878 and 1879. Sig. Peroncito, a veterinary surgeon of Turin, also corroborated their investigations. It was reserved, however, for M. Pasteur, the eminent French physiologist and chemist, to apply the knowledge already obtained on this point to practical use. In a paper "on virulent diseases, and especially on the disease commonly called chicken cholera," read before the Academie des Sciences, February 9th, 1880, and translated and published here by P. Casamayer, Ph. D., in the "Journal of the American Chemical Society," Prof. Pasteur details the results of his experiments carried on for many months with this specific poisonous germ, by which he has demonstrated that its virulence may be greatly diminished, and that if the chickens are inoculated with this modified germinal poison their sickness will be slight and they will be perfectly protected from the original disease. In a word he has applied Jenner's principle of vaccination to the chicken cholera. The processes by which this may be accomplished are so simple and the results so satisfactory that we presume it will be largely practised where there is danger of the prevalence of chicken cholera.

But until this method can be more generally made known and adopted, it is certainly best that measures of prevention should be resorted to, and that the roosts and henneries should be kept perfectly free from vermin, by the free use of whitewash and kerosene oil, that no lice or other insects should infest the fowls, and that they should have pure water and perfectly clean feed, with fine gravel, red pepper, and occasionally a little assafœtida put in their water to act as a tonic. Their food should not be exclusively of corn, but meal, bran and other articles should be given a part of the time. They should have no access either to their own droppings, or any manure heaps, especially if any disease prevails among other domestic animals, but should have during the day the range of a large, and if possible, gravelly lot.

Another disease which affects fowls very often, and is considerably destructive, though less so than the chicken cholera, is *roup*. Under this name several distinct diseases, though all affecting the air passage, are included. It is sometimes

analogous to croup, and the fowls die of suffocation; at other times it is only a severe catarrh, and sometimes a contagious one; at still other times it is an inflammation of the lungs or a sort of pleuro-pneumonia. These are all caused primarily by damp and unwholesome temperatures at the roosts, foul air, currents of air, etc. The symptoms are sneezing, mucous discharge from the nostrils, froth in the corners of the eyes, and a tendency to suffocation—stimulating food, red pepper, and bran mash, are as good as any medicines internally, and the external application of a wash of sulphate of iron (copperas), spirits of turpentine or kerosene to the head and throat (taking care that none of it enters the eyes), are the best external remedies. If the mucous discharge is copious and offensive, separate the sick fowls from the rest of the flock, as, at this stage, the disease is contagious. A lump of borax of the size of a chestnut dissolved in one or two quarts of their drinking water, is a very good remedy for the suffocating trouble of the throat.

CHAPTER XI.

SPECIAL CROPS—RICE CORN—PEARL MILLET—OTHER MILLETS—HUNGARIAN GRASS — SWEET POTATOES — PEA-NUT OR GROUND-NUT — THE SUGAR QUESTION ONCE MORE—IS NOT CORN WORTH MORE THAN TWENTY CENTS A BUSHEL TO MANUFACTURE INTO SUGAR?—THE CULTIVATION OF TEXTILES—FLAX, HEMP, RAMIE, JUTE, TAMPICO, TULE, NETTLE, ESPARTO GRASS, THE BRAKE OR SWAMP CANE—SOME OF THE CACTI—CULTIVATION OF OIL-PRODUCING PLANTS—CASTOR BEAN, OLIVE, FLAX, RAPE, HEMP AND COTTON SEED, TAR WEED, SESAME, PEPPERMINT, SPEARMINT, BERGAMOT—CULTIVATION OF NUT-BEARING AND FRUIT-BEARING TREES AND SHRUBS—ENGLISH WALNUT, BLACK WALNUT, HICKORY-NUT, COMMON CHESTNUT, ITALIAN CHESTNUT, ALMOND, FILBERT, PECAN, HAZEL-NUT, PAWPAW, PERSIMMON, JAPANESE PERSIMMON, POMEGRANATE, MANDRAKE, APRICOT, MEDLAR, ORANGE, LEMON, SHADDOCK, ETC.—ORDINARY FRUITS, APPLES, PEARS, QUINCES, PEACHES, PLUMS, CHERRIES, PRUNES, ETC.—SMALL FRUITS, GRAPES, CURRANTS, GOOSEBERRIES, STRAWBERRIES, RASPBERRIES, BLACKBERRIES, DEWBERRIES, PARTRIDGEBERRIES, WHORTLEBERRIES—EMPLOYMENT FOR PROFESSIONAL MEN, ARTISANS, TRADESMEN, FLORISTS, MARKET-GARDENERS, FACTORY OPERATIVES, ETC.

IN previous chapters we have endeavored to place before the settler the results attained by skilful farmers and stock-raisers,

in the ordinary crops and avocations of an agricultural or pastoral life. It now remains for us to show what special crops have proved, or are likely to prove, profitable, when their culture is undertaken under favorable circumstances.

We have already said in our First Part, that above the thirty-second parallel of north latitude, the best first crops which a settler can raise, on new lands, are wheat or the root crops. But, after the arable land of the farm has been under the plow two or three times, and a rotation of crops seems desirable, it is well for him to turn his attention to some other crops in addition to his wheat, oats, barley, corn and potatoes, which with proper care he may find, perhaps, more profitable than the staples which he has been cultivating, and must still continue to cultivate on the larger part of his farm.

If he has any cows, kept for dairy purposes, any sheep or swine, he will do well to turn his attention first to forage plants, or to those which, in addition to their value for this purpose, yield some other important product. The different varieties of *Sorghum*, differing in their time of ripening, in their size and in the amount of saccharine matter they contain, answer an admirable purpose for both these crops. They can be sown early and cut just as the seed ripens, the leaves stripped for forage and the tops either reserved for feeding stock or for sowing, while the stalks can be crushed for the saccharine juice. *Indian corn* may be made to furnish a triple product in the same way; the leaves being used for forage, the stalks for sugar and syrup, and the bagasse or dry crushed stalks used for fuel or for paper, the corn preserved for its various uses, not the least profitable of which is now the manufacture of glucose sugar. With such a demand as there now is for corn for this and other purposes, it ought to be worth much more than twenty cents a bushel, at which price it has been sold, for several years past, in Western and Central Kansas, and even within ten or fifteen miles of a railway. There is some dispute in regard to the healthful character of the glucose sugar and syrup, which are now made to the extent of many millions of pounds annually in Chicago, St. Louis, and Buffalo, some contending that as made, it contains free sulphuric acid and other

substances which are very injurious; others insisting that it is perfectly devoid of any injurious quality, and equal in quality to any sugar in the market.

These crops are both easily raised, and can be cultivated without any special instructions. *Broom corn* is largely cultivated in several of the States and Territories, and is a very sure crop, growing and ripening wherever sorghum and Indian corn will ripen. In Kansas the average yield is about 580 pounds to the acre. It always finds a prompt and ready sale, and brings from $20 to $25 per acre. Another excellent plant for both forage and grain is the *Egyptian rice corn*, or Pampas rice. It has been extensively tested in Kansas, and while inferior to Indian corn as a forage plant, its grain is richer in fattening qualities, yields on good land a larger crop, and stands drought better than any other grain, ripening its grain where Indian corn and all the cereals failed. It is not only excellent for fattening stock, swine and poultry, but when ground yields a richer, better and more appetizing food for family use than any of the other cereals. It yields from forty to sixty bushels of grain to the acre, and as it tillers very widely, requires less seed for sowing than other grains.

Another of these forage plants which promises fairly, is the pearl millet. Its yield of forage is enormous; it can be cut four or five times in a season, and will yield from fifty to eighty tons of green forage, or seven to ten tons of dry, to the acre. It stands drought much better than Indian corn, and though its stalks are not as sweet and somewhat more woody than those of the corn (it is one of the sugar-producing plants), it yields a much larger quantity, and in its green state is eaten with great avidity by cattle. The seeds or grain are excellent food for cattle or poultry, though not quite so rich in the fat-producing principles as the rice corn. It is sometimes confounded with the German millet, an inferior plant, and one of much less value for forage, though even this yields from five to six tons of dry forage to the acre.

Alfalfa, a species of Lucern, long cultivated in Chili and Peru, has been very widely introduced into California, Arizona, Texas, New Mexico, Colorado and Kansas as a forage grass, and is

much liked. It has a long tap-root which reaches far down below the surface and draws moisture from the depths of the soil below, so that it does best in a dry climate. The grass is perennial, and these tap-roots, in the course of four or five years, grow to the size of a carrot. It yields four or five crops, in all from five to eight tons of hay, in a year, which is very nutritious and eagerly sought for by horses and cattle. It does not flourish well in cold climates, and cannot be successfully cultivated north of 40° north latitude.

Hungarian grass, a species of millet very nearly akin to the *Sitaria Germanica* or German millet, is also a great favorite as a forage plant throughout the West. It grows to the height of three or three and a half feet, and yields from two to four tons of hay per acre. It is better to cut it before it seeds, and to take off two or three crops a year. It is an annual, but is better on the plains than timothy or common clover. The seed should not be fed to horses or cattle alone, but should be mixed with bran or some lighter food, as it is very rich and stimulating and often proves a powerful diuretic. The product of this grass in Kansas, in 1878, was $1,782,000. It is said to exhaust the soil more than the Alfalfa.

Another class of special crops, which will often pay a very handsome profit, are the TEXTILES. Some of these, as cotton, jute, ramie, and the cacti, can only be successfully cultivated in the southern portion of our Western Empire. All, or nearly all, these flourish well in Texas, Arkansas, the Indian Territory, Southern Kansas, New Mexico, Arizona, Southern Nevada, and Southern California. *Cotton*, like *flax* and *hemp*, is valuable not only for its textile product but for its seeds, which produce a valuable oil, and a rich oil-cake for feeding cattle, of which we shall have more to say by-and-by. It can be raised as far north as Kansas, or in the latitude of Southern Illinois, but is not a very profitable crop above the 35th parallel. *Jute* is a shrub of the order Tiliaceæ, to which the linden or basswood trees also belong. It is an annual, a native of the East Indies, but is easily cultivated in the extreme Southwestern States. The fibre has many uses; though too easily affected by moisture for cordage,

it is largely used for gunny-bags, for paper stock, as a substitute for hair, for cheap carpeting, and employed in the adulteration of cheap silk and mohair goods, etc., etc. The settler in Texas, Arizona, or Southern California would hardly find any crop more remunerative. The *ramie* or China grass, like the hemp and the nettle, belongs to the family of Urticaceæ, or nettle-like plants. It yields a beautiful fibre, stronger than hemp, finer than flax, and of a beautiful whiteness. It will grow wherever cotton grows, yields three crops a year, of about 1,500 pounds of fibre to the acre, and ought to be largely cultivated.

The different species and genera of the cactus do not require cultivation. They abound in Texas, Arizona, Southern New Mexico, and Southern California, and especially the peninsula of Old California. Many of the species have an abundance of long, white fibres, easily obtained by crushing them between rollers, and these can be used to advantage for many purposes. In Southern California they are curled and used for filling mattresses, for which their elasticity admirably adapts them.

The *brake, or swamp-cane*, which is our only plant akin to the bamboo of the eastern continent, abounds along the shores of the Gulf and the southern rivers. It is one of the best materials known for the production of paper stock, and by an ingenious machine is easily reduced to a tough and fibrous pulp of great strength.

The *tulé*, a rush found abundantly on the islands and shores of the California lakes and rivers, is also an excellent material for paper stock. So is the *palmetto*, which will grow on the poorest lands in Texas, Colorado and New Mexico, as well as in Arkansas and the Indian Territory.

The *Agave Americana*, a native of Mexico, but sufficiently hardy to grow anywhere south of 40° north latitude, yields a fibre nearly equal to hemp, and capable of being extensively raised on sandy and dry lands. This is good for cordage, for brushes, for which purpose it is sold as *tampico*, and for paper stock. The *Esparto grass*, which is found in the south of Spain and on the coast of Algeria, is in great demand in England and to some extent here for paper stock. It grows very profusely

on the poorest lands, and at the price now paid for it would be a very profitable crop for the poorer lands, as there is a great demand for paper pulp, for all descriptions of manufactures.

Flax, *Linum Usitatissimum;* hemp, *Cannabis Sativa;* and the nettle, *Urtica Dioica*, and other species, and we might probably add the New Zealand flax, *Phormium tenax*, which would be a valuable addition to our textiles, are all natives of temperate climates, and are cultivable in any part of "our Western Empire," except where the conditions of drought prevent. All of them draw very heavily for growth and nourishment upon the soil, and rank as exhausting crops, requiring for their best growth a rich and highly manured soil; but all of them are profitable when properly cultivated; the flax and hemp yielding not only the lint, but seeds which produce valuable oils used by painters and artists; and the nettle being very valuable as a forage plant aside from its fibres. The New Zealand flax is about twenty per cent. stronger than hemp, and is well adapted to the manufacture of cordage. We are not aware of any other economical use of its seeds or leaves except for textile purposes. Where the soil and rainfall are adapted to these crops, as in Minnesota, Iowa, Missouri, Arkansas, Eastern Kansas, Nebraska and Dakota, and Western Oregon, their cultivation, though attended with considerable labor, even with the present improvements, cannot fail to be profitable. The breaking of flax and hemp, *i. e.*, the process of removing the woody portion from the fibre, was formerly a difficult and laborious process, but, thanks to the inventive skill of some American mechanics, it is now only a light amusement. The bleaching of the flax (hemp is not often whitened), as practised in Ireland, is a process requiring a peculiar climate and the constant presence of moisture. It is possible that Minnesota, and perhaps Oregon, might furnish the required conditions with their numerous lakes and their somewhat plentiful rainfall. But the cultivation of flax and hemp, especially the former, for the seeds alone is very profitable. In Kansas, in 1879 (not a favorable year for these crops), flax was raised for the seed only on nearly 70,000 acres, and the net profit was more than $9 per acre. Hemp was raised in that

State the same year on only 606 acres, but the crop sold mainly for the lint for about $56 per acre. The nettle is not yet much cultivated as a textile and forage plant; but the climate is better adapted to it than that of Germany, where it has proved a great success. The nettle fibre is fine and even and of great strength, so that it is well adapted to the manufacture of fabrics for summer wear, as well as to fine cords, etc. For these purposes it is thought to surpass flax, and it grows well on a poor soil, though, of course, not as large as on a rich one.

Turning now from textiles to oil-producing plants, we notice, first, after the textile seeds, cotton, flax and hemp, all of which yield oils of great commercial value, and which form a constantly increasing product both for home consumption and export, a very valuable though humble plant which is destined yet to become a very important product of the soil—the *Arachis Hypogæa*, known as the pea-nut, ground-nut, or goober. This singular plant possesses a variety of claims upon our consideration; its straw or vines when cured make an excellent hay or forage which cattle eat greedily; the nuts or seeds, enclosed in a hard shell and spreading and ripening beneath the soil like the tubers of a potato, are, when baked or roasted, in great demand among children, and grown people also; while they yield on pressure a clear, pure oil, which for salad purposes is equal to olive oil, and is of great value for illuminating and lubricating purposes, and is also used for the manufacture of the better qualities of soap. The nuts when powdered are, in France, largely mixed with cacao for the manufacture of chocolate, and in the so-called chocolate condiments, are substituted for the cacao. The pea-nut is very easily cultivated, and in a good soil yields a large and profitable crop. It is raised in considerable quantities in Tennessee and in Kansas, and to some extent in other States. It yields from twenty to fifty bushels to the acre, and with good cultivation on good land, the crop may easily be increased to 80, 100, or even 125 bushels. The price simply for use for roasting purposes varies from twenty-two cents to $1 per bushel; the first being an exceptionally low price caused by a sudden glut in the market which was unprepared for it at the time.

With a simple oil-mill and a sufficient local supply to keep the mill running, and facilities for marketing the product, we think the price might readily advance to $1, or even more, per bushel. Hardly any crop so easily raised will pay better.

The culture of the *Olive*, which is not only practicable but lucrative in Texas (possibly in Arkansas), in the Indian Territory, in Arizona and Southern California, is eminently desirable, wherever it is possible, both for the fruit and the oil. It is hardly necessary to go into particulars in regard to the methods of cultivation of this interesting plant, as most of those who would be likely to cultivate it have already been engaged in its culture in Southern Europe, and if not, can easily learn from those around them the best processes of propagating and training it. Pure olive oil, though a little liable to become rancid from the vegetable mucilage it contains, is generally regarded as the best of the vegetable oils, though, for many purposes for which it is used, the oil of the seeds of the *Sesamum Indicum*, of the ground-nut already described, or of the *Madia Sativa*, the tar-weed of the Pacific coast, all of which are cultivated for the oil expressed from their seeds, is preferable. These plants are all worthy of cultivation, as they yield on an average about 500 pounds of oil from the seed produced on an acre.

The seeds of the summer and winter rape, the coleworts, rocket, gold of pleasure, sunflower, white poppy, turnip cabbage and Swedish turnip, all of them plants which can be matured in any climate where Indian corn will ripen, yield from 385 pounds to 875 pounds of oil to the acre's product.

There are also a few oil-producing plants whose oils have a medicinal character, or perhaps have a certain value for the perfumer, which may be cultivated with profit by the farmer, especially on the prairie lands. The most noted of these is the castor bean or castor oil plant, *Ricinus Communis or Sanguinarius*. This is cultivated somewhat largely in Kansas and other States; fifty-five counties in Kansas having 68,179 acres planted with it, in 1879, though only twenty-two counties raised over 1,000 bushels each; and the product being valued at $766,143, or about $11.26 per acre. This is a low average, as with ordinarily good cultivation

the crop should be from twenty to twenty-five bushels per acre, and with special care should reach thirty bushels. In the absence of any oil-mills near, the price of the beans was $1 per bushel. With an oil-mill near, as they might have had in the counties having large crops of it, they would have been able to realize at least $1.50 per bushel, and still have left a large margin of profit to the manufacturer. The plant is of large, rank growth, and matures its beans in a summer of ordinary length. It is planted in Kansas in March, April or May, according to the locality.

Peppermint and spearmint are largely cultivated in some sections mainly for the oil, though the dried herbs are sold in small quantities. In Illinois there are large tracts sown with them for this purpose, and the culture proves profitable. Bergamot is sown for the same purpose. These plants can be profitably cultivated, if there is a distilling apparatus in the vicinity to distil off the oils. They are a crop easily raised, as they require no weeding or hoeing, if planted on clean land, and can be harvested with the mower or harvester.

Among other special crops, we may notice also those of the nut-bearing and fruit-bearing trees and shrubs, not included in those of the ordinary orchard.

Under the Timber-Culture Act, though orchard trees are not allowed to be reckoned among those planted for the purpose of holding the land, yet quite a variety of the nut or fruit-bearing trees are permitted. Among those which are native to our soil are the butternut and black walnut, three species of the hickory, the chestnut, of which there are two or three varieties, and its congener, the chinquepin, of which there are two; the horse-chestnut and the buckeye, which though not edible by man are prized by some animals and have an economic value for their starch; the piñon pine, whose edible nuts furnished food to Frémont's men and to many explorers since; two or three species of the beech, whose three-cornered nuts are greedily seized by swine and squirrels; the pecan nut, a shrub; the filbert, which though not native is naturalized; the hazel nut; and of imported nut-bearing trees, the English walnut, called also the Madeira nut, and the Italian chestnut. The last two

are very valuable additions both to our shade and fruit trees. The nuts of the English walnut are in great demand and are largely imported. The Italian chestnut furnishes a flour which is only inferior to wheat, and which forms the only or principal farinaceous food of the Italian peasants of the Apennines. Its cultivation would therefore be the introduction of an additional food product of great value.

Our native chestnut is undoubtedly capable of great improvement both in size and quality of its nuts, and the wood, which forty or fifty years ago was regarded as only fit for rails and the like, is now prized as one of the best of our native woods for cabinet work. The emigrant farmer, who has settled on "the plains," when planting trees, as it is his duty and for his advantage to do, will do well to set some of these noble, kingly trees. They may not grow so rapidly as ailantus, locust or *bois d'arc*, but they will be worth a great deal more when they are grown.

Orchards of fruit trees, as well as fruit-bearing shrubs, are very desirable and profitable everywhere in the West. Our space does not permit us to enumerate all the varieties of apples, pears, peaches, plums, cherries, quinces, and other fruits very widely cultivated in all or nearly all these States and Territories. The apple and pear do well almost everywhere, though of course different varieties are cultivated in different regions. The apples of Iowa, Minnesota, Dakota, Montana, Oregon and Washington are of excellent quality and command high prices. Equally valuable, though of different varieties, are the apples and pears of the middle belt of Missouri, Kansas, Nebraska, Colorado, and, to some extent, New Mexico; while Arkansas, the Indian Territory, Northern Texas, and those portions of Arizona where fruit-growing is practicable, produce excellent apples, but do not succeed so well with pears. The apples of Oregon are of such excellence that they are largely exported not only to San Francisco, which is an excellent fruit market, but to the cities and countries along the Pacific coast of South America, and to the Sandwich Islands.

Quinces grow best along the banks of streams, but the New

York market receives from California, quinces of gigantic growth, like all the California fruits, but also of the most exquisite and delicate flavor. Plums, apricots and nectarines, being all liable to the sting of the curculio—"the little Turk," as the farmers call him—are more successfully cultivated by the side or banks of lakes or streams, where their little enemy may be shaken off into the water and perish. Cherries do well only in certain localities, but are very profitable where they can be cultivated. The peach is successfully raised as far north as Iowa and Southern Dakota, and to the extreme southern limit, but the southern varieties ripen much earlier than those farther north, and command the best prices in consequence of their early ripening. A peach orchard, well cared for and managed with enterprise, in Texas, Arkansas, or the Indian Territory, should prove a fortune to its owner. Of shrubs or small trees, yielding fruit, there are the date plum, or persimmon, *Diospyros*, of which there are two American species, both very astringent before being touched with the frost, but pleasant afterward, and the Japanese persimmon, greatly superior to the American in all respects, and now extensively introduced; the fig, a favorite fruit in the southern and middle tier of States, where it ripens without difficulty; the pawpaw, or custard apple, *Anona*, which grows wild, but is easily cultivated, and a Peruvian species of very delicious flavor, *Anona Cherimoya;* the pomegranate, introduced into California, and the mandrake, *Podophyllum peltatum*, whose fruit, when carefully ripened, is equal to that of the pawpaw. All of these, as well as other fruits which only grow wild, do not flourish well in the northern tier of States and Territories, but are in their best condition in the central or southern tier. The lemon, lime, orange, and shaddock will only mature with certainty in Texas, Arizona and Southern California; but a very good Chinese variety, which should be introduced here, ripens and withstands frost and other changes in that country, above the latitude of 40° north.

Of the smaller fruits, the grape, in different species and varieties, is cultivated from the British boundary line to the Gulf coast. The vineyards of California are of immense extent, and

every grape known to European vine-growers is cultivated there; the wines of California are improving every year, and eventually must control the market. Missouri, Texas, New Mexico, Southern Arizona, and, in a less extensive sense, Kansas and Nebraska, are also noted for their vineyards. The wines of Missouri and Texas have a high reputation. The production of raisins, and especially "raisins of the sun," has been successfully prosecuted in California, and might be in Arizona and Texas. The Zante currant or grape of Corinth, a small grape which is imported in immense quantities for plum-puddings and for the use of the Germans, might easily be raised here.

The other small fruits, strawberries, raspberries, of two species and several varieties, blackberries, also of several varieties, dewberries, whortleberries, currants, black, white, and especially red, gooseberries, and several species of mulberry, which differ from the others in growing on a tree instead of a shrub or vine; the partridge or wintergreen berry, etc., etc., are for the most part cultivated, and all are cultivable, and will add a very material sum to the farmer's income. All of them bring good prices and find a ready market in their season. Their cultivation is not difficult, and the returns are very considerable, and come at a season of the year when they are particularly convenient.

We should call attention here also to the advantages of the cultivation of vegetables, etc., or, what is known in the vicinity of our larger cities, as "market-garden truck." A settler in the neighborhood of one of these western towns or villages, and especially the mining villages, if he has a farm of 160 acres, or even of eighty or forty, can make a handsome fortune in a few years, if he will devote ten or twenty acres to the intelligent cultivation of these vegetables: such as asparagus, celery, early beets, peas, string-beans, lima and kidney beans, new potatoes, sweet early corn, salsify, egg-plant, cauliflower, kale, cabbages, onions, leeks, garlics, squashes, carrots, early turnips, ruta-bagas, mangel-wurzel, etc., etc., adding, if he can find room and time, the small fruits.

In a chapter of our First Part we have already pointed out the opportunities which "Our Western Empire" offers to men who

have not been accustomed to farming, and who have no special adaptation to it. There are very few of them who are not too old for successful emigration, and who possess industry and energy, and a little capital, who will not find, in the course of five or six years, that their condition has been materially improved by their removal. All such persons should buy a little land, even if it be not more than forty acres; the time will come within the next twenty or thirty years when land even in the West will be very valuable and not easily obtained; and those who have trades or professions, or pursuits which yield them a comfortable support, though they may not desire to farm their lands, yet desire a good vegetable and a good flower-garden. They need also pasture for one or more horses, one or two cows, and perhaps some swine and poultry. Their land, meanwhile is growing in value constantly, and in their declining years may become their most important possession.

We would especially urge this upon professional men, clergymen, lawyers, physicians, artists, etc., and also upon merchants, tradesmen and master-mechanics. Florists and nurserymen can do well with small tracts of land, and will find their business, if well managed, a surer road to wealth than a large farm. Even day-laborers, especially near the mining villages and towns, will be able, by raising vegetables, keeping a cow, the inevitable pig, and a moderate stock of poultry, to make a much better living than they could in "the old country."

The concentration of a large population in these districts so sparsely settled hitherto, will, of necessity, bring in a great variety of manufactures, and thus furnish ample employment to many operatives; but to each of these we would say, in all kindness: endeavor, as soon as possible, and even at considerable sacrifice, to become the owners of a little land, and to have a home of your own. It is the first step toward independence, and when you have

> "A little home well filled,
> A little farm well tilled,
> A little wife well willed,"

and the olive-plants begin to be numerous about your table, you

will not be so anxious for strikes, nor regard the behests of a labor union as so imperative; if wages are too low, you can till your own acres and wait till they are higher—but, by all means, secure you a little homestead.

To all classes of settlers we would say, farther: in your zeal to establish yourselves in your new homes, do not forget to rear the school-house within convenient distance of your dwelling. Whether you have children or not, the school is one of the strongest safeguards of free institutions. The State has generously made ample provision, or what will be in time ample, for supplying it with good and efficient teachers, and what the State cannot now do a light tax will accomplish. If your children, and the children of the community, can be well educated, they will be the better fitted to become the rulers and leaders of a great State.

And we have still another injunction for you: In all your settlements, whether large or small, give your aid freely toward the early establishment of Christian churches. We urge this, without reference to the question, whether you are yourselves believers or unbelievers in Christianity. It will not take you long to learn that a church will do more to preserve and maintain good order and respect for law, will give you a purer and better social condition, and a higher standard of morals, than a gambling-den, a liquor-saloon, or a low varieties theatre; as you love your families, as you seek after the best interests of society and the promotion of justice and good order, give the preference to the church over these institutions which are fraught with so much evil.

PART III.

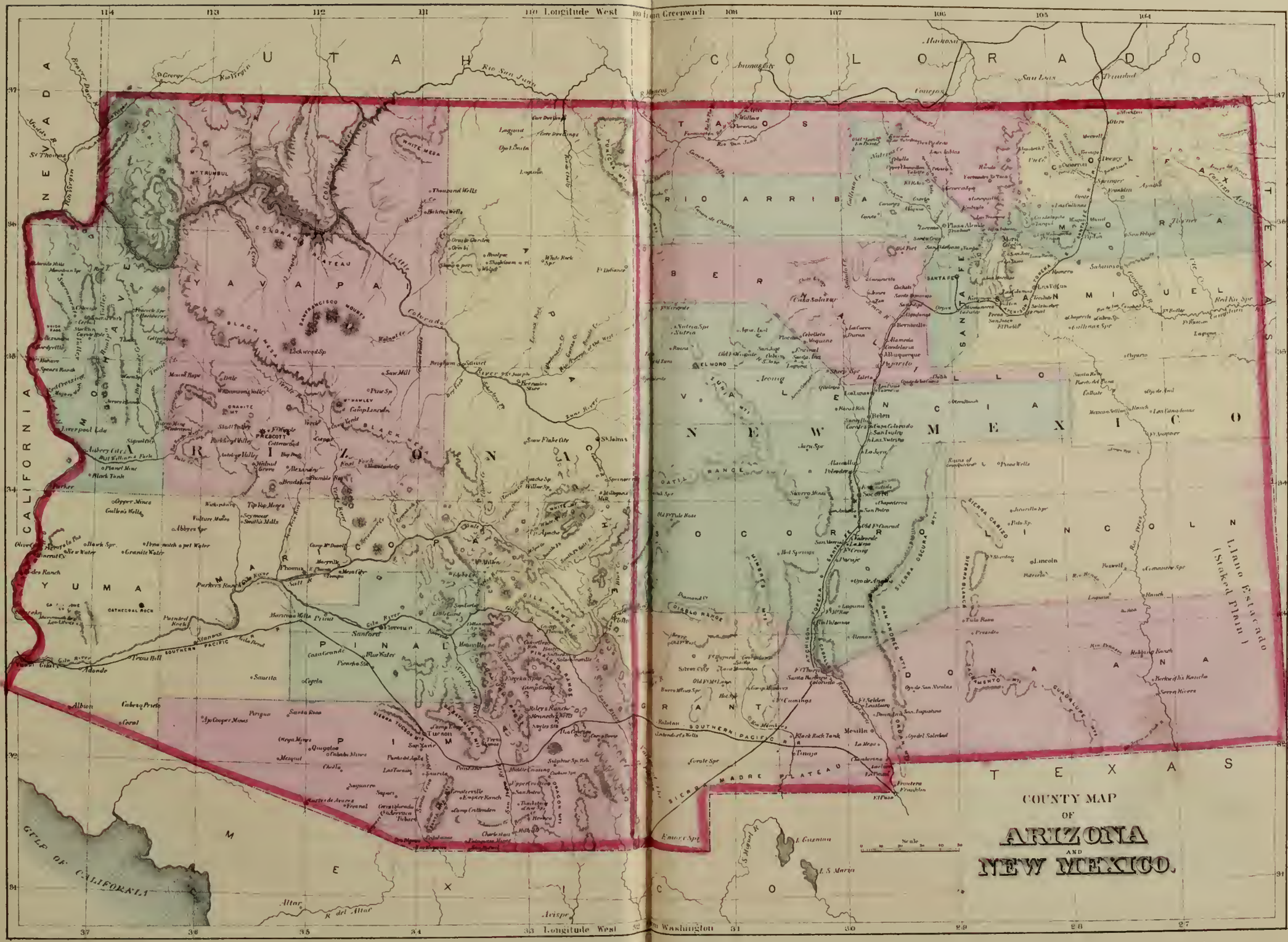
THE SEVERAL STATES AND TERRITORIES DESCRIBED.

CHAPTER I.

ARIZONA.

Its Location—Extent—Topography—Mountains, Rivers, Lakes, Canons—Table-lands—Its Soil, Climate, Temperature, and Rainfall—Its Wonders and Peculiarities—Its Minerals and Mines—Its Zoology—Adventures with its Wild Animals—Its Productions, Mineral, Animal, Vegetable—Its Population—The Indians nearly Extinct Races—The Ancient Province of Tusayan—White Inhabitants—Its Present Condition, and the Advantages and Facilities it affords to Settlers—Letters and Communications from Major-General J. C. Fremont, Governor of Arizona, and Colonel J. W. Powell, United States Army, Explorer of the Colorado, etc.—Its Probable Future.

The Territory of Arizona occupies a part of the southwestern portion of "Our Western Empire," though separated from the Pacific by Southern California and the rocky and terrible desert of Lower California, above the head of the gulf; it does not extend so far south as Southwestern Texas, but is comprised between the parallels of 31° 20′ and 37° of north latitude, and between the meridians of 109° and 114° 35′ west longitude from Greenwich. But a small portion of it has been surveyed, and as its western boundary along the Colorado of the West is irregular, there is some doubt about its actual area. It is estimated, in the last Land Office Report, at 113,916 square miles, or 72,906,240 acres. The probability is that it will be found to exceed this amount by several thousand square miles. Its form is somewhat irregular; on the north it is bounded by the Territory of Utah, the thirty-seventh parallel forming the boundary as far



COUNTY MAP OF ARIZONA AND NEW MEXICO.

west as the 114th meridian, which forms the western boundary of Utah; this meridian forms also the western boundary of Arizona as far south as the thirty-sixth parallel, where the Colorado of the West crosses the angle formed by the meridian and parallel, and proceeds northwest and then west-southwest, and turning sharply south at Callville, just after it emerges from the Grand Cañon, flows southwardly thence to the Gulf of California, forming, for all this distance (about 500 miles), the western boundary of Arizona. The original southern boundary, acquired from Mexico in the Treaty of Guadaloupe-Hidalgo (February 2d, 1848), was the river Gila, the most considerable of the lower affluents of the Colorado, and the only one which is navigable for any considerable distance. By the Gadsden Treaty, made at Mexico, December 30th, 1853, all the territory lying south of the Gila to the border of the Mexican State of Sonora, was conveyed to the United States. The southern boundary now runs due west along the parallel of 31° 20′ to the 111th meridian, and thence west-northwest in a straight diagonal line till it reaches the Colorado in about 32° 30′. The Territory is bounded on the east by New Mexico.

The law authorizing the organization of the Territory was passed February 24th, 1863, and the Territorial Government inaugurated December 29th, 1863. It has never been thoroughly explored, and, up to 1880, only about 6,100,000 acres had been surveyed, about one-twelfth of its area. Its area is about equal to that of all the New England States, New York and New Jersey. The country is mountainous in much of its extent, though there is but little regularity about its mountain ranges. In the middle and northeast there are elevated plateaux of vast extent having a mean altitude, varying from 3,000 to 7,500 feet above the sea, and from these plateaux volcanic cones and hills rise at many points. In the north a mesa or plateau stretches away far into Utah Territory. South of the Gila river the plain sinks almost to the sea-level, but in the southeast and along the Sonora line, there are fourteen or fifteen detached ranges, and four or five isolated peaks. Many, perhaps most, of the mountain ranges have a general course from northwest to

southeast, but the Mogollon Mountains, and some of the other groups extending into New Mexico, have an east and west direction. The highest known elevation in the Territory is Mount San Francisco, at the northern end of the lofty San Francisco plateau, from which it rises to a height of 12,700 feet above the sea-level.

Scattered among these mountain ranges, detached and isolated mountain summits, plateaux and mesas, are many valleys of great beauty and fertility, but the river valleys are generally narrow ravines, gorges and cañons, accessible to the rays of the sun only at high noon, and whose precipitous and nearly perpendicular walls excite terror rather than pleasure. The valleys of the Colorado Chiquito, or Flax river, and of the Rio Salinas, or Salt river, are exceptions to this, being the garden spots and granaries of the Territory, and the bordering mountains furnishing great stock-ranges where the cattle are sometimes too fat to be driven.

The most remarkable feature of the topography of Arizona is the tendency of its rivers and streams to form cañons, of great depth and with precipitous sides. Either the strata through which these rivers have cut their way to the Gulf of California are more friable and easily eroded than the same strata elsewhere, or the great descent of the rivers and their immense volume when swollen by the rains and melting snows give them a force which is irresistible. The whole Territory is drained by the Colorado river and its tributaries. Most of these tributaries—all, indeed, except the Gila, which is in itself a large river—enter the Colorado high up in its course; the San Juan, which enters the northeast corner of the Territory and receives a considerable affluent, the Rio de Chelly, there; and the Colorado Chiquito, or Flax river, with its important affluents, the Rio Puerco of the West, Rio Quemado, and Chevelon's Fork, falling into the parent stream above the Big Cañon of the river, and forming deep, dark and precipitous cañons of their own. The Colorado itself, through more than 600 miles of its course through Arizona, flows through deep cañons, and receives nearly 200 streams, large and small, all of them coming through gorges of

less depth, and falling over the as yet only partially eroded rocks in cataracts, into the main stream. Its descent in these 600 miles is more than 3,000 feet. The Big or Grand Cañon is one of the wonders of the world. Its descent has been several times attempted, and was accomplished, though not without loss of life, by a party under command of Major J. W. Powell in 1869, and again in 1871.

The narrative of these descents, as given by the intrepid explorers, is of the most thrilling interest. Through its whole course, except the last 500 or 600 miles, and through the entire course of its principal affluents, these cañons succeed one another, each one in the downward course of the current being deeper, darker and more terrible than its predecessor. At irregular intervals there are rapids, cataracts, and falls of great height, while every one of the tributary streams plunges into the main river through a minor cañon of its own, by a cataract often of 150, 200, or 300 feet. The ten stalwart men, provided with every necessity for their perilous journey, and stocked with ample supplies, who, on the 30th of May, 1869, had started from the Green river station, in four boats, to descend the Colorado, had passed through the last of the great cañons, on the 29th of August, their numbers reduced to six, their boats to two, hatless, shoeless, and ragged, their provisions exhausted, their instruments broken, and they themselves battered and bruised by their conflicts with rapids, cataracts, whirlpools and rugged rocks. The walls of their long prison house were in some places more than a mile in height, and in their dark gorges they could only catch a glimpse of the sun at high noon. Yet the monuments, towers, cathedrals, castles and lofty battlements of all conceivable colors, were grand, impressive and often beautiful beyond description; and worn and wearied as they were, they were full of enthusiasm over the accomplishment of their perilous voyage. Three of those who had left them were slain by Indians; one returned to Utah.

The river is navigable, though with some difficulty, on account of its numerous rapids, from Callville, Nevada, at the terminus of the Grand Cañon, to its mouth, a distance of 612 miles.

Neither the Colorado Chiquito nor the San Juan are navigable, but their cañons and the rapid descent of their waters are only inferior to those of the parent stream. The lower waters of the Colorado are not much higher than the Gulf of California, and, indeed, flow at one point through a broad and almost stagnant lake. The Gila rises in the mountains of New Mexico, and for about one-half of its course traverses a mountainous region, though it does not at any point cut for itself deep or precipitous gorges. From the mouth of the Rio San Pedro its course is through a less elevated region, and a part of the distance is navigable and without rapids.

These deep cañons of the principal rivers drain much of the surrounding country of its moisture, and render large tracts unfit for anything but grazing, and still larger ones unfit for that, unless by aqueducts, reservoirs, or artesian wells the necessary water can be supplied for stock. In the existing condition of the country, much of the rainfall which, in some seasons, is abundant, or sufficiently so for the country, if it could be saved, is wasted, running off from these hard-baked table-lands into the cañons and not penetrating the soil. Yet this soil under irrigation is wonderfully productive. The lands which can be irrigated yield sixty-five bushels of the finest wheat in the world to the acre, and proportionate quantities of other cereals; while Indian corn and the root crops are produced in almost incredible quantities. Fortunately for the Territory, very much of this land which once produced large crops can be reclaimed; many of the gorges and ravines can, at small expense, be made reservoirs, and thus treasure up the water which comes down from the melting snows of the mountains, or that which now runs off into the cañons after heavy rains, and this can be used with great advantage for irrigation, for the watering of live-stock, and for mining purposes; while deep plowing and the breaking up of the hard and dry sod will render the soil far more pervious and absorbent of the rains, and so capable of more easy cultivation. But on these *mesas* and high table-lands, where there are no streams available for purposes of irrigation, artesian wells have never failed to bring water, and usually with sufficient head and

in sufficient quantity to flow of itself without pumping and to supply pools or reservoirs of great extent.

No man living is more familiar with the physical geography of Arizona than Major-General John C. Frémont;* he explored it thirty-six years ago in his expeditions for the discovery of routes for railways to the Pacific coast, made under the direction of the government; he traversed considerable portions of it later in the interest of the Pacific railways, of which he was the projector and president, and, since 1877, as Governor of the Territory, he has devoted much attention to its physical geography with a view to the development of its mining, agricultural, and grazing interests. His recent proposition to our government to restore, by a short ship-canal, the great inland sea which formerly existed in Southern California, east of the San Bernardino Mountains, where its dry basin is now far below the sea-level, was so full of sound sense, so broad and comprehensive in its spirit, and fraught with so many advantages to that whole region, that it should be acted upon promptly. The evaporation from that sea would ensure a moister atmosphere and a greater rainfall to Western Arizona, and in connection with other measures would render that Territory the garden-spot of all the West, as well as its treasure-house for its mineral wealth.

In his Report to the Department of the Interior in October, 1878, General Frémont thus describes the topography of the Territory, with especial reference to its central portion along or near the line of the thirty-fourth parallel—a region which pretty fairly represents the general character of the Territory, being less moist and hot than that along and below the Gila, but perhaps somewhat hotter than that north of the Grand Cañon and above the thirty-sixth parallel.

"Broken ranges of mountains, swelling occasionally into lofty peaks and pine-covered masses, and alternating evenly with elevated valleys or mountain basins of greater or less size, represent in general terms the face of the country in Arizona. Its water-ways are the Colorado and Gila rivers, with their tributaries, of which none enter either stream in the lower part of its

* See biographical sketch of General Frémont at the close of this chapter.

course. The valley of the Colorado, between its river, hills or bordering mountains, is dry, stony, and barren, the mountains naked rock. Crossing these in journeying from Ehrenberg eastward, a traveller in spring would find this country covered with bloom, the shrubs and trees being represented mainly by acacias and cacti, and the ground covered with low-flowering plants among grass growing thinly. Except for some shrub-like trees and gigantic cactus (*Saguara*), *ocotillo*, and yucca trees, the ridges here along are still of naked glistening, and black or barren, rock, showing no signs of water. The acacias, *Palo verde*, and other trees crowd down into the dry stream-beds, reaching after the water below the sands, but the *ocotillo* and tree-cactus delight in the stony and dry mountain sides. In the rainy season these stream-beds are short-lived torrents. This is the country traversed by the *desert roads*. But this character of desert, applied to the valleys, comes only from the heated air and absence of water, and not absence of vegetation. A running stream would make anywhere here a garden.

"After some seventy miles, as the crow flies, over such country, what may be called *fertile mountains* are reached; that is to say, mountains more or less covered with shrubs and grass, and having springs and running streams, and affording good cattle-ranges. Continuing eastward, the country in this respect steadily improves, until, after travelling over about a hundred miles of air distance from Ehrenberg, scattering junipers of very sturdy growth appear, several feet in diameter, with here and there small oaks and locust trees; and presently the road enters among pines, which thenceforward generally cover the more upland parts of the country to the eastward.

"The elevation here is probably 5,000 feet in the valleys, the surrounding mountains rising several thousand feet higher. On the higher ranges, such as the San Francisco and Mogollon, these open woodlands become extensive forests, where the pines reach sometimes a solid growth of six feet in diameter. From Prescott the San Francisco Mountains show grandly in the horizon of hills some sixty-five miles away to the northeast, and 12,700 feet above the sea. These and the Mogollon Mountains

are the principal water-sheds of Arizona, rising from elevated plateaux of 6,000 or 7,000 feet into peaks between 9,000 and 13,000 feet above the sea. They make a forest country averaging forty miles in breadth, extending through the Territory southeastwardly over the headwaters of the Gila and probably into Mexico. North and east of these ranges, and running up into the flanks of the mountains, and reaching doubtless, far to the south, are reported to be the great coal-fields of Arizona.*

"In contradistinction to the Eastern States, where the streams maintain themselves in gathering strength from mountain to sea, dryness is one of the striking features of this whole elevated region. Streams and springs are few and far apart. The larger streams gather no affluents, but waste themselves in absorption and evaporation, and the smaller ones usually sink and disappear under the first valley which they enter, where the soil is generally light and loose enough to absorb them. But the water can there always be found; in the lower country, at variable depths of 50 to 250 feet, and usually only a few feet below the surface in many of the upland valleys. This may give the necessary provision of water for the farms in the valleys, while the mountains furnish it sufficiently for stock. There are two seasons of falling weather: the heavy summer rains, when the washes and stream-beds become temporary torrents, and the winter season of rains and snow. Now, at the end of October, the falling weather of the winter has not yet commenced, except in the high mountains. The days are warm, the sky is uninterruptedly cloudless, but ice makes at night, and a light snow has just fallen in the San Francisco Mountain. The grass there is beginning to dry up, and the northern face of the mountain is probably covered with snow.

* From Mr. A. O. Noyes, who had a saw-mill twelve miles from Prescott, and who was for many years engaged here in the lumber business, I learn that the pines in the Prescott Basin run from an average diameter of twenty-eight inches to four feet in the largest trees. But they do not make good lumber, because there are so many knots in the trees, caused by fires, and because so many trees have been struck by the lightning, which is one of the local features here. There are also in this basin some very fine spruce trees, nearly four feet in diameter. In the large belt of forest to the north all is clear, fine timber, with an average diameter of four feet, reaching to five feet in largest trees. Mr. Noyes has cut here some 25,000,000 feet of lumber. He tells me that on his books are crosses against the names of over 300 men, with whom he had dealings, who have been killed by Indians.

"The Little Colorado (Colorado Chiquito) and Salt river (Rio Salinas) regions are reported to be the granaries of the Territory. Their valleys are becoming garden-spots, and the bordering mountains great stock-ranges, where the cattle are sometimes too fat to be driven. Like California, the country is favorable to animal life. In the Salt River valley there are probably 100,000 acres under cultivation; in the Gila valley, between the Pima villages and the mouth of the cañon, about 50,000; in the Santa Cruz valley, about 25,000; and 25,000 more in all the southern district. In the Salt River valley the amount under cultivation is being rapidly augmented to the full extent of the water supply. On the San Pedro river the land is sparsely occupied, and mostly for grazing; and farther to the eastward the country is better adapted to grazing than agriculture. Many years ago I found on the San Pedro and neighboring country many wild cattle which had belonged to ranches now deserted, where the people had been killed or driven off by Indians. So far as my present knowledge goes, the grazing and farming lands comprehend an area about equal to that of the State of New York."

In his report for 1879, dated November 20, 1879, General Frémont gives these additional items respecting the southern and northern portions of the Territory:

"Near the end of February of the present year I found fig trees budding and apricots in bloom at Phœnix. The cotton-wood trees which line the streets were in full spring foliage, and the fields were green with Alfalfa and grain. The town is on the Salt river tributary of the Gila, about 1,800 feet above the sea. The river here runs through a broad valley plain encircled by mountains. It furnishes abundant water for irrigation, and the acequias or water-ditches are spread out over the valley in a space eight or ten miles broad. Streams of running water, which one met in every direction, gave a very grateful sense of freshness in this dry country of Arizona, and remains of old acequias used by the former Indian population show that with them, too, it was a favorite place. For seven or eight months of the year the weather is said to be pleasant, but hot for the

remainder. The town is the centre of an important farming district, and its growing prosperity is secured and made permanent by its position, which is indicated by the country surrounding it. The trade of a large neighboring Indian reservation has been an element in its prosperity, and now the Southern Pacific Railway passes within thirty miles of the town. . . . Except its bottom lands, which are of unusual productiveness and strength, the valley proper of the Colorado, below the cañons, that which lies between the bordering river hills over a space of fifty miles, is dry, hot and barren. All else is fertile and habitable. In its east and west course running through the northern limit of Arizona, the Colorado borders and encloses a beautiful country. Here in the cañons the Indians from a remote time have grown excellent fruit and grain, and with their produce have maintained a primitive trade with other tribes. In fact this whole northern region has the resources to sustain a wealthy population, and create a permanent and valuable trade for the first railway which has the enterprise to penetrate it. The climate is healthy and the country fertile; wooded and grassed from the Colorado hills eastward into New Mexico. Water in abundance will undoubtedly be had when adequate means are employed to get it. Its inexhaustible grasses will support immense herds, and its great coal fields and heavy forests of timber, continuous through the Territory, will command a ready market. It has broad valleys of farming lands, and in its mining districts are abundance of copper, silver and gold."

A correspondent of the New York *Daily Times*, writing from Tucson, May 26, 1880, complains that that region and the Globe mining district east of it, in fact the whole of Southeastern Arizona, lack water and timber. There is, however, a considerable tract of pine of large size, the forest being twelve miles long and two miles wide, beside the cottonwood and mezquite, which are used for fuel, and bring $8 to $10 a cord. The Pinal creek, which furnishes water to this district, sinks in the sands once or twice in its course for a distance of ten or twelve miles, but water can always be found by digging in its bed. Still there is unquestionably a scarcity of water in this as in many other

parts of Arizona, though by adopting such measures as were adopted by the highly civilized Indians who had populous towns in all this region ages ago, and adding to these acequias and reservoirs, drive wells and artesian wells, this desert land may again be made to blossom as the rose.

The climate of Arizona may, perhaps, be inferred from what has already been said. It varies in different parts of the Territory. The lowlands, from Fort Yuma eastward, along the valley of the Gila and farther south between the thirty-second and thirty-third parallels, are extremely hot in summer. May, June, July, August, and September are the hottest months, and a record of 112° Fahrenheit in the shade is not very infrequent during those months. During the other months of the year the heat is not excessive, and the dry air makes it healthy. The rainfall is principally in July and August in this part of the Territory, though there is occasionally a season of rain in December and January.*

It is, however, a characteristic of the heat of Arizona, that it is not enfeebling or oppressive, and that there is much less liability to sun-stroke than in the towns and cities of the north. "In the southeastern portion of the Territory," says General Frémont, "the climate is especially agreeable. In the Sierra de Santa Caterina, the Pinalena Mountains, the Chiricahui Mountains, and the Peloncello Range, as well as the Cordilleras de Rio

*Yuma (latitude 32° 43′ 32″) is probably the hottest place in the United States. Army officers assert that it has reached a temperature of 126° Fahrenheit in the shade. In 1877–78, the signal-service officers reported 106 days, between April 29 and October 3, in which the maximum temperature was above 100°; thirty days in which it was above 108°, and twelve days in which it was above 110°. On four days it stood at 112°, and on one at 113°. Tucson, though a little further south (latitude 32° 28′), is not so hot. Its maximum was 110°, and only fifty-one days, all in the summer months, exceeded 100°. Phœnix (latitude 33° 18′), Wickenburg (latitude 33° 58′), and Maricopa Wells (latitude 33° 10′) approach Yuma in temperature, the temperature exceeding 100° for seventy-nine, eighty-two and eighty-six days respectively, and reaching 112° more than once. Florence (latitude 33° 2′) is very much like Tucson in its temperature. Prescott, the capital of the Territory (latitude 34° 29′), 5,700 feet above the sea, has a very fine climate. In 1878, but two days exceeded 100°. The mean of summer temperature did not exceed 84°. The mean of the year was 65° 49′. Camp Verde, in nearly the same latitude, but less elevated, had thirty-six days in which the temperature exceeded 100°, and several times reached 108°. Camp Grant (latitude 32° 25′), on the San Pedro river, but above the canons of the Gila, was below Prescott in temperature, never exceeding 95° in summer, though its winter minimum was not below 24°, while that of Prescott was 1°.

Gila, north of the river, and just on the borders of New Mexico, the character of the country is greatly improved. It is sufficiently well watered, and in greater part an exceptionally rich pasture ground, which the mild and even climate of all the year makes favorable to animal *life*. Its annual rainfall is twenty-four inches, and as this occurs mostly in the summer months, the grass remains fresh and green the year round. . . . This grazing country comprehends large tracts of agricultural land which will become valuable because situated in the midst of a rich mining region, and the railroad which is about to penetrate it will carry off its surplus produce."

The northern and northwestern part of the Territory is not so well known, and has not been so fully explored as the central and southern portions. The region of the Cerbat Mountains, south of the Great Bend and Grand Cañon of the Colorado, was visited by General Frémont in December, 1878. He represents it as a grass-covered country, with valleys and mountain ranges well wooded with both juniper and pine. The juniper of this region is a large forest tree often four or five feet in diameter. In the Wallapai Valley, just east of the Cerbat range, is Red lake, the largest lake in the Territory, which receives the waters of a very considerable creek. There are numerous large springs in this valley; north and east of the Colorado is a region very little known. It is mountainous, but the mountains so far as known are believed to be *mesas*, isolated, lofty and flat-topped table lands. North and northeast of the Flax river or Colorado Chiquito, between the thirty-fifth and thirty-sixth parallels, after crossing a region known as the Painted Desert, from the variegated colors of its rocks, lies the ancient province of Tusayan, with its groups of villages of the Moquis or cliff-dwellers, and the ruins of their ancient towns, which we will describe presently.

Yet farther to the northeast, between the thirty-sixth and thirty-seventh parallels and the 109th and 110th meridians, just west of the Navajo reservation, are extensive beds of anthracite coal said to be of excellent quality. There are also in the *Mesa la Vaca* (Plain of the Cows) and the Calabasa Mountains, rich

deposits of gold, silver and copper. "The face of the country here," says General Frémont, "presents mountain ranges with broad intervening valleys running into each other by easy passes. The hills and lower ridges are wooded with juniper and piñon pine, worthy sometimes to be called forests, the higher ranges with yellow pine. The valleys, occasionally of several hundred thousand acres in extent, are covered with varieties of the most nutritious grass, among them bunch and gramma grass. This would be notably a grazing country if water could be had, but the scarcity of it repels settlement, and at present it is mostly unoccupied. The great trough of the Colorado near by seems to have drained it of all except what is afforded by occasional springs and the streams in the higher mountains. But no attempt to store and retain water by dams, or to obtain it by artesian or flowing wells, has been made." The elevation of this region insures for it a mild and equable temperature.

The *rainfall* of Arizona is a variable quantity in the different sections of the Territory and at different seasons. The five years previous to July 1, 1879, had been, throughout Arizona, years of drought; the rainfall had been very slight, except in a very few localities, through the entire Territory, and hence the reports of the amount of rain during that period must be regarded as below the average of ten or twenty years. This long season of drought is now happily ended. In a private letter to the writer, dated December 30, 1879, General Frémont said: "The whole country here (Prescott) is covered with snow, and the streams are impassable. We have had for a week a continued storm of rain and snow. Nothing like it has been known for many years past. There had been so little falling weather for the last five years that even the pine trees were beginning to die in the mountains. Now all vegetation will revive, and the Territory will be greatly prosperous during the coming year." The rainfall in Arizona is usually almost wholly during July and August, and so heavy a rain in December was without precedent. The signal-service year, July 1, 1877, to June 30, 1878, the first in which we had any full meteorological reports from Arizona, gave the rainfall at the different stations as follows: Yuma, two inches; Wickenburg,

five inches; Tucson, 13.03 inches; Stanwix (six months), 0.65 of an inch; Prescott, 13.81 inches; Phœnix, 5.01; Maricopa Wells (eight months), 4.89 inches; Florence, 7.18 inches; Camp Verde, 10.81; Camp Grant, 8.96 inches; Burke's (seven months), 0.88 inches; Bear Springs, twenty-four inches.

Geology and Mineralogy.—The only extensive geological explorations which have been made in Arizona are those along the walls of the cañons of the Colorado river. From the upper waters of the Green and Grand rivers, whose union forms the Colorado of the West, to the mouth of the Gila at Yuma, it is estimated that the river has cut through strata representing a thickness of 25,000 feet, or five miles of vertical height, and that there are exposed in its course every geological formation found in North America, from the quaternary alluvial deposits to the primary azoic rocks, and that at some points in its course the rocks have been altered by volcanic action and that vast streams of lava have been injected into the cañons.

Of these strata, worn through by the great volume of water which has thus torn for itself a passage, about 16,000 feet of nearly vertical descent, are within the bounds of Arizona. There are, of course, the superficial deposits, alluvium, and perhaps diluvium, and certainly loess, and the clay and sandstone detritus from the wearing down of the rocks, but we doubt whether there are many strata as high up as the tertiary among the surface-rocks of Arizona. The coal-beds in the northeast of the Territory are said to be anthracite and of excellent quality; but whether they are from the tertiary lignites and bituminous coals which have been transformed into anthracite by volcanic action like the coal-beds in New Mexico, or whether they are true anthracites from the carboniferous strata, seems to be doubtful. If they are the latter, they are the only anthracites of that period between the Mississippi river and the Pacific coast. Of marbles of all colors and shades, of sandstones, white, pink, orange, buff, vermilion and brown, and granites, rose-colored, gray, slate-colored and blue, there is no end.

The mineral wealth of Arizona is undoubtedly very great. Its veins and placers of gold, silver, copper and lead, and its car-

bonates and oxides of iron, platinum and quicksilver are distributed very widely over the Territory. Gold is found free both in placers and in quartz lodes; silver in galena, and combined with both lead and copper as sulphides and carbonates; copper is also found alone in the form of gray sulphurets; quicksilver in the form of cinnabar and perhaps other combinations; tin, platinum and nickel nearly pure; iron ores of all kinds, and well situated for producing the finer qualities of iron and steel; besides the anthracite coal in the northeast there is bituminous coal adapted to smelting purposes at Camp Apache and elsewhere. Immense deposits of salt of the purest quality have been discovered, and there are large beds of sulphur, gypsum, hydraulic lime, valuable mineral springs, natural loadstones of great magnetic power, and fossil woods of many varieties. There are also opal pebbles, garnets, red, white and yellow; azurite, malachite, chalcedony, sapphires, opals, and possibly some diamonds.

Gold and silver mining was prosecuted by the Spaniards and Mexicans for many years before the Territory came into the possession of the United States, and some of these mines are still largely productive. Among these were the Cerro Colorado, now known as the Heintzelman mine; the Mowry, Santa Rita, Salero, Cahuabi, and San Pedro, and the quicksilver mine of La Paz. Many others have since been discovered, and new mines are being constantly opened. They are found in all the explored portions of the Territory, and seem to indicate that the mineral wealth of Arizona is greater than that of any other Territory of the West. For mining purposes all the explored portion of the Territory below the thirty-sixth parallel has been divided into mining districts. These are most numerous in the southeast, though the new developments are to a considerable extent in the central and northwest portions. Those most noted in the southeast are the Dos Cabezas, the Sierra Bonita (north of the Gila), the Dragoon Range district, the Globe district, the Tombstone district, the Huachuca district, the Patagonia, the Washington and the Harshaw districts, the Santa Rita district, the mines of which have been worked for many years, and

with profit. A number of new mines have been opened at the south end of the Santa Rita mountain, the Oro Blanco and the Arivaca districts, and still further west, the Baboquivari district, and near the Colorado the Gila City district, which, after being abandoned as a placer mine many years ago, has recently come to the surface as having a rich quartz ledge of great extent. These are all, except the Sierra Bonita, south of the Gila river. North of that river, and beginning at the west, is the Castle Dome district, the ores of which are mostly argentiferous galena; the Pioneer, Pinal, Tiger and Peck districts; the Bradshaw, Oro Bonito, Gray Eagle, Silver Prince, Silver Belt and Cabinet mines, Ruffner's Camp (copper and silver), and the Verde mines. Richer than any of these is the great Mineral Park district, above the thirty-fifth parallel and on the meridian of 114° 20′, a belt nearly a hundred miles long, and which General Frémont says, "carries between porphyry walls a mile and a half breadth of ore matter, which is interspersed with veins principally chlorides of silver. These are said to be very rich, reaching several hundred dollars the ton. The whole mass is said to carry silver." The Bradshaw and other districts within a circuit of thirty miles around Prescott, the capital of the Territory, have many rich mines. The great obstacles in the way of successful mining in Arizona have been hitherto the dangers from hostile Indians, the lack of capital, want of good roads or railroads, and the scarcity of water and timber. Some of these obstacles are now removed. The greater part of the Indians in the Territory (the Apaches in the extreme east, and the Pi-Utes in the north alone being somewhat uneasy) are now peaceable and friendly to the whites. Much of this quiet and good order is due to the skilful management of General Frémont and Major-General Willcox, the army officer in command of the military district of Arizona. The Southern Pacific Railroad traverses the southern portion of the Territory from west to east, while the Texas Pacific and the Atchison, Topeka and Santa Fé are rapidly approaching from the east. Toll and good wagon-roads traverse all the southern and central portions of the Territory. Capital is flowing in rapidly, and though the vicinity of some of the mines is very bare

of timber, there is an ample supply in other portions of the Territory, which will be brought thither by some of the railways. The want of water is still a difficulty in some of the mines, and will cause the abandonment of those where it cannot be obtained, but the construction of acequias or water ditches, or the repair of those constructed many years ago by the Indians, the building of reservoir dams, and the boring of artesian or drive wells, will supply many of the mines which have hitherto lacked. Very many rich veins or lodes have been opened by individuals, generally farmers or stock-raisers, which have not come upon the market at all. Their owners have not sufficient capital to develop them extensively, and hence there has sprung up a practice which General Frémont denominates "gold-farming," which, so far as we are aware, does not prevail to any considerable extent elsewhere. A farmer, who has discovered a gold lode or placer on his farm, as very many of them do, proceeds with his farm-work or cattle-breeding just as the other farmers do, but when he has a leisure day he picks out a few bushels of ore from the lode, or of gravel from the placer, washes out the gold with the pan, or amalgamates it, if fine, and then expels the quicksilver by a slight roasting, puts the gold in a sack or pouch, and the next market-day sells it at the nearest town. He thus supplies himself with funds, and knowing his mine will not deteriorate by keeping, reserves to some future day any complete development of it.

The prospects for the speedy opening of the immense mineral wealth of Arizona to the world are now much brighter than ever before. But with this prospective development there are flocking into the Territory hosts of "mining sharps," as the miners call them, unprincipled men who will bond a mine which, while imperfectly opened, may prove to be either a pocket or a vein, and which, until it is further developed, may be dear or cheap at $5,000, but which is very probably in a district with very little water or timber, and providing themselves with opinions from some of their partners in rascality, will come East and work up this doubtful property into a gold mine with a capital of from $250,000 to $1,000,000, and interesting a few friends in the mat-

ter, dispose of the greater part of the capital to the unwary, who will be very likely to find themselves swindled most egregiously.

For the purpose of exposing these frauds we would counsel any one who wishes to invest in mining property in Arizona, or, indeed, elsewhere, before purchasing to institute the following inquiries: What is the exact location of your mine? How near is it to a permanent supply of water, sufficient for the mine? What is that water—a spring, creek, or river? Is it a perpetual stream, or does it intermit and lose itself in the sands, reappearing, perhaps, miles below? What timber is there near the mine, and at what price is it held? What progress has been made in the mine by shafts, tunnel, or winze? What amount and value of ore is now upon the dump? What is the average assay, and what the actual practical yield per ton? What is the estimated present value of the mine as appraised by skilful and honest experts?

These points being satisfactorily ascertained, the investor may be justified in offering about one-fifth of what is asked for the mine, though he would be safer if he offered only a tenth.*

The vegetation of Arizona is peculiar. The lower valley of the Colorado and that of the Gila as far east as the Rio Santa Cruz are for the most part low and dry. In the spring, the cactus, which abounds in all its species here, and delights in a dry and desert land, is in full bloom, and pleases the eye with its gay and beautiful colors.

There is very little grass here, and that little dries up under the summer's intense heat, but is renewed by the rains of July and August. The mountains are covered with scrubby pines and junipers, and along the streams there is a thin line of cotton-woods. In the desert lands, the mezquite and iron-wood contend with the cactus for a place in the parched soil, and these furnish a moderate supply of fuel, though there are bituminous coals in the Gila valley which supplement what is lacking. In

* In suggesting these inquiries and urging this caution, we do not intend to imply that there is any doubt that the mineral wealth of Arizona is vast, and perhaps greater than that of any other portion of the West; but the distance to markets is so great, the expenses so heavy, the obstacles so many, and the facilities for deception so numerous, that great caution on the part of the buyer is absolutely necessary.

the eastern and southeastern parts of the Territory there are more streams, and the mountains are covered, though sparsely, with pine and juniper. North of the Gila there is in the east an extensive mass of mountains known as the Mogollon Mountains, which are covered with yellow pine, piñon or nut-pine, and juniper, while the valleys which are watered by the streams which unite to form the Colorado Chiquito, and the Salinas, San Carlos, Bonito, Prieto, and Azul, affluents of the Gila, are covered with rich grasses and are excellent grazing and arable lands. A broad but elevated valley lies between the Mogollon and the San Francisco range, which is watered only by the San Francisco river and its affluents, and by one or two small lakes, and by one or two creeks which flow into the Salinas. This valley plateau is but little known, but in its upper portion at least is probably very dry. The lower portion is said to be an excellent grain region.

Another extensive mountain mass, extending more than 200 miles from north to south and about 125 from east to west, of which the San Francisco Mountains form the eastern barrier, and which is traversed by many fertile valleys and some lofty mesas or plateaux, extends westward to the Black Mountains, which overlook the Colorado valley. Nearly in the centre of this mountain mass is situated Prescott, the capital of the Territory, which is 5,700 feet above the sea, and enjoys a fine climate, not too hot or too cold, a pure air, and freedom from malaria.

The atmosphere here is very dry and highly electric, at times almost painfully so. Thunder-storms are very frequent in summer, and so many of the pine trees, which are abundant here, have been struck by lightning that they are unfit for lumber. Most of these mountains are covered with yellow pine, juniper, and piñon pine, with some oaks, and much good lumber is furnished from those thirty or forty miles north of Prescott. In this region, as well as farther south, those fruits which delight in a hot climate and do not require too much moisture, flourish in perfection. The peach, apricot, fig, banana, and where they have been planted, the olive and pomegranate, yield abundant fruit. The orange, lemon, and lime probably require more

moisture. Some of the palms, particularly the date and talipot palms, would undoubtedly do well in the Gila, Salinas, and Santa Cruz valleys.

Of the regions north of the Colorado and the Colorado Chiquito, there is hardly enough known to justify any considerable description of their vegetation. Near the Colorado the land is so thoroughly drained of moisture as to be almost a desert. East of the Colorado Chiquito is a broad plateau, a portion of which is volcanic in character, and is laid down upon the maps as a "painted desert," probably from the color of its limestones, shales, and sandstones. North of this are the villages of the Moquis, where, in the past, the water has been treasured up in reservoirs for domestic purposes and for irrigation. On portions of these mesas they were accustomed to cultivate their fields of blue, red, yellow, orange-colored and white corn, keeping each carefully in fields by itself, and garnering them in separate granaries. Their crops of these would indicate a fertile soil, and the grazing was good for their goats and sheep.

A large *mesa* in the extreme northeast is called *Mesa la Vaca*, which would indicate that it had formerly been a pasture ground for cattle. The Navajos, who have a large reservation, partly in Arizona and partly in New Mexico in this northeastern corner, are famous for their flocks of sheep, numbering it is said nearly or quite a million.

Zoölogy.—Geographically, all the wild animals of the western slope of the Rocky Mountains, and the eastern slope of the Sierra Nevada, should find homes in the forests and plains of Arizona. Perhaps occasional specimens of nearly all of them may be found; but, as a matter of fact, wild animals are not very numerous in Arizona. Of the larger game the elk is rare, but there are two species of deer, the Rocky Mountain antelope, the bighorn or mountain sheep, and the Rocky Mountain goat or goat antelope. Most of them were more abundant in the northern part of the Territory than in the southern. Of the smaller game, there are the sage hare, the jack rabbit, and several species of squirrels. Of the larger beasts of prey, the grizzly bear is very rare, if he inhabits the Territory at

all; the black and cinnamon bears are more numerous. The puma or cougar is found in the forests, though less numerous than in better-watered countries; the jaguar is found in the low lands, though less abundant than in Texas. The ocelot, the wild cat and the lynx are occasionally found in the forests, as well as the red or gray wolf, and one or two species of fox. The prairie wolf, usually called the coyote,* is not found in the Territory, though the true coyote, a miserable little cur of an animal scarcely larger than a fox, is occasionally seen; but there are peccaries, raccoons, opossums, skunks, and the gopher or prairie dog or marmot. There are said to be large herds of mustangs or wild horses in the plains of Southern Arizona. Of birds there are a considerable number, many of them of gay-colored plumage. The Wheeler expedition sent to the Smithsonian Institution 500 specimens, and 183 distinct species, and others have since been discovered. Game-birds are abundant, pheasants, partridges, quails and grouse, especially the sage-hen and the prairie-hen. The crane, ibis and flamingo are among the birds of Southern Arizona. Eagles, vultures, buzzards, hawks and owls are numerous; the king vulture, little inferior in size to the condor or lammergeier, a rare bird in North America, is only found in the United States, in this Territory and in Texas. There are many varieties of fish found in the rivers, some of them edible fish of great delicacy and peculiar to this Territory. Several species of fish have been discovered in the mineral springs. There are also many species of mollusks. The reptiles and serpents of Arizona are formidable, and in some parts of the Territory numerous. There are alligators in the Gila and Lower Colorado, horned toads, lizards, scorpions, and centipedes in the chaparral and among the cacti, rattlesnakes on the *mesas* or table-lands of Central and Northern Arizona.

The skunk, in other sections a harmless animal, except for his fearfully offensive odor, is, in all the region below the fortieth par-

* Colonel Richard Irving Dodge, United States Army, a very high authority in all hunting matters, insists ("The Plains of the Great West") that the coyote is an insignificant little animal hardly larger than a fox, and is found only in Texas, Arizona and Mexico; and that the prairie wolf, so often called a coyote, and so abundant on the "plains," is really an entirely different and much larger species of the canine family.

allel, very much dreaded for his carnivorous propensity. Finding his way into a camp, or where settlers are sleeping on the ground under tents, he proceeds without any hesitation to bite and gnaw the face or hands or feet of the sleepers, and his appetite for human flesh and blood once aroused he will return to his repast even if driven away. These bites in very many cases produce hydrophobia, though the animal itself shows no signs of rabies. These animals are very numerous in Arizona, New Mexico, Colorado, Kansas, the Indian Territory and Texas, and though many thousands of them are killed every year for their skins, the fur being in great demand in the fashionable world, they do not seem to diminish in numbers. Colonel R. I. Dodge relates a case of these skunk bites, which, happily, did not prove fatal. It occurred in the Guadaloupe Mountains in Texas, not far from the southeast border of Arizona. A soldier and his comrade were sleeping in a common or A tent. The soldier dreamed that he was being eaten up by some animal, but a sort of nightmare prevented his moving. After some time, however, the pain and horror together woke him up to find a skunk eating his hand. With a cry and sudden effort he threw the animal from him. It struck the other side of the tent and fell upon the other man, who, recognizing the intruder, rushed out of the tent. The bitten man, who had heard of the surely fatal result of skunk-bite, was so paralyzed with fear and horror that he made no effort to get up, and seeing the skunk coming towards him again buried himself in the blankets. The skunk walked all over him, apparently seeking for an opening, and finding none began to scratch the blankets as if trying to dig out his victim. The mental condition of this poor fellow can better be imagined than described. In the meantime the other man had loosened the tent pins and lifted up one side of the tent, letting in the moonlight; then pelting the animal with sticks, from a distance, at last frightened it so that it ran off into the deep, dark bank of the river. This skunk emitted no odor, and was undoubtedly simply hungry and not rabid. The man came to Colonel Dodge in the morning with his hand bound up, and asked if there was any cure for a skunk-bite. The colonel's heart sunk within him, but

he made light of the matter and examined the wound. The whole ball of the right thumb was torn, lacerated and gnawed in a fearful manner. He had no caustics or other means of cauterization, and so long a time had elapsed that he thought they would have done more harm mentally than good physically. So he had the wound carefully and thoroughly washed with Castile soap, cut off the protuberant pieces of mangled flesh, and, binding it up, kept on a simple water-dressing till the wound healed, which was in about ten days. The man was with Colonel Dodge for more than a year after this, but never experienced any ill effects except temporary pain from the wound. Colonel Dodge says that this was the only non-fatal case of which he knew in that region, though in other sections they were not often fatal.

The gray wolves not unfrequently suffer from rabies or go mad, and in that condition lose all fear, and will rush into houses, tents, etc., biting every one whom they can reach.

Productions of Arizona.—In 1879 there was about $3,500,000 of gold, silver and copper sent to San Francisco from Arizona. In 1880, the amount will, in all probability, be over $8,000,000, and as soon as railroads, now constructing, are completed through the Territory, the mineral exports will be much increased, and lead, anthracite coal, platinum, quicksilver and other metals will be added to them.

Wheat is the principal vegetable production exported. It is of excellent quality, fully equal to the best California, and where irrigation can be practised, the yield is enormous. We have no statistics of the vegetable crops gathered the last year, and believe none have been collected. Fruit, of semi-tropical qualities, is beginning to be extensively cultivated. Lumber and timber can be produced in some quarters, sufficient not only to supply the home demand, but to have considerable quantities to export. The Papago Indians, in the southwest, the Pimas and Maricopas, in the south and central region, the Mohaves, and to some extent, the Yumas, in the west and on the Lower Colorado, and the more civilized bands of the Apaches in the east, cultivate the soil and obtain a livelihood from it, the Maricopas and Papagos exporting considerable grain to San Francisco. In the northeast

the Navajos are largely engaged in sheep-farming, as already noticed. The Hualapais and the Yavapais, as well as some of the Apaches, are more inclined to a nomadic life, but will make good herdmen. The Apaches in the southeast, and the Pah-Utes or Pi-Utes, in the north and northwest, are not inclined to any industry, and are roving, troublesome and thievish.

The white population of Arizona is, according to the census just taken, almost 42,000 and rapidly increasing. In 1860 there were 6,482, and in 1870 there were 9,658. There has been within the past two years, a rapid influx of persons interested in mines and mining, as well as some who preferred agricultural pursuits, or the rearing of cattle and sheep. In 1870 there were 32,052 Indians in the Territory; the number has probably somewhat diminished since that time, as the small-pox and other fatal diseases have raged among them, and some of the tribes have scarcely escaped starvation, but they must number nearly 29,000 at the present time.

Besides the tribes we have named, there are other smaller bands, such as the Suechis, Apache Mohaves, Apache Coyoteros, Cosninas, Chemehuevis and Wallapis. The Apaches, who number about 5,000, and have a large reservation in the southeast, are divided into six bands: the Tontos, Pinals, Arivapas, Mescaleros, Bonitos and Cochise's band. They are, for the most part, treacherous and mischievous, and have of late been raiding in New Mexico, but have met with summary punishment. With the exception of these and the Pi-Utes in the north, the Indians of Arizona are friendly to the whites, peaceable, and, for Indians, industrious.

There are, all over Arizona, ruins of ancient dwellings, castles and fortified villages, together with acequias or water-conduits, caves and dwellings hewn out of the rocks, or built up with large stones and evidently formerly containing a large population. Of these ruins, Hon. A. P. K. Safford, formerly Governor of the Territory, and its Commissioner at the Centennial Exposition, says:

"Many portions of the Territory are covered with ruins, which prove conclusively that it was once densely populated by a peo-

ple far in advance, in point of civilization, of most of the Indian tribes. There is no written record of them, and it is only a matter of conjecture who and what they were. Occasionally a deserted house is found sufficiently well preserved to ascertain the character of the architecture. The walls of the Casa Grande, situated on the Gila, near Sanford, are still two stories above the ground. In size, the structure is about thirty by sixty feet; the walls are thick, and made of mud, which was evidently confined and dried as it was built. It is divided into many small rooms, and the partitions are also made of mud. The floors were made by placing sticks close together and covering them with cement. Around and near the Casa Grande are the ruins of many other buildings; but, by the lapse of time, the decay of vegetation has formed earth and nearly covered them, and all that now marks the place where once a stately mansion stood is the elevation of the ground. Near the Ancha Mountains are ruins not so extensive, but in far better preservation than the Casa Grande; and near these ruins are old arastras, for the reduction of silver ores—which indicate that this old people were not unmindful of the root of all evil. On the Verde river are immense rooms dug in from the sides of high, perpendicular sandstone banks, that can only be reached with ladders.

"Very little information is obtained by excavating these ruins. Pottery of an excellent quality, and ornamented with paint, is found everywhere, and occasionally a stone axe is unearthed, but nothing to indicate that they were a warlike people; on the contrary, scarcely an implement of defence can be found, though there are reasons to believe, from the numerous lookouts or places for observation to be seen on the tops of hills and mountains, and the construction of their houses, that they had enemies, and that they were constantly on the alert to avoid surprise; and also, that by the hands of these enemies they perished. It is not improbable that the Apaches were the enemies who caused their destruction. Indeed, the Apaches have a legend that such is the case. During the past year I opened an old ruin at Puebla Viejo, on the Upper Gila, and found the bones of several human beings within; also the bones of a number of domestic animals.

On the fire, an *olla* (crockery-ware vessel) was found with the bones of a fowl in it, and it appeared as though the people within had resisted an attack from an enemy, and had finally been murdered. Shortly after, I visited a ruin in Chino valley, twenty miles north of Prescott, and over three hundred miles from Puebla Viejo, and there found that Mr. Banghart had opened a ruin on his farm. In it he found the bones of several human beings—five adults and some children—and the evidences were unmistakable that the inmates had died by violence, as the door and window had been walled up with stone, evidently to resist a hostile foe. The subject is an interesting one, and it is to be hoped that further excavations may throw more light upon the subject. The ruins of towns, farms and irrigating canals, that are to be seen on every hand through this vast Territory, give abundant proof that this country was once densely inhabited, and that the people who lived here maintained themselves by cultivating the soil. Probably that is about all we shall ever know of them. Many hieroglyphics are to be seen on rocks in different portions of the Territory, but by whom made, or what they mean, no one knows.

"In excavating a well between Tucson and the Gila, at the depth of one hundred and fifty feet, pottery and other articles, the same as are found in the vicinity of ruins, were taken out."

But by far the most interesting of these ruins, inasmuch as they are not wholly ruins, but some of them inhabited by the remnant of the original tribes which built them, are those of the ancient province of Tusayan, in the northeastern part of the Territory. Seven of the sixty or more towns which constitute this once populous province, are still inhabited by the Moquis, who are undoubtedly the descendants of the original nation which once occupied the whole of this Territory, and who still adhere to the religion of their fathers. Of the sixty towns, thirty are still inhabited, but all except the seven are under the control of Catholic priests, and the Pagan rites and ceremonies are prohibited; but occasionally the inhabitants steal away from their villages and join with the Pagans of the "Province of Tusayan" in their rites and worship. There are other groups of these vil-

lages on the San Juan river in New Mexico and Southwestern Colorado, which have been visited by Professor J. S. Newberry and his companions, in 1860, whose language, religion, etc., are identical with these. Colonel J. W. Powell, United States army, visited the province of Tusayan in 1871, and spent about two months in studying the language, manners, customs, and religion of these interesting people. The narratives of Professor Newberry (which has not been published) and of Colonel Powell are both full of interest, and from them we glean a few particulars in addition to those already given in Part I., chapter vi., page 67, which will, we think, be of interest to our readers.

The villages of these Moquis are always situated on some lofty *mesa* or isolated table-land, difficult of access; their dwellings are of stone, usually three or four stories high, and around an interior court, common to the village. The outer walls are blank and inaccessible, and the inner court is only approached by a covered way easily defended. Entering the village plaza or interior court-yard, the houses are joined together, forming a continuous wall outside, and within the court they are built in terraces, the second story being set back upon the first, the third upon the second, and the fourth upon the third. There are no doors or low windows to the first story; access to it is had only by ascending a ladder to the top of the story and then descending another to the floor of the first. This lower story is for the most part a store-house where the corn or other grain used by the family is stored, each color of the corn by itself. The second story, or sometimes the third, contains the family room, which is twenty or twenty-four feet by twelve or fifteen in width, and about eight feet high. Usually all the rooms are plastered carefully, and sometimes they are painted with rude devices. For doors and windows there are openings only, except that sometimes small windows are glazed with thin sheets of selenite, the transparent flat crystals of gypsum. To go up to the third or fourth story you climb by a stairway made in the projecting wall of the partition. In a corner of each principal room a little fireplace is seen, large enough to hold about an armful of wood; a stone chimney is built in the corner, and often capped outside

CLIFF DWELLERS.

with a pottery pipe. The exterior of the houses is very irregular and unsightly, and the streets and courts are filthy, though in the centre of each court is a large, deep fountain and pool, which is used for bathing; but within the houses great cleanliness is observed. Separated from the houses, indeed belonging to the village, is the kiva, called *Estufa*, "the Sweat House," by the Spaniards. It is a large underground room in the court-yard or plaza, chiefly intended for religious ceremonies, the church, in fact, of the village, but also used as a place of social resort. A deep pit is excavated in the shaly rock and covered with long logs, over which are placed long reeds, these, in turn, covered with earth, heaped in a mound above; a hole or hatchway is left, and the entrance to the kiva is by a ladder down this hatchway.

The people are very hospitable and quite ceremonious; they are also remarkably polite. Enter a house and you are invited to take a seat on a mat placed for you upon the floor, and some refreshment is offered, perhaps a melon with a little bread, perhaps peaches or apricots. After you have eaten, everything is carefully cleared away, and with a little broom made of feathers of birds,* the matron or her daughter removes any crumbs or seeds which may have been dropped. They are a very economical people; the desolate circumstances under which they live, the distance to the forests, and the scarcity of game, together with their fear of the neighboring Navajos and Apaches, which prevents them from making excursions to a distance, all combine to teach them the most rigid economy. Their wood is packed from a distant forest on the backs of mules or asses, and when a fire is kindled but a few small fragments are used, and when no longer needed the brands are extinguished, and the remaining pieces preserved for future use. Their corn is raised in fields near by, out in the drifting sands, by digging pits eighteen inches to two feet deep, in which the seeds are planted early in the spring, while the ground is yet moist. When it has ripened it is gathered, brought in from the fields in baskets carried by

* Some of these brushes or brooms are very beautiful, and are made of the feathers of humming-birds and other birds of gay plumage found in that region.

the women, and stored away in their rooms, being carefully corded. They take great pains to raise corn of different colors, and have the corn of each color stored in a separate room. This is ground to a fine flour in stone-mills, then made into a paste like a rather thick gruel. In every house there is a little oven made of a flat stone eighteen or twenty inches square, raised four or five inches from the floor, and beneath this a little fire is built. When the oven is hot and the dough mixed in a little vessel of pottery, the good woman plunges her hand in the mixture and rapidly smears the broad surface of the furnace rock with a thin coating of the paste. In a few moments the film of batter is baked; when taken up it looks like a sheet of paper. This she folds and places on a tray. Having made seven sheets of this paper bread from the batter of one color and placed them on the tray, she takes batter of another color, and, in this way, makes seven sheets of each of the several colors of corn-batter.

They have many curious ways of preparing their food, but perhaps the daintiest dish is "virgin hash." This is made by chewing morsels of meat and bread, rolling them in the mouth into little lumps about the size of a horse-chestnut, and then tying them up in bits of corn-husk. When a number of these are made, they are thrown into a pot and boiled like dumplings. The most curious thing of all is, that only certain persons are allowed to prepare these dumplings; the tongue and palate kneading must be done by a virgin. An old feud is sometimes avenged by pretending hospitality, and giving to the enemy dumplings made by a lewd woman.

In this warm and dry climate the people live principally out of doors or on the tops of their houses, and it is a merry sight to see a score or two of little naked children climbing up and down the stairways and ladders, and running about the tops of the houses engaged in some active sport.

In every house vessels of stone and pottery are found in great abundance. These Indian women have great skill in ceramic art, decorating their vessels with picture-writings in various colors, but chiefly black.

In the early history of this country, before the advent of the

Spaniards, these people raised cotton, and from it made their clothing; but between the years 1540 and 1600 they were supplied with sheep, and now the greater part of their clothing is made of wool, though all their priestly habiliments, their wedding and burying garments, are still made of cotton. The weaving is mostly done by the men, and their woollen blankets are remarkable for their density and their fine texture. They are perfectly water-proof, as we have already noticed, page 67.

Men wear moccasins, leggings, shirts and blankets; the women, moccasins with long tops, short petticoats dyed black, sometimes with a red border below, and a small blanket or shawl thrown over the body so as to pass over the right shoulder under the left arm. A long girdle of many bright colors is wound around the waist. The outer garment is also black. The women have beautiful, black, glossy hair, which is allowed to grow very long, and which they take great pains in dressing. Early in the morning, immediately after breakfast, if the weather is pleasant, the women all repair to the tops of the houses, taking with them little vases of water, and wash, comb and braid one another's hair. It is washed in a decoction of the soap plant, a species of yucca, and then allowed to dry in the open air. The married ladies have their hair braided and rolled in a knot at the back of the head, but the maidens have it parted along the middle line above, and each lock carefully braided or twisted, and rolled into a coil supported by little wooden pins, so as to cover each ear, giving them a very fantastic appearance.

The politeness of the people is shown in their salutations. If you meet them in the fields they greet you with a salutation signifying, "May the birds sing happy songs in your fields." If you do one of them a favor, even though a very slight one, he thanks you; if a man, he says "kwa kwa;" if a woman, "es-ka-li." It is an interesting feature in their language that many words are used exclusively by men, others by women. "Father," as spoken by a girl, is one word; spoken by a boy, it is another; and nothing is considered more vulgar among these people than for a man to use a woman's word, or a woman a man's.

At the dawn of day the governor of the town goes up to the

top of his house and calls on the people to come forth. In a few minutes the upper story of the town is covered with men, women, and children. He harangues them briefly on the duties of the day; then, as the sun is about to rise, they all sit down, draw their blankets over their heads, and peer out through a little opening and watch for the sun. As the upper limb appears above the horizon every person murmurs a prayer, and continues until the whole disk is seen, when the prayer ends and the people turn to their various avocations. The young men gather in the court about the deep fountain, stripped naked, except that each one has a belt to which are attached bones, hoofs, horns, or metallic bells, which they have been able to procure from white men. These they lay aside for a moment, plunge into the water, step out, tie on their belts, and dart away on their morning races over the rocks, running as if for dear life. Then the old men collect the little boys, sometimes with little whips, and compel them to go through the same exercises. When the athletes return, each family gathers in the large room for breakfast. This over, the women ascend to the tops of the houses to dress their hair, and the men depart to the fields or woods, or gather in the kiva to chat or weave.

The theology of these people seems to be complicated. They acknowledge a Supreme or Great Spirit, the Creator of men, symbolized by the sun or by fire, but consider the planets, sun, moon, and stars the workmanship of a beneficent spirit of miraculous power and strength and most loving disposition, who dwelt among men and exerted his various powers to help them. This beneficent divinity, who bears strong analogies to the Hercules of the Greeks, the Divine Emperor of the Chinese, and the Hiawatha of the Northern Indians, they named Ma-chi-ta, and they never tire of telling of his loving tenderness to complaining and ungrateful humanity.

But they worshipped also the powers and forces of nature, at least to the extent of prayer and homage. The aridity of their soil made water, and especially rain, a prime necessity, and Colonel Powell gives us a prayer which he heard addressed, with a variety of other ceremonies, to Mu-ing-wa, the rain-god, by one

of the Moqui priests: "Mu-ing-wa! very good; thou dost love us, for thou didst bring us up from the lower world.* Thou didst teach our fathers, and their wisdom has descended to us. We eat no stolen bread. No stolen sheep are found in our flocks. Our young men ride not on the stolen ass. We beseech thee, Mu-ing-wa, that thou wouldst dip thy brush, made of the feathers of the birds of heaven, into the lakes of the skies and scatter water over the earth, even as I scatter water over the floor of this kiva; Mu-ing-wa, very good." After scattering white sand over the floor, the old priest prayed that during the coming season Mu-ing-wa would break the ice in the lakes of heaven, and grind it into ice-dust (snow), and scatter it over the land so that during the coming winter the ground might be prepared for the planting of another crop. Then, after another ceremony with kernels of corn, he prayed that the corn might be impregnated with the life of the water, and made to bring forth an abundant harvest. After a ceremony with certain jewels which seemed to be a part of the sacred emblems kept in the kiva, he prayed that the corn might ripen and each kernel become as hard as one of the jewels. This petition would seem to imply the desire that it might be preserved from the insect pests which do not attack the corn when it has become plenty. There seems to be in their theology no place for the sacrifice of animals, much less of human beings. All their sacrifices were of fruits, flowers, and seeds. The villages visited by Prof. Newberry in the San Juan region differed very little either in their religious worship, their habits and customs, or their language from these inhabitants of Tusayan. They cultivated only the *blue* corn, and their bread, made in the same way as that described by Colonel Powell, resembled nothing else so much as a ream of druggists' blue paper. Colonel Powell, after careful inquiry, estimated the inhabitants of these seven villages as about 2,700. The names of the villages are O-raibi, Shi-pau-i-luv-i, Mi-shong-i-ni-vi, Shong-a-pa-vi, Te-wa, Wol-pi, and Si-

* This declaration would seem to identify Mu-ing-wa, the rain-god, with Ma-chi-ta, their heroic deliverer and helper, for it was one of his special benefits conferred upon man that he brought him up from the lower world and raised for him the sky to its present altitude.

choam-a-vi. Prof. Newberry found a smaller number, perhaps not much more than 1,000, on the *mesas* of the San Juan region; but the ruins of their towns and villages, some of them of great size and strength and of remarkable architectural beauty, crown the summits of almost every *mesa* and hill-top throughout Nevada, Utah, Colorado, New Mexico, Arizona, and Southern California. "Not only Salt Lake City, but nearly every settlement in the Territory of Utah, and many in the State of Nevada," says Colonel Powell, "are built on the site of one of these ancient towns. They have been found also on the eastern slope of the Rocky Mountains, near Golden City, and southward from that point."

Who were these people, and from whence did they come? Colonel Powell, on somewhat insufficient evidence, thinks them related to the Shoshones, Utes, Pi-Utes, and Comanches, and regards the Navajos and Apaches, with some of the smaller tribes in California, as the intruders who have pursued them so mercilessly and nearly destroyed them from off the face of the earth. The arguments by which he supports this theory seem to us far from satisfactory. The erection of these massive buildings, the progress in agriculture, the entire avoidance of a nomadic life, the proficiency in ceramic art, the ability to spin and weave wool and cotton so dextrously, the daily preparation of skilfully cooked food, the worship of the sun, the virgin priestesses, and the complex system of religious belief, all indicate a superiority over the Utes, Shoshones, and Comanches which is entirely incompatible with any recent common origin with them, whatever may be the supposed affinities of language. It is no new thing for a conquered nation to force upon its conquerors its own language. The Saxons did this with the Normans; the Malays have done it with the Chinese. Their affinities of race, habits, and manners, as well as religion, seem to be much nearer to the Toltecs and Peruvians than even to the Aztecs, from whom they differ in language, and in the sternness and cruelty of their religious practices, while their difference from the Shoshones, Utes, and Comanches is infinitely greater. Colonel Powell says that some of the inhabitants of the thirty towns

which were destroyed have become nomadic, "for the Co-a-ni-nis and Wal-la-pais, who now live in the rocks and deep gorges of the San Francisco Plateau, claim that they once dwelt in pueblos or towns near where Zuni now stands." This is possible, though from what little is known of these tribes, the Pimas or Maricopas would seem to have had stronger claims to such an origin; but, if true, it is one of those cases of degeneration or moral lapse, which can only be accounted for on the Biblical ground of Adam's fall.

That these Moquis and their kinsmen, the ancient cliff-dwellers, were originally of Asiatic origin, and migrated from that portion of Asia inhabited by the Aryan race, is too evident to need demonstration; and those who are so zealous to find on this continent the descendants of the lost ten tribes, may find among them a more hopeful quest than among the Anglo-Saxons of Europe or America.

Returning to the general subject of the Territory of Arizona, we have but little to add. The population of the Territory in 1870 was only 9,658 whites and civilized Indians, and about 25,000 tribal Indians. The recent census (1880) makes the white population 40,441 and adding tribal Indians it is probably about 65,000. It is now divided into five counties—Yuma, Pima, Maricopa, Mohave and Yavapai. The last named has an area as large as the State of Iowa. The principal towns are Tucson, the former capital, which had in 1870 a population of 3,224. Its present population is estimated at somewhat more than 6,000; the Southern Pacific Railway now extends to it. Arizona City, situated at the junction of the Gila and Colorado, population in 1870, 1,144, now estimated at about 1,600. Prescott, the present capital, which had, in 1870, 668 inhabitants, has now about 2,000. It is, like Tucson, central to a fine mining country. Phœnix, on the Rio Salinas, is a thriving and growing town, though very hot in summer. Ehrenburg, on the Colorado, is the chief shipping point for Central Arizona. Florence, Sanford, Mineral Park, Hardyville and Wickenburg are also places of some importance.

We can hardly recommend this Territory to the emigrant

farmer, though those who take up favorably situated lands near the mining centres, and can have facilities for irrigation, will undoubtedly do well. The soil when irrigated is fertile enough to produce any crop. The stock-raiser and the sheep-farmer will find excellent grazing lands and a good market in Arizona, nor except in the extreme north or the southeast need they have any great apprehension of Indian raids. Wild beasts certainly exist there, but they are less numerous than in the other new Territories, and the losses from them will not be large, while the profits of both cattle and sheep-raising are certain and speedy.

But mining is the pursuit in which Arizona, like the adjacent State of Nevada, is likely to be pre-eminent. Transportation for mining products is now good and will soon be better; capital is flowing into the Territory. The Indians have ceased to be troublesome in the mining districts, and wood and water, two indispensable requisites for successful mining, though not as abundant as desirable, are yet to be had and without excessive cost; while the placers, veins and lodes, already opened or now opening, indicate deposits of the precious metals, richer than those of any other State or Territory in the West. The future of Arizona, after long years of waiting, trial and disappointment, seems now to be assured. It has purchased this right to a future prosperity with the blood of some of its best citizens, slain either by the fierce, treacherous and bloodthirsty Apaches, or by the still more bloodthirsty and reckless outlaws, who, prior to its territorial organization, made it their refuge and planned and executed there the most gigantic crimes. But they have now been driven from the Territory, and its present citizens are quiet, peaceful and law-abiding.

GENERAL JOHN C. FREMONT.

No description of "Our Western Empire" would have any claims to completeness, which failed to do justice to the great services rendered to almost every part of that vast region by General Frémont. His fame as an explorer, resolute, intrepid, yet thoughtful of his men, successful, notwithstanding innumerable obstacles, always grappling with broad principles, yet ever mindful of the minutest details, has become world-wide, and the title

of the "*Pathfinder*," everywhere bestowed upon him, bears testimony to the universal recognition of his great merits in the way of discovery and exploration. But his executive services have not been less conspicuous, or rendered with a smaller measure of self-sacrifice. He has devoted his life to the Great West; in his efforts for its development, he has lost more than one colossal fortune, earned by the most extraordinary labors, but has never repined over his losses. A man of impetuous spirit, of great daring and unbounded energy, but sensitive and delicate as a woman in regard to everything which concerned his honor, he has made many friends whom he has bound to him as with hooks of steel, and has also had some enemies, the bitterness of whose hatred seemed almost infernal in its malignity. But he has outlived the hostility of even these foes, and now in the ripeness of his intellectual faculties, and with a vigor which is born of his long outdoor life, he is devoting his great powers to the development of that one of the Territories of "Our Western Empire," which has hitherto been considered the most hopeless, from its arid climate, its intense heat, and the violence and treachery of the Indian tribes which roam over it. And in this great effort he is likely to succeed. He has won the confidence of most of the tribes, and led them forward to an agricultural and quiet life, and even the savage and treacherous Apaches could not refuse to listen to one whom they had known for thirty-five years as the bravest of the brave, and as a commander who had severely punished their offences, but had shown a magnanimity in his treatment of the conquered, which far exceeded their deserts. In all the region south of the forty-ninth parallel, the name of John C. Frémont is honored and reverenced. JOHN CHARLES FREMONT was born in Savannah, Ga., January 21st, 1813. His father was a Frenchman, his mother a Virginian. He was educated in Charleston College, graduating with honor in 1830 at the age of seventeen. His attainments in applied mathematics gained him a position as instructor in mathematics in the United States Navy from 1833 to 1835. He accompanied Captain Williams, United States Army, in a survey of the Cherokee country in 1837–8, and in 1838–9 assisted Nicollet in exploring the country

between the Missouri river and the British line. While thus engaged he was appointed second lieutenant of topographical engineers, July 7th, 1838. On the 19th of October, 1841, he married Jessie, daughter of Hon. Thomas H. Benton, of Missouri. In May, 1842, he began, under the authority of the government, the exploration of an overland route to the Pacific; examined the South Pass of the Rocky Mountains, ascended in August the highest peak of the Wind River Mountains, now called Frémont's Peak, and returning late in the autumn of 1842, published a report highly commended by Humboldt in his "Aspects of Nature." In the summer of 1843, in another expedition, he explored the Great Salt Lake, and reached Fort Vancouver, near the mouth of Columbia river, in November of that year. Attempting to return by a more southern route, his progress was impeded by deep snows, and his party suffered severely from hunger and cold. Changing his course he returned through the Great Basin and the South Pass, having exhibited a fortitude and daring rarely surpassed, and was breveted captain, July 31st, 1844. In a third expedition in 1845 he explored the Sierra Nevada, California, etc. In March, 1846, he successfully repelled an attack by Mexicans near Monterey; was major commanding battalion of California volunteers, July to November, 1846; was appointed lieutenant-colonel of mounted rifles, 27th May, 1846; was appointed soon after Governor of California by Commodore Stockton, whose authority was disputed by General Stephen Kearney. Arrested by the latter, he was tried by a court-martial, and found guilty of mutiny and disobedience. The finding was disapproved by the President, who offered him a full pardon. This he declined, and resigned his commission. In 1848 he undertook a new expedition across the continent. His guide lost his way, and, after experiencing incredible hardships, he returned with the loss of one-third of his party to Santa Fé. Renewing his efforts he successfully encountered the hostile Apaches, and in 100 days reached the Sacramento river. In 1849 he settled in California, having purchased the auriferous Mariposa tract, which was believed to be worth many millions of dollars. In his efforts to develop this somewhat too rapidly,

he fell into the hands of some sharp New York bankers, who by adroit management (for in financial matters he was as open-hearted and simple as a child) contrived to deprive him of the whole of this magnificent property. He had previously had six years' litigation in regard to it, but in 1855 the Supreme Court of the United States confirmed his title. But during all this time he was actively engaged in the service of his country. In 1849 he was a commissioner to run the boundary line between the United States and Mexico. He used his great influence to make California a free State, when the struggle between the South and the North, in regard to the increase of the slave States, was at its height. In 1850–51 he was the first United States Senator from California. In 1850 he received from the King of Prussia a gold medal in token of his great services to science, and the same year the great gold medal of the Royal Geographical Society of London. In 1853 he led at his own expense a fifth expedition across the continent, and succeeded in finding a new route to the Pacific, about latitude 38° north. In 1856 the Republican party, then recently organized, made him its nominee for the Presidency, and he received 114 electoral votes against 174 for his successful competitor, Mr. Buchanan. In the fall of 1860 he visited Europe, where he was received with great honors. On the 14th of May, 1861, he was appointed a major-general of the United States army, and placed in command of the Western District, with head-quarters at St. Louis. In August he issued an order emancipating the slaves of those who should take arms against the United States. This order was annulled by President Lincoln as premature. He commenced a vigorous pursuit of the insurgents, whom he had finally overtaken at Springfield, Mo., when, by the intrigues of other commanders, he was removed from the command, November 2d, 1861. Three months later he was assigned to the command of an army, poorly equipped and without sufficient supplies, in the mountain district of Virginia, where he was directed to operate against the skillful rebel general, Stonewall Jackson. His operations were unsuccessful, mainly from the want of efficient support. When General Pope was appointed to the command of the army of

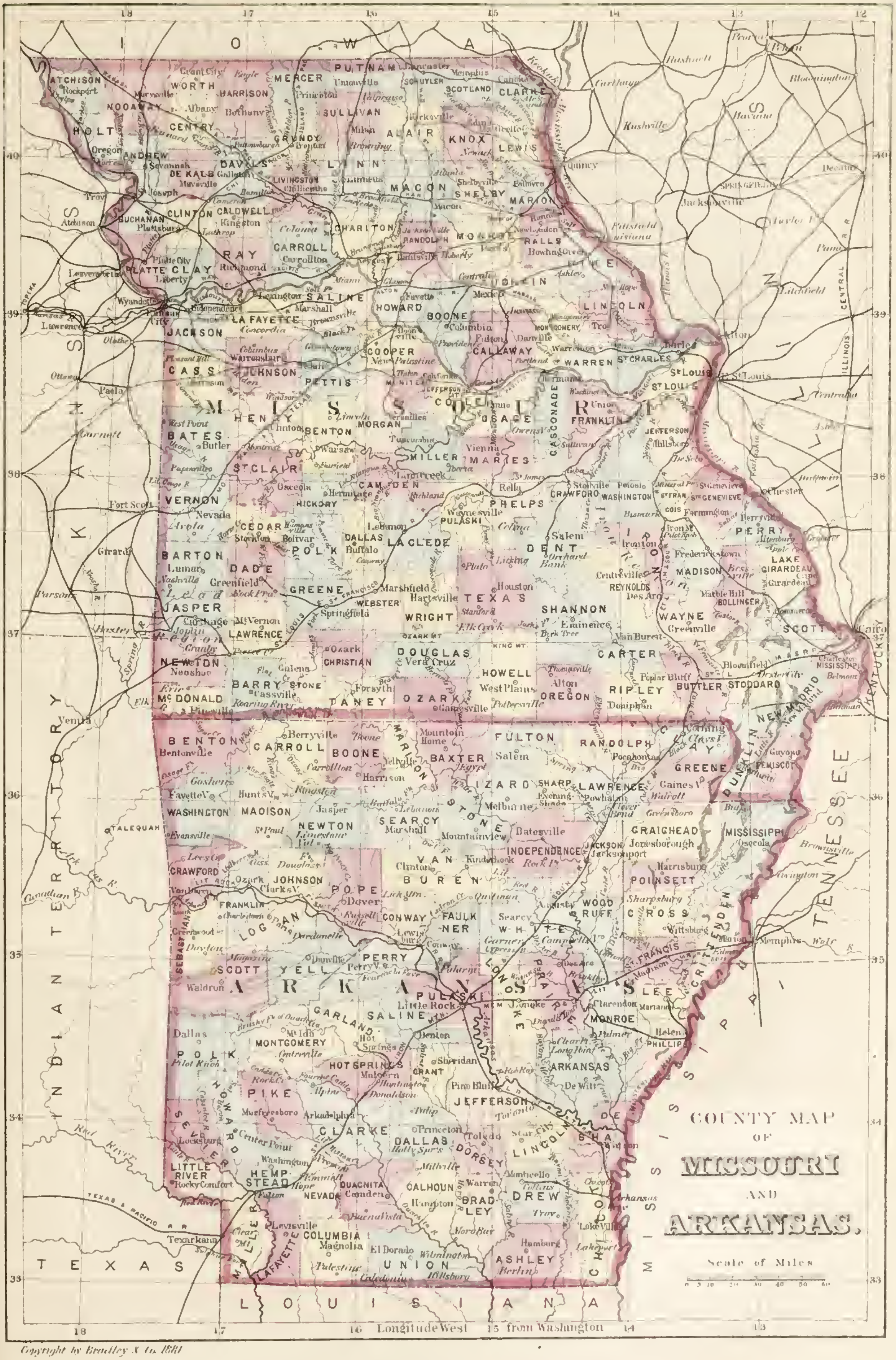
Northern Virginia, General Frémont declined to serve under an officer whom he outranked, and resigned his commission. But he was too pure a patriot to refuse his aid to the government, though he might deem them slow in their action, and his purse and influence were all at their command. In May, 1864, a portion of the Republican party, dissatisfied with the dilatoriness of the government, nominated General Frémont for the Presidency at the coming election in November. At first he accepted, but soon perceiving that his continued candidacy would injure the Republican cause, and might throw the power into the hands of its enemies, he withdrew and supported Mr. Lincoln cordially. For some years after the close of the war he took no part in public affairs, but prosecuted with great energy measures for the promotion of a Southern Transcontinental Railway to follow nearly the line of the thirty-fifth parallel. He visited Europe repeatedly in behalf of this railway, and urged a land-grant for it with every prospect of success; but the panic of 1873 crushed the enterprise for the time, and disheartened some of the promoters of it in France. General Frémont's health was seriously impaired for some years; but, on his partial recovery, he was appointed Governor of Arizona, where he is again exerting all his energies for the development of the Great West, and laying broad and deep plans for turning these arid deserts into a fruitful field.

CHAPTER II.

ARKANSAS.

ITS SITUATION, AREA, EXTENT—TOPOGRAPHY—MOUNTAINS, RIVERS, LAKES, VALLEYS—NAVIGABLE RIVERS AND RAILWAYS—SOIL—CLIMATE—RAINFALL—MINERALS AND MINERAL AND HOT SPRINGS—VEGETATION—ANIMALS—PRODUCTIONS, MINERAL, VEGETABLE AND ANIMAL—CROPS—COMMERCE—POPULATION—ORIGIN OF POPULATION—EDUCATION—RELIGIOUS DENOMINATIONS—MANUFACTURES—EXEMPTIONS—DONATED LANDS—VIEWS OF HON. CHARLES S. KEYSER, HON. DAVID WALKER, W. A. WEBBER, ESQ., AND HON. A. H. GARLAND, U. S. SENATOR, ON THE HISTORY AND PROBABLE FUTURE OF ARKANSAS.

ARKANSAS and Louisiana form the southeastern States of "Our Western Empire." Arkansas is washed by the waters of



the Mississippi along nearly all of its eastern boundary, separating it from Tennessee, except for the space of one county, where it has the St. Francis river for its eastern bound, and Missouri claims the little peninsula between the St. Francis and the Mississippi rivers. On the north, it is bounded by Missouri; on the south, by Louisiana, and on the west by Texas and the Indian Territory. It lies between the parallels of 33° and 36° 30′ north latitude, and between the meridians of 89° 40′ and 94° 42′ west longitude from Greenwich. Its area is 52,198 square miles or 33,406,720 acres, one-sixth larger than the State of New York, and about the same size as England without Wales.

Surface and Topography.—The eastern portion of the State, from 30 to 100 miles west of the Mississippi, is generally low, containing many lakes, bayous and swamps, and is, with the exception of some of the more elevated bluffs, subject to occasional inundation from the Mississippi river. These inundations, though sufficiently extensive to occasion much loss, seldom or never cover the whole of these lowlands, which rise gradually toward the foot-hills of the Ozark range.

The land rises by gradual stages from this low valley of the Mississippi, to the elevated plateaux of the central part of the State, as well as to the Black Hills in the north, and Ouachita Hills in the west. But the principal mountain range in the State is the Ozark, which, beginning in the southwest, trends northeastward and northward, spreading out into broad table-lands with narrow and deep ravines, and occasionally rising into higher summits, though of no great height. The general elevation of these table-lands is from 1,500 to 2,000 feet, and some of the rounded knobs may rise from 500 to 800 feet higher. The hills of this range have distinct local names, such as Pea Ridge and Boston Mountains (both famous during the late civil war), north of the Arkansas river, and Massime Mountains south of that river. The line of the St. Louis, Iron Mountain and Southern Railway, which crosses the State diagonally from northeast to southwest, nearly marks the line of division of the higher forest and mineral lands from the plain, prairie and lowlands in the east and southeast of the State. Large deposits of valuable

minerals are found in the northern division. The mountains, table-lands and valleys of this division present generally a rich surface, good drainage, romantic and picturesque scenery, and a productiveness remarkable for the formations and latitude. The southern, southeastern and eastern divisions have rich tertiary, post-tertiary and alluvial deposits which are not excelled in fertility by any land on the globe. Exempt alike from the intense heat of the extreme south, and the severe cold of the north, the genial climate and fertile soil of the State yield in abundance the rich productions of both regions. The rich bottom-lands will produce, under favorable conditions, from fifty to sixty bushels of Indian corn, and about 450 pounds of cotton per acre, which is considered a fair average crop. With better and more careful culture, they are capable of greatly exceeding this average, and in some instances do exceed it.

Rivers.—Arkansas is abundantly supplied with navigable rivers, so distributed as to give access interiorly to all parts of the State. The great boundary on the east is formed by the mighty Mississippi. The St. Francis on the northeast, which rises in southeastern Missouri and flows through the low, undulating portions of the northeast, where it intermingles with lakes, creeks and paludal surfaces, is a tributary of the Mississippi. It is navigable to and beyond the Missouri line.

The White river rises in northwestern Arkansas, flows through the lower southwestern counties of Missouri, and returns to the State, joining its affluent, the Black river, which affords, from the confluence, almost at all seasons, navigation for a distance of 350 miles. White river, with its tributaries, gives drainage for a broad expanse of country from the northwestern, middle and northeastern parts of the northern section of the State.

The Arkansas river, one of the largest tributaries of the Mississippi, rises in the mountains of Colorado, and flows easterly for a distance of 2,000 miles to join the Mississippi. White river is an affluent, flowing into it near its mouth. The Arkansas river bisects and drains this vast country; it is navigable entirely across the State, and, during high water, beyond it, far up into the Indian Territory. The Ouachita, with its tributaries, drains

almost the entire State lying south of the Arkansas river, or all that surface lying between it and the Red river. It is navigable 250 miles. The Red river is the southwestern channel of drainage, and is navigable throughout its course in the State, a distance of about 100 miles.

Black river rises in Southeastern Missouri and crosses five counties, discharging its waters into the White river. It is navigable from its mouth to the Missouri line.

Saline river rises in Saline county, and, after passing through six counties, discharges into the Ouachita in Union county. It is navigable for 100 miles.

Bayou Bartholomew, another tributary of the Ouachita, is navigable in the State for about 150 miles.

The Little river, an affluent of the Red river, and the Little Red river, an affluent of the White river, are both navigable for from fifty to seventy-five miles for six months of the year.

The Petit Jean, a tributary of the Arkansas, is navigable for about seventy-five miles.

Several smaller streams, such as the Caché, Dorcheat, L'Aiguille and Antoine, are navigable a part of the year.

Nearly every county in the State is traversed by one or more of these navigable streams, which, with their branches, form a navigable highway within the State of more than 3,000 miles, and secure an abundant supply of water to every county.

Most of these streams have their sources in springs in the hills or mountains, and furnish abundant and permanent water power for manufacturing purposes. Of one of these springs, the fountain-head of Spring river, a clear, limpid stream which flows through Fulton, Sharp and Randolph counties, emptying into Black river, Professor D. D. Owen, in his Geological Reconnoissance of Arkansas, thus speaks:

"The country is well watered, and possesses many fine water-powers—even at the very fountain-head of some of its numerous limpid calcareous streams, which frequently burst forth from among the ledges of rock. One of the most remarkable of these forms the fountain-head of the main fork of Spring river, known as the 'Mammoth Spring,' in Fulton county, welling up on the

south side of a low, rocky ridge, from a submerged abyss beneath of sixty-four feet, and constituting, at its very source, a respectable lake of about one-sixteenth of a mile from north to south, and one-fifth to one-sixth of that distance from east to west.

"It is said by those who have sounded the bottom, that there are large cavities and crevices in the rock, and that the main body of the water issues from a large cavernous opening, of some forty yards in circumference. It has been estimated that it boils up at the rate of about 8,000 barrels per minute; the correctness of this estimate we had no means of verifying, but it may be safely estimated that the average constant flow would be at least sufficient to propel from twelve to fifteen run of stones.

"The uniform temperature (60° Fahrenheit) and composition of the water is peculiarly congenial to the growth of a variety of cryptogamic, aquatic plants, possessing highly nutritive qualities, both for herbivorous animals and birds.

"In the early settlement of the country, herds of herbivorous wild animals travelled from great distances to this fountain for both food and water, as well as flocks of wild fowl. Now the cattle of the neighboring farms may be seen wading in its waters up to their middle, and browsing on the herbage, which appears peculiarly congenial to their tastes; it is, also, a general resort of geese, ducks and other aquatic birds. It affords valuable water-power for general manufacturing purposes."

In addition to her water-courses, Arkansas is reasonably well supplied with railways, which are being extended so as to embrace every section of the State.

The St. Louis, Iron Mountain and Southern road runs diagonally across the State, a distance of 300 miles, making connections with roads east and west. This is a land-grant road, holding nearly a million and a quarter acres of choice lands in this State which it offers to immigrants at very low rates, and by its enterprise has attracted many immigrants to the State. As a general rule an immigrant, in this State particularly, will do better to buy of the State or United States government, the lands he needs; but if, for any cause, he prefers to buy of a rail-

road company, he will find the St. Louis, Iron Mountain and Southern Railway will treat him fairly and honorably, as will the other land-grant railways also.

The Memphis and Little Rock road extends from the capital to Memphis.

The Little Rock and Fort Smith road is running a distance of 168 miles, up the valley of Arkansas, to the Indian border.

The Little Rock, Pine Bluff and New Orleans road is completed and running a distance of eighty miles, from Pine Bluff to Arkansas City, on the Mississippi river. A survey has recently been made of the gap between this city and Pine Bluff, which will soon be built.

The Mississippi, Ouachita and Red River road is completed, a distance of about thirty miles west from Chicot.

The Arkansas Central (narrow-gauge) is completed a distance of about sixty miles, and runs trains regularly between Clarendon on White river, and Helena on the Mississippi.

A narrow-gauge road is in operation between Malvern, a point on the St. Louis, Iron Mountain and Southern Railway, and the famous Hot Springs, thus giving the outside world a continuous line of railway to the Springs.

Climate and Rainfall.—The climate of Arkansas, except in the lowlands near the Mississippi, is better entitled to be called temperate than perhaps any other in the United States. The streams are not closed by ice in the winter, nor is the earth parched by drought in summer. The two points most characteristic of the climate of the State are Little Rock, the capital, for the moderately elevated table-lands, and Hopefield, opposite Memphis, Tennessee, for the lowlands. In Little Rock the mean annual temperature for a series of years is 62°.66 Fahrenheit; the highest point generally reached in August or September, and for not more than one or two days, 96°; the lowest, generally reached in December, or more rarely in January, 4°; the annual range, 92°. The average rainfall is from fifty-five to sixty inches annually. In the more mountainous region in the northern and northwestern part of the State the mean annual temperature is about 60° Fahrenheit, and the rainfall a trifle less than at Little Rock.

At Hopefield the heat of the hot months is longer continued, though but little higher.

The average maximum temperature, which is reached perhaps on twelve or fifteen days of the summer, is 98° Fahrenheit. In exceptionally hot summers it may rise to 101°.5, but not for more than one or two days. The mean of the summer months is 81°.4. The average minimum is 9°, rising some years to 17°, and at others sinking to 2°. The mean temperature of the year is 60°.6. The average rainfall 63.42 inches.

Hon. John R. Eakin, Chancellor of the Pulaski Chancery Court, an eminent agriculturist and author of a treatise on viniculture, speaking in that work of a peculiarity in the climate of Central Arkansas, says:

"In the Eastern and Northwestern States, they all try to avoid a northern exposure. Our country is somewhat differently situated, especially that portion lying west of the Ouachita and between the mountain ranges south of the Arkansas. It may be well to dwell on this a little. This section of country, and also that north of the Arkansas river for a considerable distance, is the only part of the United States protected against violent winds. The mountains which shield it range east and west. The Blue Ridge, Allegheny, and Cumberland Mountains run in a north and south direction, and, except in sheltered nooks protected by spurs, the winds rush down on each side of them from Labrador and Hudson's Bay. The same is the case with the northern portion of Missouri, with Ohio, Illinois, and Indiana, and on down the Mississippi and the Southern States east of the river. These north winds are very sudden and destructive, bringing, in twenty-four hours, the climate of the frigid zone—throwing against vegetation the identical air that was but yesterday on an iceberg. This influence is greatly modified with us. These hills, to our north, perform the same office which the Alps do to Italy. This, as to climate, is the Italy of the United States."

Sudden changes in the climate are less frequent than in the Eastern and Western States. All evidence demonstrates that there is not, on this continent, any locality superior to this region

for the equable character of its climate and its freedom from sudden changes and violent winds.

In this connection it should be said that Arkansas, and especially this central region, has a deservedly high reputation for the relief of pulmonary diseases. It strongly resembles that of Mentone and Pau in the south of France. The tables of vital statistics of the census of 1870 showed that no part of the United States was so favorable for consumptives as this, and partly no doubt for the reason which Chancellor Eakin has stated. The air, though mild and not subject to sudden charges, is not sufficiently hot to be relaxing, and respiration is not so difficult as in the thinner air of the elevated plateaux of Colorado and New Mexico. The difference may be stated in another way: the invalid who goes to Colorado may recover his health partly or wholly, but he must stay there. If he attempts to return East after one or two years the disease returns and speedily proves fatal. In Arkansas, on the contrary, the process of cure is radical, and the invalid, after one or two years, may return to the East without fear of the recurrence of the disease.

Minerals and Mineral and Hot Springs.—Arkansas has a great variety of mineral deposits, most of them of excellent quality and apparently of unlimited abundance. First in economic importance are its immense beds of coal. The Arkansas coal-fields have an estimated area of 12,000 square miles, wholly, so far as known at present, in the valley of the Arkansas river, though the carboniferous basin may prove to extend southward beyond that valley. The Arkansas river runs for more than 150 miles through this coal formation. The counties of Washington, Crawford, Sebastian, Franklin, Scott, Logan, Johnson, Yell, Pope, Perry, Conway, White, and Pulaski, are almost entirely situated in this coal basin. The veins vary from one to nine feet in thickness, though most of those which have been worked are from four to nine feet thick. It is found at from six to fifty feet below the surface. The coal is similar in structure and appearance to the Cumberland coal of Maryland, and analysis, as well as use, demonstrates its practical identity in quality with that well-known coal. It proves to be an excellent steam-

producing and manufacturing coal, and commands a high price for both purposes. Mines have been opened and are now in successful operation near Russellville and Ouita in Pope county, at Spadia, and at Horsehead, in Johnson county, and at several points in Sebastian and other counties. The coal has been used freely in Little Rock, St. Louis, Memphis, and New Orleans, and wherever tested it sells readily at a higher price than any other coal in the market. Inexhaustible deposits of hæmatite and other iron ores are found in close proximity to these coal-beds, and limestone of the best kinds for fluxing purposes and heavy forests of hard wood for charcoal are close by. Large and never-failing water-powers are contiguous to these coal and iron deposits. In the present demand for iron and steel, Arkansas offers extraordinary facilities for its successful manufacture.

Several zinc mines have been opened in the northern part of the State, principally in Lawrence and Sharp counties—which are as rich in every respect as any in the Union. Lead and silver are abundant, and several mines are now being profitably worked. Notable among these are the Kellogg mine, eleven miles north of Little Rock, two mines in Sevier, one in Montgomery, another in Boone, and perhaps others. These mines are sufficiently rich in silver (argentiferous galena ores, yielding about fifty ounces of silver to the ton) to leave the lead as a clear profit, after paying all expenses of mining, smelting, etc.

There are extensive caves of nitre and nitrous earth in Newton and other northern counties of the State, from which large quantities of powder were manufactured and used by the Confederates during the recent war.

There are also numerous salt springs—some of which are being profitably worked, notably one near Arkadelphia, which supplied salt for the entire army of Arkansas during its occupation by the Confederates in 1862–3.

Valuable mines of copper have been discovered in Montgomery and other counties, though no efforts have been made to work them.

The manganese deposits are of considerable extent and richness.

The novaculite or whetstone quarries near Hot Springs furnish a rock which has gained almost a world-wide fame, and its supply is inexhaustible.

Marble of superior quality and in exhaustless quantities has been discovered in Boone and Newton counties, a block of which has been placed in the Washington Monument.

Gypsum, kaolin, slate, limestone, granite, marl, chrome and other minerals for use as mineral paints, are among the economic minerals found in large quantities in the State, but few of them are as yet mined or quarried to any great extent.

Dr. Lawrence, of Hot Springs, contributed to the Centennial Exposition a collection of minerals, mostly from Magnet Cave, Hot Springs county, among which were manganite, or black oxide of manganese; melanite, or crystallized black garnets; green, yellow and black mica; crystallized schorlamites; quartz crystallized; crystals of Perofskite, hornblende, elæolite, epidote, strontianite, Shepardite, Lydian stone or touchstone, agate, hydrotitanite, titanic iron, sulphur from iron pyrites, talc, rutite, isolated and in quartz; rose, smoky and milky quartz, chert, burrstone; the hornblendes, novaculite, quartzite, syenite and granite.

The Hot Springs of Arkansas are situated in Hot Springs county, about sixty miles southwest from Little Rock. A narrow gauge railroad, twenty-five miles in length, now conveys passengers directly to the springs from Malvern Junction, on the St. Louis, Iron Mountain and Southern Railway. The springs, now sixty-six in number, are in a wild, mountainous region, issuing from the western slope of a spur of the Ozark range, at an elevation of about 1,400 feet above the sea-level, and range in temperature from 93° to 150° Fahr. They discharge over 500,000 gallons of water daily, sufficient in quantity to accommodate, with delightful bathing, 10,000 bathers every day in the year. These natural earth-heated waters hold in solution valuable mineral constituents. Clear, tasteless, inodorous, they pour forth from the novaculite ridge as pure and sparkling as the pellucid Neva. The various springs are qualitatively allied, not holding in solution or freighted with too many mineral constituents, and they are free from all noxious gases. It is believed that the proper-

ties of the waters, especially in the treatment of chronic diseases, and particularly chronic rheumatism, scrofula, etc., are unequalled. There are no springs known of superior value, or that can compare with the Hot Springs of Arkansas, as adjuncts in the treatment of that class of chronic diseases. The advantages of the climate throughout the entire year, the pure, rarefied mountain air, the delightful waters, all make these springs one of the most delightful resorts for invalids in the United States.

Within from seven to twelve miles of Hot Springs are other springs, sulphurous and chalybeate, but not hot, to which many of the physicians order their patients after two or three courses of the Hot Springs treatment, and the change greatly facilitates their recovery. The Hot Springs waters are not only used for bathing and for hot vapor baths, but the water is drank in large quantities, as hot as it can be borne, and with great benefit. There are about 6,000 inhabitants in Hot Springs City, and it is said that 10,000 or more invalids annually avail themselves of its baths and healing medicinal waters.

Numerous analyses of the waters, which vary but slightly in their contents, though materially in their temperature, show that among the solid constituents of a gallon of the water are found the following:

Silicates with base,	Alumina with Oxide of Iron,
Bicarbonate of Lime,	Oxide of Manganese,
Bicarbonate of Magnesia,	Sulphate of Lime,?
Carbonate of Soda,	*Arseniate of Lime,?
Carbonate of Potassa,	*Arseniate of Iron,?
Carbonate of Lithia,	*Bromine,
Sulphate of Magnesia,	Iodine, a trace,
Chloride of Magnesia,	Organic matter, a trace.

The city of Hot Springs is in a deep ravine, and the springs issue from the slopes of the mountains on either side—those on one side being of much higher temperature than those on the other. The city consists of one very long and not very

* These salts and elements were in very minute quantity in any of the waters, and were not found at all in some of those examined.

wide street, with short streets running up the hills on either side. It has almost as many hotels, boarding-houses, hospitals and private dwellings, and quite as many physicians of all sorts, as there are patients. The hills in the vicinity are occupied very largely by small farmers of the class known in the South as "poor whites," who cultivate a little corn, a few potatoes, and keep a few swine, and a considerable number of fowls, and who in their indolent and rude way, succeed in eking out a bare subsistence. The whole region containing the springs has long been in litigation, and within one or two years has been decided to be the property of the United States. Provision has been made, in a rough way, to extend the benefits of the springs to the very poor without compensation, and many of these are now availing themselves of this privilege.

Vegetation.—The area of woodland in Arkansas in 1877, was 16,815,037 acres, just about one-half of its entire surface. The rapid progress of railroads in the State and adjacent States and the demands for shipment, lumber and manufactures may have slightly decreased this amount within the past three years, but Arkansas still possesses a larger proportion of timber lands than any other State or Territory of "Our Western Empire." And a very large proportion of her timber is of the very best quality, much of it the best of the hard woods, and pines of gigantic growth. At the Centennial Exposition in Philadelphia, fifty species of forest trees were exhibited (and these did not nearly exhaust the entire number found in her forests); these included thirteen species of oak, varying in diameter from twenty-one to fifty inches; two species of pine, thirty-six inches through; black walnuts, forty-two inches in diameter; hickory of three species, thirty-five to thirty-nine inches through; a cottonwood, eighty-four inches, and sycamores, sixty inches; red elm, sixty-three inches; maple, two species, the sugar and the curled, twenty-six inches; three species of gum trees, the tupelo, black and sweet gum, from twenty-nine to thirty-nine inches in diameter; cypress, forty-eight inches; yellow poplar, forty-five inches; American elm, forty-six inches; white ash, forty-two inches; Bois d'Arc (Osage orange), twenty-two inches; blue ash, twenty-three inches;

red cedar or juniper, sixteen inches; beech, thirty inches; persimmon, twenty-four inches; sassafras, twenty-eight inches; honey locust, twenty inches, and wild cherry, nineteen inches. The supply of pine, cypress and oak is almost inexhaustible. The pines south of the Arkansas river grow to the height of 150 feet and more, and are from six to seven feet through.

At the same exposition thirty-five species of pasture grasses, many of them new and native to Arkansas, were exhibited, all of them yielding largely and much sought after by cattle. The Alfalfa and four kinds of millet were also exhibited, yielding from four to eight tons of dried forage to the acre.

All the fruits are sure of luxuriant growth, including as well the different kinds grown in the Northern States as those which nearly approach the tropics. Apples, peaches,* pears, plums, quinces, cherries, apricots, figs,† grapes, strawberries, and other small fruits, grow luxuriantly in all parts of the State, and are noted for their size and flavor. In this climate fruit trees and the vine produce abundantly, and ripen their fruit in the greatest perfection; and, though it may seem incredible to northern fruit-growers, yet we are credibly assured that the fruit crop of Arkansas has not been a failure but once in thirty years.

Chancellor Eakin, in his little work on the culture of the grape, says:

"This is the best region for wild grapes in America. What we mean to assert is, that the region between the Mississippi and the Staked Plains, and between the Missouri river and the swamp lands of the Gulf, produce more and larger and better wild grapes than any other portion of the known world. This is deliberately said, after much reading, inquiry, travel and extensive observation."

The growing of grapes for wine is largely practised in the State, as well as the culture of the other small fruits for northern

* The apples of Washington and Benton counties, and of the southwestern counties generally, are noted for their fine flavor and are in demand in St. Louis and Memphis. The peach seems specially at home in this State. The fruit is large and of excellent flavor, and grows with very little care. Peaches here ripen full four weeks earlier than in the vicinity of St. Louis.

† Figs grow as finely here as in Louisiana, and nothing better can be said of that delicious fruit.

markets. All kinds of fruit and vegetables mature and are ready for market from three to four weeks earlier than in the latitude of St. Louis; and hence the culture of small fruits, and of market garden vegetables, is as profitable a business as a settler can prosecute, the transportation by river or railroad being speedy and cheap.

Wild Animals.—Of beasts of prey, there are some black and brown bears, though a much smaller number than its extensive forests would justify, rarely cougars and other wild felines. The jaguar may sometimes stray up from his Texan haunts, but we cannot learn of any hunters who have discovered him on the soil of Arkansas. There are also occasionally wolves, foxes, raccoons, opossums, and perhaps the Texan coyotes. Peccaries and wild hogs are sometimes found. The buffalo prefers the plains, and the wooded mountainous regions of Western Arkansas have no charms for him, but there are deer of two species; rarely the elk, but not except by accident the antelope or the bighorn. Rabbits or hares, squirrels of several species and the gopher, are the principal rodents.

Birds of prey are moderately abundant, but mostly of the eagle and vulture and hawk tribes. Of game birds there are wild turkeys, ducks, partridges, pinnated grouse or prairie hens, quail, etc. Of the birds of the State, there were exhibited at the Centennial the bald eagle and the royal eagle, as well as the following:

Wild duck, crow, house-wren, blue bird, bobolink, sapsucker, red-headed woodpecker, blue jay, kingfisher, paroquet, flicker, bird hawk, robin, meadow lark, mocking bird, red bird, mammoth woodpecker, cock of the woods and the snake-killer or water turkey.

The rivers, lakes and bayous are well stocked with fish, among which are pickerel, black bass, buffalo-fish, cat-fish and shad, while the mountain streams have an abundance of perch, roach and trout. In the bayous, lakes and in the Red, Ouachita and Arkansas rivers the alligator sometimes makes his appearance, though he is less common than in Louisiana or Texas.

The copperhead, the milk adder and other reptiles, venomous

and harmless, are plentiful in the lowlands, and the rattlesnake and moccasin snake are found in the hills.

The insect tribes in Arkansas are exceedingly numerous in the lowlands, and well deserve the name of pests. The mosquito of this region is renowned for his size, vigor and venom, and the most fabulous stories are related of his strength and audacity. In the hills, however, this insect is less troublesome. The bot-fly, the tick, the chigoe and the guinea-worm are very annoying to man and beast. The cotton worm, the army worm and several flies are destructive of vegetation. Some of the pests found a little farther north, such as the Colorado beetle and the Rocky Mountain locust, have not visited Arkansas in any considerable numbers.

Archæology.—There are no ruins of ancient cities or towns, indicative of its having been, in the remote past, the home of a semi-civilized race, in Arkansas. Neither the Aztec nor the Toltec race seem to have penetrated so far to the East. When De Soto visited what is now Eastern Arkansas in 1541, the Natchez, a tribe now extinct, were in possession there, and 140 years later de La Salle found them in possession, while the Quapaws were in the northeast, and the Osages in the western part of the State. Of one or other of these tribes, mounds and relics have been found in Hot Springs, Garland, Montgomery and Phillips counties. Some of these were exhibited at the Centennial, and consisted of vases, water carriers, bowls, mortars, pestles, rollers, discoidal stones, scrapers, skin dressers and polishers, axes, hatchets, lances, darts, pipes, beads, amulets, ponays or Indian money, hand hammers, sling balls, balls for games, plough points, knives and drills.

Productions.—Until returns are had from the tenth census of mineral products, we cannot estimate the mineral productions of Arkansas. There is a moderate but constantly increasing quantity of her excellent semi-anthracite coal mined each year, and many thousand bushels of the lignite in the southeastern part of the State are also furnished to the Mississippi steamers. There are large quarries of novaculite, the Arkansas hone or oil-stone, in Hot Springs and Grant counties; of brimstone in

the Ozark Mountains; of slate of excellent quality in Pulaski, Polk, Pike, and Sevier counties; and of pink and gray marbles in Madison and other counties. Of agricultural products, the latest full returns (and even these are partly estimated) are for the year 1875. They are as follows:

Articles.	Amount of Crop.	Average Yield Per Acre.	Market Value.
Cotton, pounds	442,258,400	356	$55,282,300
Corn, bushels	33,601,200	27½	11,760,420
Wheat, "	3,598,200	14	3,797,146
Oats, "	4,328,800	26	2,380,840
Rye, "	522,500	17½	391,875
Irish potatoes, bus.	2,778,600	105	3,820,775
Sweet " "	6,693,000	139	9,202,875
Hay, tons	76,242	1.86	1,524,840
		Total value of crops	$88,161,071

REMARKS.—There were, of course, a number of minor crops, such as sorghum, melons, squashes, cucumbers, market garden products, small fruits, grapes and wine, not included here, which would very probably bring the aggregate up to $100,000,000; but 1875 was a year of exceptional productiveness which has not on these crops been equalled before or since, and we are inclined to believe that $88,000,000 will cover the entire value of the average agricultural products. The Agricultural Department's estimate in 1878 was less than half that sum.

LIVE-STOCK IN JANUARY, 1879. (AGRICULTURAL DEPARTMENT ESTIMATE.)

Animals.	Number.	Value.
Horses	180,300	$7,347,225
Mules and asses	89,300	4,606,987*
Milch cows	187,700	2,490,779†
Oxen and other cattle	357,000	3,430,770
Sheep	293,500	437,315
Swine	1,123,500	2,696,400
	Total value	$20,999,476

* Probably an under-estimate.

† Probably an over-estimate. Cattle, horses, mules, and sheep thrive and keep fat the year through, without feeding, in the central and southern portions of the State, where, in addition to the native grasses, they feed and do remarkably well on small cane, which, in many locali-

Manufactures, in Arkansas, are yet in their infancy, but have made considerable progress since 1870, when there were only 1,364 manufacturing establishments, great and small, in the State, employing 4,452 hands of all ages, using $2,137,738 of capital and $4,823,651 in value of materials; paying $754,950 in wages and producing goods and wares of the value of $7,699,676. There were also home manufactures of the value of $807,573. Of the whole number of manufacturing establishments, 283 were cotton gins, 272 flour and meal mills, mostly small grist-mills, the average capital being only $1,750, and 212 saw-mills. There were two cotton and thirteen woollen manufactories. There are now numerous large flouring mills, and the Arkansas brand commands a high price in the St. Louis markets. The cotton and the woollen mills have greatly increased, and a new manufacture, that of oil from cotton seed, has been built up within the past seven or eight years. Arkansas has now the largest cotton seed oil mills in the world. There are also factories for wagons, tobacco and cigars, stoneware, brooms, doors, sash, blinds, leather, etc. The magnificent water-powers in the State and the cheapness of fuel for the production of steam, as well as the liberal encouragement given by the State to manufacturing and mining establishments in exempting them from taxation, the large product of cotton and wool, the extensive forests of hard woods, and the valuable deposits of iron, coal, and lime in close proximity, offer the best inducements for the development of manufactures on the largest scale.

Population.—The population of the State in 1870 was 484,471, an increase of only 49,021 over the population of 1860. Several causes had conspired to produce this result, among others the civil war, the emancipation and escape of many of the slaves, the

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ties, grows luxuriantly the entire year through, affording a nutritious range during the winter. Fat cattle from this State find a ready market at St. Louis and Memphis. Prairie and Lonoke counties do a considerable business in this line. They shipped last year several hundred carloads of cattle raised on the prairie. This business has been found, by those who have tried it, more profitable even than farming. Hogs can be raised here without cost. They fatten readily in the fall from the abundance of mast in the woods. Large numbers of hogs are driven to Little Rock, Memphis, and other markets during the fall and winter from the northwestern counties.

depression in business, and the hopelessness of the inhabitants in regard to their future. Since 1870, great changes have taken place in the State. The construction of railroads, the introduction of new branches of industry, the improvement in the means of education, a good market for all agricultural products, and the development of the resources of the State through the infusion of new blood by immigration has greatly promoted its growth, and the census of 1880 shows a population of the large number of 802,564, an increase of 318,093 from 1870. It is fair to say, however, that the accuracy of the enumeration is doubted in some quarters.

The change in the character of the population is also marked. In its early days, both as a Territory and a State, it had within its borders a great number of outlaws—ruffians, gamblers, highway robbers, murderers, horse-thieves and brigands. Human life was not safe, and crime was rife. Every man went armed, and the "soft notes of the pistol" were heard everywhere day and night; while a man was made an offender for a word, and was often shot down in sheer wantonness. The natural consequence of this state of things was that the better disposed part of the community were compelled to take the law into their own hands. Vigilance committees were appointed, and when the outlaws found their occupation gone, they retaliated by banding themselves together as "Regulators" and raiding the settlements. For some years a desperate warfare was waged between these outlaws and the rest of the community, and the services of Judge Lynch were often called for.

At length law and order triumphed; the outlaws were driven out, and peace and quiet were established. It was time. Business was paralyzed; and ignorance and brutishness prevailed. In this partial restoration to order, some attention was paid to education, and from 1850 to 1860 there was a rapid growth, the population doubling, and a decided advance being made in the social condition of the people. The number of slaves was very large, and some of the worst evils of slavery were rife there. With the commencement of the war, the old outlaw spirit revived, and for some years there was anarchy again. But the friends

of law and order were, after a time, in a majority, and they have succeeded in putting down ruffianism completely. The era of railroads was late in opening in Arkansas, but it helped materially in producing order, enterprise and development in the State. The people are now law-abiding and orderly; the carrying of fire-arms is prohibited, and the prohibition pretty well enforced. The people are industrious and desirous of improvement; strangers who come into the State to settle are cordially welcomed and protected; and all things being taken into account, the State is a desirable one for immigrants to settle in. Great efforts are now making to improve the system of public school and higher education, and an advance on this subject is perceptible.

If the emigrant from the busy States of the East or Europe find the citizens a little slow or apathetic, in regard to progress, it is to be attributed to the influence of their early history. There is a most commendable desire for improvement manifested, and if an intelligent class of emigrants come into the State and endeavor to promote its interests, the State will become in a few years one of the best in "Our Western Empire," in all the elements which conduce to a permanent prosperity.

Religious Denominations.—The Methodists are the leading religious denomination in the State, but are divided into the adherents of the "Methodist Episcopal Church, South," and those of the "Methodist Episcopal Church," as the northern body is called. The next denomination, and but little inferior in numbers, are the Baptists, with whom may also be numbered in this general estimate, the Christians, Disciples or Campbellites. After these come the Presbyterians, in several divisions, such as the Southern Presbyterian Church, the Cumberland Presbyterian, Presbyterian Church (north), etc.

There is a Roman Catholic diocese and a few churches, perhaps fifteen or twenty; an Episcopal diocese with about the same number; a few Lutherans, etc.

Education.—One of the best indications of progress in the State is the advance which it is making in education. In 1870 two-fifths of the population above ten years of age could not read or write, and of these 133,339 illiterates, 64,095 were whites

and 69,222 colored. There are still not over one-fifth of the school population (between the ages of six and twenty-one) in attendance upon the schools, but there are better and more efficient teachers, and the schools are held for a greater number of weeks in the year. The schools assisted by the Peabody fund are also improving, and those in the larger towns are up to the grade of similar schools in other States. The half dozen colleges in the State are doing well and advancing their requirements for admission. The Industrial University, at Fayetteville, is doing a good work, but there is great need of more thorough agricultural education. The farming is, much of it, slovenly, and calculated merely to skim the surface of the soil and thus render it barren, than to improve it. When on excellent cotton lands the average crop is but 273 pounds to the acre, but little more than half a bale; when the average wheat crop, in a good year, is but six bushels to the acre, of Indian corn but twenty-four bushels, of oats the same, and of potatoes but 121 bushels, the fault is not in the land but in the cultivator, and there should be some force somewhere to stir up such indolent and inefficient farmers.

There are a few men of force in the State, men who have the interests of the State at heart, and are ready to do all they can to promote its prosperity; among them we may name the present Governor, Hon. W. R. Miller; Hon. A. H. H. Garland, United States Senator; Hon. David Walker, Hon. Charles S. Keyser, Dr. G. W. Lawrence, late United States Centennial Commissioner, Hon. W. A. Webber, and others. These gentlemen may be too sanguine in regard to the rapidity of the future growth and prosperity of the State; but they are well versed in its history, and they have proved their faith by their works and the zeal with which they have labored for its interests. We should not do justice to the State, and to those who are so desirous of its growth and prosperity, if we neglected to state the special advantages which are offered by the State government to immigrants. The exemption laws of the State are singularly favorable to the settler.

The homestead law of the State is more liberal than that of any other State in the Union; the homestead of any married

man or head of a family, to the value of $2,500, or 160 acres of land outside of a city or village, and the homestead in any city or village, not over one acre of land and improvements of that value, and one-quarter of an acre and improvements, without regard to value, are exempted from execution. The benefits of this exemption, should the head of the family be removed by death, inure to his widow while she remains unmarried; also to his children during their minority. In addition to his wearing apparel, the personal property of any resident citizen of the State, to the value of $500, to be selected by such resident, is exempted from sale or execution, or other final process of any court issued for the collection of any debt. No taxation for State purposes is allowed beyond one per cent.

All capital invested in the manufacture of cotton and woollen goods and yarns, agricultural implements and machinery, in tanneries, in the manufacture of cotton-seed oil, in mining and in smelting furnaces, shall be exempt from taxation for a period of seven years from and after the thirtieth day of October, 1874, the date of the ratification of said Constitution: provided, that the capital invested in such manufacturing establishments shall exceed $2,000; and, provided further, that no person, corporation or company having, prior to the passage of this act, invested capital in any such manufacturing establishment in this State shall be entitled to the exemption herein provided for, unless the capital stock so invested shall be increased twenty-five per centum of its value as determined by the last annual assessment.

The United States lands in the State exceed in quantity 7,500,000 acres, all of which are for sale at $1.25 and $2.50 per acre. Some of these lands are excellent, and some not so good. The homestead law of the United States applies to them.

The State has also about 3,000,000 acres of land subject to entry and sale, besides nearly 1,000,000 acres of swamp lands, not yet approved to the State by the General Government, and about 681,000 acres of forfeited lands for non-payment of taxes. Of these the internal improvement, seminary, saline, and swamp lands, amounting to about 70,000 acres, are for sale at from $2 to $3 per acre, and small fees. The school lands, of which there

are over 1,000,000 acres, are for sale at $1.25 to $2 per acre, and the forfeited and unconfirmed swamp lands, about 1,600,000 acres, are for sale at fifty cents per acre and fees, or are donated to the settler in quantities of 160 acres on proof of residence and cultivation and improvement of five acres, and the fees, which are about six dollars.

The railways in the State have lands to the amount of about 2,600,000 acres for sale on several years' time at $2.50 per acre.

With these facilities for purchase and settlement, the lands of Arkansas offer to the immigrant homes which are within the reach of all. The land may not all of it be of the highest quality, though there is much excellent land there, but there is none of it from which an industrious man cannot make a comfortable living.

CHAPTER III.

CALIFORNIA.

ITS SITUATION—TOPOGRAPHY—MOUNTAINS, VALLEYS, LAKES, RIVERS, HARBORS, ISLANDS—GEOLOGY AND MINERALOGY—SOILS AND VEGETATION—ZOOLOGY—WONDERS—PROF. E. W. HILGARD ON CLIMATES OF THE STATE—AGRICULTURAL PRODUCTS—MANUFACTURES, MINES AND MINING INDUSTRY—RAILROADS—STEAMERS—ITS COMMERCE AND NAVIGATION, IMPORTS AND EXPORTS, BANKS, ETC.—CALIFORNIA AS A HEALTH RESORT—POPULATION, HOW CLASSIFIED—EDUCATION—CHURCHES—COUNTIES AND PRINCIPAL TOWNS—ITS HISTORY AND PROBABLE FUTURE.

CALIFORNIA is one of the largest States of "Our Western Empire," and stretches for 700 miles along the Pacific coast. It is between the parallels of 32° 28′ and 42° north latitude, and between the meridians of 114° 30′ and 124° 45′ of west longitude from Greenwich. It formed a part of the territory ceded by Mexico to the United States at the close of the Mexican war, and is bounded north by Oregon, east by Nevada and Arizona, south by Lower California, and west by the Pacific Ocean. The Pacific coast of California trends southward from the Oregon line

to Cape Mendocino in latitude 40°, and thence in a nearly south-easterly direction to the coast of Lower California. The area of the State is 188,981 square miles, or 120,947,840 acres, or about the combined areas of New York, New Jersey, Pennsylvania, Ohio and Michigan. Its length is 700 statute miles, and its average breadth more than 200 miles.

Topography.—The mountain systems of California are vast in extent, diversified in character, rich in mineral wealth, and unsurpassed in beauty and grandeur of scenery. They may be considered under two great divisions: the Sierra Nevada or Snowy Mountains, on the eastern border, stretching with its spurs over a breadth of about seventy miles in a series of ranges; and the Coast Range, which, in its several chains, includes about forty miles in breadth, extends near the coast the whole length of the State and into Lower California. These two ranges unite near Fort Tejon in latitude 35° and again in latitude 40° 35′, and separating again form the extensive and fertile valleys of the San Joaquin and Sacramento. The two lines of ranges of the Sierra Nevada may be traced in regular order for a distance of nearly seven degrees by their two lines of culminating crests, which rise in varying heights from 10,000 to 15,000 feet above the sea. There does not seem to be as much order in the position and direction of the summits of the Coast Range, peaks of widely varying heights and entirely different mineral constitution being found in close proximity. The summits of the Coast Range vary in altitude from 1,500 to 8,000 feet. The highest peaks of the Sierra Nevada are Mount Shasta, Lassens Butte, Spanish Peak, Pyramid Peak, Mounts Dana, Lyell, Brewer, Tyndal, Whitney, and several others of less note. Those of the Coast Range, though richer in minerals, are less lofty and less noted.

On the eastern side of the crest line of the Sierra Nevada are a chain of lakes, including the Klamath lakes, Pyramid, Mono and Owen lakes, lying wholly east of the range, and Lake Tahoe, a gem of the purest crystal water, far up in the mountains, occupying a depression between two summits. The depression, in which most of these lakes are situated, continues southward

to the entrance of the Gila river into the Colorado. For a considerable distance northward from the southern limit of the State it is many feet below the ocean level, and geological investigations show that it was once the bed of a large lake or estuary communicating with the ocean by a somewhat narrow strait. It has recently been proposed to reopen this strait as a ship canal, which could be done at a very moderate expense, and thus restore this ancient land-locked sea, to modify the climate, and remove the drought from a region once populous, but now excessively arid.

A similar depression, though not quite so extensive, exists on the western slope of these mountains for a width of about fifty miles, and contains several lakes.

The region lying east of the Sierra Nevada is called the eastern slope; that between the foot-hills of the Sierras and the Coast Range is known as the California Valley, and that west of the Coast Range is called the Coast Valley, or simply the Coast. Another geographical division is made by drawing an east and west line across the State in the latitude of Fort Tejon, that part of the State lying south of this line being called Southern California. The country between this line and one extending east and west through Trinity, Humboldt, Tehama and Plumas counties is called Central California; all north of this is known as Northern California. Central California contains about three-fourths of the known wealth and population of the State.

The Monte Diablo division of the Coast Range, about 150 miles long by 50 miles wide, is a striking landmark of the State when approached by sea, and from its summit may be obtained the finest views of the varied scenery and landscapes of California which can be found anywhere.

The valleys of the Sacramento and the St. Joaquin, though the largest, are by no means the only valleys of California. There are hundreds of them of greater or less extent, and many of them remarkable for fertility and beauty. East of the Sierras, in Southern California, some of these valleys, the deepest portions of a former extensive inland sea, are now salt lakes and

are surrounded by most forbidding and unpleasant scenery. In Mono, Fresno and Kern, Inyo and San Bernardino counties there are several of these salt lakes, and in the last-named county, among the other evidences of volcanic action, is that combination of horrors known as the sink of the Amargoza river or "Death Valley." It is 150 feet and probably more below the level of the sea, intensely hot, dry, and sulphurous.

California is, for the most part, well watered, but the Coast Range limits the length of its navigable rivers except in two or three instances. The Rio Salinas is the only navigable river on the coast which discharges directly into the Pacific below Cape Mendocino, but the Sacramento river from the north and the San Joaquin from the south, large and navigable rivers, both discharge into the beautiful Bay of San Francisco. The Klamath river at the north, rising in the Klamath lake, flows through a crooked valley to the ocean, but is not navigable for any considerable distance. This is also true of the other rivers north of the Golden Gate. Most of the rivers east of the Sierras, in the long, depressed basin already described, discharge into lakes in the basin, and have no connection, direct or indirect, with the ocean.

The harbor of San Francisco is the finest on the whole Pacific coast, fifty miles in length by nine in width, landlocked and approached by the Golden Gate, five miles in length with a width of one mile, and having nowhere less than thirty feet of water. That of San Diego, at the southern extremity of the State, is next in importance, and, with its railway connections soon to be completed, will prove a formidable rival to that of San Francisco. The other harbors, ten or twelve in number, are either shallow or not well protected from violent winds, and need breakwaters or other improvements. There are many islands along the coast, some of them small and rocky, like the Farallones off the Golden Gate, and inhabited only by seals, sea-lions, and aquatic birds; others are large and adapted to grazing or cultivation.

The amount of arable lands in California, including those which only require irrigation to make them productive, and are so situated that they can be irrigated, and the swamp or *tulé*

CHINATOWN.

SAN FRANCISCO BAY AND HARBOR.

CHINESE FISHERMAN.

lands which, when reclaimed and protected from overflow, yield the largest crops in the world, is estimated at not less than 60,000,000 acres, or about one-half the area of the State; the grazing lands on the mountain slopes and on the sides of the valleys are estimated at 40,000,000 acres more, and the forest areas, much of them too steep for cultivation, were officially stated at 9,604,607 acres in 1872, but have been considerably diminished since that time. There are then somewhat more than 10,000,000 acres which, from one cause or other—some being under water, some volcanic and barren, or arid and not irrigable, or bald and bare mountain peaks—are worthless. This is, however, but one-twelfth of the area of the State.

Geology and Mineralogy.—The Coast Range and its foot-hills generally belong to the tertiary system, but at San Pedro bay (about latitude 34°) the cretaceous rocks come to the coast, to be replaced at the mouth of the Margarita river (about 33° 10′) by quaternary or recent alluvial deposits which extend to the southern line of the State. It is these alluvial deposits which General Frémont believes have filled up the ancient strait or estuary which led to the now dry and desert site of the inland sea, which formerly occupied a large part of Southeastern California, and which he urges our government to re-open and thus render an extensive portion of Western Arizona and Southeastern California again habitable.

At two points of the Coast Range, viz.: at the Monte Diablo mines, in Contra Costa county, nearly east of San Francisco, and in Mendocino county (about latitude 39° 30′), the tertiary coal or lignite crops out in extensive beds. The first of these has been worked for many years, and produces a fair burning coal, of which about 150,000 tons are annually sent to market.

The valleys lying between the Coast Range and the Sierras belong mostly to the cretaceous formation, though in the extreme south they are overlaid by alluvial sands. There is very little gold in these valleys except in placers which have been washed down from the mountains, though occasionally pockets, and possibly true veins, have been found in metamorphic rocks belonging as high up in the series as the cretaceous. This may be due to volcanic action in ages long past.

The greater part of the auriferous and argentiferous rocks of the State belongs to the triassic and Jurassic strata, which form the surface rocks of the Sierra Nevada from the Columbia river nearly to the head of the Gulf of California. It is in these triassic and Jurassic strata that most of the gold and silver deposits from the Rocky Mountains to the Pacific occur. South and west of the sierras, and in the vicinity of the upper waters of Kern river and its tributaries, is an extensive volcanic region, where basaltic and porphyritic rocks, sulphurous and chalybeate springs, deposits of sulphur and large tracts of lava and lava ashes are found. A somewhat similar though much smaller tract exists in Sonoma county, between two spurs of the Coast Range. There are geysers here, and other indications of former volcanic action. Much of the region east of the sierras is of recent formations, though modified by former volcanic action, and is forbidding to the last degree. The lakes or sinks, often very deep, are always salt and bitter, and often without water most of the year. The beds of the lakes are covered with alkaline deposits. The famous Death Valley, the Dry Lakes, of which there are at least a dozen, Dry Salt Lake, Owen's Lake and other sinks of this region give striking evidence of its former volcanic character, and of the great changes which have taken place, some of them within modern times in this part of the State. The earthquakes of 1871 were most violent in this section, especially in Kern, Inyo, and San Bernardino counties.

Mineralogy.—Gold is found pure, in scales, fine dust, in nuggets and in crystals, and in combination with copper, silver, lead, zinc, cinnabar, arsenic, iron, sulphur, tellurium, iridosmine, etc. Silver is found native, though very rarely, as a chloride (horn-silver), in combination with lead as argentiferous galena, sulphurets and carbonates of silver and lead, with copper as copper glance, red silver ore, etc., and with several of the rarer metals as well as with sulphur, iron, etc. Copper exists in the form of native copper, and as malachite, copper glance, rubescite, azurite, chalcopyrite and chrysocolla, in combination with sulphur, etc. Mercury or quicksilver appears as cinnabar very abundantly throughout the Coast Range, as coccinite in Santa Barbara,

and native in the Pioneer claim and elsewhere. There are now about sixty mines of quicksilver in the State, and the supply increases with the ever increasing demand.

Platinum has only been found in California in placers, though its occurrence in veins with gold or silver is not improbable. Tin is found as cassiterite or binoxide of tin in the Temiscal range about sixty miles from Los Angeles, and in grains elsewhere. Lead is abundant as galena all over the State, and in many cases carries a considerable percentage of silver. The molybdate of lead (Wulfenite) occurs in one or two localities. Arsenic occurs pure in Monterey county, and as arsenilite in one or two counties, and is extracted as white oxide in smelting several ores. Iron exists in various forms, as chromic iron, as hæmatite, as magnetic and specular ores, and as oxide or bog iron ore in several localities. Tellurium occurs native and in combination with gold and silver and copper, and forms one of the most refractory of ores. Diamonds (so called) are found in several localities, but are not probably the genuine article, though they possess many of the properties of the diamond. Graphite occurs in Tuolumne county and elsewhere; borax and boracic acid in one or more lakes and in the marshes adjacent; salt as rock-salt, as brine, and evaporated from the sea water and from the numerous salt lakes; soda, both as caustic soda in deposits of a hundred feet or more in thickness and of great extent, and as carbonate of soda around some of the alkaline lakes, and in the volcanic valleys; sulphur, pure, and in sulphurets and sulphates; gypsum, barytes, antimony, ochre, alabaster, fluorspar, corundum, and cobalt in the form of erythrine, abound in various parts of the State. Magnesite, iridosmine, magnetite, limonite, tourmaline, pyrolusite (binoxide of manganese), zircon, garnets, chrysolite and haysine are the other principal minerals. Coal, as already stated, occurs in several localities. Petroleum and bitumen are found in several of the coast counties, and the former, after many mishaps and failures, has become one of the standard products of the State, and is now supplying a considerable part of the local demand.

Mines and Mining.—California is one of the great mining

States. Her production of the precious metals has been larger than that of any other State or Territory, though Nevada has approached it, and amid all changes, and with the exhaustion of the ordinary placer-mining, the State has still maintained a very large yield, and is likely to increase rather than diminish it. Gold or silver or both have been discovered in paying quantities in eighteen counties of the State and possibly more. Of these counties all (except Humboldt, Klamath and Del Norte, which have deposits only in the shore and beach sands, being all coast counties, and Los Angeles, in which silver mines have recently been discovered) are situated along the eastern or western slopes of the Sierra Nevada; some of them extending also across the valley to the eastern foot-hills of the Coast Range. These counties, with the character of their product and the processes used in obtaining it, are as follows, beginning with the southernmost: 1. *Inyo*—silver mines in veins or lodes, mostly in Owen's valley and on the western slope of the Inyo or Buena Vista Mountains, one of the parallel ranges of the Sierra Nevada, from twelve to thirty miles southeast of the head of Owen's Lake. There are 700 or 800 claims here, and many of them are worked successfully.

2. *Mariposa county*, lying on the western slope of the main range of the Sierras, and having the famous valley of the Yosemite within its borders. The mines are mostly in the west and southwest part of the county, and the greater part of them, on the Mariposa estate, were once the property of General Frémont. Besides these there are the Oaks and Reese mines, which are largely productive. These are gold only, and in quartz veins.

3. *Tuolumne county*, lying immediately north of Mariposa on the western slope and foot-hills of the Sierra. The mines, mostly gold, though there are a few silver, and all in veins or lodes, are in the west and southwest portion of the county. There are somewhat more than fifty mines.

4. *Calaveras county*, situated northwest of Tuolumne, but on the same range. The mines are scattered throughout the county. There are many gold mines in quartz veins, and extensive placers (of gold), but they are very nearly exhausted.

5. *Amador county*, immediately north of Calaveras, a small county, but rich in gold deposits. It has twelve or fifteen mines, mostly in the western part of the county, gold in quartz veins, and yielding well.

6. *Eldorado county*, the county in which gold was first discovered. This county is partly in the Sacramento valley, and is drained by one of the affluents of the Sacramento river. The mines (gold in quartz veins), which have always been productive, though the placers have long since given out, are situated mostly in the western part of the county. There are a dozen or more large stamp mills and a greater number of mines.

7. *Placer county*, north and northwest of Eldorado. Lake Tahoe is mostly in this county, and the Central Pacific Railway traverses the entire length of the county from southwest to northeast. There are many placers and large deposits in the former beds of what are known as "dead rivers," which are being worked by the process of hydraulic mining. There are also some quartz veins which yield liberally. The product is gold exclusively. There are about forty mines and placers now worked.

8. *Nevada county*, north of Placer county, is probably the richest of all the counties of California in mineral wealth. Its gold mines and placers, many of them very rich, are scattered all over the county. Its placer gold is nearer to absolute purity than that of any other mines or placers in the State. Of the 130 placers recorded, the gold product in most ranged from 900 to 976 (absolutely pure gold being 1,000), and the "You Bet" claim gold assayed 994. The gold from the thirty-seven quartz veins of the county did not assay quite so high, but ranged from 798 to 875.

9. *Sierra county*, north of Nevada county, is noted for its hydraulic mining. Through this county, on a ridge one or two hundred feet above the adjacent lands, is the ancient bed of a river, which the miners know as the Big Blue Lead, whose sands, for a depth of five or six feet or more, and for a distance of probably a hundred and ten miles, were rich with gold. It had been upheaved in the volcanic changes through which the Sierras

have passed, and wherever living streams cross its ancient bed with their deep cañons, they wash down rich masses of gold dust. The miners have been breaking down the blue gravel of this "dead river" bed by tunnels, blasting, and the hydraulic process, for the past twelve or thirteen years, and have reaped a rich harvest. In this county was found, in August, 1869, a nugget of gold weighing 95½ pounds, worth $21,156.52.

10. *Yuba county*, southwest of Sierra, is also a famous county for hydraulic mining, having five or six large deposits of gold.

11. *Butte county*, west of Yuba, has many quartz veins rich in gold. Seven or eight large mines are worked.

12. *Plumas county*, north of Sierra, has in the eastern and central portions of the county fifteen or twenty gold mines, some of them hydraulic, others quartz mines.

13. *Alpine county*, situated on the extreme eastern border of the State, on the crest of the Sierras, between latitude 38° 20′ and 38° 50′. The ores here are sulphurets and antimonial sulphurets; in all of them silver predominates, in some with a liberal percentage of gold, in others with considerable copper. The claims, which are very numerous, are all of them worked by opening adits or tunnels. This requires more capital at first, but is necessary in so mountainous a region. The mines, so far as developed, yield very well,—from $40 to $75 per ton of ore,—though there are difficulties in the reduction.

14. *Shasta county*, in the northern part of the State, the forty-first parallel passing through it, has deposits and quartz veins of gold and copper. The gold mines yield either free-milling gold or gold combined with sulphurets of copper, lead or zinc. The mines, eight or ten in number, which are worked, are in the western part of the county.

15. It has generally been supposed that the western slope of the Coast Range was barren of ores of the precious metals, but recent developments show that the silver-bearing ledges are found there as well as on the eastern slope of the same range, or on both slopes of the Sierra Nevada. Los Angeles county, in the southern part of the State, on the coast, has hitherto been regarded as the finest agricultural county in the State, but

recently there have been discovered extensive veins of silver there, and numerous mines are clustering around Silverado in the southern part of the county. The ore is argentiferous galena (sulphurets of silver and lead), and the assays range from $18 to $200 per ton.

The beach deposits of Del Norte, Klamath and Humboldt counties of gold in iron sands are not simply those found in the sands washed by the tides, and which are common to all coasts which have rivers discharging into a sea or ocean from gold-bearing mountains; these sands, though extending ten miles out from the coast, contain gold in such small quantities, as hardly to repay the labor of collection; but they occur in terraces or old beaches and bluffs, sometimes two or three miles back from high-water mark, and from 250 to 1,200 feet above the sea. In these bluffs or terraced beaches are extensive layers of iron sand, rich in gold, and varying in thickness from a few inches to three or four feet. The miners call this terrace-mining. Several of these strata have been discovered, one at five miles below Trinidad, in Klamath county, one at Crescent City, in Del Norte county, one in Humboldt county, and one at Randolph, Curry county, Oregon. These terraces indicate either an upheaval of the coast or a retrograding of the ocean.

The falling off in the production of silver in the Comstock lodes of Nevada has produced a reaction in favor of the gold placer and quartz mines of California, and there is at the present time (August, 1880) a greater activity in gold mining in California, than at any time for the last fifteen years. All the gold mines in the counties named above have been reopened, and are now actively worked with a greatly increased production; more than a hundred new quartz mills have been erected within the past year and a half, and are now actively at work, and many new mines and placers have been opened and developed in the counties which have previously yielded gold, while Trinity, Klamath, Fresno, San Bernardino, and Mendocino counties are added to the list of mining counties. It is confidently predicted that the gold yield of California, in 1880, will be much greater than in any year since 1866.

Soils and Vegetation.—"In a region of such vast extent," says Professor E. W. Hilgard, "traversed by mountain ranges formed of rocks of all kinds and ages, there is, of course, an endless variety of soils, to describe all of which would exceed our limits, even if the data were available. Unfortunately this is far from being the case, the geological survey" (of which Professor Hilgard was the chief) "having paid but little attention to the examination of soils, which, it is true, is a subject requiring special qualifications and care on the part of the observer to insure useful results. There are, however, some general features developed on a large scale in the more thickly settled parts of the State, a brief summary of which may find an appropriate place here."

"It is well known that the main axis of the Sierra Nevada is formed by granitic rocks, which in the northern portion of the range, as well as on the slopes, are usually overlaid by clay slates and shales, forming the proverbial 'bed-rock' of the gold-placers and gravel-beds. The soil derived either directly from the granites or from the older portion of the slates—in other words, the gold-bearing soil of the Sierra slope—is an orange-colored (commonly called 'red') loam, more or less clayey or sandy according to location, and greatly resembles, on the whole, the older portion of the 'yellow loam' subsoil of the Gulf States. Of course it contains much more of coarse materials in the shape of undecomposed rock, and its sand-grains are sharp instead of rounded. It is the predominant soil of 'the foot-hills,' and where ridges extend from these out into the Great Valley, they are usually characterized by the red tint, which gradually fades out as the ridges flatten into swales in their approach to the San Joaquin and Sacramento rivers, being lost in the gray or black of the 'adobe,' or the buff of the river-sediment soils. Its admixture is everywhere, I believe, found to be advantageous to the other soils; and in the foot-hills themselves it proves to be highly productive, as well as durable, easy of tillage, and what is termed a 'warm' soil. The rocks of the lower slope of the Sierra, but more especially those of the Coast Range opposite, are predominantly of a very clayey character, soft gray clay

shales and laminated clays alternating with ledges of soft clay sandstone and brittle hornstone. Their mechanical and chemical decomposition results, therefore, in the formation of gray, buff, or sometimes almost white clay soils, which occupy the hillsides and higher portions of the valleys, while in the lower portions the admixture of vegetable matter, especially in the presence of a comparatively large amount of lime, causes them to appear dark, and often coal-black. These soils constitute the 'adobe,' so often mentioned in connection with California agriculture. They are substantially the same, both as to tilling qualities and chemical composition, as the prairie soils of the Western and Southern States. Like these, they are rich in plant food, durable and strong, yielding the highest returns of field crops in favorable seasons and under good culture, but sensitive to extremes of wet or dry seasons, and of course more in cultivation, as well as more liable to crop failures, than lighter soils.

"During the dry season the adobe soil, unless it has been very deeply and thoroughly tilled, becomes conspicuous by the wide and deep gaping cracks which traverse it in all directions, sometimes to a depth of several feet, precisely as in the 'hog-wallow prairies' of the Southwestern States. Of course the effect of rains is here also similar in causing a bulging up of the masses between the cracks when the material which has fallen into the latter expands forcibly on wetting. Hence the 'hog-wallow' surface is as familiar in California as in Texas; and the fact that a traveller outside of the Sierras in the dry season is rarely out of sight of some such land is eloquent as to the wide prevalence of the 'adobe.' On the steep hillsides of the Coast Range the sun-cracks aid in giving foothold to stock; and during the rainy season the water running into them to the bed-rock causes numberless land-slides, such as gave rise to the memorable case of Hyde *vs.* Morgan. As it is well ascertained that at a former geological period the entire interior valley, as well as the Bay of San Francisco, was fresh-water lake basins, the bulk of the adobe soil would seem to represent ancient lake, or rather, perhaps, swamp deposits, which are therefore found in corresponding

positions in most of the connecting valleys. On the bay we find usually only a narrow strip of sandy soil running along the beach; inland of this a level belt of black adobe (or at times salt marsh), from which there is a gradual ascent toward the foot of the Coast Range, the soil becoming lighter colored and mingled with bowlders and rock fragments. The nature of the materials, as well as the form of portions of this slope, characterizes them almost inevitably as the result of glacial action.

"The peninsula on which San Francisco is situated is overrun with the dune sand drifted from the ocean beach for a distance of several miles south from the Golden Gate, so that the fixing of the sand and its conversion into soil is one of the chief problems of the gardens and parks of that city. The city of Oakland, also, is situated on a somewhat sandy, but nevertheless quite productive, soil; and land of a similar character, but stronger by admixture of the adobe, yet easily tilled, forms the soil of the fertile valleys in the plain lying between the eastern shore of the bay and the Coast Range, which are largely devoted to market-gardens and fruit-culture, and, farther from the cities, to that of barley. The comparative difficulty and more or less of uncertainty attendant upon the cultivation of the adobe soils, unless very thoroughly tilled, has caused a preference to be very commonly given to the lighter soils found nearer to the streams, which are formed of a mixture of the adobe with the river sediment, or, nearest the water-courses, of that sediment alone. It is suggestive of the character of the majority of California streams that the word 'bottom,' used east of the mountains to designate the well-defined flood-plain, is scarcely heard in the State, the more indefinite and general term 'valley' being in general use. The obvious reason is that there is in most cases no very definite terrace, but a rather gradual slope from the bank to the bordering hills. The Sacramento and San Joaquin have not, as a rule, raised their immediate banks perceptibly above the rest of the flood-plain, because the sediment they carry is not such as will subside at the slightest diminution of velocity, but is apt to be carried some distance inland. At the points of its upper course the San Joaquin, and in the lower

portions both it and the Sacramento, subdivide into numerous sloughs traversing wide belts of more or less marshy flats, subject to overflow, and covered with a rank growth of 'tule.' This name applies, strictly speaking, to the round rush (*Scirpus Lacustris*), which occupies predominantly the tide-water marshes, here as well as on the Gulf of Mexico. The farther from salt water, however, the more it is intermingled with (or locally almost replaced by) other aquatic grasses, sedges, and cat-tail flag (*Typha*), affording, together with the young 'tule,' excellent pasture nearly throughout the year. Here as elsewhere in such districts, the cattle soon acquire the art of keeping themselves from getting bogged, by maintaining a sort of paddling motion when on peaty ground, while draught-horses require to be provided with broad 'tule-shoes.' These tule lands, embracing a large number of rich and partly reclaimed islands, such as Union, Brannan, Sherman, and others, forming part of the counties of Sacramento, San Joaquin, and Solano, continue with varying width along the east shores of Suisun and San Pablo bays, and up the tributary valleys of Napa, Sonoma, and Petaluma, nearly to the limit of tide-water. It is noteworthy that, as regards salubrity, the tules, at least so far as they are within reach of brackish tide-water, are less liable to malarious fevers than the upper portions of the great valleys.

"The soil of the tule lands is of two principal kinds: sediment land, found chiefly along the Sacramento and other streams, carrying much 'slum' from the hydraulic mines; and peaty land, more prevalent along the San Joaquin and its branches. The latter kind consists almost entirely of tule roots, in various stages of freshness and decay, to a depth of from two to twenty and more feet; in the latter case we have the 'float land,' which rests on the water-table and rises and falls more or less with it. Like the 'Prairie Tremblante,' near New Orleans, it often trembles under the tread of man, but will nevertheless sustain herds of cattle without the least danger, its bulges forming places of refuge for them in time of high water. An excellent fuel has been made by pulping this mass and forming it into bricks like true peat.

"The tule lands were long thought to be worthless except for pasture purposes; but it has now come to be well understood that they are in large part of extraordinary fertility, and, if protected from overflow by levees, are almost sure to yield abundant crops every year, even in seasons when those of the uplands fail for want of moisture. In their reclamation the construction of levees is of course the first thing needful. The sediment land can then be taken into cultivation at once by the use of large sod-plows, resembling the prairie plows of the Western States. It is usual to burn off the rushes and native grasses previous to plowing, especially in the peaty lands where the plow would otherwise find no soil. But here the fire penetrates several feet down, either to the underlying soil or to moisture, leaving behind a layer of ashes so light that the plow is useless. At the proper season grain is then sown upon the ashes, and either brushed in or trodden in by sheep, and extraordinary grain-crops are thus produced during the first years, the duration of fertility depending, of course, upon the soil underlying after the ashes have been exhausted. The tule lands bordering upon Tulare lake are of a different character from those of the lower rivers. The soil is heavy, consisting of fine sediments mixed with gray clay and shell *débris*, contains a large supply of plant food, and with proper cultivation will doubtless prove as highly productive as are the soils of the Great Tulare plains themselves.

"The soils of the Mojave desert seem on the whole to be rather light, whitish silts, of whose possible productiveness little can as yet be said, except that without irrigation culture is hopeless. In striking contrast with these close soils of the San Joaquin valley are those which prevail south of the Sierras, San Fernando, and San Gabriel, in the Los Angeles plain and its tributary valleys, the home of the orange, lemon, and olive in their perfection. The fine rolling uplands ('mesas') of that region are generally covered with a brownish, gravelly loam, from eight to twenty feet in thickness, which, with tillage, assumes the most perfect tilth with ease. It is a generous, 'strong' soil, varying locally so as to adapt itself to every variety of crop, yet readily identifiable by its general character from Los Angeles to

San Diego. In most respects it may be considered a variety of the red soils of the Sierra slope already described, like which it appears to be pre-eminently adapted to fruit culture.

"The soils of the plain to seaward of Los Angeles, and of the coast plains south of Santa Barbara generally, so far as not modified by the sediments of the streams, seem to be uniformly characterized by a very large amount of glistening mica scales, distributed in a rather sandy, dark-colored mass, destitute of coarse materials. They are easily cultivated and highly productive when irrigated, although not unfrequently afflicted with a certain taint of 'alkali.' This, however, when not too strong or salt, is here readily neutralized by the use of gypsum.

"'Alkali' soil is the name used in California to designate any soil containing such unusual quantities of soluble salts as to allow them to become visible on the surface during the dry season, as a white crust or efflorescence. They are of course found chiefly in low, level regions, such as the Great Valley, and the plains to seaward of the Coast Range; sometimes in continuous tracts of many thousands of acres, sometimes in spots so interspersed with non-alkaline land as to render it impossible to till one kind without the other. The nature and amount of salts in these soils is of course very variable. Near the coast the 'alkali' is often little more than common salt, and can be relieved only by drainage or appropriate culture. At times we find chiefly magnesian salts, when liming will relieve the trouble. But in the Great Valley the name 'alkali' is in most cases justified by the nature of the salt, which almost always contains more or less carbonate of soda, and sometimes potassa. The presence of these substances, even to the extent of a fourth of one per cent., while it may do but little harm during the wet season, results in their accumulation at the surface whenever the rains cease, and the corrosion of the root-crown, stunting, and final death of the plants. But when stronger, as is too often the case, the seed is killed during germination. Moreover, land so afflicted cannot be brought to good tilth by even the most thorough tillage. Fortunately, a very effectual and cheap neutralizer of this, the *true* 'alkali,' is available in the form of gypsum, which transforms

the caustic carbonates into innocent sulphates. Wherever the amount of alkali present is not excessive, the use of gypsum relieves all difficulties arising from the presence of the former. Moreover, analysis shows that in many cases large amounts of important mineral plant-food, such as potash, phosphates, and nitrates, accompany the injurious substances; so that when the latter are neutralized, the previously useless soil may be expected to possess extraordinary and lasting fertility. Abundant deposits of gypsum have been shown to exist in many portions of the State since attention has been directed to its importance in this connection.

"On the eastern affluents of the Sacramento river, the American, Bear, Yuba, Feather, and other streams heading in the region where hydraulic mining is practised, a new kind of soil is now being formed out of the materials carried down from the gold-bearing gravels. The enormous masses of detritus washed into the streams, filling their upper valleys to the height of sixty feet and more with boulders and gravel, while a muddy flood of the finer materials overruns the valley lands in their lower course, have given rise to a great deal of complaint on the part of farmers; and the 'mining *débris* question' has been the subject of numerous lawsuits, and of much angry debate in the legislative halls. In some cases the lands so overrun are definitively ruined; in others the new soil formed is of fair quality in itself, but as yet unthrifty; in many, the best quality of black adobe is covered many feet deep with an unproductive 'slum.' By the same agency, the beds of the Sacramento and its tributaries have become filled to such an extent as to greatly obstruct navigation and to cause much more frequent overflows, whose deposit, however, appears to improve, in general, the heavy lands of the plain, as well as the tules. It is difficult to foresee a solution of this question that would be satisfactory to all parties concerned; the more as the navigation of the bay itself is beginning to suffer from the accumulation of deposit, the reddish sediment-bearing waters of the Sacramento being always distinguishable in front of the city from the blue water brought in by the tides."

Much of the soil of the State, especially of the mountain slopes, is peculiarly adapted to the growth of gigantic forest trees. Of these there have been recognized and described forty-eight genera and one hundred and five species in the State, the greater part of which are not only indigenous but only to be found on the Pacific slope. Of these forty species are evergreens, found mostly on the mountains of the Coast Range and the Sierras. The most remarkable of these are the two species of *Sequoia*, *Sequoia gigantea*, or mammoth tree, and *Sequoia sempervirens*, or California Redwood. Of the former there are nine groves known in the State, though the largest trees have been felled by the barbarity of the showmen, who could not be contented without despoiling the forests of their monarchs, the growth of thousands of years, only that they might exhibit their own meanness and brutishness for a miserable pittance. Some of these trees were more than 450 feet in height, with a circumference near the ground of not less than 120 feet. The giant *Eucalypti* of Australia may have had a somewhat greater circumference, but they were not as tall as these. The largest now standing is said to be 376 feet in height and 106 in circumference.

The Mariposa and Calaveras groves are the best known, though not the largest, of these collections of mighty trees. Mr. A. R. Whitehill, of the Chicago *Tribune*, who has recently visited several of these groves, thus describes the "Grizzly Giant," and the Mariposa grove in that paper:

"The principal tree in the grove is the one known as the 'Grizzly Giant,' and the eye and sense of the spectator are at once bewildered at the size of its mighty proportions. At the base of this tree the carriage road stops, and the trail for horses begins. Carefully measuring the circumference with a line carried for that purpose, we found it to be over ninety-three feet at the base, and this not counting the burnt-away portions, which would have made the total still greater. We measured thirty-one feet as the diameter. At the base were five openings, any one of which seemed large enough for the accommodation of a camping party; and immediately around these the bark was gone. From the ground to a height of about eleven feet the

tree contracted perceptibly; then, perfectly round, it shot up with scarcely a change to the lowest limbs, which were fully 100 feet from the ground. On one side were about ten limbs, varying from two to six feet in diameter, and on the other about twelve almost as large. The largest limb was probably 150 feet from the ground, and this was fully twenty feet in circumference where it left the trunk. Shooting out in a straight line for a distance of thirty feet or more, it curved then suddenly upward in a perpendicular direction, and, at a distance of seventy-five feet more, was lost in the upper foliage. Secondary branches, as large as a full-grown eastern oak, shot out from this primary branch as a trunk, and there again produced other branches, to the third and fourth generation. Some of these branches were decayed; some were moss-covered; some were in the full vigor of their extraordinary growth. The top of the tree seemed to have been broken off, perhaps by lightning; and the appearance of the whole was that of a war-worn veteran of the Sierra.

"It was near dusk when we had finished our inspection of this mighty tree. We were over a mile above the level of the sea, and six miles from our stopping-place for the night. Still we lingered. Although it was then June, yet the eternal snows of the mountains were everywhere around us, and, as the huge banks and drifts stretched away off in the distance, the melting power of heat and the elements was on every side defied. Not a weed or blade of grass relieved the monotony of the view; not the chirping of an insect or the twittering of a bird was heard. The solemn stillness of the night added a weird grandeur to the scene. Now and then a breath of wind stirred the topmost branches of the pines and cedars, and, as they swayed to and fro in the air, the music was like that of Ossian, 'pleasant, but mournful to the soul.' There were sequoias on every side almost twice as high as the Falls of Niagara; there were pines rivaling the dome of the Capitol at Washington in grandeur; there were cedars to whose tops the monument of Bunker Hill would not have reached. There were trees which were in the full vigor of manhood before America itself was discovered; there were others which were yet old before Charlemagne was

born; there were others still growing when the Saviour himself was on the earth. There were trees which had witnessed the winds and storms of twenty centuries; there were others which would endure long after countless generations of the future would be numbered with the past. There were trees crooked and short and massive; there were others straight and tall and slender; there were pines whose limbs were as finely proportioned as those of the Apollo Belvidere; there were cedars whose beauty was not surpassed in their counterparts of Lebanon; there were firs whose graceful foliage was like the fabled locks of the gods of ancient story. It was a picture in nature which captivated the sense at once by its grandeur and extent; and, as we drove back through six miles of this forest luxuriance, with the darkness falling about us like a black curtain from the heavens, and the mighty cañons of the Sierra sinking away from our pathway like the openings to another world, then it was not power, but majesty; not beauty, but sublimity; not the natural, but the supernatural, which seemed above us and before us."

The *Sequoia sempervirens*, or Redwood, is a very stately tree, attaining a height of 300 feet and a circumference of seventy-five or eighty feet. It is the most valuable timber-tree of California, but is fast disappearing, being confined to the upper portion of the Coast Range, not appearing below San Luis Obispo and but sparingly below San Francisco, and disappearing entirely when felled, being replaced by other trees. Its gigantic congener does not appear on the Coast Range, but is confined to four or five counties along the western slope of the Sierras. Both of these trees belong to the cedar family. The sugar pine (*Pinus Lambertiana*) is almost the peer of the Redwood in size and commercial value. Its wood is white, straight-grained, clear and free-splitting. Its height is sometimes 300 feet, and its circumference forty-five feet. It has cones eighteen inches long and four thick; a sweetish, resinous gum exudes from the harder portion of the wood, tasting much like manna, and having cathartic properties. There are fifteen other species of pine, of which the finest are the *Pinus ponderosa*, or yellow pine, 225 feet high,

Pinus Sabiniana, Sabine's or nut pine, which has an edible cone or nut, much valued by the Indians, and *Pinus insignis*, or Monterey pine. This and the yellow pine are similar to our yellow and pitch pines at the East, and are in demand for flooring purposes. The other species of pines rise from 30 to 100 feet in height, but are not so much prized. There are six species of true fir, one of them, *Abies Douglasii*, Douglas's spruce, being 300 feet in height, and three of the others, stately trees, 100 feet or more in height; the western balsam fir, *Picea grandis*, grows to the height of 150 feet.

The California white cedar—*Libocedrus decurrens*—grows to the height of 140 or 150 feet. There are also four species of cypress, three of juniper, two of arbor-vitæ, and one of yew—*Taxus brevifolia*—which attains the height of seventy-five feet. The wild nutmeg—*Torreya Californica*—the California laurel—*Oreodaphne Californica*—the madrona—*Arbutus Menziesii*—and the manzanita—*Arctostaphylos glauca*—are all beautiful evergreens. There are twelve species of oak, two of them evergreen or live oaks, the rest deciduous. The burr oak—*Quercus macrocarpa?*—is the largest of these, but its wood, like most of the others, is principally valuable for fuel. The *Quercus Garryana*, sometimes called white oak, though not a large tree, has a dense, fine-grained wood, used for making agricultural implements. There is one of the chestnut family, the Western chinquapin, a fine tree, sometimes attaining a height of 125 feet. There are four acacias, thorny enough; three poplars, or cottonwoods, one very large; two alders; the Mexican sycamore; one species of walnut—*Juglans rupestris*—a fine tree; three species of dogwood or Cornel, all differing from the Eastern dogwoods; four wild lilacs; two wild cherries, both shrubs; two maples—*Acer macrophyllum*—a large and beautiful tree—and *Acer circinatum*—the vine maple, a smaller tree, found only in the mountains. There are three yuccas, two species of willow, a box elder, an Oregon ash, and the flowering ash, which is not a true ash, one species of buckeye, one of ironwood, a *Parkinsonia* or greenwood, small but elegant; two or more species of cactus, a native persimmon, and the valuable Japanese species; the pis-

tachio-nut and many species of semi-tropical trees which are unknown elsewhere. The shrubs and small fruits are numerous, but the cultivation of these and of grapes and edible nuts and berries belongs rather to horticulture. There are many medicinal plants and shrubs, some of them possessing very valuable qualities. Grasses are very numerous, and some of them highly nutritious, but they are nearly all annuals, and except in the foggy regions along the northwestern coast, there are hardly any native grasses which will make a sod or which are adapted for hay. The greater part of the State is entirely destitute of anything like a permanent sod, and aside from the wild oat (*Avena sativa*), the wild barley (*Hordeum jubatum*), the burr clover (*Medicago denticulata*) and four or five species of native clovers, which are annuals, and are cured by the sun at the beginning of the dry season, but form for a time good pasturage, the farmer and stock-raiser is compelled to rely on Alfalfa and the forage grasses and cereals, Hungarian, German, and pearl millet, Egyptian rice-corn or Dhurra, oats, wheat, rye, sorghum as a forage plant, etc., for late feeding of his stock.

Wild flowers abound in California, many of them those highly prized by florists elsewhere, of remarkable beauty of form and color, and some of them exceedingly fragrant. The lily and syringa families, many of them shrubs and even trees, and conspicuous alike for beauty and fragrancy, are found growing wild and filling the air for long distances with their perfume. Of cryptogamous plants, the quantity and variety is almost without limit. One hundred species of mosses have been described, and the mushrooms, seaweeds, lichens and fungi are still more abundant.

Zoölogy.—There are 115 species of mammalia in California, of which twenty-seven are carnivorous, including the grizzly, black, and brown or Mexican bear, the raccoon, badger, two species of skunk, the wolverine fisher, American sable or marten, mink, yellow-cheeked weasel, California otter and sea otter, the cougar, jaguar, wild cat, red lynx and banded lynx, raccoon fox or mountain cat, gray wolf, coyote or barking wolf (this differs somewhat from the prairie wolf, and is becoming annoy-

ingly abundant in the State, preying upon lambs, young pigs, fowls, etc.), five species of fox, three or four species of sea-lion, two species of seal, and the sea-elephant. The larger and more formidable of these carnivora are becoming rare in the State except in some of the more sparsely inhabited counties; the grizzly and other bears are found in the mountains, but the *felidæ*, especially the cougar, jaguar, and the lynxes are rare, and the gray wolf is not often found near the settlements.

Of the insect eaters, there are two moles, two shrews, and sixteen species of bats. Of the rodents, there are the beaver, the sewellel or mammoth mole, five species of ground-squirrels, pests which multiply by the million and levy their assessments upon the grain crop, often carrying off half the crop and riddling the stacks and sacks of grain, and even finding their way into the barns and storehouses. There are also five species of tree-squirrels, more harmless in their character. Of the mouse family there are eighteen species, including three naturalized ones. The musk-rat, jumping mouse, four species of kangaroo mice, and five of gophers, a pest almost as destructive of trees, shrubs, and plants as the squirrel is of the grain. There is a yellow-haired porcupine, six species of hares and rabbits, some of them peculiar to the Pacific coast, and a coney or rat-rabbit. Of ruminants, there are the elk, the white-tailed, black-tailed, and mule-deer, the American antelope, the mountain goat or goat-antelope, and the big-horn or mountain sheep.

Of the cetacea, as well as of the sea-fishes, California claims justly all that are found in the waters of the Pacific within the bounds of the United States, possibly excluding Alaska. This includes the right and the California gray whale, the hump-back and fin-back, two of the beaked whales, the sperm whale, the black fish and three species of porpoise.

Of birds there are 350 species or more, recognized as natives of California. There are twenty species of climbers, fifteen of them wood-peckers; of birds of prey there are thirty-seven species, including five of the eagle family, ten species of buzzard-hawks, four hawks and four falcons; twelve species of owls; the king of the vultures, and the turkey-buzzard, or turkey-vulture.

There are eleven species of perchers in the first group, including the crows, ravens, magpies, jays, and king-fishers; 148 species in the second and third groups, the insectivorous and granivorous perchers, including the fly-catchers, humming-birds, swallows, wax-wings, shrikes, tanagers, robins and thrushes, wrens, chickadees, grosbeaks, finches, linnets, larks, orioles, and sparrows. There are but three species of pigeons, the band-tailed pigeon, and the turtle and ground-doves. Of grouse there are the blue grouse, sage-cock, prairie-hen, and ruffed grouse, and three new species of quail. The waders are numerous, fifty-one species having been described. These include cranes, herons, bitterns, ibises, plover, kill-deer, avocets, snipes, sandpipers, curlews, rails and coots. Of swimmers over ninety species have been described, including many species of geese, brant, teal, ducks, scooters, coots, sheldrakes, mergansers, pelicans, cormorants, albatrosses, fulmars, petrels, gulls, terns, loons, dippers, auks, sea-pigeons and murrés.

Of the fishes, about 240 species have been discovered in the lakes, bays, rivers, and on the sea-coast of California, of which more than 200 are edible. These include nine species of the salmon family, four of the cod family, a dozen eels, seven or eight species of mackerel; numerous species of the perch family and the allied genera; two tautogs, viz., the red-fish and the kelp-fish; fifteen flat fish and flounders; nine species of shad, herring and anchovies, two of them introduced from the East; twenty-two carps, and thirty-five species of cartilaginous fishes, sturgeons, sharks, rays, sun-fish, etc., etc.

There are sixty species of mollusks, including a great variety of clams, oysters, mussels, scollops, whelks, limpets, sea-snails, cuttle-fish, squids, nautiluses, etc., etc. Of crustaceans there are eight or ten species, including crabs, king-crabs, lobsters, shrimps and craw-fish. Of the reptiles there are great numbers, though there are no true saurians (alligators or crocodiles), except in the Colorado river on the southeast border of the State. There are three species of tortoise, possibly some terrapins, thirty-one lizards, five rattle-snakes, twenty-five species of harmless snakes, twenty-three frogs, several toads, horned toads, salamanders, etc.

Objects of Interest and Wonder.—First among these is the far-famed valley of the Yosemite, known everywhere as one of the wonders of the world. The best and most accurate and satisfactory description of this wonderful valley ever written is that from the pen of Josiah D. Whitney, LL. D., State Geologist of California, and a member of the National Academy of Science. This description, slightly condensed, we give below:

"The word *Yosemite* means 'a full-grown grizzly bear,' and was not the aboriginal name of the valley itself, but that of a noted chief of the tribe inhabiting it. The present Indian name of the Yosemite is said to be *Ah-wah-nee.*

"The Yosemite valley is situated in the Sierra Nevada of California, about 150 miles in a direct line a little south of east from San Francisco, nearly in the centre of the State of California, north and south, and about midway between the east and west bases of the Sierra, which is here not far from seventy miles in width. It is a level area, about six miles in length, and from half a mile to a mile in width, and is sunk nearly a mile in depth below the general level of the adjacent region. It has very much the character of a gorge or trough, hollowed in the mountains in a direction nearly at right angles to their general trend. This gorge has not a regular form, but while its general direction remains nearly the same, its sides advance and retreat, with angular projections and recesses, thus giving a great variety of outline to the enclosing masses. The river Merced, which rises in the Sierra, some fifteen miles higher up than the head of the valley, in the group of mountains of which Mount Lyell is the dominating peak, runs through the Yosemite with many graceful windings, and gives rise at the head of the valley to the remarkable waterfalls, which will be noticed farther on. Two branches of the main Merced also enter the valley near its head; one, the Tenaya Fork, which rises in a beautiful mountain lake of the same name, comes in from the northeast; the other, the Illilouette, enters from the south. These tributaries join the Merced through deep cañons, as the mountain gorges in the Sierra are always called; but there are several other smaller streams which also enter the valley, leaping over its walls, and giving rise in

almost every instance, to interesting falls; which, however, are not in general of any great size, except during the early part of the season, when the snow upon the adjacent mountains is melting.

"The pleasure-seeking traveller, who visits the Yosemite, does not confine his explorations to the valley proper, but from various commanding points adjacent to it obtains a great variety of views of the groups of peaks which form the crest of the Sierra in that region, as well as of the spurs which extend down from the main range, or stretch along parallel with it. Thus a journey to the Yosemite properly includes a tour around its exterior, or at least one or more visits to prominent points of view above it, from which the observer cannot only look directly down into the depths of the valley below him, but also command a variety of views of lofty and in part snow-clad ranges, which offer among themselves most remarkable contrasts of form and structure.

"In noticing the details of the scenery of the Yosemite, the valley proper may first be considered. The prominent features here are: the great elevation of the walls which enclose it; the remarkable approach to verticality in these walls; their great height and their wonderful variety and beauty of form. To these features may also be added the attractions of the magnificent waterfalls which occur at various points on both sides of the valley, although these, as already noticed, must be seen early in the season in order that the traveller may be greatly impressed by them. In entering the Yosemite by the roads which approach it from the lower end, the visitor notices that he has before him a valley of a different type of form from those he has before been accustomed to see. He passes from a V-shaped gorge or cañon into one which may be fairly called U-shaped, since its walls rise almost vertically from its floor. This change of form is strikingly impressed on the visitor as he approaches what may be called the gateway of the Yosemite. Here he sees before him, on the north side of the valley, the mass of rock called El Capitan, and exactly opposite the Bridal Veil and Cathedral Rocks. At this point the distance across the valley is only a mile, measured from the summit of the Bridal Veil Rock

to that of El Capitan, and at the base of these cliffs there is only just room for the river to pass. El Capitan is an immense block of granite projecting squarely out into the valley, and presenting two almost vertical faces, which meet in a sharp edge 3,300 feet in perpendicular elevation. The sides or walls of this mass are bare, smooth and entirely destitute of vegetation. It is doubtful if anywhere in the world there is presented so squarely cut, so lofty and so imposing a face of rock. On the opposite side of the valley is the grand mass of the Cathedral Rocks, divided into two parts by a deep notch between them. The most striking face of the larger Cathedral Rock is turned up the valley, but on the side facing the entrance there is a feature of great beauty, namely, the Bridal Veil Falls, made by the creek of the same name, which, as it enters the valley, descends in a vertical sheet of 630 feet perpendicular, striking there a pile of *débris*, down which it rushes in a series of cascades, with a vertical descent of nearly 300 feet more, the total height of the fall being 900 feet. This creek flows through the entire year, but the fall is only great when the amount of water is near its maximum. When the stream is neither too full nor too low, the mass of water, in its fall, vibrates with the varying pressure of the wind blowing in the daytime up the valley in the most beautiful and remarkable manner. It is this fluttering and waving of the sheet of water which has given it the poetic but somewhat fanciful name it now bears, that of the Indians having been *Pohono*, a term having reference, it is said, to the chilliness of the air under the high cliff and near the falling waters. There is also a charming fall in a deep square recess of the rocks opposite the Bridal Veil, and just below El Capitan. This fall, which is over 1,000 feet high, is called the Virgin's Tears. It runs, however, but a short time during the early summer months.

"Passing up the valley after entering between the Cathedral Rocks and El Capitan, the level area or river-bottom increases to nearly half a mile in width. This area is broken up into small meadows, gay with flowers in the early summer, and sandier regions on which grow numerous pitch-pines, and some oaks, cedars and firs. The walls of the valley continue lofty and

broken into the most picturesque forms. Of these the Three Brothers and the Sentinel Rock are the most conspicuous. Nearly opposite the Sentinel Rock is one of the most attractive features of the Yosemite, namely, the fall made by the descent of Yosemite creek down the wall on the north side of the valley. The vertical elevation of the edge of this fall is 2,600 feet, but the descent is not in one unbroken sheet. There is first a vertical fall of 1,500 feet, then a descent of 626 feet in a series of cascades, and finally one plunge of 400 feet on to a low talus of rocks at the foot of the precipice. The body of water is not large, and it decreases considerably as the season advances, becoming very small, in ordinary years, by the end of August. The width of the stream in June and July is usually about twenty feet, and its depth about two feet. The beauty and grandeur of this fall, however, taken in connection with the majesty of its surroundings, give it a claim to be ranked among the most remarkable natural objects in the world. There are certainly very few waterfalls which can compete with it.

"At the head of the valley the falls of the Merced river are of great interest. There are two of them with beautiful intervening rapids. The lower one is called the Vernal Fall, and is about 400 feet in vertical height. The upper, the Nevada Fall, is about 600 feet in elevation. The body of water in these falls is large, and the effect very grand. As the Merced river is fed by melting snows high up in the Sierra, the amount of water is not so much diminished toward the end of the season as it is in the case of the smaller creeks heading at an inferior elevation; thus the falls of the Merced usually remain extremely picturesque and attractive objects during the whole summer.

"The dome-shaped masses of granite which characterize the vicinity of the Yosemite are also extremely grand. The North Dome, on the north side of the valley, lends itself to beautiful combinations of scenery, as seen from various points a little above the Yosemite Falls. The Sentinel Dome, on the opposite side, is not visible from the valley itself, but it affords a magnificent view from its summit of the valley and its surroundings, and especially of the high Sierras. A projecting cliff called

Glacier Point, a little lower than this, and just on the edge of the valley, is also much visited for the sake of the grand view which it offers of the whole region, but especially on account of its favorable situation with reference to the Half-Dome, of which it commands a most wonderful view. The rock thus named is the highest point in the immediate vicinity of the Yosemite, rising to an elevation of 4,737 feet above the general level of the valley. The Half-Dome has the appearance of having been originally a dome-shaped mass which has been split into two parts, one of which has sunk down and disappeared; hence the name. It fronts the Valley of the Tenaya fork of the Merced with a very steep slope, crowned by a vertical wall of fully 1,600 feet in elevation, forming together a mass of rock of the most astonishing form and imposing magnitude. Arrangements are now made by which this Half-Dome, or, as it is now called, the South Dome, may itself be ascended. It is a weary climb, possible only by the aid of a rope of great strength fastened to the rock by iron staples every fifteen feet, by which the climber works his way, hand over hand, for about 1,500 feet; but the view at the top is grand and beautiful. Still more magnificent is the view from Cloud's Rest, fourteen miles away by the trail, and a most fatiguing journey, but once reached, the traveller feels that he has seen 'all the kingdoms of the world and the glory of them.'

"The rocky citadel juts out into space, so that you seem isolated from the world, and held pendant over the valley. Around you is an unbroken horizon of mountain peaks, with the great valley in the centre, its walls dwarfed to pigmy proportions. The lesser mountains and barren rolling ridges resemble nothing so much as a storm-tossed ocean turned to stone. A more absolute desolation could not be conceived. You feel the weight of the centuries that look down upon you from the lonesome peaks of the Sierras. The spectacle reminds one strongly of maps of the moon; it gives the same impression of lifeless repose after giant upheavals of mountains and rending of rock-buttressed walls. Thomas Hill, the artist, says that he once took a seven days' camping excursion about the

valley, with a nephew of the present Czar of Russia. At all the other peaks the Prince found some mountain in the Alps or the Himalayas the view from which surpassed the one before him. But when the summit of Cloud's Rest was reached, he took off his hat and said: 'I salute the grandest view in the world.'"

The Yosemite valley was given by Congress to the State of California in 1864 to be "held for public use, resort, and recreation," to be also "inalienable for all time" with the condition that portions of the valley might be leased, the income arising from such leases to be expended "in the preservation of the property or the roads leading thereto." The grant is managed by commissioners appointed by the governor of the State. Wagon roads, railroads and trails have been built to afford more convenient access to the valley, and to various points commanding remarkable views of the valley and its surroundings.

The Tuolumne river, another tributary of the San Joaquin, which enters it a few miles north of the Merced and drains Tuolumne county as the Merced does Mariposa, also has its sources in the Sierra Nevada, and about fifty miles northwest of the Yosemite valley, flows through another valley nearly or quite as picturesque and grand as the Yosemite and with as many and as lofty waterfalls.

But these remarkable valleys do not furnish all the natural wonders of California. In Tulare, Fresno, Mariposa, Tuolumne, and Calaveras counties there are groves of the gigantic Sequoias, whose vast height and wondrous beauty would well repay a journey across the continent.

In Napa county, near Calistoga, is a narrow valley where are all the evidences of recent, and, indeed, existing volcanic action. The whole valley or cañon is filled with flowing (not spouting) hot springs, which are called geysers (an inappropriate name, though they are very singular in their action, flowing with intermissions), and the whole soil is covered with a crust of sulphur, iron-rust, and other mineral deposits, and filled with steam from the boiling water. The ground shakes under the foot-steps, and is so hot as to be uncomfortable to the feet.

Besides these there are the natural bridges and the chyote

caves of Calaveras county, with their bell-sounding rocks, the magnificent grotto near Grizzly Flat, in El Dorado county; of the lakes, Tahoe, the gem of the mountains, almost at the summit of the Sierras, and the smaller but romantic Lake Donner on the boundary line of Nevada; Mono (salt) lake, in Mono county, not far from Yosemite; Klamath lake, in the north; Tulare lake in the county of the same name; and the wild volcanic region in the southeast in Inyo, Mono, San Bernardino, and Kern counties; that region of horrors enclosing the sink of the Amargoza river, the "Death Valley," of which we have already spoken, 400 feet below the level of the sea, while within sight of it the Sierras tower 14,000 or 15,000 feet above the sea. This deep depression, forty miles long and eight or ten wide, is partly crusted over with salt and soda and other alkalies several inches thick, and partly composed of an ash-like earth mixed with a tenacious clay, sand, and alkali so soft that no animal can cross it without being mired. There is no vegetation on any part of it, and the temperature during at least six months of the year ranges from 110° to 140° Fahrenheit.

Climates.—Prof. E. W. Hilgard thus describes the various climates of the State:

"Taking as a convenient point of view the central portion of the State, the climates of California may be roughly classified as follows:

"1. *The bay and coast climate.* Its prominent characteristics are, first, the small range of the thermometer, caused by the tempering influence of the sea, the prevailing winds being from the west. The average winter and summer temperature at San Francisco thus differs by only about 6° Fahrenheit (53° and 59° respectively). Snow rarely reaches the level of the sea, and is sometimes not seen for several seasons, even on the summits of the Coast Range.* A few light frosts with the thermometer at between 28° and 32° Fahrenheit for a few hours during the

* The winter of 1880 was one of the exceptional years in which snow *did* reach the coast, and the thermometer marked 18° Fahrenheit. This severe weather was very destructive to flowering plants and shrubs, but was said not to have occurred for more than thirty years previously. Ordinarily, the fuchsia and heliotrope live and thrive in the open air there in winter.

night is the ordinary expectation for winter, while in summer the number of 'hot' days on which the thermometer reaches 80° or more, rarely exceeds eight or ten. These occur chiefly in September and under the influence of the 'norther,' which causes the hot dry air of the interior valleys to overflow the barrier of the Coast Range. Under a brilliantly clear sky, it sweeps over the mountains, accompanied by clouds of dust, and, like the hot breath of a furnace, it licks up all moisture before it, wilting and withering the leaves of all but the most hardy plants, cracking and baking the soil, loosening the joints of all wooden structures, whether wagons, furniture, or houses, and causing the latter to resound at night with the splitting of panels and similar unearthly noises, to the discomfort of the nervous sleepers, that at such times comprise the vast majority of the population. This universal infliction fortunately lasts but rarely more than three days, when the welcome sea-fog, which has been kept standing like a wall forty or fifty miles in the offing, gradually advances, and with its grateful coolness and moisture infuses fresh life into the parched vegetation and the irritable, panting population.

"During the winter months the north wind is equally dry, but at the same time cold; and while it then sometimes lasts a week or more, it causes but little discomfort or damage, save occasionally to the young grass and grain. The second distinctive feature of the coast climate is the fogs brought in from the sea by the prevailing west winds or summer trades, as the result of their crossing the cold Alaskan current in-shore. The sea-fogs, coming in regularly almost every afternoon from the latter part of June to that of August, and more or less throughout the year, often with a gorgeous display of cloud pictures, temper materially not only the heat, but also the summer drought; so that under their influence plants requiring but a moderate degree of moisture can, in a loose soil, grow throughout that season. In the latitude of San Francisco it thus happens that in the coast climate sub-tropical and northern plants may thrive side by side; the latter (such as currants and cranberries) ripening with ease and in great perfection, while the fig, grape, orange, etc., though growing luxuriantly, can ripen their fruit only in valleys pro-

tected by mountain ridges from the direct influence of the summer trade-winds. Thus while a broad river of fog may be pouring in at the Golden Gate, covering the two cities and spreading out on the opposite shore to a width of eight or ten miles, the hamlet of San Rafael, only fourteen miles to the north, but under the lee of Mount Tamalpais, and the old town of San José, under the protection of its seaward mountains, forty miles to the south, are mostly basking in full sunshine, and ripen to great perfection not only the grape, but also the more tender fruits of their groves of fig and orange.

2. *Climate of the great interior valley.* "The *average* winter temperature is lower than that of corresponding portions of the coast, although the *minimum* is little, if at all, below that of the latter. Sub-tropical plants, therefore, winter there almost as readily as on the coast. In summer, however, the average temperature is high, often remaining above 100° Fahrenheit for many days, the nights also being very warm. At the same time, however, the air is so dry as to render the heat much less oppressive than is the case east of the mountains, sunstroke being almost unknown. Standing on the summits of the Coast Range in summer, and looking down upon the thick shroud of fog covering all to seaward, the white masses can be seen drifting against the mountain side, and, rising upward, dissolving into thin air as soon as, on passing the divide, they meet the warmth of the Great Valley. From points in the latter the cloud-banks may be seen filling the mountain passes and sometimes pouring like a cataract over the summit ridges, but powerless to disturb even for a moment the serenity of the summer sky, or to yield a drop of moisture to the parched soil of the San Joaquin plains. The unwary traveller, starting from Sacramento or Stockton on a hot summer's day without the thought of shawl or overcoat, may find himself chilled to the bone on crossing the Coast Range, and runs imminent risk of rheumatism or pneumonia. On the other hand, the San Franciscan, feeling the need of having his pores opened by a good perspiration, can have his wish gratified in an hour or two by taking the reverse direction. The 'norther' is, of course, more frequent in the great valley

than on the coast; but its dryness and high temperature are not so much of a change from the ordinary condition of things, and it therefore does not cause such general remark, disturbance, or damage unless unusually severe.

3. *Climate of the slope of the Sierra Nevada.* "The essential features of the climate of the Great Valley may be roughly said to extend to the height of about 2,000 feet up its flanks into the 'foot-hills,' with, however, an increasing rainfall as we ascend, and therefore greater safety for crops and less absolute dependence upon irrigation. Higher up, the influence of elevation makes itself felt; snow falls and lies in winter, while the summers are cool; and we thus return to the familiar *régime* of seasons as understood in the Middle and Northern States, including, especially in the more northern portion, the phenomenon of summer thunder-storms, which are almost unknown on the coast and in the San Joaquin valley. The same general features come into play more and more as we advance northward in the hilly and mountainous regions lying north of San Francisco bay, toward the Oregon line, marked also in general by a gradual increase of timber growth. The features of the three principal climates described intermingle, or are interspersed, according as the valleys are open to seaward, run parallel to the coast, or are in communication with the great interior valley. We thus find numberless local climates, 'thermal belts,' and privileged nooks adapted to special cultures which may be impracticable in an adjoining valley, and almost insular as regards the region where similar conditions are predominant. To the southward, the chief climates above defined are modified by three factors, viz.: the increase of temperature, the decrease of rainfall, and the decrease, from about San Francisco southward, of the feature of summer fogs. As regards temperature, the extreme range is still very nearly the same at Los Angeles as at San Francisco; but the averages are very considerably higher at the former point, that of the winter being 60°, that of summer about 75° Fahrenheit. At intermediate points along the coast, local variations excepted, the averages vary as sensibly as the latitude. As to rainfall along the coast, its decrease is slow, descending

from twenty-four inches at San Francisco to fifteen at Santa Barbara, twelve at Los Angeles, and nine to ten at San Diego. But in the interior valley the decrease is much more rapid, as previously stated, modified locally, according as the divide of the Coast Range is so high as to preclude the access of moisture from the sea, or low enough to admit its influence. The same factor influences also the cooling and moistening effect of the summer winds and fogs, which temper the summer climate of the Los Angeles plain, but fail to reach the Mojave desert or the fervid plains of the upper San Joaquin valley."

We supplement this general statement by the following table, corrected to the latest date. It is the average in most cases of twenty years:

Places.	Mean temperature. Spring.	Mean temperature. Summer.	Mean temperature. Autumn.	Mean temperature. Winter.	Mean temperature. Year.	Rainfall. December to May.	Rainfall. June to November.	Rainfall. Year.
San Francisco .	56.3°	59.5°	58.8°	51.9°	56.6°	24.97	2.31	27.28
Sacramento . .	58.5°	71.5°	62.1°	47.9°	59.9°	19.80	1.70	21.50
Humboldt Bay .	52.0°	57.5°	53.0°	43.5°	51.5°	. . .	. . .	57.24
Benicia	56.5°	67.0°	60.5°	49.0°	58.0°	. . .	. . .	22.86
Monterey . . .	54.0°	59.0°	57.0°	51.0°	55.5°	. . .	. . .	12.20
Visalia	60.6°	79.5°	60.9°	48.6°	62.4°	9.96	0.53	10.49
San Diego . . .	59.4°	69.1°	63.8°	54.1°	61.6°	11.70	.80	12.50
Los Angeles . .	58.6°	68.6°	65.1°	54.3°	61.7°	19.88	1.38	21.26
Fort Yuma . .	72.0°	90.0°	75.5°	57.0°	73.5°	1.89	.73	2.62

In 1878, the maximum temperature was reached in San Francisco, September 15th to 18th, when the thermometer stood at 86°, 90°, 92° and 93° Fahrenheit. In no other days of the year, except one in October, did it reach 80°. The lowest point was reached on the 4th of January and was 39° Fahrenheit. There were no frosts during the year. The extreme range of the year was 54°.

In Sacramento the highest point reached was 103°; for three days the thermometer rose above 100°; for twenty-three days it exceeded 95°, and for sixty-three days it was above 90°. The lowest point was reached January 3d. It was 27°. For six days there were frosts. The extreme range was 76°.

In San Diego the thermometer indicated 91° on the first of

September, but did not reach 90° on any other day. It exceeded 80° only eleven days of the year. The minimum was for three days in January, 38°. The range was 53°.

Visalia (latitude 36° 20′, west longitude from Greenwich 119.16) reached 106.5°, July 14th. During twenty-three days the temperature exceeded 100°, and for sixty-nine days it exceeded 95°. The minimum, January 4th, was 24°. There were eight days of frost. The range was 82.5°.

Los Angeles (latitude 34° 3′, west longitude from Greenwich 118° 16′) reached 93° on the 20th of July and the 1st of September. Seven days exceeded 90°. The minimum was 36.5° on the 31st of December. There were no frosts. The range was 56.5°.

Fort Yuma (latitude 32° 43′, west longitude 114° 36′) reached 113°, July 19th; four days were above 112°; eleven days above 110°; fifty-three above 105°, and one hundred and six above 100°. In other years the maximum had been as high as 126°. The minimum, December 31st and January 3d, was 33°. Range 80°.

Agricultural Products.—Professor Hilgard has treated these in a manner so attractive, that we quote from him, in part, in regard to them. Speaking at first of cereal crops, he says:

"Of all the field-crops grown in the State, wheat is the most important at this time. It was the first culture on a large scale introduced on the subsidence of the gold fever, and the returns received proved to be so much greater and more certain than those from the placer mines that it extended rapidly, and has ever since remained the largest and most generally appreciated product of California agriculture. The amount produced in 1878, an average year, was 22,000,000 of centals, of which 8,069,825 were exported as grain, and about 500,000 barrels of flour. In the markets of the world the wheats of the Pacific coast are noted for their high quality, the plumpness and light color of the 'berry,' and the high percentage of first-class flour it furnishes in milling. At home the extraordinarily high product per acre of forty to sixty bushels, and even more, under very imperfect tillage, for a number of consecutive years, forms a strong

incentive to this culture. Nor is the California wheat-grower obliged to be very careful in the choice of his seed. Probably every known variety of wheat has in the course of time been brought and tried here; but all, in a short time, seems to assume very nearly the same peculiar California type, upon which, in fact, it would seem hard to improve materially. It is almost ludicrous, at times, to compare the eastern seed with its California offspring, which has undergone the 'swelling process' of one season's growth in her generous soil and climate. It is but fair to say that substantially the same peculiarities are observable in the wheats of Oregon, grown in the valley of the Willamette and on the plains of the Upper Columbia. Since the growing season in the greater part of California extends, with little interruption from cold, from the beginning of November to June, the distinction between winter and spring grain is also in a great measure lost. The farmer plows and sows as early as practicable, watching his chances between rains, in November and December if he can, in March if he must, or at any convenient time between; increasing the amount of seed sown per acre in proportion as there remains less time for the grain to tiller. Should the ears fail to fill, he can still make hay.

"Much discussion has been had concerning the merits of early as compared with late sowing. The objections against the former practice are that copious early rains may start the growth too rapidly, the chances being that in that case but little more water will fall until Christmas. It is true that the weather-wise may sometimes gain materially by delay in sowing; but the general result of experience seems to be that it is better in the long run to take the risk of having to sow twice, rather than that of being kept from sowing at all, until too late, by persistent rains. It has therefore become a very common practice to 'dry-sow' grain in summer-fallowed land in September and October. The seed lies quiescent in the parched and dusty ground until called forth by the rains, and in clean fields and ordinary seasons such grain generally yields the highest returns. The preparation of the ground for the crop on the large wheat farms is usually made by means of gang-plows with from two to six shares, drawn by

from three to five horses or mules, three animals very commonly walking abreast. At the critical season it is not uncommon to see half a dozen such implements and teams at work in a single field, closely followed by a wagon carrying seed-grain and the centrifugal sower, which showers the grain upon the fresh-turned furrows, in strips thirty or more feet wide. Before the day ends the great (usually flexible) harrows have also performed their work, and thirty or forty acres of what was a stubble-field in the morning have been converted into a well-seeded grain-field. Of late, appliances for seeding and covering have been attached to the gang-plows themselves, so that the whole task is performed in one operation—certainly the perfection of labor-saving machinery. Seed drills are as yet in but limited use; although nowhere, probably, would drilling be more desirable, in order to admit of subsequent culture, for want of which crops often totally fail on the heavier soils. During the rainy season the covering is often done by rolling alone, and on harrowed ground the roller is frequently used later in the season, in order to compact the surface so as to mitigate the drying effects of 'northers.'

"In the grain harvest (which begins in the second week of June) the 'wholesale' mode of procedure is equally prevalent. The scythe is used only to cut the way, and that on small farms; then follows the reaper, hired if not owned by the farmer himself. But the binding and shocking process that is to succeed is far too slow for the large grain-grower, who has his hundreds, and sometimes thousands, of acres to reap within the short time allowed by the exceedingly rapid maturing, which threatens him with serious loss by shedding, the air being at that season very dry even at night. His implement is the giant header, pushed into the golden fields by from four to eight horses. Its vibrating cutters clip off the heads with only a few inches of straw attached, on a swath sixteen and even twenty-eight feet wide, while a revolving apron carries the laden ears to a wagon driven alongside, and having a curious, wide, slanting bed for their reception. Several of these wagons drive back and forth between the swaths and the steam-thresher, where, within half an hour, the grain that was waving in the morning breeze may be sacked ready for

shipment to Liverpool. Even this energetic mode of procedure, however, has appeared too slow to some of the progressive men in business, and we have seen a wondrous and fearful combination of header, thresher and sacking-wagon, moving in procession side by side through the doomed grain. If this stupendous combination and last refinement shall prove practically successful, we shall doubtless next see the flouring-mill itself form a part of this agricultural pageant. Where farming is not done on quite so energetic a plan, the reaped and bound grain being at that season perfectly safe from rain, is left either in shocks or stacks until the threshing party comes around, mostly with a portable engine often fed with straw alone, to drive the huge 'separator,' whose combined din and puffing will sometimes startle late sleepers, as it suddenly starts up in the morning from the most unexpected places. Two wagons usually aided by some 'bucks' (a kind of sledge-rake, which also serves to remove the straw from the mouth of the thresher) feed the devouring monster. In an incredibly short time the shocks or stacks are cleared away and in their stead appear square piles of turgid grain-sacks and broad, low hillocks of straw. Both products often remain thus for six or eight weeks, the grain getting so thoroughly dry in the interval that there is frequently an overweight of five or more per cent. when, after its long passage in the damp sea air, the cargo reaches Liverpool. The moral question thus arising as to who is entitled to the benefit of this increase I will not pretend to determine; but the producers say that they rarely hear of any differences in their favor.

"The manner of disposing of the straw is one of the weakest points of California agriculture. Near to cities or cheap transportation, much of it is baled like hay, and finds a ready market, but in remote districts it is got rid of by applying the torch; and these 'straw fires' habitually redden the autumn skies as do the prairie fires in the Western States, covering the whole country with a smoke haze, as a faint reminiscence of the Indian summer, which is not otherwise well-defined on the Pacific coast. This holocaust of valuable materials, which might be made the means of some slight return of plant-food to the soil, is a standing re-

proach to those who practise it; yet they have some excuse in the fact that the peculiarities of the climate do not make it as easy to convert it into manure as is the case in countries having summer rains. For in winter the temperature is, after all, too low to favor rapid decay, while during the summer months the intense drought soon puts an end to fermentation. It therefore takes two seasons to render the straw fit for plowing in; and in the mean time, as left by the thresher, it occupies considerable ground. As yet, the conviction that straw-burning is penny-wisdom and pound-foolishness has not gained sufficient foothold to induce the majority of wheat-growers to take the pains of putting the straw into stacks with concave tops, to collect and retain the water. But those who have done so report that the resulting improvement of the soil pays well for the trouble. The practice of burning will, of course, disappear so soon as the system of large-scale planting gives away, as it soon must, to that of mixed farming on a smaller scale.

"Of the other cereals, barley and oats are the only ones that can as yet lay claim to general importance; and the methods of culture are much the same. Like the wheats, so the barleys of California are of exceptionally fine quality, that of the 'Chevalier' variety being so eagerly sought for by eastern brewers that but little of it finds its way into California-brewed beer. The common (six and four rowed) barleys are, however, themselves of such high quality that the absence of the highest grade grain is certainly not perceptible in the quality of the beer, into which, unlike most of its eastern brethren of St. Louis and Chicago, nothing but barley and hops find their way. The various kinds of oats are produced for home consumption only, the difficulty being very commonly that the straw becomes so strong as to interfere seriously with its use for forage. Rye is grown to some extent in the mountain counties, and yields a splendid grain, called for chiefly by the taste of the German population for rye bread. Some Polish wheat (*Triticum polonicum*) is grown under the name of 'white rye.' *Maize* is thus far grown but to a small extent, compared with wheat, barley, and oats; not, however, because of any difficulty in producing corn, which, both as

to quality, size, and yield per acre, can compete with any in the Mississippi valley. The large foreign element in the population limits the demand for corn-meal, and, as before remarked, on account of the mild winters, hog-raising on a large scale is not likely to become important in the State. A good deal, however, is planted for green-soiling purposes in connection with dairies. The planting is generally done very late in April, and in May after everything else has been attended to, since in the coast climate a crop of corn is often made without a drop of rain from the time of planting, when the season has been one of abundant moisture. Of late, several millets, and among them especially the *Dhurra* or Egyptian corn, are coming into favor. The Dhurra, though not as much relished by cattle as maize fodder, will admit of three cuttings each season, when irrigated, and the meal made from its grain is by many preferred to corn-meal, while as a chicken-feed it is, apparently, superior to anything else.

"Of other field crops, the 'beans' that formed the chief solace of the Argonauts of early days are still prominent, especially where the Mexican element is somewhat strong. To them 'frijoles' are still the staff of life, supplemented by the 'tamales,' the native preparation of the 'roasting-ears' of green corn.

"The Irish potatoes grown in California are not, as a rule, of first quality, but incline to be watery. The tuber is largely imported from Utah under the name and style of 'Salt Lake potatoes,' albeit much that is sold under that brand is of California growth. The sweet-potato flourishes especially in the lighter soils of the coast south of San Francisco; its quality would not be likely to be criticised by any but those who have been accustomed to the product of the Gulf States or of the Antilles.

"The big pumpkins of California have acquired a world-wide reputation not unlike that enjoyed by the sea-serpent. The unprejudiced observer, however, readily appreciates the fact that when a well-organized pumpkin has ten months' time to grow instead of three or four, it has every reason to give a corresponding account of its stewardship. But while a laudable ambition to excel may result in the production of three hundred-

pound pumpkins, it is but fair to say they are not the rule; being inconvenient to handle, and, like other organisms exceeding a certain age, inclined to be hard and tough. The same is true of mammoth beets (mangel-wurzel), carrots and turnips, which, when left out in the field during a mild winter, continue incontinently to grow and develop until the time comes to put in another crop. The dairy-men and stock-breeders raise these crops largely, and are chiefly responsible for the production of the monsters.

"The sugar-beet succeeds admirably in a large portion of the State, and in appropriate locations yields a juice of extraordinary richness; as much as nineteen per cent. is clarified in some cases (but I can vouch for fifteen only from personal experience), and a fair degree of purity. Several prosperous beet-sugar factories already exist, the failures reported having apparently been due to mismanagement. It is difficult to see why, with such material and the possibility of keeping up the supply for nine months by the planting of successive crops, this industry should not become one of the most important and lucrative in the State, and fully able to compete with any sugar-cane planting that may hereafter be introduced in the southern portion of the coast.

"Hop-growing is an important industry in the middle portion of the State, especially in the Sacramento valley and in the Russian river region, north of San Francisco bay. The product is of excellent quality, and is much sought after by Eastern brewers.

"Of other crops of minor or only local importance may be mentioned the culture of pea-nuts, chiefly in the coast region south of San Francisco; of the chiccory root, in the neighborhood of Stockton, supplying a large amount of the parched and ground 'old government Java coffee' sold by grocers. In the same neighborhood the culture of the 'Persian insect-powder plant' (*Pyrethrum carneum*) is being successfully carried out, the product being in very general requisition on account of the prevailing abundance of fleas. This neighborhood supplies a quality of mustard that is somewhat overwhelming to the novice, and even for plasters should be diluted with flour. Were rape-seed

oil in demand, the fact that the whole State is overrun with the plant that produces it, as a most troublesome weed, proves what could be done with it if fostered.

"Nothing, probably, strikes the new-comer to California more forcibly, and nothing certainly more agreeably, than the advantages offered by a climate where plants can ordinarily be kept growing from ten to twelve months in the year, provided water is supplied. The immigrant desiring to make a home for himself is delighted to find that the rapid growth of shrubbery and flowers—and among them many that he has so far seen only nurtured in greenhouses—will enable him to create around him in the course of three seasons, on a bare lot, a home atmosphere that elsewhere it would have required ten or more years to establish. The housewife, however industriously disposed, is not ill-pleased to find herself relieved from the annual pressure of the 'preserving season' by the circumstance that fresh fruits are in the market at reasonable rates during all but a few weeks in the year; so that a few gallons of jellies is all that is really called for in the way of 'putting up.' It is not less pleasing to her, as well as to the rest of the family, that a good supply of fresh vegetables is at her command at all seasons, and that the Christmas dinner, if the turkey *does* cost thirty cents a pound, may be graced with crisp lettuce, radishes, and green peas just as readily as it may be celebrated by an open-air picnic on the green grass under blooming bushes of the scarlet gooseberry. Of course there are seasons of preference for each vegetable, but among the great variety naturally introduced by the various nationalities there are few that cannot be found in the San Francisco market at almost any time in the year—if not from local culture, then from some point between Los Angeles and the mouth of the Columbia. The truck-gardens are largely in the hands of the Italians and Portuguese, who have brought with them from their home habits of thrift; and their manure piles, windmills for irrigation, and laborious care of their unceasing round of crops on a small area, render their establishments easy of recognition. Their products are distributed partly by themselves, partly by the ubiquitous Chinese huckster, trotting with

his two huge baskets under a weight that few Caucasians would carry for any length of time. Not a few Chinese also are engaged in the truck-farming business. The vegetables are in general of excellent quality, and it may be truly said that in no city in the United States is the general quality of fare so good, so well adapted to every variety of taste, and, last but not least, so cheap, as in the city of the Golden Gate; and nowhere is the decoration of even the humblest homes with flowers and shrubbery more universal, and at the same time so generously aided by nature.

"In no department of industry, probably, is the reputation of California better established than in regard to *fruit culture*. Its pears seem to have been the pioneers in gaining the award of special excellence; grapes and cherries have rapidly taken a place alongside, and, last, oranges and lemons have come to dispute the palm with Sicily and the Antilles. The most striking peculiarity of California fruit culture is its astonishing versatility, not to say cosmopolitanism; for the variety of fruits capable of successful culture within the limits under consideration in this article probably exceeds, even at this time, that found elsewhere in any country of similar extent, and is constantly on the increase by the introduction of new kinds from all quarters of the globe. Doubtless, in time, each district will settle down to the more or less exclusive production of certain kinds found to be most profitable under its particular circumstances, so far as the large-scale cultures are concerned; but whosoever raises fruit mainly for home consumption will hardly resist the temptation offered by the possibility of growing side by side the fruits of the tropics and those of the north temperate zone—the currant and the orange, the cherry and the fig, the strawberry and the pineapple, the banana and plantain, as well as the apple and the medlar. It would be supposed that the quality of these products must of necessity suffer grievously under the stress of their mutual concessions of habit; and this, of course, is true as regards the highest qualities of the extremes, under the judgment of the expert, but unperceived to a surprising degree by the taste of the public in the general market. The oranges

grown in some of the sheltered valleys of the Coast Range, and on the red soils of the foot-hills, as far north as Butte county, often successfully dispute the precedence of the product of Los Angeles and San Bernardino.

"In view of the short time within which this industry has developed, and of the multitude of nationalities which have taken part therein, it is not surprising that many important questions relating to it should still remain unsettled, and that the best regular routine for the several districts, or even for general practice, should as yet not have been established. Too many different varieties, whose adaptation to the local and general climate is undetermined, fill the orchards, and give rise to immense quantities of unmarketable fruit, that ultimately fall to the share of cattle and hogs. The high price of labor and of transportation from remote districts condemns another large part to a similar fate, especially in favorable seasons, when the local market soon becomes glutted with fruit unable to bear shipment to the East. Curiously enough, even at such times, the prices of fruit to the consumer are generally higher than is the case at corresponding times in the Western States, showing irrefragably that the cost of production is higher, and consequently that only fruit of high quality can bear exportation. Inattention to this point has rendered unprofitable, or worse, many of the refrigerator-car shipments heretofore made, and the same want of proper care in assorting the various qualities is one of the chief causes of frequent business failures of those supplying the markets of San Francisco. This practice, however, is fast being improved upon, and the disposal of the surplus fruit by drying is beginning to relieve, to a very great extent, the glut that has often depressed prices below the paying point. The exportation of dried fruits of all kinds is doubtless destined to become one of the most important branches of agricultural industry in the State, both on account of quality and of the natural facilities for the drying process offered by the dry summer air. It is found to be absolutely necessary to exclude in the drying operations all access of insects, which otherwise lay their eggs on the fruit and spoil it within a year. This is now very generally and effectu-

ally accomplished by the use of the best drying apparatus, not uncommonly in co-operative factories erected by companies or granges. The quality of the prunes, plums, apricots, pears, etc., cured by some of these establishments is not behind the best of the kind imported from France and Italy, but as yet the neatness and convenience of the packages is not so generally what would be necessary to render them equally attractive to the purchaser.

"While the orange, lemon, lime, and other sub-tropical fruits are more or less in cultivation up to the northern third of the State, they form the specialty of Los Angeles, San Bernardino, and adjoining counties, where also the pineapple, banana, guava, and other more strictly tropical fruits are mainly under trial. In a measure, what has been said above of the more northern fruits applies here also. While much fruit of the highest quality is produced, much also is still in the experimental stage, and some very poor lots are occasionally thrown upon the market. The subject has lately, however, been earnestly taken in hand by the young but proportionally energetic Horticultural Society of South California, in which a number of the most intelligent men have combined to determine in the shortest possible time, by systematic experiments, discussion, and scientific investigation, in connection with the agricultural department of the university, the practically important questions relating to this culture. While the orange and lemon product is marketed without difficulty and at good prices, the millions of excellent limes borne by the hedges customary in the southern part of the State are still mostly allowed to decay where they fall. The manufacture of citric acid can hardly fail before long to put an end to this waste of precious material. The pomegranate, which is to some extent similarly used, generally finds a ready sale for its fruit. The olive, so universally found around the old missions as a relic of the past, has not so far found its place in general culture; and on the shelves of the grocers in the cities we still find the same mixtures of cotton-seed, pea-nut, and other oils, with a modicum of the genuine product of the olive, that form the standing complaint of salad-eaters throughout the United States. The subject of olive culture has of late attracted considerable

attention, and small quantities of excellent oil have been made in various parts of the State, proving beyond cavil that its production can be made an important industry. The culture of the fig in California is co-extensive with that of the vine, and both fresh and dried fruit of the highest quality is found in the market.

"As to nuts, the European walnut, Italian chestnut and almond are those whose culture on a large scale has been successfully carried out. The filbert may also be mentioned. Of these, the almond has been made the subject of the largest experiments, and, as might be expected, there have been numerous disappointments in consequence of the selection of unsuitable localities, subject to light frosts at the time of bloom. The best results have been obtained in situations moderately elevated above the valleys, 'thermal belts,' where the cold air cannot accumulate. The quality of the product leaves nothing to be desired, where proper care is had in selection of varieties.

"The Japanese persimmon promises here, as in the Southern United States, to prove an important acquisition. The jujube, the carob, the pistachio nut, and many others are under trial.

"Of small fruits, the strawberry is in the market during the twelve months of the year. Raspberries and blackberries are largely grown, both for market and canning. The currant is of especial excellence and size, and is extensively grown between the rows in orchards. Gooseberries have not been altogether successful in general culture.

"A good deal has been said and written about coffee culture. It was currently reported that a kind of coffee grew wild in the foot-hills, and of course the real coffee must succeed. The 'wild coffee,' however, is simply the California buckthorn (*Frangula Californica*), and of course no more suitable for a beverage than turnip-seed. True, coffee trees are now growing at numerous points in the State, but it is not probable that the culture will prove a success outside of South California.

"The grape-vine was among the culture plants introduced earliest by the Catholic missionaries. The similarity of the California climate to that of the vine-growing regions of the Mediter-

ranean would naturally suggest the probable success of vine culture, corroborated by the fact that a native vine, albeit with a somewhat acid and unpalatable fruit, grows abundantly along the banks of all the larger streams. The grape variety introduced by the missionaries, and still universally known as the 'Mission' grape, was probably the outcome of seed brought from Spain; it most resembles that of the vineyards which furnish the 'Benicarlo' wine. It is a rather pale-blue, small, round berry, forming at times very large and somewhat straggling bunches. It is very sweet, especially in South California, has very little acid, very little astringency, no definite flavor, and, on the whole, commends itself as a wine-grape only by the abundance of its juice and its great fruitfulness. The American immigrants found this vine growing neglected around the old missions, along with the olive, fig and pomegranate. It soon attracted the attention of the European emigrants from wine-growing countries, was resuscitated and propagated, and still forms the bulk of the vineyards of California. We have good testimony to the effect that the wines made by the missionaries were of very indifferent quality, owing partly, of course, to the inferiority of the grape used, but chiefly to the primitive mode of manufacture; the entire caskage consisting of a few large, half-glazed earthenware jars (*tinajas*), from which the fermented wine was rarely racked off, being mostly consumed the same season. Still, the luscious grapes and refreshing wines of the missions are dwelt upon with all the delight that contrast can impart by travelers just from the fiery ordeal of the Arizona deserts, or the thirsty plains of the Upper San Joaquin. The European wine-makers soon improved vastly upon the processes and product of the padres, but, in accordance with the fast ideas of the early times of California, they imprudently threw their immature product upon the general market, and thereby damaged the reputation of California wines to such a degree that it is only of late years that the prejudice thus created has been overcome, not only in consequence of better methods of treatment, and greater maturity of the wines when marketed, but also, and most essentially, by the introduction of the best grape varieties from all parts of the world. The result

is, that at this time, a large part of the wines exported are either partially or wholly made of foreign grape varieties, and, as a whole, will compare favorably with the product of any European country, while among the choicer kinds now ripening there are some that will take rank with the high-priced fancy brands of France. It is true that so far all California-grown wines are recognizable to experts, a peculiar flavor difficult to define, which has been called 'earthy,' recalling to mind that of the wines of the Vaud and of some of Burgundy. But this peculiarity remains unperceived by most persons, and is not comparable in intensity to the 'foxy' aroma of wines made from the American grape varieties.

"Another prominent peculiarity of the California wines is that they are generally of considerable alcoholic strength, as the result of the intense and unremitting sunshine under which they invariably ripen. This is especially the case in the Los Angeles region, whose natural wines are by many, at first blush, thought to be 'fortified,' since they not only reach the maximum alcoholic strength attainable by fermentation, but even then retain a very perceptible amount of unchanged sugar. This circumstance interferes, of course, with the safe daily and sanitary use of the native wines at home, and explains the fact that as yet a not inconsiderable amount, of French clarets especially, is imported into California for table use by the foreign-born population. This folly (for such it must be considered in this point of view) has already been in a measure remedied by the use of such varieties as the Hungarian 'Yinfandel' and others of a more acid and tart character; and it is quite probable that it will be found desirable to limit the time of exposure of the ripe grapes to the sugar-making autumn sun in order to restrict still further the alcoholic strength of some of the wines. Of course, the German and French vintners are difficult to convince that there may be in California too much of the blessed sunshine, every hour of which, in their native climes, adds to the market value of their product. This is but one of the many points in which the vinicultural practice of California seems susceptible of improvement. We find elsewhere that long experience teaches the vintners of

each country how to obtain the best possible results under their particular conditions; and it is not surprising that during the short period of experience had in California, and with the tendency of Spaniards, Portuguese, Italians, French and Germans to introduce each the practice of his own country under circumstances so different, the best methods and uniformity in quality should not yet have become fixed. What is true of wine-making proper is equally so of the modes of culture. The padres naturally adopted the system of short pruning prevailing in their own country, and the later comers as naturally continued it, and, oddly enough, applied it almost indiscriminately to the other grape varieties brought from Northern France, Germany and Hungary, in some cases even to the varieties of the native American stock, altogether unused to such summary treatment. The experimental stage in California wine-making is also strikingly evidenced by the great variety of grapes still found in the vineyards of progressive growers, as the result of which we find in the markets and in fairs a most tempting and beautiful display of the grape varieties of all countries; and nothing can be more convincing as regards the peculiar adaptability of the State to this industry than the excellence of most of these, often surpassing in this respect the best of their kind in their original homes. Yet we can hardly wonder at this in a climate which allows the currant and the orange to ripen side by side.

"Another drawback to the quality of the wines thus far is the tendency of each vine-grower to make his own wines, involving not only an unnecessary multiplication of costly buildings, caskage, etc., but also the unfounded assumption that wine-making is an easy thing, and can be managed by any one having a moderate amount of common sense; whereas, on the contrary, the production of the best possible result from a given material requires in this case, as in other manufacturing industries, a very considerable amount of knowledge and good judgment, which can be in some degree replaced by mere practice only in countries where long experience has settled all into a regular routine. The introduction of large wineries, managed by professional experts (like the magnificent establishment of Buena

Vista, near Sonoma Town), has gone far toward redeeming the wines of California from the reproach cast upon them by the hasty marketing of first crude efforts, which has, until lately, caused much of the native product to be sold under foreign labels. They have always possessed at least the merit of being made of the grape pure and simple, ungallized and unpainted, not so much, perhaps, as the result of superior virtue of wine-makers on the Pacific coast as because the superabundance and low price of grapes reduces the temptation to adulterate or 'correct' the natural product to a minimum. Even within the last few years some vineyards in the interior have been in part harvested by turning in hogs; and other uses for the surplus product have been sought and found in the making of an excellent syrup by evaporation of the must. The growing appreciation and consequent better price of California wines will probably hereafter prevent recourse to such expedients.

"A detailed consideration of the methods of wine-making is beyond the limits of the present article, but it should be said that after the picking of the grapes (usually by Chinese) the means and appliances used in the succeeding processes are generally (as in other branches of agriculture in California) of the most approved and efficient kind, and the operations conducted in the most cleanly manner. The reported treading of the grapes by the feet of 'Greasers' in the southern part of the State applies only to the pommace destined for distillation into brandy; albeit for certain kinds of wine (*e. g.*, Port) the treading process is deemed indispensable in Europe, and, after all, feet can be washed as clean as hands.

"Again, there are in California, as elsewhere, regions whose soil and climate favor the development of the highest qualities in wines, while there are others whose product, however abundant, good-looking, and pleasant to the palate when fresh from the vine, will fail, even with the best management, to yield a beverage fit for exportation.

"The volcanic soils of the beautiful valleys of Napa and Sonoma have thus far achieved the highest general reputation for wines of fine bouquet; yet even there the products of adjacent vine-

yards sometimes differ widely, and these differences are not yet, as a rule, sufficiently considered by the producers, or by those who blend the several products for market. The red soils of the foot-hills of the Sierra also give high promise of fine wines, and in the Coast Range those of the valley of San José are noteworthy. The wines made from the sugary berries of Los Angeles are, of course, very similar to those of South France, Spain and Portugal—fiery, and with a heavy body, but less 'bouquet' than those grown farther north. Its least deserving wine (if it may be so classed at all) is perhaps the far-famed Angelica ; and the mission grape almost alone is in bearing there as yet.

"The vineyards planted on the heavier soils of the Sacramento plain yield a large part of the table grapes for the home and eastern markets, and seem destined to become one of the chief regions for the raisin-making industry, to which the climate of the great interior basin is, of course, especially adapted in consequence of its rainless summers and intense, dry heat, sweetening the grape to the utmost, and rendering the curing process easy. Owing probably to a combination of favorable soils and good management, some of the Muscatel raisins from near Woodland, in Yolo county, have proved fully equal to the highest quality of those imported from Malaga. Unfortunately the commercial standing of California raisins, like that of its wines, has been injured by putting into market such as, from the mode of curing, did not possess the requisite keeping qualities. The efficient drying apparatus now introduced obviates this objection, and being accompanied by a superior style of packing, it is probable that raisin-making will hereafter take its place, alongside of wine-making, among the most important industries of the State, as indeed the increased demand and large advance in price already indicates.

"Brandy-making, also, has not been neglected, but in consequence of unfavorable Federal legislation has until lately labored under great disadvantages. Most of the native 'Aguardiente' has been distilled from pommace, and is, of course, rather hot and rank-flavored. In the Los Angeles region it is, to a great

extent, the 'first run' of the grapes only that is made into wine, no presses being used; hence the brandy made from the residue is of higher quality. The distillation of brandy from wine itself (now so rare in France) from the best of foreign grapes has been made a specialty by General H. Naglee, of San José, and the quality of the product is far above that of any imported now in the market. That the extensive importation of grape varieties should result in the introduction of their formidable enemy, the *Phylloxera*, is not surprising; but we may well wonder at the indifference with which that now well-known fact is regarded by the majority of wine-growers, even in districts in which the insect has already made its appearance, and has shown its power for harm. This is due largely to the fortunate, as well as unexpected and hitherto unexplained, circumstance that the progress of the pest has been remarkably slow as compared with its sweeping advance in Europe, though evidently not less sure. It is as though the winged form were not produced at all, or very much restricted in its powers of locomotion. It therefore seems quite possible to check, and perhaps stamp it out by timely precautions. But nothing of the kind has been done, and the penalty of this neglect has already been dearly paid in the Sonoma valley, the region chiefly afflicted. Sonoma Mountain seems to have proved an effectual barrier against its transmission to the Napa valley. The ravages of the insect are also reported from some other localities, but no noteworthy damage has thus far been heard of. Of other vine pests, the *Oidium* and a kind of black knot are the chief; but, on the whole, the damage done has been merely local and easily checked, and it may be truthfully said that to the grape vine, as to the human race, the climate of California is exceptionally kind."

"*Forage Crops.*—The strong tendency of the farming population of California to engage in stock-raising, dairying, and wool-growing, and the fact that the rainless summers of the greater part of California exclude from its agricultural system, at least on unirrigated land, both permanent meadows and clover, render absolutely necessary the cultivation of forage plants suitable for such climatic conditions. The search for these was early begun and is far from being yet concluded.

"The most obvious expedient, adopted at the outset, and still supplying the bulk of dry forage, is the cutting of the ordinary cereal crops for hay before the grain ripens. 'Wheat hay' and 'barley hay,' which, with oats similarly cured, constitute the main mass of the hay crop, are among the Californian oddities that first strike the agricultural immigrant. Most of the late sown grain, as well as so much of the early sown as from any cause does not promise a good grain crop, and the 'volunteer crop' that commonly springs up from the seed shed in harvesting the previous season's grain on land left untilled, is devoted to this purpose, for which it generally becomes fit some time in May, according to location. Oddly enough, embarrassment not uncommonly arises on fresh and strong land, from the fact that the straw is so strong and tall as to render it unsuitable for cutting into hay. A great deal also is cut at too late a period, when the grain is almost full-grown—it being well known that it is then that the greatest total weight is harvested; the quality, however, is in that case of course injured. During hay-making time (end of April to that of May) the weather is usually so dry that there is little difficulty about curing. There are no sudden thunderstorms to call for a hasty garnering of the hay. So little danger is there that injury from rains will occur after May that the shocks are often left exposed for many weeks to the bleaching action of dew and sunshine. The regular practice, however, is to gather them into large rectangular ricks, built without much reference to protection from rain, but mainly with regard to the convenience for pressing into bales. This is mostly done by contract with gangs or 'pressers,' usually consisting of four men with a wagon and press, who perambulate the country from June to October.

"Undoubtedly the most valuable result of the search after forage crops adapted to the California climate is the introduction of the culture of Alfalfa; this being the name universally applied to the variety of Lucerne that was introduced into California from Chili early in her history, differing from the European plant merely in that it has a tendency to taller growth and deeper roots. The latter habit, doubtless acquired in the dry

climate of Chili, is of course especially valuable in California, as it enables the plant to withstand a drought so protracted as to kill out even more resistant plants than red clover; as a substitute for the latter, it is difficult to over-estimate the importance of Alfalfa to California agriculture; which will be more and more recognized as a regular system of rotation becomes a part of the general practice. At first Alfalfa was used almost exclusively for pasture and green-soiling purposes; but during the last three or four years Alfalfa hay has become a regular article in the general market, occasional objections to its use being the result of want of practice in curing. On the irrigated lands of Kern, Fresno, and Tulare counties, three and even four cuts of forage, aggregating to something like twelve to fourteen tons of hay per acre, have frequently been made. As the most available green forage during summer, Alfalfa has become an invaluable adjunct to all dairy and stock-farming, wherever the soil can, during the dry season, supply any moisture within two or three feet of the surface.

"*Grasses.*—Of the ordinary pasture and meadow grasses of Europe and the East, but a few have to any extent gone into cultivation. One of the most unsuited to the climate, viz., Kentucky blue grass, is carefully nurtured by daily sprinklings as the chief ingredient of lawns, for which the Eastern immigrant generally maintains a preference, often satisfied at an inordinate cost of money and labor, and sometimes of health. As water for household purposes is almost universally kept under pressure from elevated tanks or water-works, the hose and lawn-sprinkler are probably in more general use here than in any other country; and innumerable attacks of rheumatism and malarious fever are traceable to their intemperate use, even to the injury of the coveted grass itself. But few attempts have as yet been made to find an acceptable substitute for the costly blue-grass lawn. Among those which promise best are the Italian rye grass, which remains green all summer without irrigation in the bay climate; and, with proper treatment, doubtless the Bermuda grass could also be used. In either case, fully six out of seven weekly sprinklings might be dispensed with. This

rye grass (*Lolium Italicum, multiflorum*) has in some districts become so naturalized as to be cut for 'volunteer hay,' while at other points it is regularly cultivated with irrigation, if needed. In the tule lands and other naturally or artificially irrigated regions, the soft meadow grass (*Holcus lanatus*), under the singularly inappropriate name of 'mezquite,' as well as the orchard grass (*Dactylis glomerata*) have come into use for pasture as well as hay; but the latter is not found in market. So of the millets (*Panicum Italicum, Germanicum*), which are locally in use. Of late various species and varieties of sorghum are coming into favor; among these especially the Dhurra, or Egyptian corn, and the pearl millet (*Penicillara spicata*). Other forage plants are under trial in various portions of the State; but thus far none can compare in importance with the cereal grasses and Alfalfa. It is probable that hereafter some of the native grasses and clovers, now considered as weeds only, will be found profitable for culture.

"*Stock-breeding and Dairying.*—Prior to the American occupation, the breeding of sheep, horses, and, to a less extent, of neat cattle, roaming in flocks over the extensive ranches, was the chief occupation of the inhabitants; and to a great extent the remnant of the original Spanish-Mexican population still clings to the old pursuit, which affords an easy livelihood, and permits of indulgence in that *dolce far niente* which seems to be impossible to the 'Americanos,' however varied may be the nationalities that compose the population of the United States. It thus happens that even where the 'ranche' and stock are owned by Americans, the herders are to a great extent still the native 'vaqueros,' who, mounted on their hardy mustangs, and with the old-time lasso (more properly 'lazo'), coiled around the horn of their high Mexican saddles, and rarely more than a rope to guide their steed, may be seen careering around the steep hill-sides with a disregard of all the ordinary precautions against the breaking of necks, that is quite straining to the nerves of novice lookers-on. As a matter of fact, accidents very rarely happen to these wild riders; and their efficiency in keeping in bounds and 'corraling' the cattle intrusted to their care,

on the most rugged ground, is remarkable. It is but fair to say, however, that their practice has been quite successfully imitated by other nationalities, and that many a swarthy herdsman now-a-days responds more promptly to the Saxon or Norse salutation than to that of the Mexican-Spanish dialect.

"The purely pastoral method of stock-raising is, of course, gradually receding before the advance of agriculture proper to the more thinly settled regions; maintaining itself, however, in some of the large ranches owned by parties declining to sell to small farmers. The obvious disadvantage of being entirely at the mercy of the seasons, thus sometimes losing in a single dry year all the increase of a previous succession of favorable ones, has gone far toward the introduction of a safer system, in which the hardy and nutritious Alfalfa serves to carry reduced numbers of stock of correspondingly higher quality safely through the dry months. In few States, probably, is the value of improved breeds more highly appreciated than in California; and nowhere, probably, can the best strains of the more important breeds be seen in greater perfection. The one domestic animal of common note, not as well represented in California as elsewhere, is the hog; the obvious cause of the comparative neglect being the absence of a sufficiently long and regular period of freezing weather, whereby the safe packing and curing of pork, hams, etc., is rendered too precarious. While, therefore, fresh pork of excellent quality is commonly found in the markets, the supplies of bacon, ham, and lard are, as a rule, furnished by the Western States, and partly by Oregon. Foremost in numbers among the rest is undoubtedly the *sheep*, in its double capacity of wool-bearer and producer of some of the best mutton in the world; a combination which has doubtless contributed much to the preference given it on the part of the somewhat inert native population. Easily satisfied with scanty pasturage, and in the southern part of the State scarcely needing shelter, the sheep is the very animal for the swarthy inhabitant of the adobe house, who loves to take his ease lounging on the airy veranda, asking of fate no luxury beyond a due allowance of cigaritos, and not at all envious of the greater comforts and riches of his unquiet, hard-working, and ever-scheming Saxon neighbor.

"The common sheep of the country, while far from being a high-bred animal, is yet superior in many points to the stock commonly found in other countries, and its adaptation to the climate has rendered it profitable in cases where improved stock failed to pay. The Spanish Merino, whose blood doubtless runs in the veins of the native stock, seems to be best adapted to its improvement, and the best of this breed has been imported into the State. The wool-clip is among the most important products of South California; but it would seem that the attainment of the highest quality requires some change from the natural conditions of pasturage, which present too great a contrast between the wet and dry seasons to insure perfect uniformity of the fibre. This, however, can undoubtedly be accomplished by the introduction of the proper forage plants. In dry seasons, such as that of 1876–77, the mortality among the larger flocks has sometimes amounted almost to annihilation. The sheep-owners of the plains, in order to save something, have driven their flocks to the foot-hills and valleys of the high Sierras, leaving their route marked with the festering carcasses of the weaker animals, and sweeping every green thing before them, to the dismay of the dwellers in the invaded regions, who were thus sometimes themselves reduced to extremities. In ordinary seasons, this migration has its regular methods and routes, the herds ascending the mountains in the wake of the summer's drought, and returning to the foot-hills or plains to winter.

"Of other fleece-bearing animals the Angora or Shawl goat has attracted considerable attention, and seems to succeed well; but the industry has not as yet assumed large proportions, chiefly, it seems, on account of the want of a regular market sustained by competition among the purchasers.

"*Of Horses.*—The Mexican mustang, a rather undersized yet hardy and serviceable, but proverbially tricky, race, descended from the Spanish breed, and therefore far from being inferior blood, still forms the greater portion of the horses in common use in California. The larger American horse brought from the Eastern States, although preferred for heavy work, is not so well adapted to the mountains, and requires higher feeding.

The two varieties are, of course, rapidly mixing, and better blood than that of many California studs it would be hard to find anywhere. Fast horses and fast men have here, perhaps, more than elsewhere been the bane of the agricultural fairs, whose real and important objects have, until lately, been most frequently swallowed up in that of an opportunity for betting and horse-racing, to the disgust of the agriculturists. The introduction of the more useful breeds has not, however, been neglected, as is evidenced by the fine Norman and Percheron dray-horses seen on the streets of San Francisco. A tolerable riding-horse can probably be bought for less money in California than anywhere else in the United States, the mustangs (which are generally of light build) being bred in large herds on pastures, with little care and therefore little expense. But when the excursionist pays twenty or thirty dollars for his steed he must not expect to find it trained to gentleness and affection, for the 'breaking-in' process which these animals undergo on the ranches has but few of the features that Mr. Rarey would recommend. The unwary horseman will pay for his experience by many an unexpected nip or kick, or by being left on foot at inconvenient distances from his destination, in consequence of a dexterous slip of the rein from his arm, a sudden rush under a tree with low branches, or a 'bucking' process of exceptional suddenness and violence. The mustang will, ordinarily, abandon these practices in proportion as it feels that the rider is 'up to' its tricks; but the latter should never be found altogether off his guard against them, as he might safely do with a well-educated horse.

"The *neat cattle* of California, previous to the American occupation, were chiefly of a type whose ancestry may still be seen on the pastures of Andalusia—a middle-sized race, lightly built, bearing medium, long, but aggressively-pointed horns, which, combined with an irritable temperament and a fair capacity for speed, render the proximity of a herd of these cattle not altogether pleasant to the novice. Like its cousin, the Texas Long-horn, now familiar to the West, it is a hardy, prolific race, yielding a fair quality of beef, and a thick and tough hide, well

adapted either to the production of sole leather or to that of the strong rawhide thongs, which serve the Mexicans in place of rope, twine, nails and other domestic appliances deemed indispensable by more pampered nations. As milkers, however, its cows are a failure; nor are its oxen remarkable for either docility or disposition to engage in agricultural pursuits, being the natural result of a nomadic life on wild pastures, from which they were driven in and 'corraled,' for branding or slaughtering, only a few times in the course of the year. All this, of course, has materially changed since the advent of the American. The immigrants brought their cattle with them over the plains, and found no reason to exchange the progeny of these for the pugnacious natives. The latter have, therefore, greatly diminished in numbers, and are little seen in the more populous regions, retiring before the advance of culture like their original masters. The gentler race that accompanied the Americans across the Rocky Mountains now dots the plains and foot-hills of the Great Valley of California; and since their weaker brethren mostly perished on that trying and weary voyage, a process of selection has taken place, as a result of which the worst breeds of 'scrubs' are rarely seen in the State. Moreover, the tendency to improvement that is so apparent in the use of perfected appliances of every kind has manifested itself at least equally in the importation of the best breeds of neat cattle, among which the Short-horn, Jersey, Alderney and Ayrshire, and to some extent the Devon, have found especial acceptance, and are represented by some of their best strains. Much discussion prevails as yet in regard to the relative merits of the various breeds under the peculiar climatic conditions of California; but already they are beginning to become localized in accordance with their several adaptations to local climates, which can be found to suit all; and perhaps in time the tawny race of the Swiss Alps will find a congenial range on the Sierra Nevada.

"The production of beef is as yet limited by the requirements of home consumption; but the dairy interest is rapidly assuming a wider range, and with an increasing knowledge of the modifications of the processes demanded by climatic conditions, the

quality of dairy products is improving so much that as a market for all but the choicest kinds, California will soon be closed to the Eastern producer, and will, perhaps, compete with him in foreign markets. The average quality of the milk supplied to San Francisco and Oakland, from the numerous 'dairy ranches' on the coast and bay and in the Coast Range, is greatly superior to that generally found in Eastern cities; one obvious reason being that in the absence of distilleries there is no opportunity or temptation to feed the cows on unhealthy offal; nor do the sleek and healthy cows that range the breezy hills of the coast ever need to be propped or slung up in order to enable them to stand the milking process. It is believed that an undue increase of bulk from a too free use of the pump is all that the milk consumers of these cities ever have to complain of.

"*Butter* is now very generally of fair quality, some brands being quite up to the 'gilt-edge' standard. It is usually sold in rolls supposed to weigh two pounds, but in reality always several ounces below that weight—a circumstance so well understood, however, that the practice hardly amounts to deception. The price per roll rarely falls below fifty cents to the consumer, and ranges more generally from sixty cents to $1.10 about Christmas time, when even that which has been packed in casks with salt during the spring and summer brings seventy cents.

"The intimate connection (to the housekeeper at least) of butter with *eggs* suggests a few words on that subject in this place. The demand for eggs is unusually large in California cities, in consequence of the commonly prevailing practice of not only single men and women, but also small families in moderate circumstances, living in lodgings, and taking an easily made breakfast of eggs, bread and coffee, thereafter going to the restaurant for dinner, and thus avoiding the pains and pleasures of housekeeping. Whatever may be said of the desirability of this practice in a social point of view, it manifests its effects in the price of eggs, which rarely falls below thirty cents per dozen to the consumer, and is more frequently among the fifties and upward; even so, fowls cannot often be bought at less than eighty cents apiece, and $1 is a common price. Poultry-keeping is

therefore a very remunerative pursuit when judiciously managed, since feed is as cheap as elsewhere; and it is one of the industries which have not, as yet, been overdone. There are no special difficulties to be overcome in poultry-raising in California; yet a great deal of money has been lost in attempts made by persons unfamiliar with its proper management. There is no lack of the improved breeds, but among them the Leghorns seem to enjoy the widest acceptance at this time.

"*Apiaculture* is common throughout the State, and nowhere is the product of the bee of finer flavor, or marketed in a more attractive form. The best of improved hives are in common use, and the market is always supplied with the frames filled with the delicate, almost white, comb. Of course the improved varieties of bees have been introduced, and in the southern part of the State especially this industry is practised on a scale not often to be met with elsewhere, as can readily be seen from the figures showing the export, amounting in 1878 to no less than three and a half millions of pounds. How kindly the honey-bee takes to even the desert region of that country is well illustrated in what has been supposed by many to be a 'snake' story, but what is an unquestionable fact; namely, that some miners, prospecting in Arizona, struck a regular 'fissure vein' of honey in a rocky ridge, where the bees had been making deposits for years, and, although the vein-contents were not what they had been searching for, they took to it kindly and worked it, extracting therefrom a fabulous amount of honey. Another adventurous colony took possession of the court-house cupola at San Bernardino, and had accumulated several hundred pounds of honey when discovered. The bee is very fond of the flower of the mountain sage (*Artemisia*), as well as of a number of other desert plants, and is thus afforded unlimited pasture through three-fourths of the year. It seems that certain kinds of flowers, not yet identified, impart to the honey a tendency to become turbid after straining, from the separation of minute white crystals, whose nature has not as yet been ascertained. Such honey, whose other qualities are generally of the highest, has been unjustly suspected of adulteration in Eastern and English markets. The prejudice arising from

this merely conventional defect will soon be overcome, and South California will doubtless become one of the largest, if not the largest, honey-producing country of the world.

"*Silk-culture* is at present almost extinct in California in consequence of the reaction against the mania for this industry that began in the State some eighteen years ago and raged with unabated fury for several years, inflicting severe losses upon those who indulged in the popular delusion that the silk-worm would thrive in the State without any special precautions in the way of shelter and such intelligent care as can be given only by those versed in its treatment. Some of the airy sheds that were supposed to be an adequate protection against the comparatively slight changes of temperature are still extant, as monuments of that flush period when mulberry trees were thought to be the only nursery stock worth having. It can hardly be doubted that the advantages offered by a climate in which the food of the worm is available during all but two or three months in the year, yet free from the excessive heat that elsewhere militates against the insect's well-being, will ultimately assert themselves in the resumption of silk-culture in a calmer mood. It has been very successfully kept up, on a small scale, by Mr. Gustavus Neumann, of San Francisco, showing pretty conclusively that it is not the nature of the climate, but adverse commercial and industrial circumstances that at present keep the rise of silk-culture in check."

The tables on page 615 show the leading agricultural products of the State (except grapes and wine) for the year 1878 as estimated by the Agricultural Department; the statistics of 1879 are not yet received. They give also the estimated live-stock of the State in January, 1879.

In regard to items not entering into these statistics, we may say that in 1877 California had 30,000,000 grape vines, most of them in bearing, one county (Los Angeles) alone having over 6,000,000; of fruit trees, common to temperate climates, 340,000 in bearing, and of sub-tropical fruit trees, the almond, lemon, orange, olive, fig, etc., 500,000. Of wine 6,400,000 gallons were exported in 1877 over the Central Pacific Railway, and about

45,000,000 pounds of wool, beside the large amount retained for home consumption. Of salmon, mostly in tins, 7,841,680 pounds were shipped eastward in 1877; of borax 536,000 pounds.

Crops. Products.	Measures.	Quantity produced.	Av'ge yield per acre.	Number of acres of each crop.	Value per bushel or ton.	Total valuation.
Indian corn	bushels	3,467,250	34.5	100,500	.60	$2,080,350
Wheat .	"	41,990,000	17.	2,470,000	1.03	43,249,700
Rye . .	"	195,000	15.	13,000	.75	146,250
Oats . .	"	4,350,000	30.	145,000	.69	3,001,500
Barley .	"	14,950,000	23.	650,000	.65	9,717,500
Potatoes.	"	4,377,600	114.	38,400	.98	4,290,048
Hay . .	tons	1,271,000	2.05	620,000	12.61	16,027,310
				4,036,900		$78,512,658

Live-stock.—Animals.	Number.	Average price.	Value.
Horses	273,000	$43.95	$11,998,350
Mules	25,700	66.24	1,702,368
Milch cows . . .	459,600	25.90	11,903,640
Oxen and other cattle	1,010,000	18.91	19,099,100
Sheep	6,889,000	1.61	11,091,290
Swine	565,000	5.95	3,361,750
			$59,156,498

Manufacturing Products.—California, not content with being the richest agricultural State and one of the best mining States of "Our Western Empire," aspires also to a high rank as a manufacturing State, for which, indeed, she has many facilities. Her earliest manufactures were connected with her mining interests, mining implements and machinery, and generally, miners' supplies. In these she has been remarkably successful, and at the present time some of the best mining machinery known is produced at San Francisco, and in other California cities; the exceptional size and excellence of her forest trees led to the production of lumber for mining, building, and railroad purposes, and to the finer manufactures of wood as furniture, etc.; the vast herds of cattle and the great quantities of hides placed upon her market led to the establishment of tanneries and to the production of leather for harness, saddles, hunters' trappings, etc., a class of manufactures very greatly to the taste of her Hispano-

American population; and her vast flocks of sheep made her chief city one of the best wool markets in the country and stimulated manufactures of several classes of woollen goods, in which she has attained great excellence. Her immense production of wheat led to the establishment of extensive flouring mills, and the San Francisco flour has a great reputation. The development of grape culture naturally led to the manufacture of wine and brandy. Carriages and wagons, and iron manufactures and iron castings were the outcome of the production of mining machinery and miners' supplies. Of other manufactures, most have grown out of her commerce. She buys largely of unmanufactured tobacco, which is made up there into cigars, chewing and smoking tobacco. The raw sugar received from the Sandwich Islands is manufactured into refined sugar, syrup, and candies; and the bags in which her grain is exported are manufactured in her own mills. Gunpowder, dynamite, giant-powder, and chemicals, which also figure among her products, are mostly in demand for the mining districts and miners' supplies. What amount of capital is invested in her manufactures, and what is the annual value of the products now, it is difficult to say. In 1870 the amount of capital reported (and very much understated) by the census was $39,728,202, and the annual product stated was $66,594,556. It would undoubtedly be three times the amount, if not more, in both cases at the present time.

Mining Products.—The official statement of the production of gold and silver in California in 1879 gives $18,190,973 as the amount, but this does not include considerable sums forwarded to the East in private hands, nor the amount used for manufacturing and other purposes in the State, nor what was on hand at the mines, mills, and smelting works at the close of the year, but only what was either deposited at the mint or passed through the express companies. There is to be added to this also about $1,000,000 worth of lead (5.55 per cent.), parted from the silver in the smelting works. Dr. Rossiter W. Raymond, late United States Mining Commissioner, and now editor of the *Mining Exchange Journal*, the highest authority on this subject, estimates that, throughout all these mining States and Territories,

and especially in California, the gold and silver product is only about one-tenth of all the mineral products of the State; that the quicksilver, platinum, copper, lead, iron, tin, coal, borax, soda, salt, sulphur, gypsum, marble, granite and other building stone, mineral waters, etc., together aggregate nine times as much as the precious metals. However it may be with the other mining States and Territories, this estimate probably very closely approximates the truth in California; so that we may put the entire amount of mining and mineral products for the year 1879 at about $181,900,000.

Railways.—The present railway system of California is very simple, though it traverses almost the entire State. The Central Pacific and its branches, one of which stretches up almost to the Oregon boundary, and others extend to Calistoga, San José, Santa Cruz, Soledad, and Monterey; and the Southern Pacific, composed mainly of the same stockholders and directors, extend from Redding on the north to Fort Yuma in the southeast and from the Nevada line to a dozen places on or near the coast. The Central Pacific extends to Ogden, where it joins the Union Pacific; and the Southern Pacific, crossing the Colorado at Yuma, has nearly traversed Arizona, and is making its way as rapidly as possible to El Paso on the Rio Grande. The Southern Pacific is now pressing forward its construction with all speed, intending by arrangements with roads already built, to make its eastern terminus within a twelvemonth at Galveston, Texas, and thus find an outlet for the rich products of Southern California, by way of the Mexican gulf, and the Atlantic. Two other roads are proposing to enter California at the south; the Atchison, Topeka, and Santa Fé, or its extension, the St. Louis and San Francisco, already beyond Santa Fé, will probably cross Arizona on or near the thirty-fifth parallel, and, sending one branch through the rich Mexican State of Sonora, make one terminus at Guaymas on the Gulf of California, and another either at Santa Barbara or San Diego; while the Texas Pacific, following the valley of the Gila river, will also make its western terminus at San Diego. With the exception of the completion of the Oregon Railway and the extension of some two or three

branches to the coast, these seem to be nearly all the railways which are practicable for the State.

Commerce and Navigation of the State.—The two customs districts of San Francisco and San Diego (the latter, however, being of only small account) stand third in the United States in the amount of their imports, which in 1879 were $35,105,639, sixth in the amount of their exports, which were in 1879 $35,575,838, and second in the amount of foreign exports, which were the same year $4,117,886.

The number of vessels entering these two seaports from foreign countries in 1879 was 579, having a tonnage of 645,262 tons; the number which cleared for foreign ports was 676, having a tonnage of 752,431 tons, in both cases about equally divided between American and foreign vessels.

The vessels engaged in the coasting trade and fisheries are not reported at the custom houses, except when they have foreign goods on board, so that the greater part of the coasting trade is not reported. But of the number which come under the conditions, there were 382 vessels entered of 417,992 tons, and 389 vessels cleared with an aggregate of 378,627 tons. The number of registered, enrolled and licensed vessels in the two districts was 918, their tonnage 200,319 tons.

But the greatest commerce of the State is conducted over her railways. We have no returns of this commerce later than the close of 1878, and these only over the Central Pacific and its branches, which, however, carries the greater part of the freight. The freight over this road in that year was 3,575,573,390 pounds $=1,787,786\frac{695}{1000}$ tons—and the freight received therefor was $10,802,276.

The ocean steamers from the port of San Francisco ply between that port and Panama, between that port and the Sandwich Islands, and those crossing the Pacific go to Hong Kong and Yokohama. There is also an indirect steamer trade, and a direct one with sailing vessels with the South American ports on the west coast, and with Australia, New Zealand and the islands of the southern seas.

Banks.—There are seven national banks in California, all re-

deeming their own notes in gold, as all the California banks have done since 1861. These banks have a capital of $4,000,000 and a circulation of $1,534,000, and a large amount of deposits. There are besides these 115 State banks and trust companies, private banking houses and savings banks, with an aggregate capital of $31,707,107, and deposits in December, 1879, of $81,019,951. Some of the private banking houses do an immense business.

California as a Health Resort.—The data which we have already given show conclusively that the coast region of California from San Francisco southward, with its small annual range of temperature, and the very slight mean difference between the averages of the winter and summer months, its clear, dry and bracing air, and its abundant nitrogenous food and luscious fruits, is the best region to which an invalid with weak lungs or a tendency to predominance of the white tissues could possibly come. What has been deduced theoretically from these premises proves to be true in practice; there is no better climate for consumptives, scrofulous persons, or those of anæmic tendency than the coast of California from the 38th parallel southward. The ocean winds may be a little harsh at San Francisco, though the temperature is otherwise unobjectionable; but at San José, Santa Cruz, Monterey, Soledad, Santa Barbara, San Buenaventura, Los Angeles, Florence, Anaheim, Wilmington, San Bernardino and San Diego, the climate is simply perfect. Farther north, from the 39th to the 42d parallel, the mountains come closer to the coast, the shores are forbidding and very sparsely inhabited, and the rains are too many and too heavy to make it pleasant. The valleys between the Sierras and the Coast Range are very pleasant in winter, but the summers are intensely hot and dry. On the mountain slopes there is every variety of climate, but Lake Tahoe, the Yosemite and the Sequoia groves, though healthful and pleasant summer resorts, are not specially adapted to invalids of this class. Many of the mineral springs of the State have a high reputation for rheumatic and cutaneous diseases. The Warm Springs of Calistoga, in Napa county, and the Sulphur Springs and waters at the "Geysers," not far distant, are largely visited by invalids.

Population.—The population of California in 1870 was, excluding tribal Indians, 560,247; with these Indians, 582,031. Of these 499,424 were whites, 4,272 colored (*i. e.*, of African descent), 49,310 Chinese and Japanese, 7,241 civilized, and 21,784 tribal Indians. Of the 560,247 inhabitants (exclusive of tribal Indians), 349,479 were males, and 210,768 were females. The census of 1880 makes the population, exclusive of tribal Indians, 864,686, or with them, about 875,350. The number of persons of African descent has probably moderately increased; the Chinese are stated by the census as only 51,000, but the largest accessions to the population have been from the Eastern States and from Great Britain, Germany, the Scandinavian States, and other European countries.

Of late years there has been violent opposition on the part of a portion of the workingmen and some other classes in the State to the influx of Chinese immigrants, of whom considerable numbers had come into California as house-servants, mechanics, railroad laborers and miners. The Chinese have been very useful in all these capacities, and have unquestionably added materially to the wealth of the State, but it is objected, that they work for lower wages than other workingmen; that they send back their money and their bones to China, and many of them return thither themselves carrying their earnings with them; that they are addicted to opium-eating and other vices.; that the Chinese women do not migrate hither, and that their habits and modes of life are uncleanly. Moreover they are idolaters or at least heathen, and are under the control of the six Chinese companies in San Francisco, who contract for their labor, and govern and rule them absolutely. There are, undoubtedly, valid objections to the admission of a class of laborers in a community, who are wholly foreign to our religion, language, customs and authority, who are really the subjects of a foreign and irresponsible power, and especially when the greater part of them are coolies, or in reality the slaves of the Chinese companies, who exercise over them a really absolute authority. The difficulty is enhanced when these foreigners do not, and cannot, become nor seek to become citizens. As General Garfield has well said, their coming "is too

much like an importation to be welcomed without restriction, too much like an invasion to be looked upon without solicitude. We cannot consent to allow any form of servile labor to be introduced among us under the guise of immigration." Still the objections urged against the Chinese as a race, and which have led to serious riots and great injustice against them, seem at this distance trivial. Our country boasts that it is the refuge and home of the oppressed of all nations, and if some of these objections are to be regarded as valid against the Chinese, it might be well to inquire whether most of them might not be urged with the same propriety against other nationalities, some of which are now the bitterest persecutors of the Orientals.

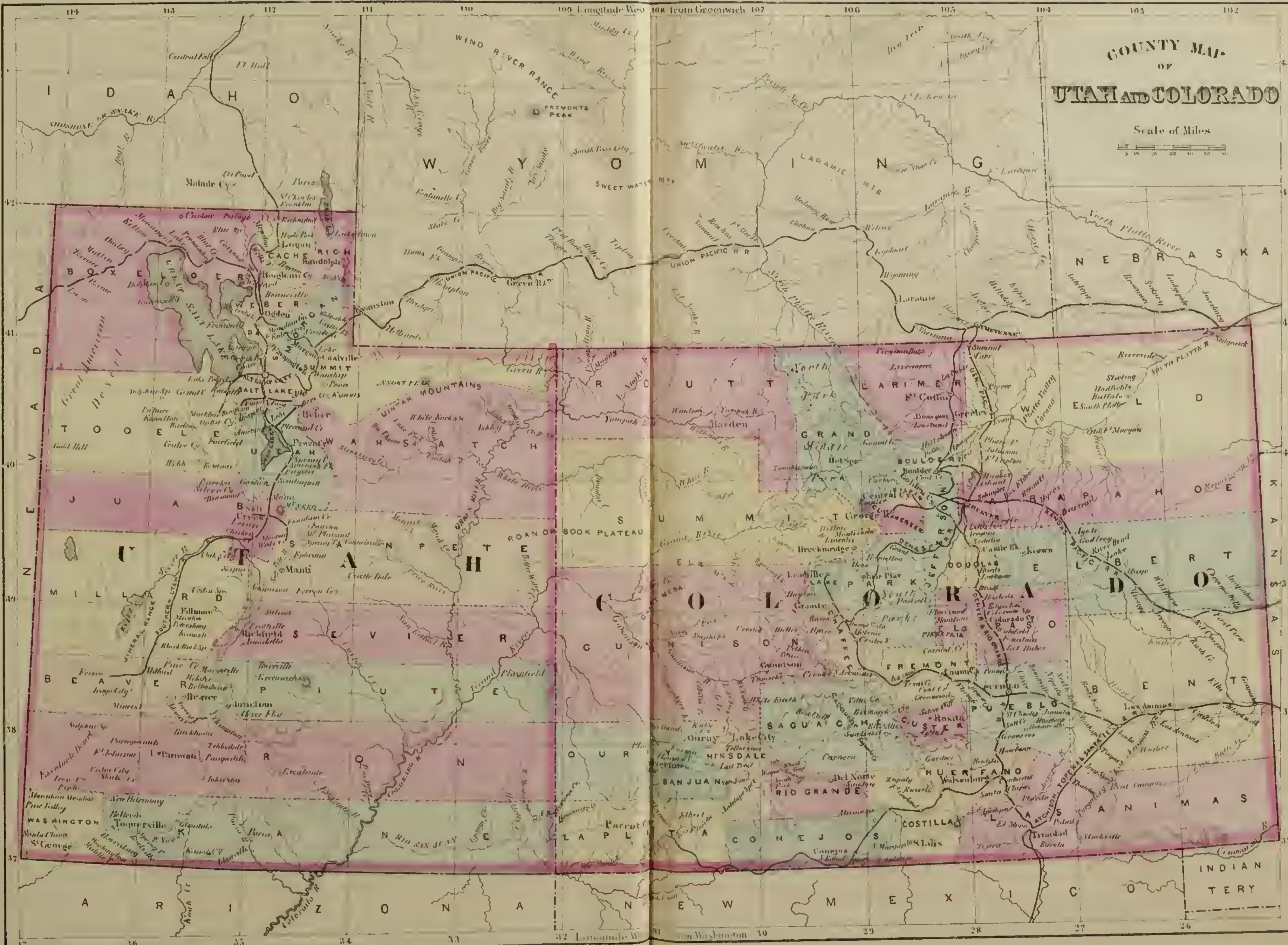
It is rather because of the danger of the introduction of a servile class wholly irresponsible to our laws and institutions, than from any regard to the demonstrations of the hoodlums and dangerous classes of the Pacific coast, and the demagogue leaders who have urged them on, that our government, recognizing its duties and responsibilities to a nation, with whom all our relations have been as friendly as they have been with China, have sent a commission composed of three of our most eminent citizens to treat concerning these and other matters, with the Chinese government, and while preventing this coolie immigration, to encourage the coming of respectable Chinese citizens and their families. We must admit these, and, admitting them, we are firmly persuaded that the dawn of the twentieth century will see a population of not less than ten millions of Chinese in "Our Western Empire."

Education.—The educational position of California is worthy of all praise. No child in the State need grow up in ignorance. She has a permanent school-fund of about $2,000,000, but her annual expenditures for her public schools alone exceed $5,000,000, and include a tax of ten cents on every hundred dollars of taxable property. Her teachers are well paid, and somewhat more than $2,000,000 is expended annually for teachers' wages. There are, besides these public schools, which are free to the children of the whole State, a great number of private and endowed academies, institutes and high schools for secondary

instruction; many of them of the highest character. A State university, well endowed both by the State and United States; a State normal school, an agricultural college, and a military academy, all well and efficiently managed, and thirteen other universities and colleges, mostly sustained by the different religious denominations. These have 180 professors and about 2,500 students, and property, including their permanent funds, to the amount of about $2,500,000. There are also professional schools of law, medicine, theology and science, and there is now building an observatory in an eligible site, endowed most liberally by a former citizen of California, Mr. James Lick.

Churches.—Every denomination known in the United States has its representatives in California. The Roman Catholics have several dioceses and one arch-diocese there, nearly 200 priests, and an adherent population (estimated) of somewhat more than 100,000 persons, made up of Mexicans, Spanish, Irish, Germans, Italians and some Americans. The Methodists are probably quite as numerous, having about 225 churches and a still larger number of preachers. The Presbyterian churches have somewhat more than 100 churches and ministers. The Baptists about ninety churches. The "Christian" connection and the Disciples about fifty churches. The Protestant Episcopal about fifty-five churches; the Congregationalists about seventy churches. There are also "Friends," Jewish Synagogues, "Evangelical Association," Lutherans, German Reformed "United Brethren in Christ," Unitarians, Universalists, New Jerusalem Church, Second Adventists, Greek Church, six Spiritualist organizations, four Mormon churches, seven Chinese congregations with five temples, etc., etc.

Counties and Cities.—There are fifty-three counties in the State, some of them of great extent, but sparsely inhabited. The most populous counties (most of them also the smallest in area) are San Francisco, Alameda, Sacramento, Santa Clara, Sonoma, San Joaquin, Nevada, Los Angeles, Solano, Placer, Butte, Humboldt, Yuba, Amador, Napa, Yolo, Mendocino, Monterey and Contra Costa. Of cities and towns San Francisco has, by the census of 1880, 233,956 inhabitants. It is much the



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largest city on the Pacific coast and has an extensive commerce and a large amount of manufacturing. Sacramento, the capital of the State, had 16,283 inhabitants in 1870, and the census of 1880 gives it 21,420. Oakland, across the bay from San Francisco, had 34,556 in 1880; San Jose, 12,567; Los Angeles, 11,311; and Stockton in the San Joaquin valley 10,287 inhabitants; Marysville, Santa Cruz, San Diego, and Santa Barbara are the other towns of importance.

California, as the gateway of the Pacific, holds a different position to "Our Western Empire" from any other State or Territory in it. With its fine climate, its vast extent of fertile soil, its rich and abundant pasturage, its great mineral wealth, its extensive commerce, and its growing manufactures, it has a career before it much like that of the State of New York on the Atlantic coast. If it shall shake off the death-grapple of the horde of political communists and demagogues, the miserable miscreants, who call themselves "workingmen," but most of whom never did an honest day's work in their lives, who are now trying to throttle it, it will have a great and glorious future as the leading State of this great Western Empire; but if not—

CHAPTER IV.

COLORADO.

SITUATION, BOUNDARIES, AREA—TOPOGRAPHY—MOUNTAINS, VALLEYS, PLAINS, PARKS, RIVERS, LAKES, CANONS—CLIMATE, SOIL, AND VEGETATION—GEOLOGY, MINERALOGY, ANIMALS—MINES AND MINING INDUSTRY—THE EXTRAORDINARY DEVELOPMENT OF MINING IN THE STATE SINCE 1875—MINING DISTRICTS — FARMING — STOCK-RAISING — WOOL-GROWING — RAILROADS — COMMERCE — POPULATION — INCREASE SINCE 1870 — COUNTIES — EDUCATION — CHURCHES—THE FUTURE OF COLORADO.

COLORADO, often called "the Centennial State," because it was admitted to the Union in 1876, the year of our Centennial celebration of our national existence, is situated very nearly in the centre of "Our Western Empire," the distance in a direct

line being about the same to St. Louis and to San Francisco—to the frontier of British America and to that of Mexico. It lies between the thirty-seventh and the forty-first parallels of north latitude, and between the 102d and the 109th meridians of longitude west from Greenwich. Its width from north to south is about 280 miles, and its length from east to west about 370 miles. Its area is 104,500 square miles, or 66,880,000 acres.

The great plains which stretch from the Missouri river to the foot-hills of the Rocky Mountains, rising slowly but steadily with each mile of their advance westward, have attained, when they reach the mountains, an elevation of between 6,000 and 7,000 feet above the sea. Eastern Colorado, for about three-sevenths of its extent, from east to west, consists of the most elevated part of these plains, which reach as far as Denver. West of the 105th meridian come the Rocky Mountains, which here attain their greatest breadth. The mountains consist of several principal ranges (which, however, do not extend continuously from north to south, but are broken off and made irregular by the great parks which are a feature of the mountains in Colorado), and of numerous spurs or short ranges extending westward, southwestward and northwestward, and terminating usually in broad plateaux, which are suddenly broken off by the deep cañons of the Green, Grand, and other tributaries of the Colorado of the West. It is a feature of the Rocky Mountains, and perhaps of all mountain chains on this continent, that the eastern slope of each range is generally much more gradual than the western, and that the ascent, even of its highest summits, is less difficult on the eastern than the western face. The western slope of each range is generally precipitous and sometimes impracticable. The ranges in their order, beginning with the easternmost, are the Colorado Front Range, which, though adopting some local names in the southern part of its course, extends from the northern to the southern bounds of the State. It has several lofty peaks, among which are Mount Evans, Mount Rosalia, Pike's Peak, and Chief Mountain. The first three are over 14,000 feet in height. The next in order is the Northern Colorado or Main Range, which joins the Front Range at the northern face of the

South Park. It has three summits above 14,000 feet, and three above 13,000; the first three are Gray's Peak, Irwin's Peak, and Long's Peak; the second three, Arapahoe Peak, Mount Guyot, and James Peak. Bald Mountain, in Gilpin county, 10,322 feet, is also in this range. The Park Range, between which and the preceding are situated the three great parks, North, Middle and South, extends from the northern border of the State nearly to the Arkansas river, in latitude 38° 40′. This range has six summits of 14,000 feet or above, viz.: Buckskin Mountain, Mount Cameron, Horseshoe Mountain, Mount Lincoln, Quandary Peak, Silverheels, and Sheep Mountain, 12,589 feet.

The Sawatch or Saguache Range, which is reckoned a part of the Main Range, begins at the Grand river and extends south as far as the Saguache river, where it sends out a spur to the southwest, known as the Cochetopa Hills—has ten summits, all but one of them over 14,000 feet; these are: Mount Antero, Mount Elbert, Mount Harvard, Holy Cross Mountain, La Plata, Massive Mountain, Mount Princeton, Shavano and Mount Yale, while Mount Grizzly is 13,956 feet in height.

Between the Saguache and the Park ranges is interposed, in Southern Colorado, the Sangre de Christo Range, which has four summits over 14,000 feet; one of them, Blanca Peak, the highest in Colorado, and the highest, except one, in the whole West. Besides Blanca, Baldy Peak, Culebra and Hunt's Peak are above 14,000 feet, and the two Spanish Peaks are 13,620 and 12,720 feet respectively.

In Southwestern Colorado there is a confused group of mountains, consisting of the main or dividing range and numerous spurs, known as the Uncompahgre Mountains, San Miguel Mountains, Dolores, La Plata, etc. There are thirteen principal peaks in this group, eleven of them over 14,000 feet, several of which are within a few feet of the altitude of Blanca Peak. These summits are, Mount Æolus, Handie's Peak, Pyramid, Pridgeon's San Luis Peak, Simpson's, Mount Sneffles, Stewart's Peak, Uncompahgre, Wetterhorn, Mount Wilson, and the two lower summits, Blaine's Peak, 13,905, and Engineer Mountain, 13,076 feet. On the west, these mountains terminate in broad

and elevated plateaux and *mesas*, which extend to the river banks and there are riven by the deep cañons of the affluents of the Colorado. Among these plateaux are the Grand Mesa, north of Gunnison river, the Uncompahgre Plateau, between the Gunnison and the Dolores, and extending to the Grand river; the Dolores Plateau, between the Dolores and the San Miguel river, and the Southwest Plateau, between the Dolores and the Rio Mancos, and extending to the San Juan river.

In Western Colorado, in what is known as the Gunnison country, there is another mass of mountains, probably spurs from the Saguache or Sawatch range, which trend northwestward, westward and southwestward. There are many summits in this group which is known as the Elk Mountains; more than twenty being visible from the summit of Castle Peak, but only four rise to 14,000 feet, and one, Teocalli, is but 13,113.

Besides those which we have named, there are several hundred peaks in the State ranging from 10,000 to 12,000 feet above the sea, which would be noticeable in any other State, but rising from elevated table-lands 6,000 to 8,000 feet above the sea, they seem much less lofty than they otherwise would. Of the twenty most famous passes over the Rocky Mountains in this State only two are below 9,000 feet, and only five, of which the noted Veta Pass is one, are below 10,000, while five are above 12,000 feet, and one, the Argentine, is 13,100 feet above the sea, and is only practicable in summer.

Of the great numbers of lakes scattered in the mountain valleys, only one group, the San Luis lakes, situated in the beautiful San Luis Park, are below 8,000 feet in altitude, while the Green Lakes are 10,000 feet, and the Chicago Lakes 11,500 feet above the sea.

Of seventy-three important towns or locations in Colorado, only twelve are below 5,000 feet, and ten are above 10,000 feet, the Present Help Mine on Mount Lincoln being 14,000 feet.

"The parks of Colorado are a distinct and remarkable feature of this mountain system. They are generally composed of level or rolling lands, covered with luxuriant grasses, and dotted here and there with groves of timber. They are walled about with

mountains grand and high, and are watered by streams of the purest character." *

The North, Middle, and South Parks, and the San Luis Park form an almost continuous belt across the State from north to south, varying in width from thirty to fifty miles, and only separated from each other by mountain chains. The North Park has a diameter of about thirty miles, an area of somewhat less than 1,000 square miles, or over 600,000 acres, and an average elevation of about 9,000 feet. The Middle is much larger, having a length of sixty-five miles by a breadth of forty-five miles, an area of about 2,800 square miles, or 1,900,000 acres, and an altitude of about 8,000. The South Park is closed in by mountains on all sides, except the east; its elevation is nearly 9,000 feet, its area about 1,200,000 acres. The San Luis is lower (about 7,000 feet above the sea), but as large as all the rest, having an area of about 4,000,000 acres. The North Park is drained by the north fork of the Platte; the Middle by tributaries of the Grand river; the South by affluents of the South Platte, and the San Luis by the Rio Grande del Norte, and its tributaries, and by streams flowing into the San Luis lakes.

Egeria, Estes, Animas, and Huerfano Parks are also of considerable size and of great beauty. Monument Park and the Garden of the Gods adjacent, are not so much parks as natural phenomena illustrating the erosion of the rocks. It is the opinion of geologists that these parks were ages ago the beds of vast lakes, but that by some volcanic or other cosmical convulsion they were upheaved and drained of their waters, though their relative position to the mountains was not disturbed.

The mountains of Colorado are covered with pine, fir, spruce, aspen, and other forest trees up to elevations varying from 10,800 to 12,800 feet. Above the timber line all is bleak and barren rock, varied by the occasional presence of grass and Alpine flowers.

Rivers and Streams.—Though within the meridians of longitude which but five years ago were declared to be those of the "Great American Desert" *par excellence*, it cannot be justly said

* Frank Fossett's "COLORADO."

that Colorado is not well watered. Its higher lands may require some irrigation, but the streams are there to irrigate them. On the east of the "Great Divide" the South Platte river, with about twenty tributaries on each side, rises far up among the summits of the Park Range, and pursuing a north-northeast, and then an easterly course, drains ten of the central and northeast counties; while the North Platte, taking its rise in the Rabbit Ears Range, drains the whole of the North Park. Returning to the eastern part of the State the Republican river, an affluent of the Kansas, with its four principal tributaries drains the eastern portion of Weld, Arapahoe, and Elbert counties. But the royal stream of Eastern Colorado is the Arkansas, which rises in the Saguache or Sawatch range, its sources interlacing with those of the Grand river, the largest affluent of the Colorado of the West, and in its passage downwards to the eastern boundary of the State receives more than sixty tributary streams. It is a noble river, and, in its passage through the mountain chains, cuts deep and frightful cañons almost to the base of the mountains themselves. Some of its tributaries, like the Purgatoire, Big Sandy creek, Horse creek, Apishapa, Huerfano river and *Fontaine qui Bouille*, are themselves rivers of considerable magnitude. The Rio Grande del Norte rises in the San Juan Range, where it interlaces with the sources of the Gunnison, Dolores and San Juan rivers, and flowing east-southeast receives numerous tributaries from San Juan, Hinsdale, Rio Grande, Saguache, Conejos, and Costilla counties, turns south near Alamosa and passes out of the State very nearly midway of its southern border.

The western slope of the "Great Divide" is drained wholly (except for some small streams which fall into the San Luis lakes) by the principal affluents which go to make up the Rio Colorado of the West. All of these except the main stream and some of the tributaries of the Green river have their sources in the Rocky Mountains of Colorado, and most of them either in the Park, the Saguache, the Elk or the San Juan Mountains. The tributaries of the Green river are, the Yampah or Bear river, with its branches, Elk and Elkhead creeks, Little Snake river and Vermillion creek, and the White river with its numerous

CAÑON OF THE COLORADO.

tributaries. The Grand river has its sources in the North Park, traverses with its tributaries the Middle and Egeria Parks, and by its affluents, Eagle river and Roaring Fork, distributes its waters through all the valleys of the northern Sangre de Christo Mountains and the Elk range, while its two great affluents, the Gunnison and the Rio Dolores and their numerous tributaries, the Uncompahgre, the San Miguel and Disappointment creek, drain all the western slope lying between 40° and 37° 30′ north latitude. In the extreme southwest the Rio San Juan and its numerous branches drain the whole of La Plata, San Juan, Hinsdale, and the western part of Conejos counties. All these rivers have scores of creeks and streams tributary to them, so that there are but few square miles in the State which are destitute of one or more living streams.

Mr. Frank Fossett, a recent able writer on Colorado, thus speaks of the cañons of these rivers:

"The river cañons, or deeply cut ravines that are found in all of the more elevated portions of Colorado, constitute a peculiar and striking feature of the great Rocky Mountain system. In the countless ages of the past, the waters of the streams have worn channels deep down into the hearts of the mountains, leaving the perpendicular granite or sandstone standing on either side for hundreds, and in some localities for thousands of feet. Nowhere are the grand and beautiful in Nature more effectually illustrated than in these mountain cañons. The glories of Boulder, Clear Creek, Cheyenne, and Platte cañons, and the Grand cañon of the Arkansas, all on the eastern slope of the Continental Divide, defy description. The walls of the Colorado, Gunnison, and Uncompahgre rivers, in the western part of the State, are still more massive and wonderful. In many sections they rise without a break or an incline to heights of thousands of feet, and along the Colorado continue in that way with hardly an outlet of any kind for hundreds of miles. The Grand cañon of the Gunnison is one of the world's wonders. Its walls on either side of the stream, and bordering it for miles, are usually not far from 300 feet in width, and are composed of stratified rock. In places these perpendicular sides, rising from

the water for distances of from one to three thousand feet, terminate in level summits surmounted by a second wall of prodigious height, thus forming a cañon within a cañon. Through the chasm between these giant formations and huge bastions and turrets one above another, dashes the river, its surface white with foam. The heights of these perpendicular cañon walls and their elevations with that of the river above sea-level at several points, are as follows: Level of the Gunnison at mouth of Mountain creek above sea-level, 7,200 feet; of top of wall or plateau on north side, 8,000 feet; height of wall, 1,600 feet; height of wall at point below on east side, 1,900 feet; on west side, 1,800 feet; height of wall in gneiss rock, 900 feet. Some distance below, the cañon wall rises directly from the river, 3,000 feet, of which the 1,800 feet nearest the water is gneiss rock; total elevation of top of wall or plateau above the sea, 9,800 feet."

Climate.—The great elevation of most of the places of residence in Colorado insures a temperate climate, rather too cool than too hot. The mean annual temperature of most of the towns, which are 5,000 feet or thereabouts above the sea, is not far from 50°—perhaps for a long term of years 48.5° to 49.3°.

The summer mean ranges from 64.6° to 69.2°, and the winter mean from 31.3° to 32.8°, so that the mean difference or range does not exceed 37° or 38°. The extremes are 93° to 99° maximum in summer, with from six to thirty days, according to the elevation, above 90°, and the minimum in winter —3° to —12° with an average of six to ten days with the mercury below zero. There is, therefore, an extreme range in the whole year of from 96° to 110°.

The rainfall averages about 18.84 inches, and is increasing. The dry and bracing character of the air at 5,000 to 6,000 feet above the sea renders the climate a desirable one for invalids with weak lungs, where the disease is not too far advanced, and thousands who have resorted thither have been temporarily, and many of them permanently benefited. Generally it is not safe for persons who are suffering from pulmonary diseases to return to the East, at least not for four or five years, however

complete may seem to be the recovery, as the return of the disease at the East is almost sure to follow even a brief visit thither. Those whose lungs are diseased should also avoid the higher elevations. An altitude exceeding 7,000 feet is dangerous, because the rarefaction of the atmosphere makes respiration more difficult, and will often bring on hemorrhage of the lungs. We give below the Signal Service reports—the average from three points, one of them the station on the summit of Pike's Peak, 14,147 feet above the sea, for the sake of comparison:

PLACES.	Elevation above the sea.	Mean annual temperature.	Mean spring temperature.	Mean summer temperature.	Mean autumn temperature.	Mean winter temperature.	Maximum temperature in summer.	Number of days thermometer above 90°.	Minimum temperature in winter.	Number of days thermometer below zero.	Range of year.	Annual rainfall. Inches.
Denver..... ..	5 197 ft.	49.5°	48.1°	69.2°	49.5°	31.3°	99°	32	—12°	9	111°	18.63°
Colorado Springs	6.023 ft.	47.8°	45.°	64.6°	48.8°	32.8°	93°	6	—3°	2	96.°	19.48°
Pike's Peak.....	14.147 ft	18.7°	13.6°	35.5°	20 6°	5.03°	58.2°	above 50°. 25	—23.6°	86	81.8°	27.82°

West of the mountains the snow comes earlier and lies longer and the mean temperature of winter is lower. The average elevation of the towns is higher, averaging at least 8,000 feet. These towns ar so new that we have not statistics of their climate which can be depended upon.

The quantity of the snow-fall is not great except on the mountain ranges and higher elevations. In the mountain towns it begins early and lies late, blocking the trails and passes over the mountains, and requiring often a circuitous journey to reach them. The railways now building will be protected from these heavy snows generally by snow sheds. The snow never entirely disappears from altitudes of from 12,000 to 14,400 feet.

Soil and Vegetation.—Of the 104,500 square miles which constitute the area of Colorado, it is difficult to estimate very accurately what proportion should be considered as arable land, for several reasons. But a small portion, comparatively, of the State has been surveyed; only one-third in all, including the great area of pasturage, mining and timber lands. The great amount of land included in railroad grants, and the still greater quantity in Indian reservations, most of which are now in process

of extinction, the uncertainty whether land at first regarded as desert, or, at most, as sterile grazing lands, may not prove to be arable land of the very best quality when irrigated; and the almost daily discovery of new means of irrigation. It was roughly estimated in 1878 that there were about 15,000 square miles of arable lands, or lands which would become arable with irrigation, in the State. With the great increase of irrigating canals constructed since that time, and the large body of good lands which will be thrown on the market by the treaty with the Utes, confirmed by Congress in June, 1880, which sets free nearly 11,400,000 acres, and the cultivation of the great parks which is just beginning, there can hardly be less than 25,000 square miles entitled to that designation to-day, or in round numbers, 16,000,000 acres. Probably not more than one-fifth of this is under cultivation, though the amount is rapidly increasing. "The soil at the first glance does not look promising. It is composed of a fine, dark-brown mould mixed with gravel, very compact, but at the same time very porous and friable. When the gravel has been completely decomposed, or the soil consists of fine dust, blown or washed from the higher portions of the plains (called bluffs), it inclines to clay. Near the surface the earth is darker than lower down, but the quality is essentially the same and very uniform throughout. The soil is indeed so rich in the mineral constituents of plants, and its depth so great, that with a proper supply of water, it yields larger and finer crops of wheat, barley and oats than any other State in America. Water, however, is necessary, except in the bottoms of the shallower valleys traversed by streams; and the cultivable land is thus limited to the area that the water of the mountain streams will suffice to irrigate. The agricultural portion of the State is now mainly the strip of land, ten to thirty miles broad, which extends from north to south, the whole width of the State, along the plains at the base of the foot-hills. Owing to the general flatness and gradual sloping character of the ground the land can be irrigated at small cost. Between Denver and the northern boundary of Colorado, six principal streams, besides the river Platte, flow from the foot-hills across the plains. The water from these streams is con-

veyed in canals or ditches, which are sometimes as much as fifty miles long. Some of the smaller canals have been built by co-operation among the farmers. In other cases they are owned by local joint-stock companies, of which the shares are held principally by the farmers themselves. The largest of all—the Larimer and Weld Canal—is the property of the Colorado Mortgage Company of London. It is fifty miles long, from twenty-five to thirty feet wide at the bottom, and carries water to irrigate 40,000 acres. The company itself owns 20,000 acres, which, with a right in perpetuity to sufficient water for irrigation, it is selling at $13 to $15 per acre. The land is sold in quantities of eighty acres and upwards. At this rate the land is freely purchased, payment being taken in five installments for the convenience of buyers. Settlers on the public lands can buy water for $5 per acre. By homesteading a settler can become owner of 160 acres for a few dollars, but he must reside on it for five years before he can get a title. The settler may choose to pre-empt, in which case residence for six months, together with the execution of certain improvements, gives a title. By pre-emption the land may be obtained for $1.25 an acre if distant from a railway, or $2.50 an acre if in the vicinity of a railway. A settler can only homestead or pre-empt once. Railways are owners of land along their lines, in square miles alternately with the public lands, which are subject to homesteading and pre-emption. Railways sell their land at prices varying from $3 to $6 an acre, according to circumstances.

"The undulation of the plains makes plowing and irrigation very easy. The water is supplied to the farmer, not directly from the main canal, but from a subsidiary ditch, formed with a plow along the surface of the plain, on a nearly uniform slope. The farmer excavates with his plow a similar smaller trench along the top of the land he intends to plow, and then, making breaks in the lower side, allows the water to flow over the whole surface of the field. After two or three days the land is ready for plowing, and the water is turned off. After irrigation, a pair of light horses will turn over the soil at the rate of an acre a day, or a gang-plow, drawn by four or six horses, will break up

ten acres in the same time. Cereals require to be watered once or twice in the season. The custom is to break new land in August, September, and October, turning the sod two or three inches deep, and the winter frost pulverizes it, and makes it into a good seed-bed by spring. Old stubble-land is irrigated in a similar manner before being plowed, either in autumn or spring, and the seed is sown as soon after plowing as possible. The soil, once thoroughly wet, is very retentive of moisture, and no more irrigation is necessary till June, when the water is again turned over the crops for a day or two. The land is very easily tilled and cleaned, and irrigation is a simple process, as may be easily understood from the fact that one man alone (exchanging, it may be, help with a neighbor in harvest) can cultivate eighty acres under crops in rotation, and that, too, without working so hard as a small farmer in this country (England). Self-binding reaping machines are in general use, and give complete satisfaction. Threshing machines, driven by steam or horse-power, are driven from farm to farm as at home.

"Colorado produces all kinds of crops and vegetables grown in England, with the addition of many that flourish only in a warmer climate, such as Indian corn, sugar-beet, tomatoes, etc. Grapes and peaches ripen in the open air, and in the southern parts of the State grapes and plums grow wild. Flax is also occasionally met with, growing wild. The wheat and barley raised on the irrigated lands are as fine as any in the world. The average crop of wheat is from twenty to twenty-five bushels per acre; of barley, about thirty-five bushels; and of oats, it is asserted that in the uplands the yield is occasionally as high as from eighty to ninety bushels per acre. Specimens of cabbages, mangolds, swedes, and beet root of enormous size, are exhibited at the State fair; but as cattle-feeding is not yet practised, they are raised chiefly for domestic use. But the average of crops is not much indication of what the soil, in the hands of a skillful farmer, may be made to yield. The majority of those who have taken to farming in Colorado, knew little or nothing of the business when they settled, and their cultivation would generally be considered slovenly at home. When the soil is well cleaned

and tilled, and the supply of water adequate, a return of thirty-five and forty bushels of wheat per acre may be reasonably expected; and in several cases last season (1879), although the crops are not considered generally large, over forty-five bushels of wheat have been threshed out.* The prices to be obtained are, and must continue to be, tolerably high. The quantity of land as yet under cultivation is not sufficient to supply the fast increasing mining population, and as the nearest competitor is about 500 miles away, the Colorado farmer has the cost of carriage in his favor. The demand for poultry, butter, eggs, and milk is great, and in supplying it the industrious farmer's wife can add very materially to his income. Wheat sells at from $8 to $9 per quarter (eight bushels); barley, from $6.25 to $7.50; oats from $4.38 to $5 per quarter. Hay is sold at from $12.50 to $15 per ton of 2,000 pounds; butter from 25 to 38 cents per pound, and eggs from 25 to 31 cents per dozen. Farm labor of satisfactory quality can, without difficulty, be obtained. Wages are about $25 per month, with board and lodging, which cost as much more. The laborer is engaged by the month, and, although he is dispensed with from October to April, he finds employment at the stock-ranches or the mines, and the farmers easily get hands when they need them. As a general rule, however, farmers in Colorado work on their farms themselves; but they have the satisfaction that the land is their own, and that in such a climate, and with such a soil, labor is much lighter and more agreeable than is dreamed of in this country (Great Britain). For the same reasons the cost of labor per acre, although the wages paid to the laborer are high, is scarcely, if at all, greater than the farmer has to pay in Scotland, and by those who have capital, farming is being prosecuted on a

* Mr. Barclay is, as he should be, wisely conservative in his statements concerning the crops in Colorado as affected by irrigation. Where, as in Greeley, Evans, Longmont, etc., and still more in the south of the State, the farmers are skillful, and apply the water judiciously, crops of wheat of eighty or one hundred acres have turned out sixty to seventy bushels of wheat to the acre for the whole crop, and in some instances even more; while Indian corn, which our British friends do not fully appreciate, yields, under irrigation, not the fifty or seventy bushels which are elsewhere considered a good crop, but two hundred bushels and more, over large tracts of land, and oats yield seventy-five to one hundred bushels. Barley is not so largely grown in Colorado as to make the amount raised at all certain, but it would doubtless do quite as well as wheat.

large scale with great profits. During two or three months in the year there is little, if any, work to be done on farms, but a pushing man may hire out his team and make a good bit of money in the winter months."*

In 1871 the amount of wood-land and forest growths in Colorado was estimated, by the United States Land Office, at 6,667,000 acres, or one-tenth of the area of the State. The estimate was, of necessity, a mere guess, since at that time not more than one-sixth of the area of the State had been surveyed, and much of it was entirely unexplored. Very large quantities of the timber have since been sacrificed for railway ties, buildings, and machinery, for mining supports and machinery; for dwellings and fuel, for flumes, aqueducts and bridges, and the thousand uses to which wood is put. It is hardly probable that the present forest area of the State exceeds one-fifteenth of its surface. Much of the timber on the mountains is large, but it ceases before the snow-line is reached. The principal forest trees are the pines of six or eight species, including the white, the yellow (a large fine tree, much like the Georgia), the *nut-pine*, and some others; several species of fir and spruce, large and beautiful trees, the cypress in Southern Colorado, several species of oak, the chestnut and the chinquepin, the hickory, black walnut, horse-chestnut, etc., etc.

The great parks in the spring and early summer are resplendent with beautiful wild flowers.

Geology and Mineralogy.—Within the limits of the State, on its varied surface, down the precipitous sides of its lofty mountains, and on the deeply eroded sides of its great cañons may be found every geological formation known on this continent. In general it may be said that the plains of Eastern Colorado are tertiary and alluvial, being formed largely of the loess which has for ages washed down from the mountain summits. The axis of the Rocky Mountain ranges is eozoic, and yet it has been so completely upheaved that the granite strata are completely broken and reversed, and form the surface rock of the summits of the highest mountains. In the valleys between the ranges

* Hon. J. W. Barclay, M. P., in the *Fortnightly Review*, January, 1880.

the great parks are tertiary. At numerous points on the mountain sides and in the cañons the coal crops out, sometimes tertiary lignites, but as often from the upper coal measures, and in the southwest from the lower coal measures. Sandstones, limestones, slates and shales of every geologic age crop out, especially in Western Colorado, and triassic and Jurassic rocks appear both in the San Juan country and in the region lying between Pueblo and the Spanish peaks. In the vicinity of many of the coal beds the rocks are cretaceous; while the Devonian and Silurian systems are largely represented in the south and southwest. In the upper valleys of the Rio Grande del Norte, and in the vicinity of some of the affluents of the Grand river, there are evidences of extensive volcanic action.

The erosive action of large streams having a rapid descent and perhaps also of glaciers (though this is not quite settled) has nowhere produced such remarkable results as in Colorado. It is not only manifest in those deep cañons which are only rivalled in Arizona, but in such wonderful productions as the "City of the Gods," in the White river region, in the northwest part of Summit county, where a tract large enough for a city is cut into the semblance of cathedrals, castles, towers, and dwellings, in ruins indeed, but glorious in their ruin—the spires, domes, terraces and many storied temples set in such regular order and with such broad avenues between that it seems impossible that it should be other than the work of human hands; or the similar though less extensive wonders of Monument Park, Talbott Hill and the Bottle Rocks; or the remarkable arrangement of the rocks (which may or may not have been the result of erosion) in the "Garden of the Gods;" or the Royal Gorge, or the Grape Creek and Temple cañons, or the Grand cañon of the Arkansas, and farther west the Great cañon of the Gunnison.

For an interesting account of some of these wonders, especially those of Frémont county, as well as of the remarkable bones of the gigantic Camarasuras and other fossils, reptiles and mammals of the Jurassic period which, in size as well as geologic age, surpass all previous discoveries, we are indebted to Mr. J. G. Pangborn, author of the "New Rocky Mountain Tourist," a part

of whose very vivid description of a tour through this true wonderland we here introduce to our readers.

"Rattling over the bridge spanning the Arkansas at the city's* feet, we speed on through clumps of richly foliaged trees, and in a few moments are at the entrance of the cañon, catching a glimpse, just as we enter between its towering walls, of the Grand cañon of the Arkansas and the cosy-looking bath-houses at the springs near by. A quick word of wonder at the height and the closeness of the walls, a sharp turn of the road, and looking back, the way is lost by which we came. Here in the solitary mountains we are alone. No world behind; no world before. Turn upon turn, and new walls rise up so abruptly before us as to cause an involuntary cry of terror, soon relieved, however, as our excited senses become more familiar with the new tension upon them. Awe still holds us bonden slaves, but the eye drinks in such beauty as fairly intoxicates the soul. On either hand the walls loom up until only the slender opal of a narrow strip of sky forms exquisite contrast with the pine-covered heights. Rifled boulders every now and then wall in the road on the river side, their base washed by the creek, wild and beautiful in its whirl and roar. Here the perpendicular piles of rock are covered with growths of trees that ascend in exact line with the wall and cast their shadows on the road below. Nature's grapevines trail along the ground and cling around the trunks of the trees, hanging like Arcadian curtains and making bowers of the most exquisite character imaginable. Between these, we catch bewitching glances of the creek on its merry, tempestuous way to the Arkansas, its sparkling surface throwing back rapid reflections of masses of green foliage and trailing vines. Deep pools give back the blue of the cloudless sky, and as base accompaniments come in the dark shadows of the cañon walls with their sharply drawn ridges and truncated cones. Here and there, all along the wild way, are rushing cascades, tortuous twists of the stream, gayly lichened or dark beetling rocks, mossy nooks or glowing lawns, and overhead the cottonwoods mingling their rare autumnal splendors of red and gold with the sombre green

* Cañon City.

of pine and cedar. The cañon is beyond question the most beautiful in marvellous coloring, wondrous splendor of foliage, picturesque cascades and winding streams of any in Colorado. The Grand cañon of the Arkansas is deeper, but it is awful as seen from the only point of view, that from the top, and the sensations caused in strongest of contrast with those experienced in Grape Creek cañon. The walls of the latter are so gorgeous a variety of colors as to fairly bewilder with their splendor: red—from the darkest tinge of blood to the most delicate shades of pink; green—from the richest depths to the rarest hues of the emerald; blue—from the opal to the deepest sea, variegated until almost defying the rainbow to excel in exquisite blending. These glorious transitions of color meet one at every turn, and the contrast formed every now and then by tremendous walls of bare, black rock, or broad seams of iron ore set in red or green, render all the more striking the singular beauty of the cañon. Over the walls on either side, the grapevine, from which the cañon takes its name, climbs in wonderfully rich profusion, and in autumn, when the leaves become so delicately tinted and the vines hang thick with their purple fruit, the effect is something to call to mind but never to describe. Added to the indescribable beauty of the vines are the many-colored mosses which paint the rocks in infinite variety of hue, ofttimes growing so high and rank as to reach to the very pinnacle of the topmost rocks and fringe their craggy brows so lavishly as to render them almost symmetrical in appearance as seen below. At different points these moss-covered walls rise to the height of 1,000 feet, and so completely do they hem one in on all sides that with but slight stretch of imagination the place could be viewed from below as a gigantic, moss-covered bucket, but one that never 'hung in the well.' Just above Temple cañon, and where Grape creek enters the cañon of its name, the walls are exceedingly high and precipitous, and in the coolest nook of their shadows, where sunlight can never reach, is a quiet, placid pool of water clearer than a crystal, and so faithfully reflecting back the curiously and brilliantly colored rocks overhanging it, as to have gained the name of Painted Rock Pool. It is a very gem in itself, and its setting

and the rare grandeur of the surroundings, is well in keeping. Those visiting the cañon should not fail to follow up the course of the creek from the point where it debouches into the cañon. It will have to be done on foot, but the wholly unexpected surprises of the hour or two's ramble will more than repay the exertion. The walls of the sides of the parent cañon are fully 1,500 feet in height, and so narrow that the tall pines and cottonwoods keep the gorge in a tender half-light, broken at midday by glaring rays that give a magical charm to the scene. On all sides from points in the walls of rock, tufts of grass and bluebells grow, forming, with the grapevines, most pleasing pictures in contrast with many-tinted rocks, in the crevices of which their roots have found nourishment. The walls are of almost as many colors as there are sharp turns in the creek's course, and rare and perfect in beauty is the amphitheatre of black rock with pearly-white veins running in every direction, the whole overhung by climbing vines and their pendant berries. Just at the entrance to Temple cañon is a little grove of cottonwoods. Their pendant swinging boughs meet in perfect arches overhead, and the profusion of their polished, brilliant leaves renders complete the most charming of bowers in which to take the noonday lunch and prepare for the climb into Temple cañon, which must be done on foot. Temple is a side cañon, with entrance from Grape Creek cañon, some four and a half miles from Cañon City, and was discovered but a year or two ago.

"The climb is not steep, though rather rough, especially to effect an entrance into the Temple proper, which is to the right of the little cañon, and can only be accomplished by clambering over several-huge boulders, which, if removed, would render the illusion of a temple and stairway all the more striking. Once passing in through the great rifts of rock, for all the world like the stairway to some grand place of amusement, the body of the Temple is reached, and to the tourist's astonishment, before him is a stage with overhanging arch, with 'flats' and 'flies,' with dressing-rooms on either side, and a scene already set as if for some grand tableau. If so intensely realistic from the parquet, as the broad circling floor might aptly be termed, or from the

parquet or dress-circles, as the higher ledges would suggest, the clamber up to the stage itself renders it all the more so, for there is found ample room for a full dramatic or operatic company to disport upon, while in the perpendicular ledges and caves on either side, twenty-five to thirty people might retire and not be observed from the body of the hall. The stage is at the least thirty feet deep, and some sixty to seventy broad; the arch above fully one hundred feet from the floor of the cañon, the stage itself being about forty feet above the floor. The arch is almost as smooth and perfectly proportioned as if fashioned by the hand of man, and during the wet season the water from a stream above falls in a great broad sheet over its face to the floor of the cañon below. At such times the effect from the stage of the Temple is, as can be imagined, exceedingly fascinating, for there, entirely protected from the water, one looks through the silvery sheen out upon the scene below. Upon the rear wall of the stage quite an aperture has been hewn out by some action, and the shape it is left in is peculiarly suggestive of tableaux preparation. Away up in the very highest crevice under the arch a pair of eagles have mated for years, and though most daring efforts have been made to reach the nest none have succeeded. The coming of visitors is almost invariably the occasion of a flight from the nest, and breaking in so suddenly upon the supernatural stillness of the place is apt to cause a shock to the timid not readily forgotten. There is absolutely not a solitary sign of vegetation about the Temple; all is bleak, bare and towering walls, and a more weird spot to visit cannot possibly be imagined. Coming out from the Temple itself the tourist should by all means clamber up to one of the lofty pinnacles in the adjoining cañon, for the sight from them down upon the mighty masses of rock below, the cottonwoods, the stream in Grape Creek cañon and the lofty walls beyond is one to be treasured up among the brightest recollections of the tour.

"One could spend days in Grape Creek and Temple cañons alone, but our week demands that we should spend the second day in Oak Creek cañon, with its wonderful formations of arches, deep tints of evergreens and wealth of wild flowers.

"Oak Creek cañon is left with unfeigned regret, and as we toil up the ascent on the return trip we cast many glances back to aid memory in fixing its beauties upon the mind. A couple of miles over a road the tamest imaginable, after the three miles of down grade, brings us to the base of Curiosity Hill, well named, as is speedily proven by the discovery of all sorts of odd and beautiful little specimens of ribbon moss and linear agate crystals and the like. The surface of the hill is one vast field of curiosities, and so plentiful and varied are they that even those usually wholly indifferent to such things soon find themselves vying with the most enthusiastic in exclamations of delight upon finding some particularly attractive specimen. By blasting, large bodies of the most perfect crystals are obtained, invariably bedded in ribbon agate of the most beautiful colors and shapes, and polishing readily, they form beyond all comparison the loveliest of cabinet attractions. Many very valuable specimens of blood agate have been found on Curiosity Hill, and for agates of all hues and forms it is possibly the most satisfactory field for the specimen-seeker in Southern Colorado. Trotting homeward we watch the blazing splendor of the sunset upon the lofty heads of the rocky monarchs around us, while the cool twilight of the open park between us and Cañon City envelops all about our road.

"Next morning we are off for Oil Creek cañon, which is wholly different from others seen thus far. The windings of the road in following the heavily-wooded stream are decidedly of a romantic character, running now through a bewitching little grove, and the next moment joining with the merry waters and keeping them close company until another cluster of aspens or firs causes a separation of sight only, for the music of the foaming stream comes to us through the leaves, thus rendering the meeting all the more delightful. A half mile from the mouth of the cañon we come upon the oil wells from which the stream takes its name, and about which its perfect purity is polluted by the petroleum that lies thick upon its surface. Some considerable surface work has been done at the wells in the way of tubing and the like, and they have been yielding more or less oil for

the past fifteen years. Preparations are now being made, however, for boring for flowing wells, and the probabilities are that more oil will be taken from them this year than ever before since the first discovery. Beyond the wells the road winds around and about in enticing proximity to the stream, and then leaving it, winds high above, crossing picturesque bridges, and finally emerges into the open known as Oil Creek Park, hemmed in on all sides by ranges of sandstone that show a countless succession of rock sculptures, the effect heightened by the brilliancy and variety of the coloring. High up on the ridges are the crumbling ruins of castellated battlements, formidable bastions suggestive of frowning guns, lofty and imposing sally-ports, portcullis, moats and drawbridges. Great cliffs have fallen, and avalanches of rock have plunged their way down the hillsides; yet here and there and everywhere upon the walls stand the grim battlements, as if defying wind, storm and time. The most imposing of these tremendous ruins are the Twin Forts, standing upon the very verge of a precipitous wall of 500 feet of alternate layers of creamy yellow and brilliant red. One looms up a hundred feet or more above the wall, but the other is sadly battered and rapidly crumbling away. Along the wall are numberless towers of rock worn by the action of the elements into fantastic shapes, and many of them looking as if the breath of a child would topple them over. Progressing on through the park we fancy in each transformation of rock some familiar thing, while the mighty tiers extending toward us ofttimes call vividly to mind the bulwarks of great ships of the sea stranded here to be worn away to dust. Directly ahead of us, as we near the centre of the park, we catch full glimpses of new and singular rock sculpture, the entire south end of the park showing tier upon tier of rock so striking in resemblance to stockades and outlying fortifications as to cause one to involuntarily seek not only for the colors, but the soldiers defending them. Back of the stockades, stern, dark and cold, rises Signal Mountain, and still back of it the long, wave-like lines and great snowy domes of the Sangre de Christo range, their stupendous proportions dwarfing all below into littleness.

"The road, as it nears the head of the park, abruptly dashes into a thickly grown grove of piñon trees. We halt for a moment to get a full view of the largest piñon tree in Colorado, and probably in the country, and after entertaining something of a contempt for the scraggy little trunk of the average piñon tree, it is quite refreshing to behold one fully three feet in diameter, though all the more uncouth and ugly for its unwonted circumference. The piñons bear extraordinary quantities of the sweetest little nuts, but outside of this they are of no possible worth. Around the sharpest and steepest of curves, a dash across the madly-surging stream, and a helter-skelter scramble up a low but exceedingly rocky ascent, and we are at the mouth of Marble Cave, so near in fact as to barely escape falling into it in looking for it. The ragged, jagged crevice by which the cave is entered is anything but enticing, and the sensation experienced as one's head is all there is left above ground is far from the pleasantest.

"The descent is almost perpendicular for a hundred feet or more, and the staircase formed by the broken ledges on either side of the chasm far from soothing to one's nerves, especially as all the lights obtained are the meagre glintings which steal through the three-cornered opening above and struggle faintly half way to the bottom of the rift of rocks. Stumbling over unseen boulders, and barely escaping serious contact with the encompassing walls, we grope to the point where our guide has kindled a fire, and find it the intersection of the two main halls of the cave. The ghastly flare thrown upon the walls by the burning pine chills us to the bone, and a tremulous inspection of the situation adds no warmth. We are in a strange and awful rift in some buried mountain, the walls so narrow that our elbows touch on either side, and so weird and terrific in height, as seen through the heavily-rolling smoke, as to look ten times the 150 feet our guide informs us is the distance to the roof. The pine burns brighter, the smoke grows thicker, but we press on, now crawling on all-fours into some wondrous chamber of stalactite and stalagmite, and anon tugging up a strand of rope over frightful boulders that have fallen from the dizzy height

above, to obstruct man in learning the secrets of this awful convulsion of nature. We penetrate into Satan's Bower, we look shudderingly into his Punch Bowl, and gasp as we throw ourselves into his Arm-Chair. We draw longest of breaths in Queen's Grotto, and the shortest when thoughts of the way back over those fearful rocks crowd in and demand consideration. Certainly the clear blue sky never was half so lovely as when we finally stand under it again. The cave is, as its name implies, encompassed by marble walls, and the specimens of marble brought from its innermost recesses, as seen in the full glare of the sun, are exceedingly beautiful in their mottled surface of red and white. The marble is susceptible of the highest and richest polish, and parties in Cañon City use it for artistic as well as practical purposes. All about the hill, from the low crest of which the cave is entered, are the finest specimens of jasper, agate and shell rock, and not far distant are immense trees petrified to solid rock, and where broken often showing beautiful veins of agate and crystals. On the return trip we take more notice of the cosy and comfortable farm-houses scattered throughout the park, and become much interested in the details of the yield of grain—principally wheat—secured through the system of irrigation practised so extensively in the State; in fact, no grain whatever can be successfully cultivated in Colorado without irrigation. Midway in the park we pull up at the pleasant home of the gentleman who is to show us to the top of Talbott Hill, where Professor Marsh, of Yale College, and Professor Cope, of the Academy of Natural Sciences, Philadelphia, have parties at work exhuming the recently discovered bones of animals, compared to which in proportions and importance the mastodon sinks to insignificance. We at once leave the road and make direct for the wall of blood-red rock on the west side of the park, and a short drive bringing us to its base, we alight. Reaching the summit, the long-drawn breath of relief is half choked by the indescribable magnificence of the view, and for the first time we appreciate the sublimity and grandeur of the Sangre de Christo range. A few more steps and we are at the tent of Professor Cope's party, and all within and without is

heaped-up bones, rocks now, and many of them so perfectly agatized that at a casual glance it would stagger any but a scientist's belief that they were ever covered with flesh. As seen, here, however, it is so palpably apparent that the seeming rock and agate are bone as to leave no room for shadow of doubt. Before us are perfect parts of skeletons so huge as to prepare one for the belief that Noah's Ark was a myth; sections of vertebræ three feet in width; ribs fifteen feet long; thigh-bones over six feet in length—and the five or six tons of bones thus far shipped East comprising only the parts of three animals. In one pit the diameter of the socket of the vertebræ measured fifteen inches, width of spinal process forty-one inches, and depth of vertebræ twenty-nine inches. In another place there was a thigh-bone six feet and two inches in length; a section of back-bone lying just as the monster rolled over and died, with eleven ribs attached, the back-bone twenty feet long and from sixteen to thirty inches deep, and the ribs five to eight feet in length and six inches broad. Just showing upon the surface was a part of a thigh-bone twenty-two inches in width and thirty in length, and near it a nine-foot rib four inches in diameter, a foot wide at six feet, and where it articulated with the vertebræ, twenty-three and a half inches in width. The entire rib was fifteen feet in length. All over the hill we come upon little piles of broken bones which will require days of patient labor and skillful handling to properly set in place. The first discovery of the fossils was made in April last by a young graduate of Oberlin College, who, teaching a country school in the park five days in the week, spent his Saturdays about the hills hunting deer, and occasionally getting a shot at a grizzly. Immediately upon satisfying himself of the character of the discovery, the young man wrote to his old Professor in Ohio, and subsequently to Professor Cope, of Philadelphia. Hardly had the latter organized his party of exploration before Professor Marsh had his, under the leadership of Professor Mudge, of Kansas, duly equipped, and by the middle of May both parties were actively engaged excavating, setting up and preparing for shipment the bones which Professor Marsh declares are seven million years old.

"The first animal discovered was of entirely new genus and species in scientific circles, and was named the camarasuras supremus, from the chamber of caverns in the centres of the vertebræ. Of the first petrifactions exhumed was a femur or thigh-bone six feet in length, scapular or shoulder-blade five and a half feet long, sacrum, or the part of the backbone over the hips—corresponding to four vertebræ united in one—forty inches. Vertebræ immediately in front of this measured in elevation two feet six inches, and the spread of the diapophyses was three feet. Professor Hayden, the widely-known chief of the United States Geological Survey, upon visiting this place and inspecting these and other parts of the animal, declared it his conviction that the beast must have been fully a hundred feet in length. The thigh-bone, measuring some six feet, stood over the hips eighteen to twenty feet. The animal was undoubtedly shorter of front than of hind legs, and Professor Marsh thinks it had the power to raise up like a kangaroo on its hind legs and browse off the leaves of the trees from sixty to eighty feet in height. The professor also gives it as his opinion that the 'critter' fed entirely upon grass and leaves, the vertebræ of the neck being some twenty-one inches in length, and the spread of the diapophyses three feet, this being understood of cervical vertebræ. The skeleton is not completely exhumed, though between 7,500 and 8,000 pounds of bone have been shipped to Professor Cope. A part of the jaw of a lælaps trihedrodon, ten inches long, and containing eight teeth varying from five to eight inches in length, has also been shipped. Recently a leg bone of this same animal was exhumed and found to measure a little over four feet, and with a portion of the head all crushed into small pieces, sent on to the professor. A part of the femur of another animal has been found, measuring six feet, but somewhat lighter than the others. The vertebræ are three feet six inches in eleavtion, showing a very tall brute, but not so heavy as the camarasuras. When found, it was lying on the right side with vertebræ and ribs of that side in place, the ribs measuring over six feet in length, and the prongs where they join the back fifteen inches in width. Many of the bones of the camarasuras are misplaced

and broken up, quite a pile being found at the spot where several of the teeth of the trihedrodon were discovered, thus indicating the preying of the one upon the other. While the general estimate of the age of these huge fossils among American geologists is seven million years, English scientists declare them fourteen million years old. Both the camarasuras and the trihedrodon were of the Jurassic period, being found in beds, which, according to Professor Marsh, correspond with the Wealden beds of England. All this section of the country must have been a plain when so much of Colorado was covered by an ocean, and before the mountains were formed. The fossils are found in rock long upheaved, its character now a sort of shale or marlite, which upon being dug out and exposed to the air crumbles to pieces. In most instances it is free from bone decay, the parts of animals taken out being remarkable for their clean and perfect solidity. Marsh and Cope agree that the camarasuras was the largest and most bulky animal capable of progress on land of which we have any knowledge, it being very much larger than the mastodon, which was of a much later period.

"Professor Mudge, with his party, is working about three-quarters of a mile distant from Professor Cope's camp, and very recently discovered portions of an animal of even more monstrous proportions than those already referred to, and of entirely different genus and species from either. The explorations of the Marsh and Cope parties will be pushed with all possible vigor, the entire scientific world being intensely interested not only in the work here on Talbott Hill, but in the setting up of the gigantic skeletons at Yale College and the Academy of Natural Sciences at Philadelphia. Excursions from several of the leading colleges to the scene of the discoveries are planned for the summer, and the season's work promises to add to the lively interest in scientific circles.

"The next morning our way is southward ten miles or more to the coal mines, stopping at the iron spring a little over three miles from town. It is up a short, dry gulch leading off from the road, and quite peculiar, inasmuch as the water springs from and has worn its tiny channel up the very edge of a long, thin ridge that

juts out into the gulch. Over the face of the ridge the water has scattered its iron sediment with lavish freedom, but only in this is there anything that to the eye indicates aught but spotless purity in the wonderful clearness of the spring. To the taste, however, the iron at once asserts itself, and the water is so strongly charged with it as to render it the healthiest of beverages. We drink our fill, and are off for the coal mines. An hour, and we are bowling along in a coal truck attached to a blind mule, through a vein of solid coal something over five feet in diameter. It is a weird ride, this mile or more into the inky bowels of the earth, the faint shadows from our diminutive lamps causing a ghastly effect not at all lessened by the blackness of the coal on either side and overhead. Every few feet we peer into the dusky depths of the apparently unending series of side chambers, catching quick glimpse of the little fire-bugs, as the miners look to be, as we pass so swiftly on. We see not the forms of the men, their faces, nor their hands, only the lamp-wicks' sickly flaring from the unseen hats. Every now and then piles of powder in canisters almost block up the entrance to the chambers, and at one point we are shown the very fuse that sent a poor miner to his death but a day or two before. But still the old, blind mule trots on, and the passing through and rapid closing behind us of the heavy, oaken door, that preserves the little of wholesome air left in the drift, is as if it barred us forevermore from the world behind. The ride in appears an age; the ride out but of a moment's time in comparison. There are eighty-six side chambers, or rooms, as the miners know them, in the main entry, fifty-seven in another entry, and in all, four miles of track upon which the coal is carried to the outer world. The veins average five feet two inches, and run three and one-half miles east and west, and ten miles north and south. A hundred miners are at work, and the yield averages 400 tons per day. The gigantic, solid lump of coal eight feet nine inches long, six feet across and four feet four inches high, that attracted such great attention at the Centennial, being beyond all comparison the greatest single piece of coal on exhibition, was taken from this mine. It weighed seven tons, and was cut and brought out

of the mine in three days. Cañon City coal is probably the finest bituminous coal in the world, and is so extensively used throughout the West as to require the running of special trains for coal alone, on the Denver and Rio Grande road, which has its own track to the mines. The supply is beyond all human calculation, for the valley of the Arkansas is one vast coal bed for mile upon mile.

"On the return trip we make quite a detour to the east, to spend a little time at the gypsum beds, which are twelve feet in thickness.

"Leaving the hotel immediately following an early breakfast, next morning, a drive of twelve miles brings us to the Grand Cañon of the Arkansas. Disappointment is bitter, and feelings of resentment almost beyond control, as nowhere can the eye discover the cañon. In the immediate foreground the piñon growth is rank and dense; just beyond, great, bleak ridges of bare, cold rock contrast strongly with the profusion of foliage hiding everything beneath from sight, while away in the dim distance the snow-crowned peaks of the continental divide are outlined sharp and clear against the solid blue of the morning sky. Though grand beyond anything we have seen in amazing extent of vision, the mind is so wrapped up in the anticipation of full realization of the gloom, and vastness, and solemn grandeur of the Grand Cañon, as to resent almost angrily their apparent absence. A half dozen steps from the clump of piñon trees where the horses have been fastened, and all thoughts of resentment, of disappointment and chagrin vanish, and a very cry of absolute terror escapes us. At our very feet is the cañon—another step would hurl us into eternity. Shuddering, we peer down the awful slopes; fascinated we steal a little nearer to circumvent a very mountain that has rolled into the chasm, and at last the eye reaches down the sharp incline 3,000 feet to the bed of the river, the impetuous Arkansas, forty to sixty feet in width, yet to us a mere ribbon of molten silver. Though surging madly against its rocky sides, leaping wildly over gigantic masses of rock and hoarsely murmuring against its imprisonment within these lofty walls, it finds no avenue of escape. Every portion of these marble

bastions is as smooth as if polished, and as stationary as the mighty walls that look down upon them from such fearful height.

"Fairly awed into a bravado as reckless as it is strange to us, we crawl out upon tottering ledges to peer into sheer depths of untold ruggedness; we grasp with death-like clutch some overhanging limb and swing out upon a promontory beside which the apex of the highest cathedral spire in the world would be as a sapling in height. We crawl where at home we would hardly dare look with telescope, and in the mad excitement of the hour tread, with perfect abandon, brinks, the bare thoughts of which, in after recollection, make us faint of heart and dizzy of head. Eager now for still greater horrors of depth, blind to everything but an intolerable desire to behold the most savage of nature's upheavals, the short ride to the Royal Gorge is made with ill-concealed impatience. If our first experience upon the brink of the Grand Cañon was startling, this is absolutely terrifying, and the bravest at one point become the most abject of cowards in comparison at the other. At the first point of observation the walls, though frightfully steep, are nevertheless sloping to more or less extent; here at the Royal Gorge they are sheer precipices, as perpendicular as the tallest house, as straight as if built by line. So narrow is the Gorge that one would think the throwing of a stone from side to side the easiest of accomplishments, yet no living man has ever done it, or succeeded in throwing any object so that it would fall into the water below. Many tourists are content with the appalling view from the main walls, but others, more venturesome, work their way 600 to a 1,000 feet down the ragged edges of a mountain, that has parted and actually slid into the chasm, and as we have come to see it all, the clamber down must be accomplished. For some distance we scramble over and between monstrous boulders, and then reach the narrow and almost absolutely perpendicular crevice of a gigantic mass of rock, down which we must let ourselves 100 feet or more. As we reach the shelf or ledge of rock upon which the great rock has fallen and been sundered, we glance back, but only for a second, the thought of our daring making us grow sick and dizzy. But a step or two more, and the descent just

made sinks into utter insignificance compared to what is before us. Then we had the huge walls of the parted rock as the rails of a staircase; now we have naught but the smooth, rounded surface of the storm-washed boulders to cling to, and on either side of our narrow way, depths, at the bottom of which a man's body could never be discovered with human eye. Behind us the precipitous rocks, over and through which we came; ahead of us the slender barrier of rock overhanging the appalling chasm, and all there exists between us and it. Cowards at heart, pale of face and with painful breath, we slowly crawl on hands and knees to the ledge, and as the fated murderer feels the knotted noose fall down over his head, so feel we as our eyes extend beyond the rocks to catch one awful glimpse of the eternity of space. Few dare to look more than once, and one glance suffices for a comprehension of the meaning of the word depth never before even dreamed of, and never afterward forgotten. The Gorge is 2,008 feet sheer depth, the most precipitous and sublime in its proportions of any chasm on the continent. The opposite wall towers hundreds of feet above us, and if possible to imagine anything more terrifying than the position on this side, that upon the other would be, were its brink safe to approach. Overhanging crags, black and blasted at their summits or bristling with stark and gnarled pines, reach up into profoundly dizzy heights, while lower down monstrous rocks threaten to topple and carry to destruction any foolhardy climber who would venture upon them. Among all the thousands who have visited the Grand Cañon and the Royal Gorge harm has befallen none, for, despite the seeming horror of the situation, the appalling depths and rugged paths, the fascination of the danger appears to give birth to greatest caution. The Cañon, except in the dead of winter, is approachable only from the top, the walls below being so precipitous, and the river such a torrent, as to defy all access. When frozen, as the waters are for brief periods during the coldest months, the way up the cañon may be accomplished, but only at the risk of personal comfort and not a little danger. Mr. Talbott, the photographer at Cañon City, ventured into the cañon last winter with his apparatus, and, after infinite

trouble, secured the excellent views which afford us some conception of the grandeur of the gorge from the bottom.

"Returning to Cañon City, we conclude to remain about the hotel for a day resting, and deciding upon the route of a tour through Southern Colorado, taking in the San Juan country, Chalk Creek, California Gulch, Twin Lakes, South Park, etc. We have enjoyed to the fullest the jaunts of a day, and now long for a month on the road with headquarters wherever night may overtake us. The reader may be inclined to ask if there are no more comparatively short trips, with Cañon City as the base, and the reply would be, there are, and so many in fact as to be almost beyond enumeration. A most enjoyable four to five days' tour is that from Cañon City to the wild and picturesque region of the Sierra Mojada, or Wet Mountains, thirty miles *via* Oak Creek Cañon to Rosita, altitude 8,600 feet, and return *via* Wet Mountain valley and Grape Creek cañon. This is a 'timber liner,' as an old prospector would denominate so wide and high a range of altitude, and affords capital opportunities for the enjoyment of life ofttimes above the clouds. Near Rosita are several distinct craters, and in the very accessible grass-covered, cone-shaped hills that rise 500 feet or more above the town are innumerable mines. About them are found the most beautiful specimens of crystallization, different kinds of spar and pyrites of most brilliant hues. The ride down the little grassy gulch or glade to obtain a nearer view of the Wet Mountain valley, and the Sangre de Christo range beyond its western limit, is a very delightful one, looking at sunset time like some grand painting with the point of view at the small end of the vista, and the eye, ranging down the timber-girted glade to mountains 13,500 feet in altitude, beholds the massive and majestic peaks rolling and swelling against the clearest sky ever mortal eye was gladdened with. Many Englishmen have made homes in the valley, often called 'The Britons' Paradise,' a name which seems appropriate to the tourist, after leaving the grayish green of the foot-hills and reaching its bright green meadows, starting up here a prairie dog and there a rabbit, and crossing and recrossing its trout-filled silvery streams. In the valley is the famous

Lake of the Clouds. The fourth night ends at Cañon City, and the expense of the trip hardly averages $5 per day, including everything. Another exceedingly pleasant trip from Cañon City is to Poncho Springs, sixty-five miles up the Arkansas river, for which a running description of the drive through the Upper Arkansas cañon will suffice. Engaging a seat in the regular buckboard line leaving Cañon City every other day, the start is made immediately after early breakfast, and the sun is hardly over the mountains before the sublimely grand confines of Grape Creek cañon are reached. A word as to the buckboard, for beyond all comparison the most comfortable and enjoyable of all vehicles for mountain travel, it deserves at the least a passing mention. Built expressly for Barlow & Sanderson, the great stage men of Colorado, the buckboard of their lines is a roomy, double-seated, open vehicle, the slatted bed lying directly upon the axles, and the seats set well up on fish-plate springs, the jar consequent upon striking rock or stone is almost lost before it reaches the seat. There is none of the rolling, swaying motion of the bulky coach, or of the short, jerky action of the aptly named 'Jerkee.' There being no top, the eye ranges at will, and the bed of the conveyance is so near the ground one can readily spring out and walk when so inclined, many preferring so to do when climbing long hills.

"Emerging from Grape Creek cañon the road winds through Webster Park, thence into Copper Gulch, at the head of which is a towering gateway of solid rock, and passing through it to the top of the divide the scene is grand beyond all conception. Directly ahead is the snowy range, with its white-capped crests looming high above the clouds, which hang about the rocky breasts below as if loth to leave their ample resting-place. To the left is the Greenhorn range, to the right the great continental divide, and imagination could not picture sight more sublime. Through Seven-mile Gulch the road enters Pleasant Park, with its rugged rock sculptures, its densely-wooded slopes and grassy lawns. On every side are most curious monuments formed of monster boulders one atop the other, and holding position, by apparently so frail a thread, that the gust of a mo-

ment's duration would hurl them from dizzy heights to the level of the park. While in the park, magnificent views are obtained of Mount Blanca and Pike's Peak, either of them not less than eighty miles away, and at the summit of the divide between Pleasant Park and the South Arkansas—altitude 7,800 feet—the view in all directions is beyond description. From this the descent is commenced; at nightfall the solid, comfortable and roomy old stone house, known, Colorado over, as Bales', is reached, and with it the South Arkansas. Twenty miles farther is the Chalk Creek region, with its hot springs, fishing and hunting, and thirty miles beyond are the noted Twin Lakes. Fifteen miles from the lakes is California Gulch, with the wonderful Mount of the Holy Cross to the north."

There are, in the southwestern part of the State, in La Plata, Conejos, and San Juan counties, and around the head-waters of the sources of the San Juan river, many of those ruins of houses cut in the rocks of the perpendicular cliffs, or on the summits of the isolated *mesas* or table-rocks, of which there are so many hundreds of examples in New Mexico, Arizona and Southern Utah. This whole region was densely populated ages ago, and by races far superior to the existing tribes of Indians. The Moquis, already described in our account of Arizona, may possibly belong to the same race with these cliff-dwellers, for they have similar ideas in regard to their dwellings and languages, customs, habits and religion, entirely diverse from any of the other Indian tribes, but some of these ruins are many centuries old. They were in their present condition of ruins when the Spaniards first penetrated here, 330 or 340 years ago. That they had formidable enemies, whose attacks they evaded by their fortified dwelling-places, seems evident; but whether those enemies were Apaches, Aztecs, or other tribes or nations, now, like themselves, extinct, does not clearly appear. The extent of these ruins, often 250 by 600 or 700 feet, the massive blocks of stone of which some of them are constructed, and the vast labor by which others were hewn out of the solid rock, are well fitted to excite our admiration. The *Estufas* or chapels, for their worship of the sun in these buildings, were very large and

elaborately constructed. It is believed that they were so unwarlike as to have no offensive weapons. They probably burned the bodies of their dead. (See ARIZONA.)

The mineral wealth of Colorado does not consist alone in the amount of the precious metals contained in its broad mineral belt, though this will eventually be found, we think, greater than that of any other State, but includes also copper, lead, zinc, platina, tellurium, iron in vast quantities and of all kinds of ores, coal, gypsum, salt, kaolin, and pottery clays, etc., etc.

The coal of Colorado is worthy of special remark. It is widely distributed, being found and worked in Weld, Boulder, Jefferson, El Paso, Frémont, Huerfano, Las Animas, and La Plata counties, and is known also to exist in San Juan, Ouray, Gunnison and Summit counties. It is of very different qualities and of different geologic ages. In the north it is a lignite of the tertiary period, of very good quality. Toward the centre of the State it is a lignite of the cretaceous period, but of still better quality. In the south, in the vicinity of Trinidad, Las Animas county, the true coal measures have been reached, and the coal is a bituminous coking coal of great value. West of the Rocky Mountains, in La Plata county, it is from the true coal measures, semi-bituminous or semi-anthracite. Volcanic action in Las Animas and La Plata counties has probably affected the quality of the coals, much as it has in some parts of New Mexico, making, what would otherwise have been a soft, bituminous coal, a hard and dense anthracite. It is believed that the coal mines of Gunnison county, which are known to be anthracite, have been changed in the same way, but the quality is not inferior to that of Pennsylvania and a coking coal of the best quality. The area in this county is about 600 square miles, and the beds are from ten to fifty feet or more in thickness. There are two distinct beds, separated only by four feet of iron shale. Some of it is said to be a true anthracite of excellent quality, whether affected by volcanic action or not is not fully settled. The coal mines of Colorado will eventually be sufficient to supply the entire West.

Zoölogy.—The wild animals of Colorado are usually those of the plains, though there are a few not found in any considerable

numbers on the plains or elsewhere in the Rocky Mountains. The black and brown bear occur in considerable numbers both in Eastern and Western Colorado, and are hunted to some extent. The grizzly bear is not common even west of the Rocky Mountains, and is unknown in Eastern Colorado. He is a formidable customer in a close fight, but is easily frightened away by shouts or yells, when uninjured. The puma, cougar or panther is somewhat rare, except in the northwest of the State, but his congener, the jaguar, American or mountain lion, is found west of the Rocky Mountains, in the San Juan country, though his *habitat* has been generally supposed to be limited to Texas and Arizona. The gray or black wolf is found west of the Rocky Mountains, and, perhaps, east of them; the prairie wolf, usually, though perhaps incorrectly, called *coyote*, is frequent enough in Eastern Colorado, but not plenty in the west. The lynx, ocelot, wild cat, martin, fisher, and skunk are here, as elsewhere, in considerable numbers. The buffalo still frequents, though in greatly decreased numbers, the elevated plains of Eastern Colorado, but never appears in the mountains or west of them. His rare congener, the mountain or wood buffalo, is occasionally found, solitary, in the Rocky Mountains. The elk (*wapiti*), the finest game animal of the West, has been thus far very abundant in the West and especially in the great parks; but it has been so destructively hunted that its numbers are fast diminishing. The Virginia and mule-deer are numerous, and the antelope is found on the plains, while in the mountains the bighorn, or Rocky Mountain sheep and, more rarely, the Rocky Mountain goat, are plenty enough to make hunting of them rare sport. The smaller rodents and munchers, squirrels of many species, beavers, minks, muskrats, rats, mice, moles, gophers, marmots, rabbits, sage, and jackass hares, etc., etc., are, in the agricultural districts, more plentiful than desirable.

Birds, though not as numerous as in California, are yet abundant and of many genera and species. Of birds of prey, there are two, possibly three, species of the eagle, several of the vulture, and hawks and owls in abundance. In and around the lakes, in the parks and elsewhere, and on the plains, are a great

abundance of game birds, the wild goose migrating southward, ducks, brant, teal, and other water and marsh birds, including cranes, ibises and English and jack-snipe. The prairie-hens and other species of grouse, partridges, ptarmigan, quail, and, more rarely, the wild turkey and pheasant, are found in countless numbers on the plains and in the parks. In the mountains are many song birds.*

Reptiles are not very numerous nor formidable. There are lizards, horned toads and frogs, terrapins and turtles of the smaller kinds, one species of rattlesnake, and many harmless snakes.

Fish abound in the rivers and lakes, most of them edible. Trout are plentiful, and of large size in all the mountain streams, and grayling, black bass, pickerel, etc., are found in the lakes and larger streams. Many of the streams have been stocked with fish from the United States Fish Commission. The insect tribes, though numerous enough, are not as annoying as in some sections. Even the fly, which, in the West, accompanies civilization, has been known to the hunters in the Rocky Mountains less than ten years. The mosquito does not "pipe his soft note," nor present his formidable bill as ferociously as in Arkansas, nor are the other insect pests troublesome. The Rocky Mountain locust, rather contemptuously called "grasshopper," and the ten-lined spearman, generally known as the "Colorado beetle" or potato-bug, are both popularly supposed to be natives of Colorado. We doubt whether the State is entitled to the honor or the reproach. Many circumstances seem

* Mr. S. Nugent Townshend, an eminent English sportsman and correspondent of *The Field* (London), thus speaks of some of the rarer game birds and animals he had shot in Northern Colorado:

"A few of the rare species we have seen in the Rockies, all of which are worth preserving, are the blue hares (white in winter); the gray-crowned finch, supposed to be the rarest bird in America, because he is always above timber-line, where few go to look for him; Clarke's crow, or the noisy chatterer, also living only at great altitudes; the pine grosbeak, also found only at high elevations, red in summer, in winter gray, with yellow head; long-crested jay, black head and crest, blue and black transverse, ribbed wings and tail; red-shafted woodpecker, rather rare and a beauty, body cuckoo-marked, with regular gray woodpecker head and breast, red under the wings. Great horned owls are, though handsome, very common, as is the towhee finch. The cross-bred foxes, between red and gray, are large, abundant, and very pretty when stuffed."

to indicate the origin of the latter from some part of the Great Basin, possibly in Western Utah; while the locust, according to its usual habit of making its original home in the desert, probably made its way into Colorado from the arid plains and mesas of Southern Utah and Southern Nevada, or possibly from Arizona. At all events, they have never proved as destructive to the crops in Colorado as they have in States farther east and northeast.

Mines and Mining Industry.—Though Colorado is likely to achieve some distinction and reputation for her agricultural and horticultural productions, and a much larger measure for her large stock-raising and wool-growing interests, which are now attaining such a wonderful development; yet she is and will be *par excellence* a mining State. About 100,000 mining claims have been entered upon her county records, more than 80,000 of which have been filed since 1875. Of these, of course, a considerable proportion have lapsed from not being worked during the time prescribed by law, and others perhaps from the poverty of the veins or lodes; while of the placers some are exhausted, and others have been turned into hydraulic mines. But every day adds largely to the recorded claims. Those of Lake county, in the vicinity of Leadville, are many of them in litigation, claims having been abandoned or forfeited, or jumped and re-entered over and over again. Just now the drift of the mining population is mainly to Western and Southwestern Colorado, the San Juan and the Gunnison regions in the mountains and basins, and the streams having their sources in the Elk, Uncompahgre, San Miguel, San Juan, Dolores and La Plata Mountains. Most of the streams in these mountains—all of them, indeed, except the highest sources of the Rio Grande del Norte, and the Saguache, which falls into the San Luis lakes—flow westward; here are found the Roaring Fork, the Gunnison, the Uncompahgre, the San Miguel, the Dolores, and numerous affluents of each, all tributaries of the Grand river, one of the two constituents of the Rio Colorado of the West, and in the extreme southwest, the Rio Navajo, Rio Blanca, Rio Piedra, Rio de los Peños, Rio Florida, Rio de las Animas (a large stream), Rio la

Plata, Rio Mancos (also an important river), McElmo, Hovenweep and East Montezuma creeks—all tributaries of the San Juan river, another of the principal affluents of the Rio Colorado. This whole region of Western and Southwestern Colorado, composed of the spurs and outlying ridges of the westernmost range of the Rocky Mountains, is full of veins and lodes of gold and silver, and unless portions of Arizona may be excepted, there is no richer region for the precious metals in the whole West.

But let us go into the mining history of the State somewhat more in detail. Gold was discovered in the Colorado Territory, not far from Pike's Peak, in 1859; it was in refractory forms, mostly sulphurets of iron and gold, a pyrites of iron and gold reduced with great difficulty, though in the placers there was some free gold. The production for ten years after 1859 was on an average about $3,000,000 per annum, exceeding that amount by $300,000 or $400,000 each year of the first five, and falling short of it by about the same amount in the last five. All of this product was gold except about $330,000 of silver and $40,000 in copper, both parted from the gold.

The entire production of the Colorado mines and placers up to the close of 1869 was estimated at $27,583,081, and as it was apparently diminishing and was difficult of reduction, while that of Nevada and California was increasing, the population did not greatly increase and many of the miners migrated to Nevada and elsewhere. Thus far all the gold and silver had been produced either on the eastern slope of the Rocky Mountains or at least on the slopes of the front or lower range and east of the Main, Park, or Sangre de Christo range. But in 1870 the silver product began to increase, moderately at first, but soon more largely. Lake county had been among the earliest gold producing counties, and its placers, though yielding from $100,000 to $230,000, yet seemed to be gradually diminishing, till, in 1876, they yielded but about $91,000; then came the wonderful discoveries of silver at Leadville and its vicinity, and the large silver and gold developments elsewhere. The following tables show first the metallic production of the State up to the close of 1879, classed first as gold, silver, copper and lead, and total for each

year; and second by counties in each year since 1870, so far as they have been officially reported.

COLORADO'S MINING PRODUCT PRIOR TO 1880.

(*Coin Value.*)

YEAR.	GOLD.	SILVER.	COPPER.	LEAD.	TOTAL.
Previous to 1870	$27,213,081 00	$330,000 00	$40,000 00	.....	$27,583,681 00
1870.....	2,000,000 00	650,000 00	20,000 00	.....	2,670,000 00
1871.....	2,000,000 00	1,029,046 34	30 000 00	.....	3,059,046 34
1872.....	1,725,000 00	2,015,000 00	45,000 00	$5,000 00	3,790,000 00
1873.....	1,750,000 00	2,185,000 00	65,000 00	28,000 00	4,028,000 00
1874.....	2,002,487 00	3,096,023 00	90,197 00	73,676 00	5,262,383 00
1875.....	2,161,475 02	3,122,912 00	90,000 00	60,000 00	5,434,387 02
1876...	2,726,315 82	3,315,592 00	70,000 00	80,000 00	6,191,907 82
1877.....	3,148,797 56	3,726,379 33	93,796 64	247,400 00	7,216,283 53
1878.....	3,492,384 36	6,341,807 81	89,000 00	636,924 73	10,558,116 90
1879	5,700,000 00	13,100,000 00	150,000 00	829,584 61	19,679,584 61
Total.....	$53,917,450 76	$38,911,760 48	$782,993 64	$1,960,584 34	$95,472,790 22

COLORADO'S MINING PRODUCT BY COUNTIES, 1870-'71-'72-'73.

NAMES.	1870.	1871.	1872.	1873.
Gilpin.....	$1,552,000 00	$1,400,000 00	$1,389,289 00	$1,340,502 00
Clear Creek.....	481,354 08	869,046 34	1,503,291 00	1,205,761 00
Lake.....	125,000 00	100,000 00	133,000 00	230,000 00
Park.....	60,000 00	100,000 00	250,000 00	459,000 00
Boulder.....	130,000 00	250,000 00	346,540 00	390,000 00
Summit.....	150,000 00	66,000 00	125,000 00	106,000 00
Other Products.....	171,645 92	274,000 00	50,000 00	297,737 00
Total of Colorado.....	$2,670,645 92	$3,059,046 34	$3,790,000 00	$4,028,000 00

COLORADO'S MINING PRODUCT BY COUNTIES, 1874-'75-'76.

COUNTIES.	1874.	1875.	1876.
Clear Creek.....	$2,203,947 00	$1,780,054 31	$1,982,548 28
Gilpin.....	1,531,863 00	1,520,677 13	2,105,544 78
Park.....	596,392 00	716,258 62	550,044 84
Boulder.....	539,870 00	605,000 00	547,085 20
Lake.....	223,503 00	104,258 62	90,900 00
Summit	126,108 00	122,413 78	350,000 00
Frémont.....	.....	294,827 58	251,121 06
The San Juan Region.....	.....	90,517 24	244,663 66
Other sources and unaccounted for...	40,620 00	200,380 55	70,000 00
Totals.....	$5,362,383 00	$5,434,387 02	$6,191,907 82

COLORADO'S MINING PRODUCT BY COUNTIES, 1877-'78-'79.

Counties.	1877.	1878.	1879.
Lake	$555,330 30	$3,152,925 44	$12,032,808 61
Gilpin	2,208,037 09	2,280,901 11	2,608,055 00
Clear Creek	2,206,577 91	2,511,105 85	1,912,410 00
Boulder	593,325 35	679,123 50	800,000 00
Custer	354,081 34	452,500 00	720,000 00
Park	616,459 32	426,698 00	434,749 00
Gunnison	.....	.....	300,000 00
Summit	190,000 00	320,774 00	295,717 00
Chaffee	.....	.....	71,240 00
The San Juan Region	377,472 52	534,089 00	483,500 00
Other sources	118,000 00	200,000 00	12,940 00
Totals	$7,216,283 53	$10,558,116 90	$19,679,584 61

The first of these tables is remarkable as showing the wonderful development of silver production in the last ten years, and especially in the last five or six years. The carbonate silver lodes of Leadville and its vicinity, and the silver production in other counties in 1879 brought the aggregate of silver product to $13,100,000, and will probably bring it to $17,000,000 or $18,000,000 the present year. Meanwhile, the production of gold is not only not diminishing, but last year was almost double what it had previously been, and the present year will probably advance still more rapidly. Gold production has passed through three successive stages in Colorado. From 1859 to 1869 it was obtained very largely from placer deposits; and later from hydraulic mining, which is only placer mining on a larger scale; then came the era of the sulphurets of gold and iron, and the tellurides, refractory ores, but rich in gold; now the mines of the San Juan region (the counties of Hinsdale, San Juan, Ouray, and La Plata) as well as those of the Gunnison, so far as they are gold, are mostly free-milling gold, easily extracted, and yielding large amounts to the ton of ore; the mines of Silver Cliff and Rosita, in Custer county, so far as they yield gold, which many of them do, differ from all the other gold mines of the State, but are not specially difficult of reduction. The mining product of Colorado seems likely to be, when it shall be well developed, of nearly equal values of gold and silver; while its mines of copper, lead, zinc, iron, and coal are of great and constantly increasing

value. Nevada, a much older State, has produced much more silver thus far, but, with her rapid and scientific development, and her wide diffusion of the precious metals (the western half of the State being a vast series of ore beds), Colorado bids fair within twenty years to pass her sister of the "snowy plume."

The Gunnison region, though but little explored as yet, gives promise of immense mineral wealth, as does also the whole of the San Juan country, and, when the Ute reservation is opened to settlers under the new treaty, there will be such an abundance of mineral wealth that the old story will be revived, "that the miners are completely discouraged, because they have to dig through four feet of solid silver to get down to the gold."

Let us take another glance at the mineral wealth of the State from the topographical point of view. The only part of the State which has not, up to the present time, given indications of deposits of the precious metals, is the region lying east of the meridian of 105° west from Greenwich, and extending eastward to the eastern boundary of the State on the 102d meridian. This embraces the large grazing and, to some extent, farming counties of Weld, Arapahoe, Elbert, Bent and Las Animas, as well as parts of Huerfano, Pueblo, El Paso and Douglas, and small fractions of Frémont and Larimer. It is about three-sevenths of the State, and is a part of the great plateau or plain which extends with a very gradual slope to the Missouri river, and includes the whole of Kansas and Nebraska. There are not as yet any manifestations of mineral wealth in Costilla county, which includes the great San Luis Park, and is largely inhabited by Mexicans, nor very much in Conejos, both counties being largely inhabited by Mexicans. But the whole region west of the 105th parallel, except the two counties named, is a congeries of mountains, all or nearly all of which are rich in gold, silver, copper and lead.

"A belt," says Mr. Fossett, "showing but slight interruptions, has been traced from the North Park and the northern part of Boulder county, south through Gilpin and Clear Creek, thence southwesterly through Summit, Park, Lake Chaffee, and into Gunnison county. It approaches the point where the great

Sawatch (Saguache) or main range divides into the Sangre de Christo on the southeast, and the San Juan Mountains on the southwest. The belt appears at intervals in each of these mountain systems or their outlying spurs and valleys down to the New Mexico boundary, and across it.

"In the San Juan Mountains, which form the Continental Divide in the south, it is rich in silver veins, extending all through the counties of Hinsdale, San Juan and Ouray. Gold is also found there, as well as in Rio Grande county. The gold and silver bearing deposits of the Sierra Mojada and of the hills and valleys skirting the Sangre de Christo range are fast bringing Custer county into notoriety.

"The Sawatch (Saguache) range extends from the point of union of the more southerly mountain systems northward to the Mount of the Holy Cross and the headwaters of the Arkansas, and is but another name for a portion of the main Rocky Mountain divide. It forms the dividing line between Gunnison county and Chaffee and Lake counties, and also separates Summit from the latter. Rich mineral discoveries have been and are still being made on both its eastern and western slopes, silver being the predominating metal.

"East of this, and of the upper Arkansas valley, is the Park range of mountains, separating the latter from South Park, and uniting with the main range at Mount Lincoln. This, with its foot-hills, is enormously productive. On the western slope are the world-renowned carbonate deposits and veins of Leadville, immeasurably rich in silver and lead, and the gold veins and alluvial deposits of California Gulch. On the range itself and its eastern slopes are vast numbers of deposits and veins. Silver predominates there, but gold, copper and lead are mined. Down in the park are gold placer mines."

Northward extends the main range which, all along its course between Summit and Grand counties on the western slope and Park, Clear Creek, Gilpin, and Boulder on the east, is more or less rich in silver veins. Its extending foot-hills possess veins and alluvial deposits rich in gold. The outlying mountain spurs, hills and gulches are also ribbed with metalliferous veins, some

producing silver and copper, others silver and lead, and others gold and silver, with one or both of the baser metals. Close beside each other, on this eastern slope, are the famous mining districts of Clear Creek and Gilpin. The latter has produced most of Colorado's gold, and the former gave much the larger part of its silver for years, up to the time when Leadville came to the front. Both counties, however, have gold and silver mines, and so has Boulder, whose telluride veins, carrying the precious metals, are something rarely encountered elsewhere. Ouray, and indeed all the San Juan counties, and Gunnison, possess rich deposits of both metals, and will henceforth take a prominent place among the gold and silver producing counties.

Westward, over among the mountains and valleys of Summit, Grand, and Routt counties, are numerous argentiferous and galena veins and gold-producing gulches and placers. Some of these have been worked for years, and others are of recent discovery, such as those of the "Ten Mile Range." Some are included in the great Ute Reservation, and cannot be explored or wrought until the recent treaty, which will open this vast tract to the market, is fully settled.

The great central mineral belt of Colorado has a width of from twenty to eighty miles, but often branches off to the right or left, and again contracts, so that the breadth is by no means uniform. Continued discoveries indicate that its extent is not yet ascertained. It is impossible to make anything like a close estimate of the wealth that lies imbedded in these mountains, where constant developments show that only the beginning of it has yet been found.

Let us then briefly pass in review the mining counties, and classify as far as we may their mineral wealth.

We begin with

Boulder county, as the first in which gold was discovered as early as 1858. Boulder county is not only rich in mineral wealth but possesses a large amount of fertile lands under a high state of cultivation. Its combination of mountain, valley and plain renders it admirably adapted to farming and horticulture as well as to mining, while its mineral deposits are of great extent and

variety. Flourishing towns and beautiful farms dot its surface, and mines and mills are profitably operated all over the mountain sections, from the sunny plains at Boulder back to the snow-barren summit of the snowy range. On the plains are extensive coal measures, and on hill-slope and in valley are rich and pleasant farms. The mineral deposits of Boulder are very extensive, and embrace a wonderful variety. First, there are alluvial deposits in creeks and gulches, but these are of limited extent and mostly worked out. The gold and silver lode veins and the coal measures are the main sources of mineral wealth. The former are located on the mountains and the latter on the plains. The lode veins may be classed under three heads: silver, gold and telluride; the latter carrying both metals. They are generally of the kind denominated true fissure veins, very many of them having well-defined walls, and seemingly unending depth. They commonly occur either in gneiss or granite rock or between the two. There are exceptions, however, in regard to formation, regularity and continuity. Several thousands of locations have been recorded, and the number profitably worked is large. Here, as in California, the placer deposits were first worked, but some large gold-bearing lodes were discovered as early as 1859–60, and the quartz mills for several years turned out a great deal of bullion. After a time more difficulty was experienced in reducing the ores and extracting the gold than was usual with free gold ores in other counties. Many processes were devised of reducing these refractory ores, but none of them were very successful. In 1869 silver ores were discovered near Arapahoe peak, in and about what has since been known as the Caribou mine. This has proved one of the most uniformly productive silver mines in Colorado for the past ten years. Many other silver mines have been opened on the same or adjacent veins.

The prospectors searching for new gold or silver lodes in 1871, 1872 and 1873 often encountered mineral of great weight but of a peculiar appearance, which they passed over as worthless. In 1873 Professor J. Alden Smith and others began to test this mineral and found it to be tellurides of gold and silver,

and especially the former, and that it was remarkably rich in gold. The combination of tellurium with gold prevented its yielding well in the stamp mills, and it was found necessary to smelt the ores. By smelting they were found very profitable. With the exception of one mine each in California, Montana and North Carolina, the telluride compounds of the precious metals are only found in Boulder county. They are somewhat difficult to reduce, and only in Colorado and in Boulder county has their working been found profitable. The tellurium itself has no economic value, and many of its compounds are intensely poisonous and fœtid. The silver mines have proved profitable. The amounts of gold and silver taken iron the mines of Boulder are: of gold about two-thirds, silver one-third, in value. There are eight mining districts, viz.: Caribou or Nederland, Boulder, Ward, Gold Hill, Central, Orodelfan, Salina and Sugar Loaf. The actual production of gold and silver in the county in 1878, was $704,123.50; that of 1879 about $800,000. The coal mines of Boulder county are lignites of the tertiary period, but are of excellent quality though not coking coals.

Gilpin county is the smallest county in the State, and is mainly important for its mines, though it has some good farming and grazing lands, and some which are of very little value. It lies directly south of Boulder, and is bounded by that county, Jefferson, Clear Creek and Grand. Most of its population is concentrated in Central City, Black Hawk and Nevadaville, while a few are gathered in Smith's Hill, Empire City and Lawson's. The remainder of the county consists of farms and scattering mining camps. The gold belt of Gilpin county is a continuation of that in Boulder, and extends into Clear Creek county south of it, crossing the county diagonally. Its greatest development and most valuable deposits are in the immediate vicinity of the almost continuous city known under the names of Black Hawk, Central City and Nevadaville, though there are some valuable gold lodes outside of this. These mines have proved very rich, though owing to the combination of iron and sulphur with the gold, there has until within a few years been a difficulty in reducing them. The new silver belt in the county extends to the

north and northwest of Black Hawk, across North Clear Creek and other hills from York Gulch to the Day Hill. Some of the silver lodes here rank with the best in the State. The production of the precious metals began in Gilpin county in 1859, and has steadily increased in value, except in 1861 and 1866, to the present time. More than $30,000,000 of gold and silver have been produced in the county in that time. The yield in 1878 was $2,280,871, and in 1879, $2,608,159. Of this about nine-tenths is gold, eight per cent. silver, and the remainder copper and lead. The ores are not rich, but for the most part are now easily reduced. Most of them are treated by the stamp mill processes, though a few of them are more readily and profitably reduced by the smelter.

No other county in the State has given so uniform and ample returns in gold mining as Gilpin, and recent developments, both in gold and silver lodes, give good reason to believe that its past production will very soon be doubled and perhaps quadrupled. The richest gold lodes on Quartz Hill and elsewhere are being consolidated, and contrary to usual experience are found to yield more largely the deeper they go. At a thousand feet depth the ore is very rich. There are now in the county over 1,000 stamps and all are kept busy. The mines are splendidly equipped, have a large capital, and the universal practice now is, to have large reserves of ore constantly on the dump, so as to avoid stripping the mine at any time of ore. In 1878 and 1879, new discoveries of silver ore were made of exceptional richness, yielding at the rate of several thousand dollars to the ton.

Clear Creek county includes the region drained by South Clear creek, south and southwest of Gilpin, and bounded by that county on the north, Jefferson county on the east, Park on the south, and Summit and Grand on the west. The western part of the county is covered with lofty mountains rising to a height of 11,000 to 14,000 feet. There are twelve or fifteen of these summits, spurs of the Colorado Front Range, and the streams which descend from their snow-clad heights cut deep cañons and long narrow valleys and ravines, which are ribbed with veins

of silver. In these valleys most of the inhabitants of the county have their dwelling-places. Clear Creek county, until the recent wonderful discoveries at Leadville, was considered the best known and best developed silver district in Colorado. Mining for gold commenced there in 1859, and the first silver discovery was made late in 1864 on McClellan Mountain. At first the silver ores could not be reduced in the county, and it was not till 1868 that smelting was carried on to any great extent in the county. Since 1871 the annual product has averaged $2,000,000, reaching $2,206,578 in 1877; $2,511,106 in 1878, and falling off to $1,912,410 in 1879. About nine-tenths of this was silver and the remainder gold, lead, and copper, the value of the two base metals nearly equalling that of the gold. There is a probability of an increase in the gold production in the future, as the Freeland, Hukill and some other lodes, carrying gold, silver and copper in nearly equal quantities, have now come into the possession of an energetic and wealthy California company which is driving them forward to their utmost limit of production. Many of the silver mines, especially those on Sherman, Republican, Democrat and Brown Mountains, are yielding very large quantities of silver ores which are easily reduced. There are eight extensive reduction mills and works in the county, six of them in Georgetown.

Lake County and Leadville.—Lake county is not new as a gold-producing region. In 1860 Gilpin county miners had penetrated there and found rich gold placers in a ravine which they named California Gulch. So abundant was the yield of gold and so easily and rapidly was it washed out that claims were staked out in a continuous line for the whole length of the gulch, about 33,000 feet or six miles. At one point the hills which bordered the ravine partially broke away, and the trade of the mining village, which soon had about 5,000 inhabitants, partly concentrated at this point, which was called Old Oro. This is partly on the site of the Leadville of to-day. Another centre of trade was two and a half miles farther up the gulch and is still known as Oro. The water supply was limited, and the site was so elevated, over 10,000 feet above the sea, that little could be done

in placer mining from the middle of October to May or June. The greater part of the miners went to Denver or to the States on the approach of winter, and stayed till the next summer, most of them squandering their gains before their return.

But the placers were very rich. Some claims yielded over a thousand dollars a day, and one firm was said to have taken out $100,000 in sixty days. Careful estimates give $1,000,000 as the yield of the first summer, and $4,000,000 as the production of the six years ending with December, 1865. Subsequent to that date the production was light—$100,000 or so for a year or two—dwindling to $60,000 in 1869, and to $20,000 in 1876.

Meantime placer and lode mines had been developed in other parts of the county, and some gold lodes were discovered near Old Oro. At Granite, seventeen miles away, and now the county-seat of Chaffee county, some gold was discovered, and at Homestake, thirty miles north, on the Tennessee fork of the Arkansas river, mines were opened, which were at first rich in lead but poor in silver. In all up to 1873 the mines and placers of Lake county had yielded about $6,400,000, almost entirely gold. After that time, for three years the yield was light, a part of it silver, and up to the close of 1876 only amounted to $343,200.

Some time in 1874 Messrs. W. H. Stevens and A. B. Wood, practical men and experienced miners, had bought up a considerable portion of the California Gulch placer claims, which had been carelessly and imperfectly worked, and commenced building a twelve-mile ditch from the headwaters of the Arkansas, to re-work them by the hydraulic process. This required considerable time, and the ditches and hydraulic apparatus were not ready till 1878. But Messrs. Stevens and Wood were too shrewd to let any chances of bettering themselves pass. The placer miners had from the beginning complained of the great weight of the boulders they were obliged to move over and over in the creek, but it had never occurred to them that these boulders might owe their weight to their metallic constituents. Messrs. Stevens and Wood ascertained that these boulders contained a large amount of carbonate of lead carrying silver, and

very quietly secured government titles to nine claims, each comprising 1,500 feet by 300, or in all about 100 acres, crossing California Gulch and extending high up on the hills. The names of the principal locations made by them were the Dome, the Rock, Stone, Lime, Bull's Eye and Iron. The "Rock" claim was first worked, and proved to be rich in lead but poor in silver. Soon others located claims, and considerable activity in mining began.

As yet, however, there were no great discoveries of silver to attract people to the as yet unnamed site of the great silver city. The agent of the St. Louis Smelting and Refining Company in April, 1877, commenced the establishment of sampling works in what is now Leadville, and in May began the erection of a smelter, and by October had a blast furnace in operation. So doubtful was he of success, that he made a contract before the smelter was completed with Messrs. Stevens and Wood for the delivery of a thousand tons of their lead ore from the Rock mine. Before this was entirely delivered, so many discoveries had been made, and such development of mines had taken place, that the only difficulty experienced in both the sampling and smelting works was that of handling the rich ores which were forced upon them. In the summer of 1877, the now growing village received its name of Leadville from what seemed thus far to be the staple ore of its mines.

It was during this summer that Mr. A. B. Wood, the partner of Mr. Stevens, despondent perhaps at the small yield of silver in his nine claims, sold his half interest in them to L. Z. Leiter, of the great Chicago firm of Field, Leiter & Co., for the sum of $40,000. At that time the "Iron" mine, one of the best in Leadville, was undeveloped, and Mr. Leiter was thought to have paid all the claims were worth. A year later he refused a million dollars for his property, and now it is said that five millions would not purchase his Leadville interests, which, however, include other mines as well as these.

Discovery and development went forward with a constantly accelerating force. The Iron mine yielded its hundreds of thousands of dollars of silver, and scores of others in the same

vicinity were equally prolific. The town had grown to be more than a mere mining camp by January, 1878, and its production for the previous year was $555,000. In April, 1878, George H. Fryer began to sink a shaft on the hill east of Stray Horse Gulch, now known as Fryer's Hill. His shaft struck at first low grade carbonates, and he gave his mine the name of New Discovery. A month later August Rische and George T. Hook, two prospectors without money, persuaded Mr. H. A. W. Tabor to furnish them what are called in Colorado "the grub stakes;" *i. e.*, the necessary money outfit on the chance of a third interest in whatever they might discover. In this case the "grub stakes" amounted to $17. They struck ore very near the surface, sold their first wagon load for between $200 and $300, and found it growing richer as they went down. They named the mine the Little Pittsburgh. In September of the same year, Tabor and Rische bought out Hook, paying him $98,000 for his one-third interest in the mine. This mine was now consolidated with the New Discovery, the Winnemucca and the Dives, and Rische's interest was bought about the first of November, 1878, by J. B. Chaffee and Moffat for $262,500. In the next seven and a half months the consolidated mines yielded of ores actually sold $2,184,586. Other mines on the same hill, the Little Chief, the Chrysolite, Vulture, Colorado Chief, Amie, etc., etc., etc., proved nearly as rich. The production of the Leadville mines in 1878 was $3,152,925.

The process of development went on still more rapidly in 1879, and what was originally a mere mining camp became a city of no mean pretensions, having in June, 1880, a population of over 30,000 inhabitants. Its yield of silver and gold for 1879 exceeded $12,000,000. It has sixteen smelting establishments and two sampling works, which together in 1879 produced $10,500,000. Besides this was the amount sent by private parties to foreign smelters, and the large yield of gold from places worked by hydraulic mining—making in all between $12,000,000 and $13,000,000 for Leadville alone.

As we have said elsewhere, the silver at Leadville is a carbonate of lead and silver, and does not occur in placers nor in

fissure veins, but in broad strata of ore between strata of rock, which have received the name of "contact lodes."

The "Eagle River country" and the "Ten Mile District," north and northwest of Leadville from fifteen to twenty-five miles, are also engaging the attention of miners as exceptionally rich in the carbonates. They may prove formidable rivals to Leadville. The completion of railroad communication with Leadville by two routes, will give that wonderful city a still more rapid development.

There are, of course, seasons of depression in all these mining interests. The Comstock Lode in Nevada, after years of unrivalled prosperity, has come to a time when the yield of its mines does not pay expenses, and the Little Pittsburgh and Amie have had a somewhat similar, though fortunately a less protracted, experience of the same kind; but the prosperous days will return, and the wealth, hoarded up for geologic ages in these mountains, will be put at the service of man.

Chaffee county, a new county set off from Lake, and including the southern part of that county, has some mining importance and will have more. Granite is its county-seat. The Arkansas river traverses it from north to south. The Park range forms its eastern wall, and the Sawatch or Saguache its western boundary, and from the latter the bold and lofty peaks, La Plata, Mount Harvard, Mount Yale, Mount Princeton, Mount Antero, and Mount Shavano stand forth as sentinels of the main range. Both ranges are silver-bearing, and the county, which in 1879 produced $71,000 of the precious metals, may be relied upon to do much better in 1880.

Park county, enclosing as it does the great South Park, with an area of nearly 2,200 square miles, ranks more appropriately as a grazing than a mining county; but a county which in twenty years has furnished more than $6,500,000 of gold and silver products has some claim to be regarded as a mining region also. The South Park is between 9,000 and 10,000 feet above the sea; but the Mosquito range, which connects the Colorado Front range with the Park or Main range, has several summits in its main line and spurs which are between 4,000 and 5,000 feet

higher. Mount Lincoln, Mount Evans, and Mount Rosalie, three of these peaks, are only a few feet lower than Blanca Peak, the king of the Colorado Mountains, their highest summits measuring 14,297, 14,330, and 14,340 feet respectively; while at the south and southwest of the Park, but still in this county, the Buffalo Peaks, Thirty-nine Mile Mount, and Black Mountain rear their lofty heads. The climate here is cool but pleasant in summer, while the winters are long and severe.

The whole of this mountain region is rich in gold and silver. The mineral belt is about thirty-five miles long and fourteen wide. The gold mines are mostly high up (above the timber line on Mount Lincoln and Mount Bross), and are very productive. There are very many of these mines near the summit of Mount Lincoln, one of them (the Present Help mine) being 14,200 feet above the sea, and said to be the highest mine in North America. The Phillips mine, in the Buckskin district, is the great gold mine of this section. It was discovered in 1862, and in four or five years yielded over $300,000. Then the ore began to be largely mixed with pyrites, and the miners not understanding how to work it abandoned it for a time, but it is now worked again with great success. There are some placers in the county which have yielded largely, and are again doing well under the hydraulic process. Nearly all the silver mines and some of the gold mines of Park county are, like those in Leadville and its vicinity, contact lodes or level deposits and not fissure veins. Since 1862 Park county has yielded $6,559,601 in gold and silver, about equal quantities of each. There are more than fifty silver mines actively employed and the number is increasing. The production averages about $500,000 a year. With the advent of the railways and the Leadville branch of the Denver and Rio Grande, the county is well supplied with railway communication, and its mining products will be largely increased. Fair Play and Alma—the latter far up the slope of Mount Lincoln—are its principal towns.

Frémont county is a region containing much arable land and fine orchards of fruit. So far as we are aware, there have not yet been any discoveries of gold or silver within its boundaries;

but it is rich in bituminous coal of excellent quality, in iron, marble, gypsum, lime, alum, and petroleum, and has the most remarkable fossils and the greatest natural wonders in the whole western country.

Here are those gigantic skeletons of extinct animals discovered by Professors March and Cope; in this county also are the Grand cañon of the Arkansas, Temple and Grape Creek cañons, Oil Creek cañon, and the Oil Springs, and numerous mineral and medicinal springs. The Atchison, Topeka and Santa Fé Railway bisects the county. Cañon City is its principal town.

Custer county has for its western boundary the summits of the Sangre de Christo Range, which is in this part of Colorado the main range of the Rocky Mountains. In the eastern part of the county is the Wet Mountain range, running parallel to the Sangre de Christo, and between them is the Wet Mountain valley, a beautiful meadow-like stretch, surrounded by dome-like hills on one side, covered with verdure, and on the other with sombre but graceful pines. The county has much arable and grazing land, but it has been found within the last five or eight years that it possessed very remarkable and varied mineral deposits.

The Senator gold lode at Rosita, now the capital of the county, was discovered in 1872 by Messrs. Irwin, Robinson, and Pringle, but was not much worked before 1874. The site of Rosita (*Spanish*, "Little Rose"), in the Wet Mountain valley, is very beautiful, and its mines have been very productive. In 1874 the Pocahontas, Humboldt, and other lodes began to produce silver, and have since yielded some $750,000.

In 1877 and 1878 came new developments. Mr. E. C. Bassick, then working at a tunnel at Tyndall Hill, noticed some blossom rock on his way which had a peculiar appearance. He had it assayed, and finally took some of the material to the reduction works, and soon found that he had a mine of chlorodized gold and silver of great value. This was new in Colorado, though it had been found in California, and was subsequently discovered in Utah. Within twelve months after the first shipment $423,608 was received for ore shipped, and large amounts

remained on the dump. In August, 1878, another discovery was made about seven miles west of Rosita, on the eastern slope of Wet Mountain valley, at Silver Cliff: a long, sloping mountain rising from the plain, terminates abruptly at its farther end, which was known as the Cliff. A miner, named Edwards, broke off a piece of the cliff and had it assayed. It yielded $27 silver to the ton. This would not pay. Some four months later he returned thither with a fellow-workman and broke off another piece which assayed $1,700 to the ton. They began work and found it profitable. Soon others came in; it was discovered that there had been volcanic action there, and that in the lava there was horn silver (chloride of silver), assaying from $10,000 to $20,000 to the ton, and the Racine Boy, Silver Cliff, Plata Verde, and Horn silver mines were started. The yield was enormous. The ores can easily be reduced by the wet amalgamation process, and at a very low rate. The Bassick, or main mine, and the Silver Cliff mines have now passed into the hands of capitalists, the first on a basis of $1,500,000 and the others at equally liberal terms.

A recent visitor to these mines, Mr. Zimri L. White, the accomplished correspondent of the New York *Tribune*, has, in some letters to that paper in July, 1880, described more fully the peculiar character of these mines, which are, as he says, the most interesting if not the most important in the West. We subjoin some paragraphs of this description which are very clear and satisfactory:

"The boundaries of the rich mineral belt are very sharply defined, not by the formation of the rocks, for, as I shall presently show, that is not uniform, but by the developments and explorations that have been made upon it in mines and prospect holes. The Wet Mountain valley at this point extends northwest and southeast, and the two mining camps of Silver Cliff and Rosita, seven miles apart, are situated about equally distant from Grape creek, which flows through it; the latter, which is the further south, being a little further up upon the foot-hills than the former. The altitude of Silver Cliff is 7,900 feet, and that of Rosita 8,736 feet above the sea. No valuable bodies of ore

have been found south (that is, on the valley side) of a line connecting these two camps. As the valley is approached, what miners call 'the wash,' that is, the deposit of sand, gravel, broken rock and soil that has been brought down from the neighboring hills, becomes deeper, and the 'bed rock' or 'rock in place,' which lies beneath, is more difficult to reach. The southern or southwestern boundary of the mineral belt may be said, therefore, to lie along the edge of the foot-hills and about two miles above the creek. The northern or northwestern boundary is a line drawn from the Bull-Domingo to the Bassick mine, which are respectively two and a half miles north of Silver Cliff and Rosita. A rectangle, therefore, of which the Bull-Domingo and Bassick mines, Silver Cliff and Rosita form the four corners, extending in its longest direction northwest and southeast, being seven miles long and two and a half wide, includes within its boundaries all the best mines of this region.

"The geological formation of this rich mineral belt is peculiar and very interesting. Resting upon and against the granite of the Wet Mountain Range and its higher foot-hills, and extending down into the valley beyond the southern line of the belt, lies an enormous deposit of porphyry or trachyte, a volcanic rock, which, according to Professor Newberry, who visited the district last autumn, was poured out and consolidated during the tertiary period.

"How great the extent of this deposit from northwest to southeast is, I do not know, but its width is at least five miles and its length is probably fifteen or twenty. Extending into the trachyte formation from the southwest and following its general direction is a tongue-shaped mass of granite about three-fourths of a mile wide and at least seven or eight miles long. When the trachyte was poured out, this granite apparently formed a ridge which rose above the level of the fluid mass of the surrounding volcanic rock, and therefore was not covered by it. That it does not now stand higher than the surrounding country does not disprove this theory, because there are everywhere to be found evidences of terrible convulsions since the trachyte was deposited which have completely changed the face of this entire region. The mines here

are found both in the granite, and also in the trachyte. Winding through the porphyry in a serpentine course, there is also a stream of obsidian, as it is called here, or volcanic glass, mixed with trachyte and quartz boulders. This stream, where it has been examined, varies from a few feet to many rods in width, and in crevices of the boulders which form the mass of it were found last week, on the Hecla claim, some very rich specimens of horn silver.

"The natural color of the trachyte is a yellowish-white. When it contains silver it is also generally stained with black oxide of manganese and red oxide of iron. This rock in many places seems to me to have been subjected to the action of water between the time it was thrown out by volcanic action and the period when it was broken up and impregnated with mineral solutions. I am led to this conclusion by the fact that in several mines and prospect holes which I have visited, I have found portions of the rock as distinctly stratified as any clay slate I ever saw. The layers of rock came apart one from another, in the hand, and presented smooth faces of stratification. I have never seen this fact mentioned in any report I have read about the mines of this region, and it may not be important, though it certainly is interesting.

"At Silver Cliff and north of here, especially, the trachyte rock has been shaken up and fractured in all directions, and in many places the crevices have been filled with iron and manganese, which had become oxidized, and with chloride of silver. This is the free milling ore which is found in the Racine Boy and Silver Cliff mines, owned by the Silver Cliff Company, in the Plata Verde, and in all the mines that lie directly north of this town and adjoining it. I shall write detailed descriptions of several of the more important of them in letters that are to follow. Generally the chloride of silver is so widely distributed through the rock and is so small in quantity that it cannot be seen with the naked eye, nor even with a powerful magnifying glass. That it is there, however, is conclusively proved by assays. Captain Turner, of Galveston, Texas, an old California miner, who has spent several months here superintending the development of a mine for a

Galveston company, told me the other day that he had caused assays to be made of at least one hundred samples of the trachyte rock found in what is known here as the 'chloride belt,' and never failed to find that it contained some silver. He selected some of the most barren-looking pieces of rock he could find, material that no miner would think of saving, and which showed no metallic stain of any kind, and even this was found to carry from two ounces upward of silver, to a ton.

"Where the rock is stained with oxide of iron and manganese, it is invariably rich in silver, which can frequently be seen upon the surface of a fracture in the form of a green scale, which on being rubbed with a knife-blade shows a metallic lustre. Occasionally the mass of chloride of silver is so great that it appears in little globules of horn silver, and I found in the workings of the Racine Boy mine an accretion of this horn silver, in a cavity two or three inches long and half an inch wide, that, if collected together in one mass, would be as large as a lady's thimble. This mass, if broken off from the rock to which it is attached and assayed by itself, would 'run,' as the miners say, more than twenty thousand ounces of silver to a ton, and a ton of it at the current rates for silver bars would be worth about $23,000. Such specimens are very frequently found in the Racine Boy and other mines on the chloride belt. While the rich ore is discovered in large masses surrounded by leaner or less valuable rock, there is nowhere in the chloride belt anything that looks like a vein. The rock just covers the entire face of the country, over an area two miles long and half a mile wide, and the whole mass of it is ore; that is, all of it contains at least a small quantity of silver. The ore in only a small portion of it has yet been proved to be rich enough to make the mining and reduction of it profitable, but this portion covers a great many mines which I believe will become very valuable properties.

"The theory of the geologists, and the one generally accepted by the miners here, is that the trachyte, after it became solidified, was shaken and broken up by some great convulsion, and that simultaneously or afterward, silver, iron, manganese and the other metals of which traces are found in the rock were disseminated

through the crevices either in water solutions or volatilized—in the form of gases. These solutions or gases are supposed to have come up through cracks in the earth's crust. Such a deposit is called in the old world 'stockwork,' and Professor Newberry, in writing recently of 'The Origin and Classification of Ore Deposits,' mentions this as one of the two most important examples of this kind of deposit that have come under his observation. The other is the gold deposit in Bingham cañon, Utah. None of the oldest miners ever saw before any ore that looked like this at Silver Cliff, and this explains their failure to discover its value until recently. The same is true of the quartzite gold ore in Bingham cañon. The miners worked for years there getting out silver-lead ores, but threw aside the gold ore as waste, not dreaming of its value.

"But the mineral belt which I have described and bounded in the earlier part of this letter contains other classes of mines. At Rosita (this beautiful name means 'Little Rose') in the Pocahontas-Humboldt lode, the trachyte, instead of being shattered and impregnated, so that the entire mass of rock may be mined out and reduced, has been rent asunder, and a true fissure formed in it which has been filled with gray copper, galena, zinc blende, iron and copper pyrites and heavy spar—all carrying sulphide of silver. These form a narrow pay streak from one to eighteen inches wide, and the remainder is filled with a gangue rock, generally of a trachytic formation. This vein is a remarkably persistent one—that is, it extends for a long distance through the hills and across the gulches, and is inclosed by walls that are as clearly defined as those of a room. Other smaller veins of the same character have been found in the country north of Rosita, and on some of them valuable mines have been located and developed.

"Still another class of mines in the same mineral belt remains to be mentioned. These are what Professor Newberry has called the 'mechanically-filled' veins, and they include the Bassick and the Bull-Domingo. The former is supposed to be a true fissure vein in the trachyte rock, the cavity of which, after the rocks were rent asunder, was filled with well-rounded pebbles and

boulders, generally similar in constitution to the country rock. The interstices in this mass have been filled with tellurides of gold and silver, free gold, zinc blende, galena and the pyrites of iron and copper carrying silver. These materials surround the stones in thin shells, the pebbles and boulders forming nuclei about which the metallic substances crystalized. In the Bull-Domingo, situated in the granite tongue which I have described, the stones are generally granite or sienite, and the cementing substance is argentiferous galena, which not only surrounds the stones, but in many cases entirely fills up the irregular spaces between them. In both of these cases it is supposed that the metallic matter came up from below in the form of a hot solution.

"From this bird's-eye view of the Hardscrabble mining district, it will be seen that it is one of the most interesting, if not one of the most important regions in the West. We have here three distinct classes of mines, two of which are almost unique. The ore which they produce is in some respects different from that found elsewhere, and presents questions in mining and reduction that are to some degree new. On the successful solution of these questions, as well as on the opening up of the large ore bodies that are believed to exist, but which have not yet been uncovered, depends the future prosperity of these camps and of the companies which are investing their capital in them."

The production of the Custer county mines from 1874 to January, 1880, was $2,112,530, of which $720,000 was the production of 1879. There are extensive iron deposits on Grape creek near the borders of Custer and Frémont counties. The ores are magnetic and contain sixty-five per cent. of pure iron and a considerable percentage of platinum, which causes difficulty in smelting, but renders the product much more valuable.

The San Juan Country.—This general name for Southwestern Colorado "includes," says Mr. Frank Fossett,* "the mountainous counties of Hinsdale, Rio Grande, San Juan, La Plata, Conejos, and Ouray; and San Luis Park, with the counties of Saguache and Costilla, are often classed under the same head.

* Colorado: its Gold and Silver Mines, etc., New York, 1879.

Here is an area of some 15,000 square miles, or more territory than is included in any one of the States of New Jersey, New Hampshire, or Vermont, with Delaware thrown in. West of San Luis Park is one mass of mountains thrown together in the most chaotic confusion.

"These mountains contain thousands of silver veins, many of them of huge size and some of great richness. There are also gold lodes and placers. The Rocky Mountain range extends to the westward in this region. The silver belt is from twenty to forty miles wide, and perhaps eighty miles long in an air-line. The rugged and almost impassable character of the mountains and their vast extent, and the heavy snows and long winters, have acted as serious drawbacks to growth and development. There is probably more country standing on edge in this section than anywhere else beneath the sun. Until recently no work was prosecuted in the winter seasons, except on a very few mines and on tunnels. It took years to build roads to the most important points—trails or foot-paths being the only thing previously afforded. The approach of the railway and the completion of many smelting works are bringing the San Juan country forward."

A Southern adventurer named Baker penetrated into this region in 1858 prospecting for gold. He had found some indications of it, and had commenced operations, when, in 1860, he became involved in difficulty with the Navajo Indians, and he had some bloody conflicts with them. Several of his followers were killed, but he held on until he heard of the civil war in the spring of 1861, when he returned East and joined the Confederate army. A bold and desperate man, he took part in several severe battles, but at length, at the close of the conflict, with two associates, one of them named White, he returned to Southwestern Colorado, and, after several sharp fights with his old enemies, the Navajos, persuaded his comrades to go with him on a perilous and foolhardy expedition to descend the unknown Colorado of the West. Just as they were ready to launch their boat on those unknown waters Baker was shot by an Indian and died soon after, but enjoined upon his comrades the prosecution

of the voyage. They set out and their journey has become historical. The partner of White was lost in running one of the cataracts, and White, lashed to his raft, was discovered by Indians, unconscious and more dead than alive, a short distance above Callville, near where the river emerges from the Grand cañon. After his escape from this perilous voyage it is said that he returned to the San Juan country, and was living there in 1878.

After this disastrous ending of the first attempts to penetrate this region, few white men ventured thither for several years. Adnah French, or J. Cary French, and two others, penetrated up the cañon of the Las Animas river and located the Little Giant gold mine in 1870. They then returned to Santa Fé, and, in 1871, came back to the San Juan country, and, while French worked his mine, the others went on to what is now Silverton. There was a fair production from the Little Giant mine for several years, but others have since overshadowed it. The entire production of gold, silver, and lead in the San Juan country up to January, 1880, is reported as $1,838,061. In 1880, they are likely to largely exceed this amount, as they have stamp-mills, smelters, and reduction works, and railways penetrating far into the region.

Most of the San Juan region was formerly included in the county of Conejos. After several mining districts had been located and settled, the counties of La Plata, Rio Grande, and Hinsdale were created, and afterwards those of San Juan and Ouray. We will take these counties in their order.

"*La Plata county*," says Mr. Frank Fossett, "is the extreme southwestern division of Colorado, bordering on New Mexico and Utah, and touching the corner of Arizona. This section is rich in coal, possesses silver veins, gold placers, and many fine fertile valleys; farming and stock-growing are especially successful. The county is settling up rapidly; a railway is expected from the East, and is nearly completed to Animas City on the Animas river, about west longitude 107° 50′, in which case La Plata would be the smelting depot of San Juan county mines.

"The stock and agricultural resources and advantages of La

Plata county and of its valleys along the San Juan river and tributaries have already been referred to in part first of this volume. The coal measures are deserving of especial mention, on account of their quality and enormous size. The area of coal land is estimated at over 600 square miles, and is cut or intersected by the Pinos, Florida, Animas, La Plata, and Mancos rivers, which flow southward into the San Juan. The thickness of the vein is reported at from ten to fifty and sixty feet between floor and roof. There are two distinct beds of coal, separated only by four feet of iron shale. In some places the two beds are said to aggregate from eighty-eight to ninety-eight feet in thickness. Those who have tested this coal, pronounce it of a semi-bituminous character, and of a better coking quality than any in the West except the Trinidad beds. In this same county are lodes carrying gold, silver, lead, copper, zinc, iron pyrites, tellurium, platina, etc.

"*Rio Grande county* is composed partly of plain and partly of mountain. Del Norte, the main town and county-seat, is located on the Rio Grande where it leaves the mountains and enters the plains of San Luis Park. There are several mining districts, but the only one that has produced much is the gold-bearing portion of the Summit Mountains, which has yielded over $400,000 to date.

"The richest gold district of Southern Colorado is that of South Mountain in the Summit Range, twenty-six miles south of Del Norte and nearly 12,000 feet above sea-level. The great drawbacks are a severe climate, heavy snows, and the altitude—a divide of 13,000 feet must be crossed to reach Summit. The summers are short and the roads are almost impassable from snow or mud during most of the year. But the gold is there, and that has built a town and attracted miners, capitalists, and stamp mills.

"These mines are true fissure veins and prove to be very rich. There are now several stamp mills, and one of the mines, the Little Annie, has yielded about $350,000 in six years.

"*Hinsdale county* is the most easterly of the important silver districts of San Juan. Its metropolis is Lake City, dating from

1874–5, located at the junction of Hensen creek with the Lake Fork of the Gunnison. Here are two smelting works in operation—Crooke & Co. and the Ocean Wave—the Crooke concentrating works and a chlorination and lixiviation mill—the latter not run steadily. The location of the town is grand and beautiful, and resembles that of Georgetown. There are numberless silver lodes in the lofty mountains that rise almost perpendicularly for a half mile or a mile on every side—many of them worked extensively.

"Promising as were the numerous discoveries of the San Juan country in 1873–4–5, they were generally of no immediate benefit to their owners, on account of the distance from an ore market, wagon roads and railways. The region labored under peculiar disadvantages. It was made up of almost inaccessible mountain ranges, and at that time was so remote from railways that capitalists and mill men were not inclined to investigate its mineral wealth. The pioneers who had been making discoveries of rich veins were too poor to build works for the extraction of the precious metals, and it cost too much to get ore to market to admit of attempting it, unless it was wonderfully rich and money was at hand to defray shipping expenses.

"This was the condition of affairs when the Crooke Brothers, the first eastern capitalists that showed their appreciation of the region by putting their money into it—began to buy mines and erect mills. They were conducting a smelting business in New York city, and inspection and contact with its ores begat that confidence in its worth that subsequent experience has in nowise abated. The results of their investments in the Little Annie and Golden Queen mines and mills in the Summit Mountain gold district induced them to look further.

"An investigation of the Lake City silver district caused them to erect a concentrating mill there. This separated the silver-bearing mineral from the gangue, or waste rock of the ore. The miner then had his value in one ton of concentrates instead of having it distributed among five or ten tons as before. This was an important item where it cost more to get ore to a market than it did to treat it after it reached there.

"The Ute and Ulé mines were purchased late in 1876, and the new owners then erected quarters for workmen and shaft and ore houses for the mine. The next spring contracts were let for sinking shafts and running drifts, and for the construction of works for the treatment of the ore. The stack furnace was not completed till near the close of the season, but 2,000 tons of ore had been mined and concentrated, and the dressed ore sent to New York. It yielded a net profit of twelve dollars per ton. The smelting works were completed so that reduction, parting and refining began in July, 1878. Up to this time Crooke & Co. had expended over $400,000 on their mines, works, and other property of this locality.

"The Ute mine is situated well up on a mountain, and the Ulé is located at the foot of the same. The patented surface ground of each is 1,500 feet long by 300 wide, and both are in Galena mining district near Lake City. There are now several smelting works doing a large business there, but as yet no railway nearer than Del Norte. From present appearances their first railway communication may be from the north by way of Gunnison, though this is not certain. The silver production of Hinsdale county, in 1878, was $156,000, and in 1879, considerably more.

"*San Juan county* is the point where several massive ranges of mountains unite; among them the San Juan, the Uncompahgre, the La Plata and the Las Animas mountains. Isolated summits, such as Sultan Mountain, Engineer's Mountain, Mount Kendall, Pidgeon's Peak, Rio Grande Pyramid and Hendie's Peak are scattered over the comparatively small territory of the county. Silverton, its capital, was one of the first locations where mining was attempted in 1871 or 1872. Its production is almost exclusively silver, and it has many hundreds of valuable and well-developed lodes, and is destined to yield immense quantities of silver and lead when it becomes more accessible by railway, and capital is led to invest here. It has several reduction and two or three concentrating works at Silverton. Several extensive tunnel enterprises are in progress, forcing their way to the silver ores through the hearts of the lofty mountains. One of these—the Reedel Tunnel, owned by the Midland Mining Company—is

intended to intersect six or eight of the largest lodes. The ores here are in true fissure veins, but the mountains are ribbed with the veins of silver ore and adits; drifts, tunnels and shafts all penetrate numerous lodes varying in width from three inches to forty feet, yielding from 40 to 500 ounces of silver, and from 60 to 62 per cent. of lead. There is also considerable free gold and chlorides. The formation containing the lodes is chiefly eruptive or volcanic porphyry, with granite and occasionally trachyte and sand-stone, as the country rock and vein walls."

The most remarkable of these silver-ribbed mountains is King Solomon Mountain, on the numerous veins of which are situated the North Star mines. The Graham Silver Mining Company's (fifteen mines), the Alaska, Adelphi, Acapulco, Victory, Red River and Saxon are all valuable mines on or near the head-waters of the Uncompahgre river. Poughkeepsie Gulch in this region has 250 well-defined lodes, all of which are or have been worked successfully. Hazelton Mountain has many profitable mines just coming into notice. The ore and bullion yield of 1878 was over $250,000, and that of 1879 perhaps more. The Denver and Rio Grande Railway, which at first proposed to extend its route westward from Del Norte and Wagon-Wheel Gap to Silverton, has since changed its plans and goes to Animas City, seventy or eighty miles farther south. Both Silverton and Ouray will, however, have a railway connection from some quarter before long. San Juan county is not an agricultural region, and most of its vegetable and cereal products must be brought from other counties.

Ouray county is on the Pacific slope of the range, and comprises the northwestern portion of the San Juan region. Like its neighbors, it is almost entirely composed of rugged and almost perpendicular mountains and deeply cut ravines and river gorges, among which it is generally an impossibility to build roads. The inaccessibility of the section has retarded rapid growth, but reduction works having at last been established, future advancement will be much more rapid. Two railways have been projected, and may be built within two years, from Leadville, or the Arkansas river through Marshall Pass, or

possibly by way of Gunnison and Grand river. Heretofore it has cost $25 a ton to pack the ore on burros from the mines to Silverton, or to a wagon road, and as much more to get it to Denver or Pueblo. The unusual value of the mineral is all that enabled the miners to dispose of their products under such disadvantages.

The county is full of mineral veins of gold, and mineral channels or lodes from ten to twenty feet wide, and of every known and unknown combination of the precious metals, with other metals and elements, abound in almost every part of the county. The San Miguel river has also immense placer deposits, which are now worked by hydraulic mining on a large scale.

As a mining county, only the eastern portion of Ouray has been much developed, but everywhere the prospector has been rewarded for his toil. The whole regions, watered by the sources of the Uncompahgre, the Upper San Miguel, the Rio del Codo, and the headwaters of the Dolores, is full of lodes of great richness and of a most peculiar character. They are believed to be true fissure veins, and not contact lodes like those of Lake county; but many of the lodes are very wide, from three to forty feet, and contain pay streaks running side by side, and only separated by clay or thin slate partitions, in which gold and silver in various and unusual forms are found, separate yet in the same lode. Sometimes several of these wide and multiform lodes run side by side. The "Begole Mineral Farm," now owned by the Norfolk and Ouray Reduction Works, is one of these singular mineral veins, but they are abundant in all the eastern part of the county. Mr. Frank Fossett thus describes the Begole Mineral Farm:

"The Begole 'Mineral Farm' is one of the wonders of this part of the State. It is near the town of Ouray, and at about 800 feet greater elevation.* It comprises forty acres of ground, being four claims 1,500 feet long by 300 wide, and was at first supposed to be a horizontal deposit of silver-bearing ore, but subsequent developments prove it to contain four mineral channels or lodes, from ten to twenty feet wide. One of these lodes

* Ouray is 7,640 feet above the sea.

has a streak of bright, fine galena with heavy spar—the former carrying over 100 ounces of silver, and forty per cent. of lead, and another streak of thirty-ounce galena with much antimony. Another lode has a very rich gray copper vein in a gangue of quartzite, and often milling from $400 to $700 a ton. A third lode carries sulphurets, and in places chlorides. This property was discovered and located in 1875 by Augustus Begole, an old Arizona miner, and John Eckles. They had worked it in the summer seasons up to the fall of 1878, when they sold it for $75,000 to the Norfolk and Ouray Reduction Company, who had built works at Ouray."

There are numerous other mines of perhaps greater promise than this in the immediate vicinity of Ouray. One of them—the Grand View mine—yields from $100 to $150 to the ton in gold, and from $10 to $20 in silver. The Mount Sneffles District, west of Ouray, has no superior among the silver regions of Southwestern Colorado. It has many hundreds of lodes now actively worked, and most of them are very rich; some—like the Chief Deposit, the Yankee Boy, etc.—producing ore that mills from 300 to 500 ounces of silver, and one or two, more than that to the ton. Most of the Mount Sneffles veins carry large amounts of gray copper as well as galena, while ruby silver and silver glance often occur. Some of the ores of this, as well as the San Miguel district, have heavy galena and zinc ores, which carry silver to the extent of $300 to the ton.

The San Miguel district is developing a body of ores even richer and more promising than those of the Mount Sneffles district. The lodes here are in pay streaks of alternate gold and silver, or sometimes of both combined, and in all possible forms.

On the Upper San Miguel, Turkey Creek and Howard's Fork, there are many hundred claims already recorded, and most of them are worked with profit despite the difficulties and enormous expense of transportation. In the summer of 1880 two or three smelters and concentration works were set up in this region. "Ingham Basin," near Columbia, one of the new towns of the Upper San Miguel, is remarkable alike for its mineral wealth and its natural wonders. The placer deposits of the San Miguel

river are pronounced by California experts the richest that have ever been found on this continent, and they are now preparing to work them with the largest and best hydraulic appliances.

An eminent French mining engineer, M. Cuemeyngs, after a careful examination of the chief mining districts of Colorado, has just decided to purchase for his principals, a Parisian banking-house, the Pandora mine, near San Miguel Park, on the upper San Miguel river, pronouncing it the richest and most favorably situated mine he had seen. Another mining engineer, Mr. E. M. Pearce, says of the San Miguel Park region: "This is the very heart of the mineral wealth of the Rocky Mountains."

The Dolores country, of which Rico, the chief town, is not yet a year old, is situated in the southern part of Ouray county, and is sixty-five miles from Animas City, the latest terminus of the Denver and Rio Grande Railway. This is destined to be the great attraction of Colorado miners for 1880–1881, rivalling in richness Eagle river or the Gunnison country. Rico has about 1,500 inhabitants. Senator Jones, of Nevada, and his associates, have already purchased a controlling interest in some of its rich mines.

The Dolores Plateau extends over most of Western Ouray. Gold and silver are said to exist there, but there is also reason to hope that with irrigation these lands may prove arable and productive, or at least well adapted to grazing. The ruins scattered over all that region indicate that hundreds of years ago, this as well as the other plateaux of Arizona, Utah and New Mexico were densely peopled by an intelligent, agricultural people.

With the possible exception of the great county of Gunnison, whose mineral wealth is as yet but slightly developed, Ouray county gives the promise of a greater out-put of the precious metals in the near future than any other county of the State; Lake county may overshadow it for a time from the great concentration of capital in and around Leadville, but when the contact lodes of Leadville begin to diminish their yield, the Ouray mines, true fissure veins, will be at their best and with a certainty of permanency; while the rich placer deposits will yield for years

to come their millions of free gold. With railway communication, and a possibility of large agricultural production and pastoral wealth on the western plateaux, the county has a magnificent future before it.

Gunnison county is the latest of the mining regions of the State to be explored, and may prove to be the wealthiest. The county is very large, having an area of over 10,000 square miles. Summit county forms its northern boundary, Lake, Chaffee and Saguache bound it on the east, Saguache, Hinsdale and Ouray on the south, and Utah on the west. It is traversed by the Grand river and its numerous affluents, two of which, the Gunnison and the Rio Dolores, are themselves large and important rivers. The Gunnison has more than a hundred tributaries, some of them important rivers, and the Dolores has a considerable number, of which the San Miguel is the largest. In the northeastern part of the county, the Roaring Fork of the Grand river, with a score of affluents having its sources in the Sawatch (Saguache) Range, winds its way among the interminable group of peaks which go to make up the mass known as the Elk Mountains. Each of these tributaries of the Grand river, large and small, has, like the parent stream, its cañon, sometimes very dark and deep, through which it finds its way to join the waters of the larger river. The Grand cañon of the Gunnison rivals some of the most remarkable cañons of the Rio Colorado of the West.

The first discoveries of silver were made in this county in 1872, though there had probably been surface-diggings there in 1860 or 1861. The discoverers, in 1872, were two brothers, George and Lewis Waite, who had drifted over the mountains from Fair Play in Park county, prospecting for minerals. They wandered into the Elk Mountain region, and there found a vein of silver that cropped to the surface above the bed of a small creek. They carried some of the ore to Denver, then the nearest point where a satisfactory assay could be procured, and found that it contained both silver and gold in paying quantities. With very little means they set about constructing a tunnel through Whopper Mountain, the location of their mine. Two or three times they were obliged to leave their mine for several months;

and go to Fairplay and work as miners in order to procure the means for obtaining supplies for the cruelly cold winters in the mountains, but they toiled on faithfully for seven years, when the reward came. In 1878 and 1879 the overflow from Leadville began to come into the Elk Mountain region, and while the brothers had secured for themselves three very excellent lodes, called the Whopper, Index, and Teller, very many new claims were entered in their immediate vicinity on the affluents of Roaring Fork; others on East river, a branch of the Gunnison; Cooper creek, and others still on the Crested Buttes, and on Slate creek. It was computed that over 18,000 persons visited these mines in the summer of 1879, and 50,000 or more in the spring and early summer of 1880. To reach the headwaters of the Gunnison from Leadville, fifty miles away, it was necessary to cross a lofty range of mountains where the passes were filled with gigantic snow-banks. In one place an immense deposit of snow was tunnelled and cut through in order to reach the land of promise ahead of those who would come with the summer. More than two thousand claims were recorded in 1879. The mines are all high up on the mountains, and the winter is long and severe. There are only about five and a half months in which work can be done in the open air; but in the tunnels work is carried on through the winter. The ore is mostly silver, with a moderate amount of gold. It is galena, ruby silver, horn silver, gray copper and native silver, and ranges from 100 to 500 or even 1,000 ounces of silver, and from one to six ounces of gold to the ton. There are now several smelters in the mining region, where numerous mining towns have sprung up within a year. Gothic City has about 2,000 inhabitants; Gunnison, the county-seat, perhaps as many, while Crested Buttes, Irwin, and some other settlements are rapidly growing. There is a possibility of a railway—an extension of the Colorado Central—to Gunnison, within a year. The mines thus far located are about six miles east of the bounds of the Ute Reservation. If that reservation reverts to the United States under the recent treaty, the whole course of the Gunnison river will be prospected, and probably valuable mines dis-

covered. Gunnison county produced $300,000, mostly silver, in 1879, the first year of its development.

Summit county has an area of about 5,000 square miles. It extends from the crest of the Snowy range westward to Utah, and lies entirely on the Pacific slope of the mountains. Clear Creek and Park counties bound it on the east, Grand and Routt on the north, and Lake and Gunnison on the south. It embraces a large amount of country adapted to farming and pastoral purposes, and is rich in silver lodes and gold placers. The yield of the latter has been very great, and that of the lode veins will evidently be immense in the near future. In the western portion are coal measures of excellent quality.

Its scenery is grand and magnificent. Mountain ranges border and intersect it in almost all directions, and among them are noble rivers, and hundreds of sparkling streams and dashing waterfalls. Vast forests of pine and spruce extend up the mountain sides, and here and there are broad valleys, green as emerald and watered by the purest streams.

The first silver lode opened in Colorado was the Coaley, in Summit county. Its discovery came about in this way: Some gulch miners from the Blue river or Georgia gulch were hunting for deer in 1861, and getting out of bullets manufactured a few from the outcroppings of what they called a lead vein. A year or two later they were in Nevada, and found that the silver-bearing galena ores of that section very much resembled the material which had supplied them with bullets in the Colorado Mountains. They wrote to an old friend in Empire and advised him to go over and locate the lode. After some delay he did so, but never made a fortune from it. Yet it led to a great silver excitement and to the development of the Georgetown silver district.

That great natural barrier, the Snowy range, has acted as a serious drawback to Summit county's progress and advancement. The heavy snows blockaded the entire region from the outside world in the winter season, and the difficulty of crossing mountains from 12,000 to 13,000 feet high caused freighting and travelling to be slow and very expensive. Matters have assumed

a different shape during the past few months. New wagon roads have been built at much lower elevations and on better grades, furnishing connection with Georgetown and Leadville. Railways are also projected and surveyed to both of these points. An extension of the Colorado Central Railroad is to be completed to Breckenridge and Leadville this year. The leading towns of Summit are Kokomo, Carbonateville, and Summit City in the Ten Mile section—all founded within eighteen months—Montezuma and Saints John in the Snake river region, and Breckenridge in the Blue river placer country.

The total mineral production of Summit county from 1861 to January, 1880, was $7,336,912, of which $6,360,912 was gold, $820,000 silver, $130,000 lead. In the early years of Colorado mining, the tributaries of the Blue river in this county were among the most productive in placer gold of any in the Territory. The Georgia, French, and Humbug gulches, the Blue and Gold Run, the Illinois, McNulty, and other placers yielded large amounts; for several successive seasons a million a season was taken out. The yield continued to be large for several years, and has been continued to the present time; and the great enterprises in hydraulic mining, inaugurated in 1878 by the Fuller Placer Company, and by L. S. Ballou, are on a more gigantic scale than any others east of California. The first named company have constructed a flume or flumes thirty miles in length, bringing the water from a lake on the eastern slope of the "Great Continental Divide," which was over 12,000 feet above the sea, through a pass in the divide 11,810 feet above the sea, and, after using it in their hydraulic mining, suffering its waters to fall into a tributary of the Grand river and thus find their way into the Pacific. The product of these placers, in 1879, was over $100,000, and, in 1880, will reach at least $500,000. It is estimated that from $8,000,000 to $12,000,000 will be realized from these placers. They can only be worked for five and a-half months in the year on account of the great elevation.

There are several important mining districts, old and new, on the eastern border of Summit county, in the Blue river valley, that are attracting much attention. Of these the gold placers

of alluvial deposits of the Blue and Swan rivers and their tributaries are the oldest. Extending north from these among the mountains is a belt of veins carrying silver and lead. The Snake river region contains both argentiferous galena and sulphuret, and copper-bearing veins. There are some very rich veins in the vicinity of Montezuma, Saints John, Peru, Geneva, and Hall Valley—all located on the main range or some of its spurs. Near the headwaters of the Blue, carbonates have lately been found.

The Snake river mining region comprises Peru and Montezuma districts, and lies on the western slope of the Rocky Mountains. Its elevation is from 9,000 to 13,000 feet above sea-level, and its distance from Georgetown and Ten Mile is from twelve to twenty miles. Gray's Peak and other mountains of great height overlook and partly enclose it, and with its magnificent forests and grassy vales presents a landscape grand and picturesque in the extreme. Snake river enters the Blue from the east at nearly the same point where Ten Mile comes in from the south. East of the Montezuma section are the Geneva district mines, located on the crest of the Continental Divide, and on the line of Clear Creek and Summit.

The great excitement, however, at the present time is over the Ten Mile district. This locality has become famous during the past seventeen or eighteen months. Rich galena veins have been opened in the mountains west of Ten Mile river, and several thousand men have assembled there. The indications are good for one of the leading silver districts of the State. Further west valuable mineral discoveries are reported in the Eagle river region, but these were made this season, and of course sufficient time has not yet elapsed for their development. The fame of Ten Mile has brought in people enough to prospect the county very extensively, and there is no doubt but that its mineral wealth is of the first order.

The Ten Mile District comprises the converging slopes of two parallel ranges of mountains and the intervening valley of Ten Mile creek. The upper and settled portion of this valley is a mile wide and 11,000 feet above sea-level. The westerly

range, containing most of the mines, is from 1,000 to 1,500 feet higher, is called the Gore range, and further north is divided by the Grand river. On the east Ten Mile range has several peaks from 13,500 to 14,200 feet high. The creek was called Ten Mile because it was supposed to be ten miles long, but it is in reality seventeen miles in length. The two ranges bordering Ten Mile valley extend northward from the main divide on either side of a depression called Arkansas Pass. This is fourteen miles north of Leadville, and from it, waters flow towards either ocean. About two miles further west the Eagle river starts from Tennessee Pass.

McNulty gulch empties into Ten Mile creek near its source and the site of the new town of Carbonateville. It gave its main gold product in 1860, 1861, 1862, but is still worked by Colonel James McNassar, and turns out from $4,000 to $7,000 a summer. Its total yield from 1860 is estimated by old miners at nearly $360,000. Further down Ten Mile are the Follett placer diggings.

This region had been prospected by several different parties, but no high grade ore was found in quantity. In the summer of 1878, George B. Robinson, a leading Leadville merchant, outfitted an old prospector named Charles Jones, and the Seventy-eight, Smuggler, and other mines of the Robinson group were found, and subsequently the Wheel of Fortune and Grand Union. Then people began to move over that way, and to stake off claims sometimes on top of the snow in mid-winter. Leadville and Ten Mile have afforded a rich harvest for surveyors.

In this elevated region snow falls deep and often, and there is usually five or six feet of it on the ground from January to late in April, but nothing could stop the fever-heat of excitement that set in with the year 1879. Men kept coming in over routes that were terrible to think of; trees were felled, cabins built, tents pitched on top of the snow, and prospecting carried on, irrespective of the difficulties in the way. The lack of surface indications were made up for by a superabundance of faith. The miner would seek for unclaimed ground, clear away the snow from a chosen locality, and then commence to sink in

search of deposit or vein. This hazardous style of prospecting was occasionally successful, and a few good strikes were reported on Sheep, Elk and Jack Mountains, all of which greatly advertised the fame of Ten Mile. Town sites were staked off for a distance of six miles down the valley, and the dull roar of the miner's blast or the echo of the woodman's axe could be heard all day long among the stately forests of pine.

The embryo cities of Kokomo, Summit, or Ten Mile, and Carbonateville presented a strange medley of log cabins, tents, and primitive habitations, and the prices of town lots compared in altitude with the places in which they were located. There were from thirty to fifty arrivals daily all through the spring, when the melting snows made the imperfect roads almost impassable. With the opening of the summer of 1879 Kokomo claimed a population of 1,500, and had an organized city government, a bank, hotels, stores, saloons, saw-mills, and the telegraph, where there was not a single settler a few months before. A newspaper and several smelters have been sent there, and are already in camp. There are over 3,500 people in the entire district. Smelting works and a home market for the mining product was the great necessity, and this has now been supplied. The Robinson consolidated mines, which embrace twelve or more distinct claims, all on the same incline vein, are the great mines of this section, and are yielding immense quantities of silver. The whole mountain side seems to be interlaced with these rich veins. The formation of this part of the mountain is an indefinite amount of red sandstone, about four feet of shale, thirty feet or less of micaceous sandstone, lime, mineral, crystal lime, and sandstone formation of unknown thickness. In places where this structure maintained the usual depth, the ore is forty or fifty feet below the surface.

On Sheep Mountain, overlooking the valleys of Ten Mile creek and Eagle river, vast deposits of silver ore, mostly carbonates, and probably, like those of Leadville, "contact lodes," have been discovered and worked. Some of these mines yield 200 ounces of silver or more to the ton.

The Eagle river starts from the vicinity of Tennessee Pass,

west of the head of Ten Mile, and flows northwesterly between the Gore and a more westerly range of mountains into the Grand. It is the newest mining district of the almost unexplored regions of Western Colorado. The mountains that enclose it are said to contain many silver veins, some of them assaying from one to eleven hundred ounces. Many prospectors went in there, in the summer of 1879, and in a beautiful park the embryo metropolis, Eagle City, was located. West of the headwaters of the Eagle is the Mountain of the Holy Cross, whose eastern face always shows vast beds of snow, which have the form of a cross. This snow fills two mammoth ravines. The height of the cross is about 1,500 feet and the arms are each about 700 feet long. The climate of the Eagle river country, and of that beyond, is fine. The river valleys form excellent grazing lands, and lower portions are adapted to farming. The country is full of wild game, and the streams abound in fish.

Summit county, west of the 107th meridian, is now included in the Ute Reservation; but when, as is now confidently expected, that vast tract is released to the United States government, a great extent of arable and grazing lands, and many rich deposits of the precious metals will be opened to the settlers who will soon fill the region.

Grand county includes the Middle and North Parks, and the slopes of bordering mountains, together with the Rabbit Ears range. Some silver veins have been discovered in the latter, but are generally of low grade. It is claimed that carbonates have been discovered in both parks, but this does not seem to be authenticated. Placer mining is carried on at Willow Creek in Middle Park, and in several localities in North Park, and good returns are reported.

Routt county is the northwestern division of the State. It is composed of mountain ranges and spurs, divided by rivers, and bordering valleys well adapted to grazing, and sometimes to farming. There are extensive placer lands on the headwaters of the Snake and Elk rivers, which are operated by several companies and individuals. The principal of these is the International Company of Chicago, near Hantz's Peak, which has been

making preparations for work on a large scale for several summers, and is now in shape to push matters. This tract of land is supplied with great flumes and ditches, miles in length, and with hydraulics, which command an immense amount of paying gravel. About $10,000 was taken out in a few weeks in the summer of 1879. The Elk river ditch and flume is seventeen miles long, and two other ditches combined are six and a half miles long. Three giant hydraulics are used, one with 1,300 feet of iron pipe, and another with 500 feet. A bed-rock flume has been run. In drifting and washing, a dike of porphyry and 170 feet of slate have been passed through.

There are over 1,000 acres of gravel land; and from forty to sixty men were employed, and over $60,000 of gold produced in the year 1879. A branch of the Colorado Central has been projected to enter the county from Middle Park and extend through Steamboat Springs and Hayden to Windsor, at the junction of Fortification creek and Yampah, or Bear river, the largest tributary of Green river. Steamboat Springs, and, in the southwest part of the county, that extraordinary instance of nature's architecture, the "City of the Gods," are wonders well worth visiting.

Part of Routt county is included in the Ute Reservation. The Green river, one of the constituents of the Colorado of the West, and its two great tributaries, the Yampah, or Bear river, and the White river, with their affluents, drain the county, and exhibit cañons of great depth. It is believed that the coal measures so largely developed in Gunnison and Summit counties are found in Routt county also; but the county is at present almost wholly unexplored, so far as its mineral wealth is concerned.

Jefferson, *Huerfano*, and *Arapahoe counties* have considerable deposits of coal, but are classed among the farming and grazing counties.

With the exception of *Las Animas county*, which has in its western section large beds of excellent coking coal in the vicinity of Trinidad, none of the other counties of the State, beside those named above, are known to possess important mineral deposits. The remainder, as well as some of those which contain the precious metals, are either farming or grazing counties.

The arable lands of Colorado comprise at least 15,000 square miles of its territory, while the grazing lands are at least four, and possibly five times that quantity. All or nearly all the arable lands require irrigation, but when irrigated they yield enormous crops, and the deposits from the canals maintain and increase the fertility of the lands, while the water dissolves the alkaline and other ingredients of the soil, and insures large crops every year. The first cost of these canals and ditches from the mountains is considerable, but it is in most cases borne by one or more communities of farmers, and the expenditure is followed by such large and abundant returns that it is not seriously felt. Of late incorporated companies have been constructing these canals and renting the water, and in some cases have purchased large tracts of land, which they sell in farms of 80 to 160 acres with the water-right at from ten to fifteen dollars per acre. The largest of these companies is the Weld and Larimer Canal Company, an English corporation. It has a canal, as we have elsewhere said, fifty-four miles in length and capable of irrigating 40,000 to 50,000 acres. The Greeley Canal is thirty-four miles long, and waters a region almost as large. There are many of these canals also in the southern part of the State.

"It is," says Mr. Frank Fossett, "a well-established fact that heavier and more reliable crops can be obtained by the aid of artificial irrigation, taking one year after another, than where the uncertain natural rainfall is depended on. . . . The prosperous, well-to-do farmers along the South Platte, the Cache-la-Poudre, Saint Vrain, Boulder, Ralston, and Clear creeks, the Fountaine, Cucharas, and the Arkansas and Las Animas or Purgatoire rivers, are all illustrative of the truth of this statement. Rich waving fields of grain now greet the eye where once were barren, uninhabitable wastes, and vegetables of such prodigious size, and in such immense quantities, are raised as would astonish those unaccustomed to the crops grown on Colorado soil. Farming has often been enormously remunerative, and few that have followed it steadily have failed to accumulate money or property. Many men have well-stocked farms of great extent and value, the result of a few years' industry and effort. We

can hardly distinguish critically between the farming and the grazing counties, since many of the latter, under the influence of irrigation, are largely productive of grains and root crops—but in general it may be said that Larimer, Weld, Arapahoe, Douglas, Boulder, Jefferson, El Paso, Pueblo, Las Animas, Saguache and Costilla, as well as Conejos, Rio Grande and La Plata have large quantities of arable land, and some of the western counties are probably not deficient in this respect. Some of these counties have also a reputation as grazing or sheep-growing counties—El Paso and Las Animas in particular being noted for their sheep farms and cattle ranches, and Weld and Arapahoe having some reputation in the same line. The grazing and sheep-raising counties, *par excellence*, are Bent, Weld, Elbert, Arapahoe, El Paso, Las Animas, Pueblo, Douglas, Huerfano, and Saguache.

"The annual farm products of Colorado are steadily increasing in quantity and value. Correct data of a detailed character have been difficult to gain, and reports from various sources are often conflicting. The farmers are not always willing to have the full extent of the wheat crop known, lest prices fall to a lower figure than might otherwise be obtained. Consequently, it is sometimes difficult to get correct estimates. Millers and speculators always figure out a much larger crop than the farmers are willing to acknowledge. The former are the buyers, and work for low prices, while the latter are the sellers, and, of course, want as much money for their products as it is possible to get.

"The farming product of 1877 was far ahead of that of any preceding year. The season was a remarkably favorable one, and the acreage of land sown or planted was much greater than ever before. The result was that a large portion of the farmers, who had previously suffered losses from grasshoppers and from other causes, came out with a handsome cash balance in their favor, as did those who had newly embarked in the business. The good fortune attending the season of 1877 caused an increase of tilled land in 1878 of at least twenty-five per cent. In some sections the acreage in wheat was one-third greater, and

in other fifty or sixty per cent. The harvest was not as bountiful, however, as in the preceding year. While the aggregate may have been somewhat greater for the entire State, the return of grain and some other crops per acre was considerably less. In the northern counties this was partly due to frequent rains just before the harvest time, causing wheat to 'rust.' In Southern Colorado no such misfortune was reported.

"The total agricultural productions of Colorado, for 1878, exclusive of stock, may be summed up, as follows:

Wheat	1,310,000	bush.	$1,310,000
Corn	300,000	"	210,000
Oats	250,000	"	125,000
Barley	150,000	"	80,000
Rye	50,000	"	30,000
Potatoes	450,000	"	350,000
Hay	50,000	tons.	800,000
Garden produce			250,000
Butter, cheese and eggs, milk—dairy product			350,000
Total			$3,515,000

The year 1879 was one of larger production as well as of much more extended acreage. In every agricultural product named above there was a marked advance; while the vast influx of settlers, capitalists, speculators and tourists furnished a ready market for all that the farmers of the State could produce, and at prices which were satisfactory to the producer. While the returns of the census which, perhaps, may not prove very accurate, are not yet at hand, there are sufficient data to make it certain that the product of the nine items named above exceeded in 1879 $6,500,000, and would have found a ready market had they reached three times that sum.

The average yield of wheat has been from twenty to twenty-five bushels. Possibly twenty-two bushels come nearer the truth, taking one year with another. There are many farms and belts of land that yield thirty, forty, and occasionally fifty bushels to the acre. This, of course, is far above average returns of the State. Colorado flour is the finest in the world. Quantities of

it are shipped to Illinois and other States. Oats, rye, barley and other cereals do as well proportionally as wheat. Potatoes return all the way from 100 to 500, and, rarely, 700 and 800 bushels to the acre. The average runs from 100 to 200. Vegetables of nearly all descriptions grow to prodigious size both on mountain and plain. The comparatively inexpensive system of irrigation constantly replenishes the soil. The water is let into the ditches and on to the land in June, when the streams are full of mineral and vegetable matter borne down from the mountains. The water goes down into the ground and leaves the mineral and vegetable substances on the surface, adding to the soil. The ground continues productive after years of cultivation, because the irrigation brings in new material. Corn does not thrive as well in the northern counties as small grains, owing to the chilly night atmosphere, yet the yield is considerable and steadily getting larger. South of the "Divide" it does much better and large crops are raised—sometimes seventy-five or eighty bushels to the acre. Large quantities of hay are cut and cured in the parks and in most of the larger plains and mountain valleys. The good prices prevailing in the mining camps make this an important article to the farmer and stock-owner.

For a long time fruit culture in Colorado was deemed impracticable. The experiments and experiences of the past few years show that fruit of various kinds can be raised successfully, and in some of the southern counties profitably and extensively. There are thrifty orchards of apple and peach trees at and near Cañon City. North of the "Divide" much more difficulty has been experienced; but apple trees are made to grow and bear fruit when protected from the winds by other trees. Several very fair crops of apples have been obtained in Jefferson, Boulder, Larimer and other counties.

The dairy has become an interest of no little importance within the past few years. Owing to the nutritious character of Colorado grasses, the milk, butter and cheese are of unrivaled excellence. Large quantities of these articles are sold in the numerous towns and camps. Several cheese manufactories have recently been established in El Paso, Boulder and Larimer coun-

ties. There, and in Arapahoe and Jefferson, more than elsewhere, are remarkably large numbers of superior cattle, many of them of the best blooded stock, and valued at very high figures. Some of the finest cows and bulls of eastern localities have been purchased and imported by these enterprising farmers of the far-away Colorado border. There are finely-stocked dairy-farms in other sections beside the counties enumerated, including Douglas, Fremont, Lake and Saguache, but those named first take the lead. At the State and county fairs the displays of Durham, Alderney, Hereford, Shorthorns, Jersey and Swiss cattle, and of stock crossed therewith, are very fine.

There is a remarkably large amount of money invested in horse-flesh in Colorado, and the average quality of stock is very high in some quarters. The liveries and private stables (especially the latter) of such cities as Denver, Leadville and Colorado Springs are of a very high order. On the farms are large numbers of horses, some of them splendid draft, work or saddle animals. Good blood is as manifest there as among the fast trotters of the towns.

Colorado can make no such showing in amount of farming products as the Mississippi valley States, where farming is the main industry; but in the yield per acre, or in quality of wheat and beef cattle, and extent of stock-farms, she far surpasses them. With little care or trouble these Colorado uplands and river bottoms turn out nearly or quite double what an equal area gives in Illinois or Iowa, and far more than is known in Minnesota or Kansas.

Wages of farm hands usually range from $15 to $20 per month, with board, for the entire year or season, or about the same as female domestic servants receive. Laborers hired especially for harvesting receive from two to three dollars per day and board. There is quite a difference in the prices received for farming products, according to locality. No country has a better market, and one beauty of this is, that it is right at home. Hay is usually from $20 to $30 per ton in the mountain mining camps, and about half that sum on the farms of the plains and parks. By the cental, or hundred pounds, potatoes ranged dur-

ing the past year or two from $1.50 to $1.75; corn from $1.50 to $1.75; wheat, $1 to $1.70, or from seventy cents to $1 per bushel; flour, $2.20 to $3 per hundred; oats, $1.75 to $2.50.

Before the railways reached Colorado there were occasional scarcities of articles of food. A single potato crop of a mountain farm near Central cleared for its owner $17,000 one year when potatoes did not do well on the plains. Many years ago receipts were often very large, from the sale of crops on such large ranches or estates as those of Colonel Craig and others. A leading farmer near Denver, who, from his penchant for potato culture, has been called the Potato King, usually raises from 40,000 to 60,000 bushels annually from 200 to 300 acres of land, and has received for his crops all the way from $40,000 to $70,000. He plants those varieties that are found to do best, and, as in most parts of the State, many grow to prodigious size. The highest reported yields of any extensive potato crops run from 500 to 800 bushels per acre. These are exceptional cases; but 200 and 300 bushels to the acre are common returns.

Magnificent crops of the finest quality of wheat ever grown are usually harvested in the fertile and beautiful valleys of the Boulder creek, and of Ralston, St. Vrain, Poudre, Clear, Bear, and Saguache creeks, and in parts of the Las Animas, and Arkansas and Platte valleys. The profits of a farm in those localities are often many thousands of dollars annually. Some farmers have hundreds of acres in wheat, and harvest from 5,000 to 15,000 bushels per annum. From three to six times as much land is usually sown in wheat as in oats or corn. The most approved sowing, planting, and harvesting machinery are used, and steam threshing-machines are moved from one place to another, as their services are required. These machines handle from 40,000 to 90,000 bushels each in the more populous districts. In July, 1877, over $75,000 worth of farming machinery was sold in Boulder county alone.

Greeley colony has over 35,000 acres of land under ditch, most of it in a high state of cultivation. Some fifty or sixty square miles of territory were made available for agriculture by the recent completion of a section of twenty miles of the Larimer

and Weld Canal. The total length will be fifty-four miles, and a tract of country thirty-six miles long, and from three to ten miles wide, will be irrigated. The canal starts from the Cache-la-Poudre river, at the Colorado Central Railway crossing, and continues eastward until the Denver Pacific is crossed. A part of this land was pre-empted, and some is being sold at from $3 to $10 per acre.

Western Colorado is beginning to be settled up by miners and farmers. For many years the great Sierra Madre acted as a barrier to immigration and advancement; but population is moving in that direction at last. Beside the wonderful mining discoveries of that region, the farming and pastoral resources are considerable. There are fine parks and numberless valleys enclosing the streams. These are extremely fertile, and will prove very serviceable and valuable now that a demand has arisen for their products. The Gunnison river alone has from 50,000 to 100,000 acres of farming land available for irrigation that is lower than San Luis Park, and which yielded 20,000 tons of hay last season.

We have devoted considerable space in Parts I. and II. to the advantages and disadvantages of stock-raising and sheep-farming in Colorado. Both pursuits are carried on with greater success and in a more thoroughly satisfactory way in that State than in any other. It is not necessary for us to recapitulate what we have said there; but we give below the statements of a thoroughly intelligent English gentleman, Hon. J. W. Barclay, M. P., himself interested at home in the cattle business, and who has spent many months in the last four years in Colorado, returning thence to England in November, 1879. Mr. Barclay has no motive for over-coloring his account of stock-raising in the State, and his views will be interesting to our readers as those of a competent foreign observer.

Mr. Barclay says:

"But although a great future undoubtedly awaits the farming interest in Colorado, the present profit is greatest for the stock-keepers. There is, indeed, probably no part of the world where a young man with a few thousands can employ himself more

agreeably or profitably than in rearing cattle on the plains of Colorado or Wyoming, or in the Parks of the Rocky Mountain ranges. A couple of thousand dollars, expended on houses and the erection of corrals in the neighborhood of a permanent stream, will form a basis of operations, and he can graze his flocks of sheep or herds of cattle on the public lands around without rent. The outlay is for the food and wages of his 'cowboys;' and after providing for that expense, he may devote the whole remainder of his capital to the purchase of graded heifers and good shorthorn bulls. Graded heifers may be got across the mountains in Montana, California, or in Oregon, at a cost of $15 each. Shorthorn bulls, fairly bred, and suitable for the country, can be purchased at from $50 to $100. Sheep of satisfactory quality are driven, or rather eat their way, from California, and can occasionally be bought in Colorado or Wyoming at $3. When crossed with a better class of sheep they soon improve, and yield fleeces of five to six pounds.

"If the stockman has the faculty to select good men—and such are to be had out in the West—he need not make himself a prisoner in his ranch, but may treat himself to a month's hunting in the mountains, or even to a trip to England, without imperiling his interests. How long the present system will last, of pasturing on the public lands, is uncertain. Last summer a Commission of Congress was engaged on an inquiry into the best system to be adopted with regard to the public lands, and an idea is entertained that the government will sell land suitable for grazing, but too dry for cultivation, in lots of eight square miles, about 4,000 acres, at a low figure. Should this policy be adopted, the ranches will be fenced in, and a much higher type of cattle can then be advantageously introduced than would pay when, as at present, the cattle of different owners roam together on the plains. The profits of the present system are enormous, notwithstanding the low price of cattle. A three-year-old steer, weighing alive about 1,200 pounds, fetches only $20. The increase of the stock, after deducting deaths, is about eighty per cent. on the number of the cows, if the cattle are fairly well attended to. The attention required is not much. To cut the

grass with a mowing-machine in some of the meadows, and to save the hay for the emergency of a snow-storm severe enough to debar the cattle from their food, is all that is necessary. But even that slight precaution is, I fear, rather the exception than the rule in the Colorado ranches.

"The ease with which meat may be grown out in the West was forcibly impressed on my attention by an incident I observed in the North Park. The North Park is a great undulating plain within the Rocky Mountains, at an elevation of 7,000 or 8,000 feet. The drove I saw consisted of 3,000 cattle, of a size and quality that would have attracted favorable notice in any of our markets at home. They had been feeding on very nutritious grass in the Park all summer, and were expected to weigh 1,400 pounds. They were born on the Pacific slope, and were feeding here, as a resting-point in their journey from California eastwards. They were part of a lot sold to Chicago dealers at $37.50 a head, and were going to Illinois to be fattened for the English market, and would reach Liverpool, ready for the butcher, early in 1880. Thus cattle that first see the light on the shores of the Pacific are driven slowly, at the rate of about ten miles a day, as far as the centre of America, and after grazing there for a year, are carried by railway to the maize-growing States, whence, after a stay of a few months, they make their final journey to Liverpool. These are facts that lead to reflection. Only ten years ago, cattle from the Eastern and Middle States were taken westward across the mountains to California, but the tables are now turned. Cattle-breeding has developed so rapidly in the Pacific States, as not merely to supply the demand there, but to pour its surplus of the improved American cattle back to the East, and thus to supplant the inferior Texas breed, which in a few years may be expected to disappear altogether. It is computed that during the present year 50,000 cattle have made the journey eastwards across the plains.

"Looking at the capacity for development shown by facts like these, it is idle to imagine that the supply of American cattle will become exhausted within any time that can be mentioned in the proximate future. These plains, covering thousands of square

miles, are specially adapted for rearing cattle. But there is one direction in which a government, even moderately acquainted with the interests of beef-producers, might confer a benefit upon the farming interest. We cannot compete with the American stock-keeper in the earlier stages of meat production, but in the last stage of all—the fattening for the market, which is at present done in Illinois and other maize-growing States —the farmer in this country has facilities which would enable him to distance his American competitor. The cattle I saw were to be transported by rail to Illinois at a cost of $6.25 or $7.50 per head; for other $25 a head those cattle could be landed at Liverpool. The store cattle sold in Colorado for $37.50. These would be sold at a profit to all concerned in Liverpool at $75 a head, and when fattened, could be sold readily, even in these bad times, for $100 a head. But this profit of $25 a head is forced into the pockets of Illinois farmers by the wisdom of our government, which prohibits the importation of store cattle for the farmer, and admits only fat cattle for the butcher. Such conduct from the 'farmers' friends' is not kindly.*

"Those who say that there is disease among American cattle, and that what the farmer wants above all things is protection from disease, betray a want of acquaintance with the facts of the case. The real opposition comes from a few breeders of cattle who have the ear of the government, and who object to any store

* Mr. Barclay's argument that the British graziers should import American "store cattle," instead of allowing the butchers to import American fat cattle, is admirable from his stand-point. It is, indeed, their only hope of making any profit from their agricultural products while they remain there; but we draw from it two very different lessons, viz.: 1st. That the British grazier will do very much better to sell his lands or his lease, and come over here, and raise cattle, where he can do it at an undoubted profit, and become the proprietor of broad lands which would form a ducal estate at home; and second, that our stock-raisers in Colorado and other States and Territories of "Our Western Empire" may just as well fatten their own cattle and sheep, which they can do at small cost, and thus command from $90 to $100 for them in the Liverpool market as to sell them to Illinois speculators at $37.50 per head, and let them make all the profit. Corn, barley, rye, millet, Egyptian rice corn, sorghum seed, and the fattening root crops can be raised in Colorado, Kansas, Wyoming, Montana or Dakota at half the cost of their production in Illinois, and containing a larger measure of carbonized or fattening food to the bushel; and with the present facilities for shipment, they will be able to place their finest beeves (and there are no better anywhere) in Liverpool, at a net cost to them of not over $40 or $45 a head, while they will command on landing from $90 to $110 per head. The Montana cattle, it is said, fatten almost too well on the nutritious bunch grass alone.

cattle being imported, whether in health or disease; but the great body of farmers want cheap store cattle, and they can have them both cheap and healthy from the natural breeding grounds of the West, if only the government would put itself to a little trouble and exercise a little care and common sense. There never has been any disease in the Western States, or in Illinois, Iowa, or Michigan. The direct route for cattle is through those States on the main lines of railway, and, crossing into Canada at Detroit or Port Huron, they could be shipped from Canadian ports. Cattle could thus be carried to England without ever approaching at any point within hundreds of miles of any place where disease has existed. Those acquainted with the system of transport know that simple and effective arrangements could be made insuring that only western cattle should pass into Canada, and the only hope I see for the British grazier is in getting these cattle. The attention of the department was called to this suggestion by a question put in the House of Commons last session, but the mouthpiece of the government would not condescend so far as even to promise an inquiry. Such neglect we are unfortunately but too familiar with, and there seems little hope of a change, until farmers or mercantile men insist on having some men in the government of this commercial and agricultural country, who know practically something of the country's interests. I cannot but think that we should be better off if we interfered less in our neighbors' affairs, and paid some attention to our own."

Dairy-Farming.—Though so new a country, Colorado has many remarkable advantages for dairy-farming. The small parks on the eastern side of the divide, where the valleys of the streams are not ravines or cañons—parks which contain from 100 to 1,000 acres each—form the best pasture grounds for a dairy-farm to be found anywhere; the grass is rich and nutritious; the water is abundant, cold, and pure; and the soil is so fertile that it yields in profusion, the roots, grains, and forage plants necessary to produce the greatest quantity of rich milk. Good cows of the Alderney, Jersey, and Holstein breeds are to be had at reasonable prices in the State, and the dairy-farmer, selecting cows which will yield at least fourteen pounds of butter

a week during the season, and selling or rearing his calves, can make a very handsome profit on a moderate investment. Good butter always commands a good price in Colorado—from twenty-five to forty-five cents a pound, and the supply is never equal to the demand.

Mr. H. Stratten, the leading dairy-farmer of the Cache la Poudre valley, Larimer county, makes the following statement of the profits of dairy-farming, as the result of his own observation:

"We will suppose eighty acres to have been tilled as a grain farm; the dairyman will put in forty acres to a mixed crop of corn, potatoes, oats, and barley for general crop, and seed down the remaining forty to Alfalfa. This will take 800 lbs. of seed, which, at 14 cents per lb., will cost $112. As the first blossoms appear on the Alfalfa, the crop must be cut, which ordinarily will just about pay for cutting; the second cutting, quite late in the fall, will, under favorable circumstances, cut one ton per acre. This forty tons of Alfalfa, with the straw and fodder raised on the forty acres set apart for the general crop, with the addition of such grain feed as the cows require, will be sufficient to keep a twenty-cow dairy in full feed until the first cutting of the Alfalfa the second year. We will suppose the farmer has made his selection of twenty good butter cows, about the first of October, and made the necessary preparations to keep them in comfortable quarters, putting the cows at once on full feed; we will figure what the result will be. Twenty cows fed as above will produce two hundred pounds each of gilt-edge butter, which properly marketed in Denver and the mining camps, will net 35 cents per pound; and 4,000 lbs. of butter at 35 cents equals $1,400. Twenty calves properly raised and fed, will, at one year old, bring $250; chickens raised on the surplus milk and refuse grain will net $200 more, which makes a total of $1,850, or an average of $92.50 per cow. The first cost of cows will be about $35 each. By making a good selection of native cows, then grading up with some good butter-making breed, the farmer will in a few years have a fine herd of dairy cows, worth at the lowest figure $50 per head."

We have devoted considerable space already in Parts I. and

II. to *sheep-farming* in Colorado, in connection with other States: it only remains to speak of the extent and success of the sheep-farming interest in the State. In 1870, Colorado had not more than 20,000 sheep. In 1880, she has not far from 2,500,000. The increase in the number of flocks of sheep is without any precedent in the history of the rapidly growing States of the West. The counties which are most largely engaged in sheep-farming are El Paso, Las Animas, Huerfano, Conejos, Pueblo, Elbert, Bent, Arapahoe, Larimer, and Weld. The sheep in the so-called Mexican counties, Conejos, Las Animas, and Huerfano, are mostly Mexican sheep, though a few of them have been improved by crossing with a superior breed; but in the other counties they are almost entirely of improved breeds. The Mexican sheep yields but three or four pounds of wool, while it costs as much to keep and care for it as the improved Merino or Cotswold grade, which yields from six to twelve pounds. As good Merino wool is worth on an average twenty-five cents per pound or more, this difference in yield makes a great difference in the value of the sheep.

In 1879, Colorado is said to have marketed 7,000,000 pounds of wool, worth $1,400,000; reared over 1,000,000 lambs, worth at the lowest estimate $1.50 each, or $1,500,000, and sent to market or consumed at home 200,000 sheep worth $2.50 each, or $500,000 more. In 1880, she will sell 10,000,000 pounds of wool, worth $2,500,000; rear 2,000,000 lambs, worth $3,000,000; and sell or consume 300,000 sheep, for which she will receive $900,000, an aggregate of $6,400,000.

"Thus far," says Mr. Frank Fossett, "the business of sheep-raising in Colorado has been very profitable. A flock of 1,800 ewes, costing $4,500, were placed on a ranche in Southern Colorado. In eight years, 1,600 sheep were killed for mutton and consumed on the ranche, and 7,740 were sold for $29,680. There are 14,800 head on hand, worth $3 per head, $44,400. The clips of wool paid for the shepherds' hire and all current expenses. The result shows a net profit over the original investment of $69,520, equal to 193 per cent. per annum for eight years in succession. Per contra, out of a flock of 1,200 very fine

selected ewes, worth $4 per head, 800 died during a storm of two days in March, 1878. The 400 that survived raised in the summer of that year more than that number of lambs.

"Many of the sheep men have two ranges for their herds—one for summer and the other for winter. The herder usually collects the sheep at night on a side hill, and sleeps by them. They lie quietly unless disturbed by wolves, who are the most troublesome in stormy weather. Shepherd dogs are very useful in the protection and herding of sheep, and are born and raised, and die with them. Lambs are weaned about the first of October. Sheep will travel about three miles out on to the range and back to water or the herding grounds each day. Those coming to Colorado to engage in the sheep business should engage on a sheep ranche, and stay there long enough to understand all about the methods of conducting the business. In selecting or taking up land for sheep-growing, plenty of range or room, with hay land and a water supply, are requisites for successful operations. Good sheep should be purchased to begin with, as they are the cheapest in the long run, and close attention must be given to the business in order to make money and build up a fortune.

"While large numbers of the sheep of Colorado are of American breeds, hosts of them are native Mexican sheep. Still larger numbers are of mixed blood, obtained by crossing the long-legged, gaunt, coarse, light-wool Mexicans with Merino rams. The Cotswold has not been crossed so successfully with the full-blood Mexican, but makes fine stock when crossed with the three-quarter Merino. This brings size to the sheep, weight to the fleece, and length of staple. Since Colorado has been found to be the sheep-growing State of the West, large herds have been driven into her borders from other sections. California has been a heavy contributor, on account of the small expenses and large profits attending sheep-raising here as compared with the Pacific slope. Thirty thousand sheep were driven in from that State in the spring of 1879."

The number of horses, asses and mules in the State is large in proportion to the population, and is rapidly increasing in two

directions: the number of wealthy mine-owners has greatly multiplied within two or three years, and these men all crave the best horses to be procured for money, and have already brought into the State very many choice animals; the mines and the railroads, as well as the immense freighting business, require a large and constantly increasing supply of horses and mules larger and heavier than either the broncho or mustang. To meet this latter demand, and to some extent the former also, such great corporations as the Colorado Cattle Company, of the Hermosillo Estate, have undertaken the rearing of many thousands of horses and mules, and find the enterprise largely profitable, even more so than cattle-breeding.

It is impossible to estimate with any very close approximation to accuracy, the present value of the live-stock interest of Colorado. So rapid is its growth; so sudden the transition from a "waste, howling wilderness" to a compact and populous State; from the sage brush, the alkaline plains, and the frightful precipices and cañons, to the fields green with future harvests and dotted all over with thousands of cattle, sheep, horses and mules, that figures which frighten us by their enormous amount prove strangely and ridiculously inadequate to express the enormous strides which every material interest is making in this land of wonders.

It is known that the increased valuation of the live-stock interest in 1878 (not the total value, that was many times more) over the previous year was $6,200,000. It is known also that the increase of the same interest in 1879 more than doubled these figures. In 1880, from the various causes we have specified, they must have doubled again, and, possibly, much more than doubled. When we add to this the receipts, gains and profits of the farming industry for the same three years, which mounted in that time from $4,000,000 to more than $13,000,000, we have an aggregate which for so young a State is astounding.

Railroads.—No State west of the Missouri river is so thoroughly interlaced with railways now completed, or soon to be completed, as Colorado.

At the northeast the Union Pacific enters the corner of the

State at Julesburg, on the North Platte, but soon passes north into Wyoming; at Cheyenne, Wyoming, it controls the Colorado Central, which extends from Cheyenne through Larimer, Boulder, and Jefferson counties to Golden, and thence over another line to Denver; this road has also its extensions in progress through Western Boulder, Grand (traversing the Middle Park) and Routt counties, to Steamboat Springs, and Hayden to Windsor, on Fortification creek, as well as through Gilpin county to Black Hawk, and through Clear Creek county to Georgetown, and is now building a further extension through Summit county to Leadville. The Union Pacific also controls the Denver Pacific, which extends through Weld and Arapahoe counties to Denver.

Under the same general control is the Kansas Pacific, and the newly reorganized Missouri Pacific, which, starting from Kansas City, Missouri, crosses Kansas from east to west, and passes through Bent, Elbert and Arapahoe counties to Denver.

The Denver, South Park and Pacific, which, starting from Denver, had its western terminus in 1878 at Webster, in Hall's Valley, pushed on, in 1879, to Breckenridge and Leadville, reaching the latter city early in 1880, and following the west side of the Arkansas river valley, crossed the main divide (the Saguache range) at Cottonwood Pass, reached Gunnison in August, and is now pushing on for Lake City (Hinsdale county), 125 miles distant, which it will probably enter by January, 1881. From Buena Vista, in Chaffee county, to Leadville, its trains and those of the Denver and Rio Grande Railway run over the same track.

From Denver, the Denver and Rio Grande goes southward to El Moro, extending a branch along the Arkansas river to its source, reaching Leadville; also westward from Cuchuras, in Huerfano county, as hereafter described, across Costilla to Alamosa, whence one branch goes to Del Norte in Rio Grande, and another through Conejos to Anemas City, in Plata county.

But the great railroad of Kansas, Colorado and New Mexico is the Atchison, Topeka and Santa Fé Railway. This railway, starting from Kansas City and Atchison, crosses the State of

Kansas on the line of the valley of the Arkansas river, which it follows in Colorado, through Bent and Pueblo, where it connects with the Denver and Rio Grande, *en route* for Leadville, and at La Junta, in Bent county, sending an arm southwestward and southward through Las Animas county, past the great coal fields and mines of Trinidad, reached Las Vegas, and crossing the main chain of the Rocky Mountains, paused for a little at Santa Fé, and is continuing its southern route down the valley of the Rio Grande to Mesilla, New Mexico, and El Paso, Texas, and stretching thence across Chihuahua and Sonora—Mexican States—will make its southern terminus at Guaymas, on the Californian Gulf. By its connection with the St. Louis and San Francisco Railway, and the Atlantic and Pacific, to all whose privileges it has fallen heir, it proposes also to strike westward from Santa Fé along the route of the Flax river, one of the affluents of the Rio Colorado of the West, cross Arizona, bridge the Grand Cañon of the Colorado with a single span of 400 feet, 1,600 feet above the water, and make a western terminus at San Diego or Los Angeles.

Neither the Union Pacific, the Northern, the Southern or the Texas Pacific has conceived a grander scheme for crossing the continent, or prosecuted it with such unfaltering energy and such audacity of enterprise and engineering skill. Its crossing of the Raton Mountains in Southern Colorado; its passage carved along the perpendicular precipices of the Grand Cañon of the Arkansas, and its other engineering feats, have excited the admiration of the greatest engineers in the world. In Colorado it has made a close alliance with its former rival, the Denver and Rio Grande, and the two having divided Southern Colorado and New Mexico between them, the latter has extended a line through Huerfano, crossing the Sangre de Christo range at Veta Pass, at the height of 9,339 feet, through Costilla county and the San Luis Park, to Alamosa, whence one branch traverses Conejos and La Plata counties, and is now completed to the Las Animas river, with an eventual terminus, perhaps, on the San Juan river; the other branch follows the Rio Grande on the line between Rio Grande and Saguache counties, to the famous mineral

springs of Wagon-Wheel Gap, and then turns westward through Hinsdale and San Juan counties to Silverton, where it is to meet an extension of the Las Animas branch to and through Ouray, and up the valleys of the Uncompahgre and Gunnison rivers to the Grand river, and thence into Utah. Another important branch of the Atchison, Topeka and Santa Fé east of the Great Divide is now in process of construction from Cañon City into Custer county to Rosita and Silver Cliff, the region of the new chloride mines. Within three years, and possibly less, there will be no county in the State untraversed by some of the lines of the Colorado Central, the Atchison, Topeka and Santa Fé, the Denver and Rio Grande, or some of the roads with which these are affiliated, and the State will have more than 2,000 miles of railway. In January, 1880, there were 1,326 miles in operation. There are now more than 1,450 miles.

The wagon roads, sometimes built at great expense, are for the most part, excellent and safe. The ascents and descents are sometimes frightful, but the drivers are cool, courageous, and thoroughly skillful men, and accidents are very rare.

These remarkable facilities for travel and transportation, so speedily created, have aided greatly in the development of the State, and have helped to place it at once on an equality with much older States in commerce and in all the appliances of the highest civilization. California, at the end of twenty years after her admission into the Union, even with her wonderful growth, had not the facilities already possessed by Colorado in the fourth year since her reception by Congress.

Education.—Colorado has an excellent public school system, modeled after the best systems of the Western States, and its public school law of 1876, amended slightly by later legislatures, is enforced with an enterprise and ability characteristic of everything undertaken by the State. It is fast accumulating a magnificent school fund, and its citizens pay no taxes so willingly as those for educational purposes. Its scattered population, especially in the grazing districts, has rendered the maintenance of public schools difficult in some of the counties; but wherever towns, villages, farming and mining districts and camps have

been established, there are good schools organized without delay. Denver is noted for its public schools, which are of the highest character. Leadville, the same month (July, 1877) that it assumed its corporate character, though then a small mining camp, established a public school, and has since multiplied its schools as rapidly as they were needed. Greeley, Evans, Longmont, Colorado Springs, Pueblo, Cañon City, Rosita, Silver Cliff, and all the rest, have made haste to establish schools.

There is a State University at Boulder endowed with lands by the government and supported by the State. It has a preparatory and a normal school department, and is about organizing its full course of university study. There is a college at Colorado Springs which has four courses of instruction—preparatory, normal, collegiate, and mining and metallurgy. The terms for tuition are only $25 a year, so that it is practically free. At Colorado Springs there is also a State Deaf Mute Institution, not yet, we believe, fully organized. There is a State Agricultural College at Fort Collins in active operation, and Farmers' Institutes are held in connection with it every winter.

Aside from these there are several private or denominational institutions of collegiate character already founded, and others in prospect. The education of the young in Colorado will be amply provided for.

Churches and Religious Denominations.—When we consider that Colorado is but four years old as a State, and that many of its larger towns and cities have not been in existence more than three or four years, we shall find that the religious progress of the State has been very commendable. The Roman Catholics have a large diocese, a considerable number of their adherents being Mexicans, of whom there are many in the southern counties, and many also of other nationalities in the central and northern counties. There is also a Protestant Episcopal diocese with a smaller number of adherents, but very active and efficient. The Methodists, Congregationalists, Baptists, Presbyterians, Lutherans, German Reformed, and many of the minor sects are also represented in the State by numerous congregations.

Population.—In 1870 Colorado had but 39,864 inhabitants,

about what Denver and Leadville each have to-day. When admitted to the Union, in 1876, it was considered doubtful whether she had more than 75,000. To-day she has, including tribal Indians (2,530), 197,179.

Counties.—The State has thirty-one counties, viz.:

County.	County Seat.	Valuation, 1878.	Estimated valuation, July, 1880.	Area, Square miles	Population, 1870.	Population, June, 1880.
Arapahoe	Denver	$11,076,761 00	$31,000,000	4,800	31,000	58,645
Bent	Las Animas	2,279,376 00	5,000,000	9,126	3,000	1,654
Boulder	Boulder	3,097,320 00	7,000,000	792	12,000	9,746
Chaffee	Granite			1,240	500	6,510
Clear Creek	Georgetown	1,932,991 31	4,000,000	437	3,000	7,846
Conejos	Conejos	244,346 00	750,000	2,588	6,000	5,625
Costilla	San Luis	319,771 90	1,000,000	1,685	4,000	2,879
Custer	Rosita	500,654 00	2,000,000	1,100	5,000	8,882
Douglas	Castle Rock	951,713 00	1,400,000	833	3,000	2,486
Elbert	Kiowa	1,202,052 52	1,300,000	6,030	2,500	1,759
El Paso	Colorado Springs	3,076,395 00	5,600,000	2,628	9,000	7,952
Fremont	Canon	946,363 00	2,500,000	1,268	4,500	4,735
Gilpin	Central	1,827,907 00	2,800,000	158	7,500	6,489
Grand	Hot Sulphur Springs	63,866 75	100,000	4,278	500	417
Gunnison	Gunnison	62,014 00	200,000	11,000	1,500	8,237
Hinsdale	Lake City	564,596 50	1,000,000	1,528	4,000	1,499
Huerfano	Wolfenburg	796,638 38	2,000,000	1,584	5,000	4,124
Jefferson	Golden	1,988,559 00	2,600,000	792	7,500	6,810
Lake	Leadville	603,858 92	30,000,000	400	15,000	23,824
La Plata	Parrott City	254,447 00	600,000	4,695	1,500	1,110
Larimer	Fort Collins	1,502,330 00	3,000,000	1,825	5,000	4,892
Las Animas	Trinidad	1,455,230 00	2,000,000	9,072	12,000	8,964
Ouray	Ouray	220,622 95	750,000	2,333	3,000	2,670
Park	Fairplay	796,259 00	1,500,000	2,222	3,000	3,470
Pueblo	Pueblo	3,069,633 00	7,000,000	2,412	9,000	7,615
Rio Grande	Del Norte	581,871 00	1,000,000	1,332	3,500	1,944
Routt	Hayden	74,661 00	100,000	5,000	300	140
Saguache	Saguache	637,627 00	1,000,000	3,312	3,000	1,973
San Juan	Silverton	255,338 00	850,000	726	3,000	1,087
Summit	Breckenridge	163,760 00	1,400,000	8,289	6,000	5,459
Weld	Greeley	2,583,827 00	7,000,000	10,494	7,500	5,646
	Total	$43,055,419 22	$126,450,000	.....	193,300	194,649

Cities and Towns.—The following are the principal cities and towns of Colorado with their population, so far as can be ascertained, in 1870, 1875, 1879, and 1880:

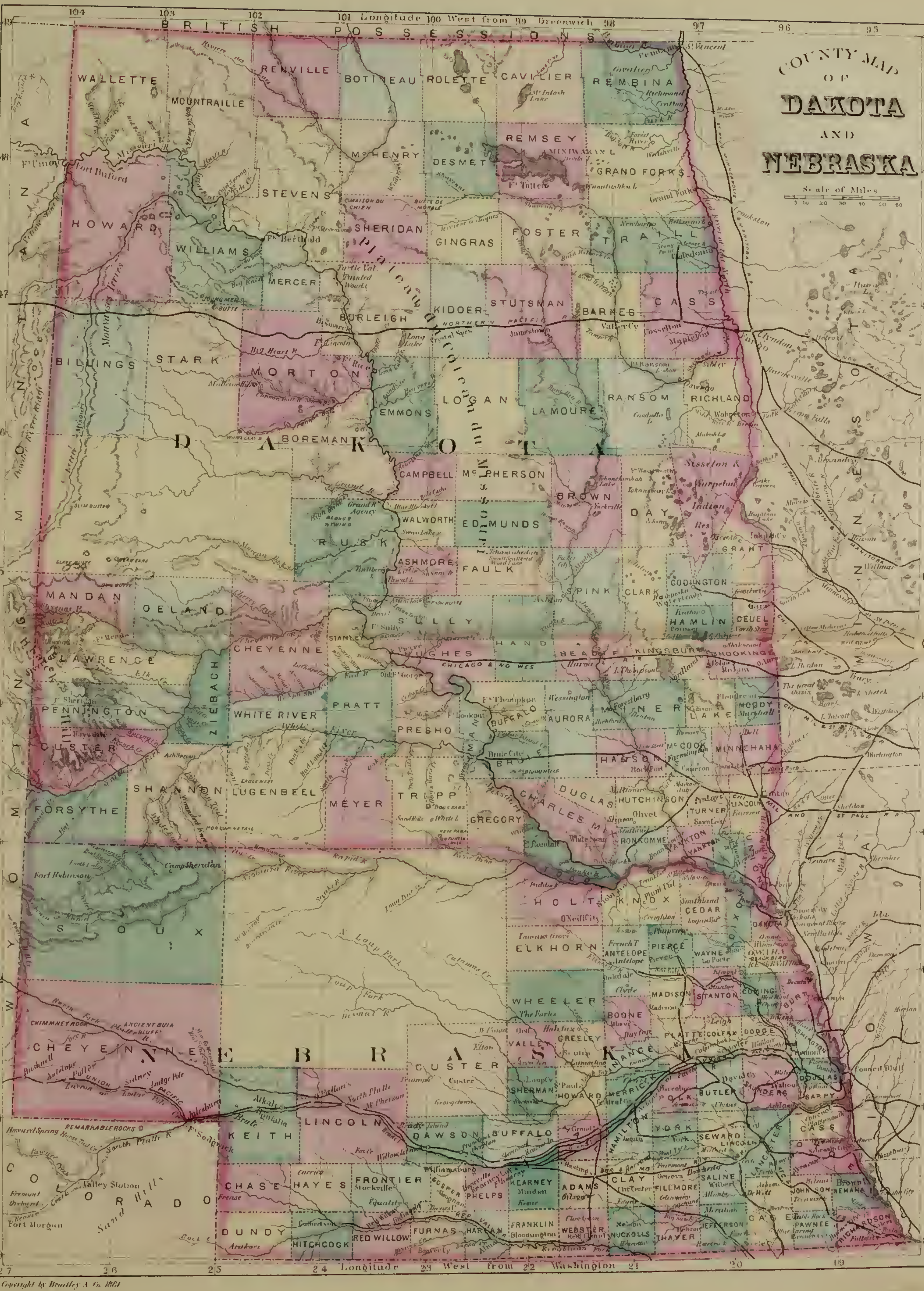
Cities and Towns.	Population, 1870.	1875.	1879.	1880.	Cities and Towns	Population, 1870.	1875.	1879.	1880.
Denver	4,759	17,000	28,000	35,630	Canon City	229	800	1,200	1,500
Leadville*	none	none	12,000	14,820	Del Norte	none	1,200	1,500	1,800
Central, Black Hawk, Nevadaville	4,401	5,000	6,500	7,200	Rosita	none	1,000	2,000	4,000
					Silver Cliff	none	none	1,200	5,000
					Kokomo	none	none	1,500	3,000
Pueblo & South Pueblo	666	5,000	6,000	6,500	Silverton	none	500	1,000	1,500
Colorado Springs	none	2,500	5,000	6,000	Ouray	none	none	1,000	1,200
Georgetown	802	4,000	5,000	5,400	Ten Mile City	none	none	500	1,500
Boulder	343	2,800	3,200	4,000	Brownsville & Silver Plume	150	700	900	1,200
Trinidad	562	2,000	3,000	3,200					
Golden	587	2,000	2,500	3,200	Buena Vista	none	none	500	1,000
Greeley	480	2,000	2,500	2,800	Carbonateville	none	none	150	1,500
Lake City	none	400	1,200	1,800	Alamosa	none	none	800	1,000

* This is within the city limits alone. Its suburbs, which belong in the miner's phrase, to the same mining camp, contain 17,000 or 18,000 more.

Of course, in such a heterogeneous assemblage of all creeds and nationalities, there are many who never attend public worship, and who are perhaps open scoffers at all religion—skeptics and infidels, either of the more intellectual and professedly scientific sort, or of the coarse brutal class, the American representatives of the Communists, Nihilists and Socialists of continental Europe. The Mormons, too, have been planting their missions in Southwest and Southern Colorado, in the hope of at least winning a sufficient number of adherents to secure the vote of the representatives of Colorado in Congress in favor of the admission of Utah, as a Mormon State, into the Union.

But it is a very gratifying fact that none of our newer States have come into the Union with a better or more deserved reputation for good order, safety of person and property, and morality in its highest and best sense.

From its central position, its rapid yet healthy development, its extensive and constantly increasing facilities of railway communication, its immense and as yet only partially developed mineral wealth, its productive farming and grazing lands, and its intense enterprise, we may safely predict that Colorado is destined to be the leading State of the Rocky Mountain region, and not improbably the leader in wealth and power of the new "Western Empire." Two decades of such growth and progress as that of the last four years will place it among the grandest of American States; the peer of New York in population and in wealth, and exerting an influence over all the sisterhood of States west of the Mississippi which will justify its claim to be the Empire State of the West.



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CHAPTER V.

DAKOTA.

BOUNDARIES, AREA AND TOPOGRAPHY OF DAKOTA—FIRST SETTLEMENTS—ORGANIZATION—RIVERS—LAKES—DAKOTA DIVIDED INTO FOUR SECTIONS: NORTHERN, CENTRAL, SOUTHEASTERN AND BLACK HILLS—CHARACTERISTICS OF EACH—THE BAD LANDS—FOSSILS THERE—GOVERNOR HOWARD'S DESCRIPTION OF THESE SECTIONS—GOVERNOR HOWARD'S ADDRESS—HIS REPORT TO THE SECRETARY OF THE INTERIOR—BIOGRAPHICAL NOTICE OF GOVERNOR HOWARD—THE SURVEYOR-GENERAL'S REPORT—NORTHERN DAKOTA—THE DESCRIPTION OF IT BY HON. JAMES B. POWER—CHARLES CARLETON COFFIN'S DESCRIPTION IN THE CHICAGO TRIBUNE—THE CORRESPONDENT OF THE CHICAGO JOURNAL—OTHER TESTIMONY—BISHOP PECK, MESSRS. REED AND PELL—CENTRAL DAKOTA—THE ACCOUNT OF THE CHICAGO AND NORTHWESTERN RAILWAY COMMISSION—SOUTHEASTERN DAKOTA—REV. EDWARD ELLIS'S LETTER—HON. W. H. H. BEADLE'S DESCRIPTION—HIS COMPETENCY AS A WITNESS—METEOROLOGY OF SOUTHEASTERN DAKOTA—THE BLACK HILLS—MR. ZIMRI L. WHITE'S DESCRIPTION OF THIS REGION—CLIMATE AND METEOROLOGY OF THE BLACK HILLS—GOLD-MINING THERE—FOUR CLASSES OF MINES—CHEAPNESS OF MINING AND MILLING—ALTITUDES IN THE BLACK HILLS—POPULATION OF TOWNS—FARMING, GRAZING AND MARKET-GARDENING IN THE BLACK HILLS—SOCIAL LIFE AND MORALS THERE—RAILROADS IN DAKOTA—POPULATION OF THE TERRITORY AND ITS CHARACTER—THE FUTURE OF DAKOTA.

DAKOTA TERRITORY as now constituted lies between the parallels of 42° 30′ and 49° north latitude, and between the meridians of 96° 20′ and 104 west longitude from Greenwich. There is also a small tract of about 2,000 square miles, lying between Montana, Idaho and Wyoming, of an irregular and partially triangular form, which was overlooked when Wyoming was organized, which belongs to Dakota, though no jurisdiction is exercised over it by the Territory, and it is at least 450 miles from its nearest boundary. This little tract is traversed by the Utah and Northern Railway, and includes a small slice of the Yellowstone Park. Dakota is bounded on the north by the Northwest British Territory and Manitoba, east by Minnesota and Iowa, south by Nebraska and the Missouri river, and west by Wyoming and Montana. Its area is 150,932 square miles, or 96,596,480 acres.

It is about 450 miles in length from north to south, and 350 miles from east to west.

The first settlements in the Territory were made in the southeast in 1859 in Yankton and vicinity, but were very few and scattering. It was first organized as a Territory in 1861, containing then a vast territory, which has since been reduced by the organization of other Territories till, in 1868, it was reduced to its present area. The Missouri river traverses the Territory from Fort Buford in the northwest to Sioux City in the southeast, and is navigable for the whole distance. Its largest affluent, the Yellowstone, enters it opposite Fort Buford, just as it enters the Territory. The Missouri receives eleven or twelve large tributaries on the south side, and about the same number on the north side, within the limits of the Territory. The Red river of the North rises in Lake Traverse (latitude 46°), and flowing due north forms the eastern boundary of the Territory for more than 200 miles to the boundaries of Manitoba, and enters Lake Winnipeg in the northern part of that province. The Red river has two large affluents, the Pembina and the Sheyenne, and several smaller ones. The Souris or Mouse river, a tributary of the Assiniboine, one of the Canadian rivers, drains the northwestern part of the Territory. The Minnesota river, a tributary of the Mississippi, has its source in Big Stone lake, and several of its affluents rise in Southeastern Dakota.

Of the tributaries of the Missouri in Dakota, the principal on the north side are the Big Sioux, and the Dakota or James. The latter is nearly 400 miles in length, a river of considerable volume, but is not navigable in any part of its course. On the south side of the Missouri, the principal affluents are: the Niobrara, which forms the boundary between Nebraska and Dakota for a considerable distance, and its tributary, the Keyapaha; the White river, the Big Cheyenne, with its north and south forks (the former bearing also the name of La Belle Fourche), the Owl river, the Grand river, and the north and south forks of the Cannonball river, the Heart river, the Big Knife river and the Little Missouri. The whole Territory is well watered.

Dakota has very many lakes, some of them, like Lakes Minne-

Waukan, Traverse, Big Stone, James, Kampeska, etc., of large size, and all of remarkable beauty.

Dakota was formerly divided into two or three distinct sections, and since the cession of the reservations of the Sioux and other Indian tribes a fourth has been added. Northeastern, or perhaps more properly Northern Dakota, extends across the State fifty miles or more on either side of the Northern Pacific Railway, from the Red River valley to the bounds of Montana. It is, for the most part, a very fine wheat region. The soil is rich, deep and easily tilled, and yields large crops of the cereals, and of potatoes and other root crops. Central Dakota, the new division, includes much of the former Sioux reservation. This is also good land for the cereals, for Indian corn, the root crops, and some portions of it for grazing. The third section, Southeast Dakota, is almost wholly farming land, and along the river valleys and the plains, which extend back from them, there is no better land anywhere on the continent. The so-called Bad Lands (*mauvaises terres*) of Southern Dakota are of much less extent than has generally been supposed. They are entirely in this section, and there are but 75,000 acres (about three townships in all) of them. There is said to be another small tract in the northwest, but not much is known of them. The adjacent lands, though not so good for farming, are yet superior for grazing; and the Bad Lands themselves yield at least an ample crop of fossils.*

The late Hon. William A. Howard, Governor of Dakota and previously Governor of Michigan, in his report to the Secretary of the Interior, under date of December 16th, 1878, thus described three of these sections:

"The Territory of Dakota is very large, being nearly 400 miles square, or more than four times as large as the State of Ohio. The settlements are principally confined to three distinct localities as remote from each other as possible, and of very difficult and expensive communication with each other.

*In these Bad Lands have been discovered some of the most remarkable fossils yet found in America. The whole region is the cemetery of the extinct monsters of the cretaceous and earlier geologic ages.

"The settlements of Southeastern Dakota, in which is located the present capital, extend from Northeastern Nebraska mainly in a northern direction up the Big Sioux, the Vermilion, and the James rivers. These settlements are extending north along the border of Northwestern Iowa and Southwestern Minnesota as far as Lake Kampeska, and as far west as the James river. Although the population is sparse at present it is rapidly filling up. Southeastern Dakota has a population at the present time of not less than 50,000, and probably 60,000.

"Northern Dakota is settled, or rather settling, along the west bank of the Red river of the North, from Richland county, opposite Breckinridge, down to Pembina, on the line of the British possessions, crossing the Northern Pacific Railroad at Fargo, and extending west along the line of that road to Bismarck. Population, perhaps 40,000.

"The other settlement is in the Black Hills, occupied mainly by a mining population, and containing a population at the present time of 10,000 at least, and probably 12,000.

"I suppose it is about 350 miles in a straight line from Yankton to Deadwood. But the only feasible way of getting there involves travel of at least 900 miles, and an expense greater than the journey from Yankton to Washington, and requiring more time to perform it. The distance from Yankton to Pembina as the 'crow flies' is at least 400 miles, and requires more time and expense than a visit to the capital of the nation.

"The three sections are not only remote from each other and of difficult access, but their interests are separate and not identical.

"In a commercial point of view, Saint Paul and Duluth are the objective points of Northern Dakota, while Chicago and Milwaukee will naturally drain Southeastern Dakota. Meanwhile the vast wealth of the Black Hills will swing to the right or left as it may best force itself out, or as railroad enterprise shall open a more direct way over which it may move. The great Indian reservation west of the Missouri river contains 56,000 square miles, about the size of all Michigan, including both peninsulas. Of course this will prevent settlement, and

tend to turn the business of the Black Hills to the south or north of itself."

At this time the treaty with the Sioux, which resulted in their relinquishing the greater part of their reservation in Central Dakota, had not been consummated, and that reservation was necessarily a barrier to any ready or easy communication with the Black Hills through Dakota.

Governor Howard added:

"The resources of this Territory are both agricultural and mineral, and of vast extent, only partially developed as yet; but enough has been done to demonstrate the fact that Dakota, considering her vast extent of territory, has agricultural resources scarcely second to those of any State in the Union. Dakota has on the east side of the Missouri river at least 60,000 square miles of land fit for the plow. It is believed that at least 15,000,000 bushels of wheat will be produced next year."*

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*In an address delivered by Governor Howard at Yankton, before the Congregational Association, November 1st, 1879, he said, among other things:

"In 1858, when it was proposed to admit Minnesota to the Union as a State, it was strongly opposed on the ground that such a region could never sustain the permanent population of a State. It was said that when the fur trade was exhausted and some pine lumber cut, in a few years, the region would be abandoned as it could not sustain animal life, especially that of mankind. But look now, after only twenty years, at the great State of Minnesota with its thirty or forty millions of bushels of wheat, and filling up to its utmost borders with a thrifty population. Here now is Dakota Territory, nearly 400 miles square, and it has more acres of arable land than any State in the Union except possibly Texas. It is more than three times as large as New York and about four times the area of Ohio. It has met the same objections as Minnesota, and is now overcoming them in the same way. Lines of railroad are rapidly building across our rich plains, and new communities are forming on every hand. I was told that on that part of our eastern border between Eden and Big Stone lake there was for some time last summer an average of 300 teams and wagons per day entering Dakota. The same is true of Northern Dakota, where the marvellous growth of country and towns is a constant surprise. The Governor alluded to Fargo and its growth and to that of Grand Forks as about equal to it. He then touched upon the population, wealth and development of the Black Hills. He was there just after the fire at Deadwood, and spoke with eloquence and high respect for the sterling manhood and self-reliance of the people under that misfortune. He noted special instances of manly traits shown, of the fair play exhibited in respect to disputed titles where so much depended on possession. He described the great mines and the new discoveries and developments steadily progressing. His general summary of the advantages and resources of all Dakota was masterly and strong. He declared that we now had at least 150,000 population and many thought more. Of these one-third had come in the last eight months and one-half in eighteen months. The railroads are going forward, more people are coming, new centres of population are forming and the future is assured. The Governor then declared that if every church would quadruple its efforts in Dakota, it would only fairly fill the present needs of new forming communities. He

Hon. Henry Espersen, United States Surveyor-General of Dakota, in his report to the United States Land Office, in November, 1879, thus states the conditions of soil, climate, agriculture and minerals of the Territory:

"The soil of that portion of Dakota lying east of the Missouri river is generally a rich clay or sandy loam, very little rating below second-class. In the valleys of the Missouri, Big Sioux, Dakota, Vermilion, Cheyenne, Red river, and other streams, the soil is exceptionally rich, producing large crops of grain and grass. In this region there are no extensive areas of marsh or sand. The country is fairly watered by the streams named and their tributaries, and by numerous lakes in the northern and eastern portions. I have yet to hear of the point in the Territory where water cannot be had at a reasonable depth by digging. West of the Missouri river the character of the soil is not so fully determined, most of that section having been included in Indian reservations, but as far as known it is generally good. The district west of the Missouri river, prominently shown upon early maps as the 'bad lands,' might be compressed into a few townships. It may be said, in fact, that the proportion of waste land in the Territory, owing to the absence of swamps, mountain ranges, overflowed and sandy tracts, is less than in any other State or Territory in the Union. In the valleys and foot-hills of the Black Hills the soil is rich and productive, and the rainfall abundant the past season. It is expected that, in an agricultural way, that region will be self-sustaining without irrigation.

"Owing to the dryness of the atmosphere and general evenness of temperature, the climate of Dakota is very salubrious, and well adapted to agricultural pursuits. The average temperature of Southern Dakota may be compared to that of Southern Illinois, Northern Indiana, and Ohio. In the northern portions the winters are somewhat more severe. In the southern

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hoped they would do so. Not only this church but all evangelical churches. He spoke of the importance of occupying strategic points, of doing this early and keeping up the communications like an army in its campaign. He alluded also to education and the munificent provision made by the United States for our future schools, declaring that if properly handled it would ultimately produce $25,000,000. He called for such a public sentiment as would paralyze any sacrilegious hand that should wrongly touch that fund."

part early frosts are very rare and the weather very fine down to the first of November. Little snow falls in the winter, and sleighs are almost unknown.

"The agricultural products of the Territory include the whole range of those common to the Northern States. Small grains and vegetables grow in the greatest perfection. Northern Dakota, particularly the Red river valley, is destined to become one of the greatest wheat-producing regions in the country. No systematic effort has yet been made in pomology, but, from what has been done, there is no doubt that when the varieties best suited to the soil and climate are settled upon, fruit-growing will become a profitable occupation. At present, next to grain, stock-raising is the most growing industry. The excellent grasses and mild climate have given this occupation a great impetus, and within the past two years large sums have been invested in young stock.

"Deputy surveyors employed this season, west of Bismarck and near the line of the Northern Pacific Railroad, report coal croppings at various points near the Sweet Brier river, and between that and the Big Heart river. One vein in that vicinity is being worked to a limited extent, but the coal taken out so far, from near the surface, is of a somewhat inferior quality. Bituminous coal has also been found in the Black Hills, but the vein has not been sufficiently developed to determine its economic value.

"No metals have been found in any quantity outside of the Black Hills. In that district gold, silver, lead, and mica have been found in quantities of commercial value. A fine bed of the latter is now being worked.

"Of the gold and silver product, it can only be said in the limits of this report that it is steadily increasing. Daily more capital and refined methods are employed in the various mines now open, and new discoveries are constantly being made. The ease with which the auriferous ores are worked makes profitable the mining of very low-grade ores. There is said, by persons competent to judge, to be enough gold and silver ore 'in sight' in the Black Hills to employ the present mining facilities for the next ten years."

In his annual report to the Secretary of the Interior, bearing date September 13, 1879, Governor Howard used the following language:

"The mineral product of the Black Hills must be at least three millions of dollars for the year, and is rapidly increasing. A large number of stamps, for crushing the ore, and machinery of every kind, have been added, and it is believed the product of gold will be more than doubled the coming year. The mines are proving rich, and the systematic working of them is proving remunerative. The rapid development of the agricultural resources of the Black Hills and the large immigration going in and producing food in the vicinity of the mines, must lessen the cost of living and stimulate production and insure the reward of all classes of labor.

"Immigration this year has been large, far greater than in any former year, and this large increase extends to all parts of the settled portion of the Territory—perhaps about the same percentage of increase in each of the three divisions. Southeastern Dakota has had a very large increase of population. I am told by persons in whom I have confidence that as many as three hundred teams, immigrant wagons, have passed into the southeastern part of the Territory daily through the summer. Quite as large a percentage has come into Northern Dakota. The same may be said of the increase in the Black Hills. In the absence of census returns it is impossible to state with accuracy our present population. The swelling tide of immigration spread over so vast a territory, much of it in unorganized counties, makes satisfactory estimates difficult if not impossible. Well-informed persons have estimated our population at 160,000, others at 170,000, and some as high as 180,000. At the present time I think it is at least 150,000, probably more than that. The immigration to the Black Hills has been large and of a very satisfactory character. They claim to have, and I think with good reason, from 25,000 to 30,000 inhabitants.

"Railroad facilities are being largely increased in Dakota. We have of completed railroad in the Territory about 400 miles; this will be increased before January next to over 500

miles. Several strong corporations are pushing their trunk lines into this Territory at various places, as well to carry the products of our rich soil as ultimately to reach the Black Hills.

"It is but a short time since vast herds of buffalo roamed undisturbed over these prairies; now farms stocked with cattle and sheep everywhere abound. It is not long since we were taught in our Eastern homes, and in our schools, and learned from our geographies the story of the Bad Lands, the 'Great American Desert,' and were left to believe that Dakota for barrenness was only equalled by the Desert of Sahara, and whose chilling blasts were equal to the cold of Greenland; but since it has been demonstrated that Dakota has a soil exceedingly rich, has more arable and less waste land in proportion to its size than any State or Territory in the whole Union, and since millions of bushels of grain are already waiting transportation to the markets of the world, capital, proverbially timid, is stretching out its arms and with hooks of steel is drawing to itself the carrying trade of an empire.

"The interest our people take in education and the moral improvements is steadily increasing. Schools are increased in number and improved in character; churches are multiplied: greater respect for law than formerly is apparent. If we consider the richness and extent of our school lands, it will be found that Congress has provided for us a school fund that, when developed, will be equal to that of any State in the Union. If no sacrilegious hand shall be permitted to squander any portion of this rich inheritance, Dakota will have a population second to no State for intelligence and virtue."*

It is due to this growing and enterprising young Territory, so soon to become a State, and possibly to be carved into two or more, that we should go somewhat more into detail in regard to the topography, soil and productions of these different sections of Dakota, and through the kindness of the late Governor Howard and the officers of the Territory, as well as personal friends

*It was a great misfortune to Dakota Territory, that in the time of her most rapid growth and development, she should have lost by death the firm guiding hand of her wise, thoughtful, generous and eloquent Governor.

whom he interested in the matter, we are enabled to lay before our readers a much more complete description of each section than has ever been published. We begin with Northern Dakota, and give a carefully written paper, prepared for the writer by Hon. James B. Power, of St. Paul, Minnesota, now the accomplished and thoroughly informed Land Commissioner of the Northern Pacific Railway. Mr. Power's opportunities of being fully informed in regard to Northern Dakota have been exceptional, and he has given our readers the full benefit of his researches.

"NORTHERN DAKOTA.

"The development of Northern Dakota in the past few years has been perfectly marvellous, and the vast plains which were once considered sterile and worthless have become populated with thousands of successful husbandmen whose labors on the soil, which is discovered to be as fertile as any in the world, add millions of dollars to the common wealth of the nation.

"The building of the Northern Pacific Railroad is, without doubt, the greatest project of the character ever undertaken, and it is, as a well-known writer recently said, 'of all the projected railroads to the western ocean, the one which must be of the greatest value and importance to the American people. It is the one which will open to settlement by far the most extensive, most fertile and in every way most desirable regions.'

"The practical history of Northern Dakota dates by the logic of events, from the advent of the railroad within its boundaries, as before that time the great plains had been almost unknown to man. Single trails extended in direct lines to the immense northern regions from whose forests came vast stores of valuable skins, and occasionally trappers and hunters made expeditions along the wooded streams which, with difficulty, find courses through the level land.

"Thousands of buffalo roamed at will, finding rich nourishment in the succulent grasses, and deer, elk and wolves aided in swelling the wild population of the region, and furnished game for the tribes of Indians who made frequent hunting sallies from the north and south. Explorers returned with discouraging

stories of the utter uselessness of the soil and the unfitness of the region for human habitation, so that it was looked upon as a great barren desert.

"The building of a railroad through such a waste was pronounced absurd, and the project of spending millions of dollars in laying a track through so extended an unproductive region, although a rich country might be reached farther west, was scoffed at, as the wildest extravagance.

"It was known that the immediate valley of the Red river was fertile, for, fully twenty-five years before, fine crops had been raised at a trading-post of the Hudson Bay Company, located twenty miles north, or down river, from the point at which the railroad now crosses.

"Several land companies had been formed about 1856, for the purpose of bringing the lands of the valley into market, but the panic of 1857 demoralized them. Of course but few of the original settlers remain on the land about the old trading-post, but one, who is now postmaster at Georgetown, twenty miles north of Fargo, has, for twenty-two years, cropped land plowed by the company, and he avers that it is still too rich.

"The railroad had done a great work in developing Northern Minnesota, but, when the operation of building was commenced in Dakota, much hesitation was displayed about undertaking the cultivation of the prairies beyond the Red River valley. Some far-seeing men, however, were satisfied that the soil was admirably adapted for wheat-raising, and, in 1875, the first experiment of importance was commenced. George W. Cass, Esq., of Boston, and B. P. Cheney, Esq., of Pittsburgh, both directors in the railroad company and heavy capitalists, decided, for the benefit of the road and themselves, to test the capacity of the land, and, with that end in view, bought 7,680 acres of railroad lands and 2,560 acres of government lands, and caused two sections or 1,280 acres to be broken and prepared for wheat. They selected land about twenty miles west of Fargo, near the present station of Casselton. Their experiment was thoroughly successful, their first harvest yielding an average of twenty-eight bushels of the finest wheat per acre. The intrinsic value of the soil having

been thus proved, the future of Northern Dakota was assured, and, as the brilliant result of the trial became known, immigration to the golden wheat gardens commenced in earnest. These gentlemen have continued and extended their operations since, and this year from 8,458 acres they have harvested 140,352 bushels of wheat, 15,867 bushels of oats, and 6,649 bushels of barley.

"These fertile lands extend northward to the boundary line and southward beyond the line of the land grant to the railroad, which reaches, with its indemnity limit, fifty miles. The soil is in many respects peculiar. First is a rich, black, clayey loam, varying from fifteen to thirty-six inches in depth, possessing substance and compactness, and, at the same time, a degree of mellowness. Beneath are several strata of clay of different varieties, some containing an impregnation of lime, which neutralizes the acids and gives vitality to the land. The clay sub-soil serves to retain the moisture, hence crops would suffer little from drought. Seeding is commenced in March as soon as the frost is out of the ground to the depth of two or three inches, when the earth becomes dry. The gradual evaporation of the frost, which extends to the depth of from two to three feet, keeps the soil in a good, moist condition, forcing the crops rapidly. This is the character of the land from the Red River valley to the bottom lands of the Missouri river, with the exception of a narrow strip running from north to south on the divide between the James and Missouri rivers, where a convulsion of nature has thrown gravel and rocks to the surface; but the land, even in that section, is, with little exception, good for cultivation and excellent for grazing.

"Wheat—the most profitable crop on account of its being a cash article, and the proximity of a great shipping point, Duluth, but 250 miles from Fargo—is the staple of the country; although corn, oats, barley, flax, and all root crops reach a remarkable degree of perfection. The average yield of wheat is twenty-two bushels to the acre, but in many cases thirty bushels are raised, and instances are not rare where forty bushels and over have been produced. Corn yields from seventy-five bushels upward,

and oats from sixty to seventy-five bushels to the acre. For both of these grains there is always a sure market. From 300 to 600 bushels of potatoes to an acre reward the farmer, and other root crops grow equally well, while all are of delicious flavor and of enormous size.

"In speaking of the values of crops, the prices given here are those paid immediately after harvest, and of course they advance with the season.

"Wheat this year (1879) has varied in price from eighty-five to ninety-five cents per bushel, and, of the entire crop harvested in Northern Dakota, but little has graded No. 2, while No. 3, No. 4, and Rejected are unknown grades. The working of a merciful decree of Providence appears in the development of these great wheat gardens at a time when disaster and distress has overtaken England and other nations of the old world through the failure of successive crops.

"Corn brings from fifty to sixty cents, oats from thirty-five to fifty cents, and potatoes from thirty-five to forty-five cents per bushel.

"Experiments extending over five years have demonstrated the fact that hardy apples of northern varieties can be grown in perfection, while native plums, berries, and grapes thrive remarkably well under cultivation.

"As was before intimated, little or no ground was broken in Dakota on the Northern Pacific line prior to the year 1875. In 1878, we find 244,240 acres under cultivation, and, in 1879, 375,972 acres. This year 266,618 acres were devoted to wheat, giving a yield of 5,332,360 bushels, calculating only twenty bushels to the acre. The new breaking this year (1879) amounts to 173,000 acres, giving us 548,972 acres which will be cultivated in 1880. It is safe to predict that the wheat crop on the line of the Northern Pacific Railroad next year (1880) will be at least 8,500,000 bushels. Two-thirds of the area of which we have written is capable of yielding 256,000,000 bushels. Some timid people aver that the business of wheat-raising is being overdone, a groundless supposition when the entire wheat crop of the world in 1879 does not exceed 1,540,000,000 bushels, or only about one bushel to every human being existing.

"In 1870 the portion of Dakota of which we write could not boast of a single permanent resident. In 1877 the population was 8,700, with a cultivated area of 67,900 acres. In 1878, population 14,560; cultivated area 90,950 acres, 71,740 acres in wheat and 80,340 acres of new breaking. In 1879 we find a population of 31,500; 179,020 acres under cultivation, 142,500 acres in wheat, and 114,000 acres of new breaking.

"The following are the most important statistics of the counties tributary to the Northern Pacific Railroad:

Counties.	Population, 1870.	Population, 1879.	Acres cultivated.	Acres in wheat.	Acres newly broken.
Cass, D. T. . . .	None.	12,000	102,000	90,000	50,000
Traill, " . . .	"	6,000	22,950	18,000	15,000
Richland, " . . .	"	3,300	31,500	25,500	18,000
Barnes, " . . .	"	3,000	13,000	7,500	14,000
Stutsman, " . . .	"	600	3,770	1,500	10,000
Kidder, " . . .	"	100	1,500	. . . . .	2,500
Burleigh, " . . .	"	6,500	4,300	. . . . .	4,500
		31,500	179,020	142,500	114,000

"The raising of wheat has not yet been commenced in Kidder and Burleigh counties, as the demand for oats northwest of Bismarck has been very great, and they have been grown at a fine profit. Next year, however, a large area will be devoted to wheat, as an extensive flouring-mill, which has just been completed at Bismarck, will consume upwards of 300,000 bushels.

"The important towns at present on the line of the railroad are Fargo, at the railroad crossing on the Red river, and Bismarck, at the Missouri river. Both are organized cities, and are quite metropolitan in character.

"Fargo contains a population of 3,500, has excellent church and school buildings, county buildings, and many fine brick and wooden business blocks, and handsome residences. Excellent brick are manufactured within the city limits.

"Bismarck has a population of at least 2,500, and is almost equally favored with Fargo in the number and substantial excellence of its buildings.

"Many other places are rapidly developing, among them being

Casselton, twenty-two miles west of Fargo. From here a branch of the railroad is being extended northward. This town has already 500 inhabitants, and over $20,000 has been expended this fall (1879) in buildings.

"Valley City, the county-seat of Barnes county, on the Sheyenne river, has a population of 600 and is growing rapidly. Next spring (1880) at least $75,000 will be expended there in the erection of county buildings, brick blocks for bank and stores, a hotel, and other edifices.

"Jamestown, county-seat of Stutsman county, on the James river, gives promise of a most vigorous advance in 1880. It has now about 400 inhabitants, a good county-house, a school-house and a fine hotel. Among the contemplated improvements are a bank and store buildings, a flouring-mill and a large elevator. The James, or Dakota river, is a very long stream, and it is claimed to be navigable, commencing at a point some miles below the town.*

"Besides the Red and Missouri rivers, the James and Sheyenne flow through Northern Dakota, and with their numberless fording creeks supply the best possible drainage to the vast arable territory. These streams are well wooded in many places, the principal growth being oak, elm, ash, soft maple, box-elder and cottonwood. Their waters are pure and palatable, and, on the prairies, excellent water is found by digging from twelve to twenty-five feet.

"It has been urged that these great northwestern prairies were uninhabitable, on account of the scarcity of fuel. A wise Providence has provided for this want, however, as from the boundless forests of Northern Minnesota wood can be obtained in any quantity at a low price, while the inexhaustible coal mines now being opened just beyond the Missouri river, will afford a limitless supply of excellent soft coal. Near the river the coal is a soft and inferior lignite, but it hardens and improves further west, there being, undoubtedly, in the Yellowstone valley, some of the finest bituminous coal ever discovered.

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* Its navigableness is very doubtful, and at most only for a very short time.

"The Red river, at Fargo, is 807 feet above the sea-level; Valley City, 1,218; Jamestown, 1.405; Missouri river, 1,609 feet.

"It has been alleged that no rain ever fell upon these plains—whatever may have been the case before civilization gained a foothold in the Territory, it is sure that the fact no longer exists, for the rainfall along the line of the railroad for this year, to the middle of October, averaged 21.07 inches. The largest amount of precipitation was in the growing months of May, June, July and early August, when over 15 inches of rain fell, while during the harvest month, September, but .07 inch fell. From the statement of the Signal Service officer, at Fort Buford, in the extreme northwesterly part of the Territory, it is found that the precipitation was 4 inches less in the same time, the greatest fall being in the months of April, May, June and July, and the smallest in August and September. It will be seen, by the appended table, that the rigor of the low temperature in winter is offset by the small amount of precipitation and the rarity of disagreeable winter thaws.

1879.	Temperature.								Humidity		Rainfall.			
	St. Paul, Minn. Lat. 44°54′		Breckenr'ge Minn. Lat. 46°20′		Bismarck, D. T. Lat. 46°50′		Fort Buford D. T. Lat. 48°		Breckenr'ge	Bismarck.	St. Paul.	Breckenr'ge	Bismarck.	Fort Buford.
	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.						
	°	°	°	°	°	°	°	°	pr. ct	pr. ct	in.	in.	in.	in.
January	49	-26	38	-21	46	-29	45	-17	84.7	77.4	.11	.05	.15	.02
February	35	-22	52	-2	44	-26	44	-35	85.5	81.6	1.12	.40	.82	.59
March	68	0	61	19	68	-21	70	-22	76.3	70.6	.97	.25	.58	.03
April	81	13	74	25	75	-11	81	24	71.0	61.8	.45	1.04	2.60	2.75
May	86	35	78	29	76	30	*85	30	65.2	58.8	7.18	5.42	3.67	5.56
June	91.5	44	89	42	91	36	89	38	75.2	64.4	1.76	2.68	4.97	3.35
July	92	54	90	44	95	48	94	44	71.1	63.6	9.32	3.78	4.27	3.63
August	92	48	90	41	90	41	98	41	71.2	54.4	2.78	2.04	2.69	.18
September	78	36	92	34	81	25	95	26	69.9	47.1	2.26	2.36	.07	.00
October	87	17	70	16	88	10	95	11	72.8	64.4	2.56	.79	1.27	1.55

"We add, so far as St. Paul and Bismarck are concerned, the following comparison of rainfall in the two places for 1875, 1876 and 1877. We have not the particulars of days for 1878, but the results are about the same.

"The following table, for the years 1875, 1876 and 1877, shows the number of days in each month through the growing season in which there was rain, and the amount of rainfall in each month,

at Bismarck and St. Paul. The data, having been compiled from the records of the United States Signal Service Office, can be relied upon as correct in every particular:

1875.

Month.	Bismarck.		St. Paul.	
	No. of days in which there was rain.	Depth of rainfall in inches and 100ths.	No. of days in which there was rain.	Depth of rainfall in inches and 100ths.
March	12	2.06	13	2.19
April	9	4.22	13	2.27
May	16	3.40	13	3.01
June	14	5.02	17	4.33
July	8	1.53	6	.82
August	10	2.89	17	8.74
September . . .	7	1.85	16	2.16
Totals . .	76	20.97	95	23.57

1876.

March	14	3.30	14	1.43
April	8	2.77	14	2.23
May	9	5 74	12	3.15
June	3	1.24	14	2.02
July	10	1.48	11	2.73
August	16	6.55	14	5.28
September . . .	10	5.61	14	2.99
Totals . .	70	26.09	93	19.83

1877.

March	20	0.77	15	1.57
April	13	1.32	10	1.92
May	27	4.15	12	5.43
June	20	7.60	13	7.13
July	10	2.52	10	0.52
August	19	0.35	11	2.83
September . . .	6	0.11	11	2.56
Totals . .	115	16.82	82	21.96

St. Paul, Minn., Oct. 3d, 1877.

J. O. BARNES,
Sergt. Signal Service, U. S. A.

"The climate is similar to that of the New England States, except that the atmosphere is always clear and dry, having none

of that penetrating saline moisture so deleterious to health. The average annual temperature may be placed at about 42°, and the statistics of several years place the maximum mean at 68° 5′, and the minimum mean at 4° 3′. The table given will afford opportunity for comparison. The snowfall is less than in the eastern and northern portions of the Middle States, and the thermometer rarely falls to zero.

"The Red river is navigable from Fargo to Winnipeg, even at low water, the government having during the past season caused all of the shallow portions to be dredged. The operations are to be continued next year, and the river will be greatly improved for navigation. During this winter (1879–80), when the ice is strong enough, the overhanging trees will be removed from the upper portion of the river, and the stream rendered navigable for flat boats from or near Breckenridge. As there is a large amount of wheat which seeks an outlet at Fargo, this improvement will prove of great benefit. It can be safely estimated that not less than one and one-half million bushels of wheat will be moved on the river next year.

"A large amount of goods is transported by steamers from Fargo to Winnipeg.

"The Missouri river is a very important factor in the transportation business of this country, and navigation by it and its tributaries extends over 1,500 miles into the northwestern regions. By this river immense freights are carried to Bismarck, and it is not unusual to find from fifteen to twenty staunch steamers at the levee there. The principal articles of merchandise brought down are wool, skins, ores and cattle, while immense quantities of provisions and goods of all descriptions find their way to the many military posts and settlements in the still undeveloped regions.

"The country thus far spoken of in this article has been only that on the line of the Northern Pacific Railroad and within the limit of its land grant. Down the Red river, between Fargo and Winnipeg, in the rich valley, the country is filled with settlers, and two important towns, Grand Forks and Pembina, in counties bearing the same names, are thriving river settlements, with a

large trade from the surrounding country. There is undoubtedly a population of 10,000 in Grand Forks and Pembina counties.

"BEYOND THE MISSOURI RIVER.

"Great interest is being displayed in regard to the character of the country which the railroad is now penetrating, and hence a little space will be devoted to it—as far as the Yellowstone river, to which point the road will probably be completed in the autumn of 1880.

"For 138 miles the road runs through the valleys of the Heart, Sweet Brier, Beaver, Foot, Curlew and Upper Heart rivers, all small streams and somewhat wooded. The valley of the Curlew is undoubtedly one of the most beautiful in the world. All of the lands in the river bottoms are exceedingly rich. Back from the valleys, both north and south, rich, rolling prairies stretch away, a lofty butte occasionally rising from the plain. There is clear water in every direction, running streams and pure flowing springs.

"Coal in paying veins is found within forty miles of the river, and extends westward as far as surveys have been perfected. A valuable quality of stone for building purposes is found in the bluffs and buttes.

"The next thirteen miles of road passes through bad lands, or 'Pyramid Park,' a most wonderful formation. The pyramids are in every conceivable form and are composed of different varieties of clay, argillaceous limestones, friable sandstones and lignite, lying in successive strata. The Little Missouri river flows through Pyramid Park at about the centre, and in high water is over 150 yards wide. The water is excellent. Considerable timber is found on its banks, and the government has just built a cantonment in a fine ash grove, near where the railroad crosses the river.

"For forty-five miles west of the Little Missouri, the railroad traverses a beautiful prairie plateau—the soil and general character of which resembles the Red River valley district. Many small running streams flow through this fertile region.

"After passing through six miles of broken country, being the

divide between the Little Missouri and Yellowstone rivers, the road descends the lovely valley of Glendive creek for eleven miles, thus reaching the Yellowstone river at a point not yet decided upon. The country about here is beautiful in the extreme, and its fertility has been amply tested by settlers, who for a number of years have raised fine crops, producing wheat, oats, corn, melons, tomatoes, beets, cabbage, turnips, lettuce, peas, and particularly fine potatoes and onions.

"For stock-raising, no country in the world excels this, the grasses and the climate being particularly adapted to such business."

It may be urged that the foregoing statements in regard to Northern Dakota are from the pen of a Railroad Land Commissioner, and so are liable to be somewhat highly colored. Mr. Power is not liable to this charge, for his tendency is rather to understate than overstate the wonderful growth of the region he represents, but, to avoid even the suspicion of exaggeration, we append in notes the testimony of competent observers who have no possible interest to misstate the facts.*

* The first witness we call is Charles Carleton Coffin, Esq., better known by his pen-name of "Carleton," an eminent author and observer, the correspondent of the Chicago *Tribune*. In August, 1879, he wrote as follows to the Chicago *Tribune:*

"RED RIVER VALLEY, August 4.—In Dakota, 700 miles northwest of Chicago, in the valley of the Red river of the North, during the present week there is a harvest scene, the counterpart of which cannot be found on the face of the earth. It is a scene where science, invention, capital, and system have reduced the cost of wheat-culture to its minimum. Nor is there seemingly any place on the face of the earth where it can be duplicated: for there is no other location where the soil, climate, location, with other conditions, combine as in that region.

"Having been one of a party of journalists to visit that section during the past week, I shall speak of what we have seen.

"There are larger fields of wheat in California than in Dakota, but California sows its wheat in the fall, while the cereals of Dakota are all sown in the spring. California has no rainfall in summer, but is dependent wholly upon the rainy season in winter. In Dakota the summer rainfall is sufficient for the production of crops in perfection. But of this more by-and-by.

"A few words of history are needed at the outset. In 1870 and 1871, at the time the construction of the Northern Pacific Railroad was begun, the newspapers contained descriptions of the country along its line, which were generally discredited and ridiculed. The country was sarcastically called 'Jay Cooke's Paradise.' The map issued by him represented the isothermal of Chicago as bending northward to the British boundary, and that of St. Paul as reaching far away to the Upper Saskatchewan. The country was declared to be the future wheat-field of the continent. Proctor Knott ridiculed the idea in Congress. After Mr. Cooke's failure, in September, 1873, and the collapse of the Northern Pacific, those who had given such glowing descriptions of the country were held up to scorn and ridicule,—the writer of this article being

Of *Central Dakota*, which lies between the parallels of 43° 50′ and 46°, and extends from the eastern boundary of the

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one of the number. The January number of the *North American Review* for January contains a crushing article by General William B. Hazen, who had been stationed at Fort Buford, at the junction of the Yellowstone and Missouri, and who, of course, knew all about the country; and, being a graduate of West Point, his testimony could not be gainsaid. He admitted that the Red River valley was fertile, but beyond that the country was in the main worthless. I quote:

"'Going west from the Red river to the James there is some fair land, but much that is worthless; and thence to the Missouri, little or no available land, except narrow valleys of the small streams. (Page 11.)

"'Beyond the Red river the country is not susceptible of cultivation. (Page 25.)

"'The country, with the exception hitherto mentioned, is practically worthless.'"

"This was a crushing statement. The men and women who had invested in the bonds of the Northern Pacific were informed that not only the bonds were worthless, but the lands also. General Hazen fortified his statements by copious citations from the reports of other army officers, graduates of West Point, and the accumulated evidence sent the bonds of the Northern Pacific down to $10.

"But, while General Hazen was writing that crushing article, Mr. J. B. Power, Land Commissioner of the company, was turning the sods on a quarter-section about ten miles west of the Red river—the company being determined to let the world know that the Red River valley, at least, was not a worthless region. That breaking was done in June, 1874, and sown to wheat in 1875, producing a good crop.

"Oliver Dalrymple, of Cottage Grove, near St. Paul, had made a fortune in raising wheat; but, through unfortunate investments, had seen it slip away. In March, 1875, he prospected the country west of the Red river, and made up his mind that Nature had given to that locality—the statements of army officers to the contrary notwithstanding—superior conditions for the production of all small grains.

"Meanwhile, two Directors of the Northern Pacific—the Hon. G. W. Cass, of Pittsburgh, and B. P. Cheney, of Boston—believing that the lands were valuable, had changed their bonds into lands, and had purchased the intervening government sections with Indian scrip—thus giving them compact farms of large area. Mr. Dalrymple, having made an arrangement with them, turned his first furrow in June, 1875, plowing 1,280 acres, harvesting his first crop in 1876. Next year he increased the acreage, and has gone on till he has this year 20,000 acres in crops, 18,000 being wheat, and the remainder oats and barley, used on the farm. He has broken 5,000 acres additional for next year.

"This does not all lie in one body; but a portion—the Grandin farm, owned by the Grandin brothers, of Tidioute, Pa.—lies in Trail county, thirty miles north. The territory contained in the Cass, Cheney, and Grandin tracts is 75,000 acres, of which Mr. Dalrymple, by the fulfilment of his part of the contract, will own one-half, or 37,500 acres, all earned since June, 1874.

"I do not propose to give the statistics of Mr. Dalrymple's system of farming; for your readers doubtless are familiar with them. Suffice it to say, that his wheat crop this year will aggregate between 400,000 and 500,000 bushels; that the cost of production is about thirty-five cents per bushel; and that the net profit will be from forty to forty-five cents per bushel. He estimates the average yield at from twenty-three to twenty-five bushels per acre. The net profits on the crop this year will not be less than $180,000! Talk about Leadville! Here is a bonanza which will be profitable next year, and the next, and the next.

"Here let me say that Mr. Dalrymple is too good a farmer to exhaust his lands. He does not burn the manure of his stalls, but piles it in the field, and, when it is well rotted, will return it to the soil; and proposes to keep his land in heart by plowing in clover and letting it lie fallow.

Territory to the Missouri river, there is not so much to be said, simply because it is not as yet much developed, most of it

"Behold the scene! Just think of a sea of wheat containing twenty square miles—13,000 acres—rich, ripe, golden—the winds rippling over it. As far as the eye can see there is the same golden russet hue. Far away on the horizon you behold an army sweeping along in grand procession. Riding on to meet it, you see a major-general on horseback—the superintendent, two brigadiers on horseback—repairers. No swords flash in the sunlight, but their weapons are monkey-wrenches and hammers. No brass band, no drumbeat or shrill note of the fife; but the army moves on—a solid phalanx of twenty-four self-binding reapers—to the music of its own machinery. At one sweep, in a twinkling, a swath of 192 feet has been cut and bound—the reapers tossing the bundles almost disdainfully into the air—each binder doing the work of six men. In all there are 115 self-binding reapers at work. During the harvest about 400 men are employed, and during threshing 600—their wages being $2 a day with board.

"It is estimated that this combination of capital, with a rigid system, adds about $1 per acre to Mr. Dalrymple's profit over those who farm in a small way.

"In the month of March, 1875, when the article of General Hazen was having its full force, Mr. Dalrymple was walking over these lands, and saying to himself, as he beheld the quality of the soil, 'Intrinsically, these lands are worth $25 per acre.' He believed it, and has demonstrated that they are worth far more than that; that, at that figure, they will pay for themselves in three years.

"The acres owned by Mr. Dalrymple are not one whit better than the average through the entire length and breadth of this valley, which is 400 miles long and 70 wide, and which is fast filling with hardy settlers. Not only the lands of the valley, but the entire section between the Red river and the Missouri—a territory containing 80,000 square miles, in Northern Dakota alone, saying nothing of Montana and Manitoba—is adapted to the cultivation of wheat, oats and barley, as will be shown in another letter.

"The reason why wheat can be produced more cheaply and to greater profit here than anywhere else, is due to several causes:

"1. The soil is admirably adapted to its production.

"2. The climatic conditions. General Hazen showed that the rainfall over all this section for the year was very much less than on the Atlantic coast; but he did not inform the public that nearly all the rainfall is in the months of May, June and July—just when it is needed; that there is very little in August; that the days are hot and the nights cool; that, consequently, rust, blight, mildew, sprouting of grain in the shock, are almost unknown.

"3. The nearness of this section to the markets of the world. It is 250 miles from the Red river to Lake Superior. The tariff adopted by the Northern Pacific is fifteen cents per bushel from any point east of the Missouri river. It costs from twenty to thirty cents to transport a bushel from Bismarck to New York. This low tariff, and the cheapness of water-carriage, give the farmer at present prices about ninety cents per bushel, leaving him a clear profit of about forty cents.

"Is it a wonder that a great tide of immigration is setting in this direction; that the railroad trains are crowded with new-comers; that hotels are running over; that the Land Office at Fargo is crowded with applicants for pre-emption and homestead claims? There are millions of acres, just as fertile as those under cultivation, awaiting the ever-increasing multitude."

"CARLETON."

The correspondent of the *Chicago Journal*, who has a high reputation for fairness and judicial accuracy in his statements, writing at about the same time from Bismarck, thus describes Northern Dakota:

"*The Hill country.* The wheat-growing region is not, however, limited to the Red River

having been until January, 1880, covered by Indian reservations, the title to which was not fully cleared. It is now open to

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valley, though in these rich bottom-lands it reaches perhaps its greatest development, and wheat-growing has thus far been more extensively and successfully carried on there than elsewhere. Passing beyond this valley in Dakota Territory, we reach a high, rolling country, which furnishes a striking contrast to the level region we have left. This rolling country extends from the Red River valley proper to the Missouri river, a distance of more than 150 miles; and yet so diversified is it by a constantly changing formation and an infinite variety of landscape that the viewer is in a constant state of surprise and delight. Many pretty lakes nestle among the hills, and there are numerous little fertile valleys through which wind small streams, everywhere fringed with timber. It is not easy to describe the formation of this country, whose high, rolling character is something peculiar to itself. It is not like the rolling prairies of Iowa or Illinois, whose gentle undulations are here multiplied a thousand times. It is like, and yet not like, Kansas and Nebraska, whose swells are here reproduced on a far grander scale, but without any of the sameness which characterizes the rolling prairies of those States. It suggests, and sometimes almost resembles, the sloping hill-sides along the valleys of the Mohawk and Connecticut; only there is here a vastness, an expanse, a sense of almost infinite distance and variety, which makes those regions, lovely as they are, tame and narrow in comparison. Looking from the car window across some pretty valley or swelling prairie, the traveller sees, a dozen miles or more away, a line of dark green hills, sometimes continuous and sometimes broken into peaks and knolls, with here and there an intersecting valley and slender fringe of timber; and when these hills are reached he finds beyond them still other ranges, broken like the first, and reaching on and on in endless succession, until their outlines are lost in the distance and blend with the blue of the horizon.

"There have been many disputes regarding the productiveness of this region of country, many of the statements of its earlier explorers having been looked upon as too extravagant or intentionally deceptive. But whatever may be the speculations as to the climatology of this region—a topic which has probably not yet been quite mastered by any of those who have attempted to discuss it—the practical fact has been established that the region along the line of the Northern Pacific road will not only produce good grain, but that it is exceptionally well adapted for that purpose. Good crops of wheat and oats have been produced all along the line from the Red River valley to the Missouri; and in the yield per acre, as well as in quality of grain, the results have been all that could be desired. This year will probably be the most successful one in the history of the region, and the result, so far as it can be determined, will powerfully reinforce the experience of other years. In the vicinity of Bismarck oats are apparently the favorite crop, on account of the fine local market for government purposes and for the subsistence of teams used for the 2,000 freight wagons employed in the carrying-trade between Bismarck and the Black Hills and other points. A good local market is thus furnished, and oats here are worth from fifty to sixty cents per bushel. On the Stark farm, a few miles from this place—the scene of a famous Indian battle, in 1862, between General Sibley and the Indians who perpetrated the Indian massacres in Minnesota that year—your correspondent saw a magnificent field of oats, 500 acres in extent, of which the yield is estimated at fifty bushels to the acre. There is another smaller field near by, the yield of which, it is thought, will reach seventy bushels to the acre. On the Steele farm of over 6,000 acres, forty miles east of Bismarck, we saw a still finer 500-acre oat-field, the yield of which is expected to reach seventy bushels per acre—worth on the track forty-five cents per bushel. Fifteen thousand dollars is not a bad result from a single grain-patch! Potatoes are also largely raised here for the frontier market, and pay a fine profit. The completion of a flouring-mill at this place, now nearly ready for the machinery, will furnish a home market for wheat, and will doubtless lead to the cultivation of this crop after this year.

"Farther east, away from the immediate market at Bismarck, wheat is the principal crop. The

settlement, and its 30,000,000 acres of arable lands are not encumbered by land grants to railroads or wagon roads. The

average yield this year is placed by the most careful estimates at from twenty to twenty-seven bushels per acre. The first wheat crop raised was in 1874, when the entire product for the whole length of the line was but 250,000 bushels. This year a single county (Cass county, Dakota) is expected to produce 1,640,000 bushels, estimating but twenty bushels to the acre. The wheat will be worth about ninety cents per bushel at any point upon the railroad, as the rate of transportation is uniform along the whole line. Much of the wheat goes to Duluth, where it is worth about the same as at Chicago; the wheat from this section being especially in demand, on account of its fine quality, for grading up No. 2 wheat. A good deal of the wheat goes to St. Paul and Minneapolis for manufacture into flour. With the completion of the large mills being erected in Minneapolis this year, that city alone will manufacture 19,000 barrels of flour per day, or 3,000,000 barrels per year. Such is the surprising development of this new and as yet almost unknown wheat country, and such are the facilities for disposing of its products. The immense mills at Minneapolis are the corollary of the vast wheat-fields of the new Northwest, and the two agencies supplement and reinforce each other.

"A peculiarity of wheat-growing in this region is the large scale upon which it is frequently conducted. Capitalists have gone into it as systematically as into manufacturing; and farming operations here assume proportions almost incredible to those familiar only with the methods of the older and more settled States. On the farm of Mr. Dalrymple—who is well called the 'boss granger' of the region—near Fargo, in the Red River valley, is a wheat-field of 20,000 acres, the yield of which this year is expected to be something like 500,000 bushels. On this gigantic farm, which is managed as systematically as a railroad, 400 men are employed in harvesting, and 500 to 600 in threshing. They use 250 pairs of horses and mules, 200 gang plows, 115 self-binding reapers, and 20 steam-threshers. The men, animals and machinery are organized into separate divisions, with a superintendent for each. Nothing could be grander than a sight of these immense wheat-fields, stretching away farther than the eye can reach, in one unbroken golden sea, while a long procession of reaping machines, in *echelon*, like a battery of artillery, moves steadily against the thick-set ranks of grain. Each machine is drawn by three mules or horses, and besides the drivers a superintendent of each gang rides along on horseback, like the captain of a battery. There are also machinists, mounted, and carrying with them tools for repairing any break or disarrangement of the machinery. When a machine fails to work, one of these repairers is beside it instantly, dismounting and examining the machinery, and unless the break is serious, having it in running order again before an unfamiliar observer could realize what had taken place. Thus everything goes on orderly and effectively. Travelling together, these 115 machines would cut a swath one-fifth of a mile in width; and they would lay low twenty miles of this mighty swath in a single day.

"The profits of farming on this extensive scale can be very closely estimated. Mr. Dalrymple finds that, for the first crop, the cost of preparing the ground, seed-sowing and harvesting, wear and tear of machinery, and interest on machinery and land, amounts to $11 per acre; and for subsequent crops, $8 per acre. A crop yields, in wheat or oats, from $18 to $20 per acre, which gives a very handsome profit. It is not unusual for the first crop to pay all expenses and leave enough to cover the cost of the land. While wheat-growing can be thus advantageously carried on upon a large scale, it can doubtless be followed successfully and profitably in a more moderate way; but a small amount of capital is absolutely essential. Besides the purchase of the land, the settler must be able to put up buildings, buy the necessary machinery, seed, etc., and also must have the means of living for a year or more, until his first crop is harvested. For those who can do this, the low price at which lands can be obtained offers a desirable opportunity for investment to the capitalist or to those who seek new homes in this growing and fertile region."

quality of these lands is said to be generally not inferior to those of the Red River valley. They yield immense crops of wheat, oats, barley, corn and potatoes. The land is mostly prairie, though the borders of the streams are heavily wooded. There is coal near the Missouri and of very fair quality. The region is well watered. The lands are mostly as yet unsurveyed, but can be procured under Soldiers' and Sailors' Homestead Law by soldiers or their families, under the General Homestead Act, the Timber-Culture Act or by pre-emption.

The very liberal timber-culture law of the government, protecting forest tree culture on the western prairies, is supplemented by a law of Dakota, which provides that for every five acres of timber in cultivation, forty acres, with all the improvements thereon, not exceeding $1,000 in value, shall be exempt from taxation for a period of ten years from the time of planting. Another law of the Territory provides that no land shall be deemed increased in value for assessment purposes by reason of such timber culture, no matter how much its real value may be enhanced thereby; so that any industrious man, no matter how poor, can come here, and in eight years be the owner of 240 or 320 acres of land, with an abundant supply of timber just where he wants it, and be entirely exempt from taxation the entire time, unless he should put more than $4,000 worth of improvements upon his land during that time.

The Chicago and Northwestern Railway, which is building railways in Central Dakota, though it has no land grants there,

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We might add almost indefinitely to this testimony, from unprejudiced observers. Rt. Rev. G. W. Peck, one of the Bishops of the Methodist Episcopal Church, writing in October, 1879, of this region, says:

"Imagine a vast plain, somewhat undulating, and yourself in the midst of it, and splendid farms and immensely larger unbroken farming lands extending to the horizon in all directions; and then think two thousand miles on beyond—nearly every acre sandy loam, vegetable mould or alluvial deposits from two to six feet deep [deeper than that, Bishop,] the greater proportion of the whole richer and finer than the gardens of the East—and you will begin to have some idea of this northern Northwest."

Rev. H. J. Van Dyke, Jr., Newport, R. I., contributed to *Harper's Magazine* for January, 1880, an account of his visit there in September, 1879, and confirms the testimony of the others in the fullest degree. Messrs. Reed and Pell, members of Parliament, sent as commissioners to ascertain the causes of England's agricultural depression, and the advantages offered to agricultural emigrants from Great Britain by Manitoba and British America, returned home with a high estimate of the superiority of Dakota lands and farming, to that of Manitoba.

has issued a pamphlet encouraging immigration to that region for the sake of bringing business to its lines, which it proposes to extend to the Black Hills. Some of its statements are interesting, and, on the best of testimony, truthful. They say:

"It should be understood, by the prospective settler, that the lands of this central belt consist almost exclusively of prairie, there being no timber, save fringes along the water-courses. The Western farmer does not need to be told of the ease with which a prairie farm can be brought under cultivation; but the farmer from the more Eastern States may be informed, that all that it is necessary to do to bring the prairie under cultivation, is to plow under the prairie grasses in the same way as he plows the meadow at home; and at once he has a field that is fit for the reception of any kind of seed, thus getting the land into as good shape for farming purposes as he could do if it had been covered with timber (as all of the Eastern States have been), after he had expended twenty to forty years' labor in getting rid of the timber and the always-following stumps.

"To give the Eastern farmer some idea of the cost of making a productive farm in Central Dakota, we quote from a very readable article, recently published in the *Atlantic Monthly*, from the pen of one of the oldest settlers in the 'New Northwest.' 'The Territory appeals more directly to the man who desires a farm of 160 or 320 acres, than to him who aims to emulate the Grandins, Dalrymples and Casses of the more northern part of the Territory, who have their ten, twenty, or even forty thousand acres in a farm.' As our estimate gives the cost of producing one acre of wheat, with hired labor, we will first say, that good men are plenty at all seasons of the year, at the following wages: from November 1st to April 1st, $15 per month; from April 1st to May 1st, $18; from May 1st to August 1st, $16; from August 1st to August 15th, $2 per day; from August 15th to September 15th, $1.50 per day; from September 15th to November 1st, $18 per month.

"The following is a careful estimate of the cost of raising wheat, furnishing everything:

	$ cts. m.
Plowing 2½ acres per day, $20 per month wages, 77 cents per day. Per acre	31
Interest on team $375, harness $25, plow $50—$450. Per acre	02 2
Wear and tear, 25 per cent. on outfit. Per acre	11 2
Board man per day, 20 cents; team 45 cents. Per acre	26
Stable men's labor and board. Per acre	20
(Stable men, wear and tear and interest on team and harness for one *year* included.)	
Sowing 35 acres per day, wages $20 per month, 77 cents per day. Per acre	02 2
Board, man 20 cents, team 45 cents per day. Per acre	01 9
Wear and tear on seeder, $55, 25 per cent. Per acre	03 9
Interest at 10 per cent. Per acre	0 2
Harvesting (wire or cord binder) for wire or cord. Per acre	50
15 acres per day, wages $20 per month, 77 cents per day. Per acre	05 1
Board of man 25 cents, team 50 cents per day. Per acre	05
Interest on reaper, $250, at 10 per cent., 150 acres per machine. Per acre	16
Wear and tear on reaper, $250, at 25 per cent., $62.50, 150 acres per machine. Per acre	41 6
Shocking man, 77 cents per day, 10 acres per day, and board at 25 cents. Per acre	10 2
Threshing, 25 men at $2 per day, 40 acres. Per acre	1 25
Board, 25 men at 25 cents per day, 40 acres. Per acre	15 6
Interest and wear and tear on thresher and engine. Per acre	10
Marketing man, 77 cents; board 20 cents; board of team, 45 cents; 4 acres. Per acre	32 5
Freight, 13 cents per bushel. Per 20 bushels	2 60
Incidentals, including interest and wear and tear on permanent investment. Per acre	2 00
Total cost per acre	$8 69 6

"This estimate makes the cost of an acre of wheat, yielding twenty bushels, placed in Chicago, with an allowance of ten per cent. interest on the whole investment for land, improvements, machinery, tools, and stock, and also of twenty-five per cent. for wear and tear of tools, machinery, and stock, to be $8.70, not including seed. Allowing $1 for the seed will make the cost of one acre of wheat, yielding twenty bushels, laid down in Chicago, and paying an ordinary interest, or profit, of ten per cent. on the entire investment, $9.70, or forty-eight cents a bushel. With wheat at eighty-five cents a bushel in Chicago, this would give

an additional profit of thirty-seven cents a bushel, or $7.40 per acre.

"From this calculation, the profit of a greater or less yield can readily be computed, the cost of raising remaining the same."

In regard to climate they give the following table, the result of the observations, we believe, of United States officers at Fort Sully:*

Months.	Temperature.		Rain and Snow. inches.		Wet days.	Prevailing winds.
	Maximum.	Minimum.	Rain.	Snow.		
January . .	53°	—16°	1½	7¾	3	N. W.
February. .	55°	—20½°	¾	5⅜	2½	N. W.
March . .	69°	—4°	5¾	4¼	7	W. N. W
April . . .	77°	8°	7⅛	0	8½	S. E.
May . . .	89°	39°	4¾	0	4½	S.
June . . .	97°	69°	4¾	0	6	S. S. W.
July . . .	103¼°	72°	7¼	0	8	S. W.
August . .	102⅜°	68°	6⅞	0	7	S.
September .	93°	41°	3⅛	0	3½	S.
October . .	84°	19°	4⅝	¾	11½	N. W.
November .	67°	29°	¾	⅜	3	N. W.
December .	49°	—18°	...	5½	5	N. W.
Total .			47·75	24	69·5	

From this it will be seen that the climate is less severe than it is in Illinois, Northern Indiana, Ohio, New York, or any part of New England.

The Chicago and Northwestern Railway has two lines penetrating Central Dakota—one from Tracy, Minnesota, northwest to Watertown, and to be extended westward to the James or Dakota river; the other from Tracy westward to Huron, and to be extended to the Missouri river the present season, and eventually to the Black Hills; it is hardly probable that any other railway (except possibly a branch of the Northern Pacific to the Black Hills) will for some years to come traverse this part of the Territory, and their rates for freight and transportation of emigrant movables and crops are therefore of interest. We

* It is not stated whether this table was for a single year or an average of several years. It was probably the former, as the rainfall is exceptionally large for the latitude.

therefore give them the benefit of the following declaration of their terms and reasons for them:

FREIGHT RATES.

	Emigrant per car.	Movables. 100 lbs.
Chicago to Volga, Dak.,	$45.00	$1.25
" " Tracy, Minn.,	45.00	1.10
" " Marshall, "	45.00	1.10

"These special rates are open to all, whether settlers on company's land or not.

"The term emigrant movables applies to all household goods, farm machinery, wagons, live-stock, trees and shrubbery, properly included in the outfit of intending settlers, but does not include general merchandise, lumber, provisions, or grain (unless intended for seed, or for feeding animals in transit). When a car contains live-stock (whether horses, mules, or cattle), *one man will be passed free* to take care of it. Those who live along the lines of the Chicago and Northwestern Railway, and desire to reach the Free Land District of Central Dakota, should apply to the nearest agent of the Northwestern Railway, who, if he is not already supplied with rates to Tracy, Marshall, and Volga, will, on application, be furnished them, as it is the intention of this company to do all that it possibly can, by the most favorable rates, to have this fertile belt made as accessible to its patrons as are any other lands in the West. As these lands are owned entirely by the United States, and are not, in any manner or form, controlled by the Chicago and Northwestern Railway, or by any other railway or corporation, no person or corporation, except the Chicago and Northwestern Railway, will be in any way interested in their settlement; and the only interest that the Chicago and Northwestern Railway has, or will have in the settlement of these lands, is merely that accruing out of the fact that after they are settled, it will reap some benefit from the shipments of the products of the farms along the line to Chicago or Milwaukee, which, as will be seen, lie almost at their doors. It may not be necessary to suggest to the prospective settler of these lands, that the earlier settlers in this tract will have a great advantage over those who come later, as the first will, for many

years, have to provide for the recent comer, who thus will furnish a home market for many of the products that will be grown in the next five years. Besides, as will be noticed by our map, these lands lie directly in the course of the traveller to the mining camps of the Black Hills, which, being, in no sense of the word, an agricultural district, will always have to be provided by the nearest farming lands, not only with provisions, but also with horses, mules, live-stock of all sorts, and forage for them, thus offering another and very valuable market for those who occupy this Free Land district. A third market for the products of these lands will, for many years to come, be found along the Missouri river; and as the Chicago and Northwestern Railway will very certainly reach the Missouri river during the year 1880, there is no doubt that steamboat lines will be established from the point where the road reaches the river to all points on the upper Missouri, Yellowstone, Big Horn, and other navigable streams in the far Northwest.

"The passenger rates announced are: from Chicago to Marshall, Minn., round trip, $21.85, single trip, $13.65; from Chicago to Volga, Dak., round trip, $24, single trip, $15. At Marshall, round trip tickets can be purchased for any points on either of the company's roads in Central Dakota at two cents a mile each way."

We come next to *Southeastern Dakota*, the section which has been longest settled, or rather the longest known to the public, for, with the exception of Yankton, Sioux City, and Sioux Falls, there are very few towns in this section that have been settled more than half a dozen years. The region is well watered and the soil is of the very best. The railways now built or building in this section make it very accessible, and the Missouri, Big Sioux, and White rivers add to the means of traversing it. The railways are from Sioux City to Yankton, Sioux City to Sioux Falls, and from the latter town to Fire-Steel on the James river, already completed, and soon to be finished to Brulé City, on the Missouri. The Rev. Edward Ellis, who has explored all parts of Dakota within the last two years, writing to New York, in May, 1880, says:

"The most desirable part of the Territory for a permanent home is the southeastern—first of all, because of its climate. It is milder and more seasonable, better adapted for fruit and all kinds of garden sauce. The water supply is also more abundant. Nearly all the rivers of Dakota converge in the southeast corner. The geographical position of Southeastern Dakota will always maintain a decided advantage over the more northern positions. There is any amount of government land that can be secured now, near the lines of these new railroads which are opening up this section. Counties where desirable land can be found are Kingsbury, in the vicinity of Lake Thompson; Miner, Bramble, and Davidson, in the valleys of the Vermilion and the James; also McCook, Turner, and Lake, but these last-named counties are more thoroughly settled. Brulé county, on the Missouri, is reported to be one of the finest counties in the Territory, and the railroad running through the centre of it makes it a desirable point for location."

The following communication, prepared for the writer by Hon. W. H. H. Beadle, for several years United States Surveyor-General of Dakota Territory, and now Superintendent of Public Instruction for the Territory, and Private Secretary (until his death) for the late Governor Howard, gives much information not easily attainable concerning the whole Territory, but is specially full in regard to the southeastern portion. Mr. Beadle is probably more thoroughly familiar with the whole Territory than any other man living, and is not, and has not been, connected with any railroad company or colonization scheme which might warp his judgment.

"Dakota Territory contains 150,000 square miles or 96,000,000 acres, which is nearly all prairie. Southern Dakota will contain 78,000 square miles.* There are erroneous impressions concerning it which are sometimes favorable, generally unfavorable. To understand it properly, its general physical features are of

* It was a favorite idea of Governor Howard, toward the close of his life, that the Territory should be divided into Northern and Southern Dakota; the two divisions, or future States, having a nearly equal area. The southern half would include the Black Hills, which would soon be reached by railroad lines from the East.

the first importance. In the first place but a very small part of it is mountainous, and this part is the Black Hills, which are hills, rather than mountains. Dakota does not lie among or upon the Rocky Mountains. If one will begin in New Mexico and follow along the Rocky Mountains, it will be found that they run nearly due north, through New Mexico, Colorado and into Wyoming, where they turn decidedly westward and then northwestward, leaving outlying lower ranges, spurs and hills to the north and northeast as far as the Black Hills. The traveler upon the Union Pacific Railroad observes this. He ascends along the Platte and the Lodge Pole to, or a little beyond Cheyenne, and finds himself upon the elevated mountain plateaux; and thence westward he follows a mountain divide, from which the country is generally lower toward the Yellowstone and Missouri, and also southward toward the Bear, Grand and Green rivers, of the Colorado. He commences to descend into the Utah basin, and the mountain range goes north-northwest through Idaho and Montana (including part of Western Wyoming).

"Ascending the Missouri river from Omaha, the course is nearly north, to the southeast corner of Dakota, where it bends decidedly west for over 100 miles, and then north and northwest for 300 miles, where it turns westward and heads far toward the Pacific ocean, in the Rocky Mountains, the Yellowstone coming in from the west-southwest.

"These features, in physical geography, materially affect the character of the surface, soil, climate and agricultural products of Dakota. For instance, one would naturally expect that the heavy bend toward the west of the Missouri river would bear with it westward, the extent of fertile lands, etc., which are found in Eastern Nebraska. Then, too, the elevation above the sea at Yankton is only about 1,100 feet, but from this on the ascent is more and more rapid.

"The general elevation of the plains about the foot-hills around the Black Hills is from 2,500 to 3,000 feet, and this is the highest part of the Territory.

"No mountains lie to the north or northwest.

"The Continental valleys of the Mississippi (and Missouri) pass

on to those of the Red river of the North, the Saskatchewan and the McKenzie—to the Arctic ocean. These streams, or their tributaries, interlock in Minnesota and Dakota, and from St. Paul to the Missouri river westward or a little north of that, is the line of greatest elevation east of the Missouri river in Dakota, being 1,500 feet at highest points. It is a general plain or prairie, with few hills even, except the so-called 'coteaus,' which are nine-tenths rich agricultural or grazing lands, and are not mountains at all; merely regions of land more elevated than the intervening great valleys.

"Most people understand what is meant by the 'Great Plains' of Nebraska, Kansas, Colorado, etc. They lie in an almost perfect inclined plain from the foot of the mountains eastward to the Missouri river, and, down this incline, the rivers are cut like grooves. The general surface is quite uniform. Take this example to understand Southern Dakota. It is composed of two such inclined plains upon a smaller plan. All that east of the Missouri river and up to about the forty-sixth parallel is a general inclined plane, sloping to the south, down and across which flow the Big Sioux, the Vermilion and the Dakota (or James) rivers, and the Missouri itself. The northern border is about 400 feet higher than the southern. That part of the south half of Dakota lying west of the Missouri is another *plane* inclined to the east—properly a part of the 'Great Plains' of the west extended up there. Its highest part is about 4,000 feet (mountains) and average lower part about 1,400 feet. Down across it flow the Keya Paha and Niobrara (near it in Nebraska), the White, Cheyenne, Moreau, Grand and Cannon Ball rivers. This region inclines more sharply, the streams are more swift, and the country is a little more rough than further south. The so-called Bad Lands occupy a small part only—not over 75,000 acres—which is not good grazing lands. We will now briefly refer again to each one of these regions.

"The western part has, especially in its southeastern quarter, and along the Missouri river, a fine body of agricultural lands, suited to wheat, rye, barley, oats and corn. As one passes west it becomes more suited to grazing, and is covered with a rich

growth of the best grasses—especially those which, curing upon the ground, afford winter grazing. This has been amply tried for many years by the herds kept by, and for feeding, the Indians. When we reach the valleys of the Cheyenne and Belle Fourche, the agricultural character again decidedly improves, and the plains between these streams and the Black Hills are being rapidly occupied as farms, stock-ranches, vegetable gardens, dairy farms, etc., as seems most profitable, to supply the people in the Hills with food. The valley of the Belle Fourche and its larger tributaries, is very delightful and fertile, one of the loveliest summer views in the West, wide, smooth and beautiful. The French called it 'La Belle Fourche'—the beautiful branch—*i. e.*, of the Cheyenne. The Hills themselves are a real wonder-land. I have travelled through them and been in the principal mines. The examination changed my opinion. I look upon them as surpassingly rich in gold. They are peculiar—different from other gold regions. The same rule of expectation does not apply. They disappoint every one—but favorably. They are in *gold* somewhat as Leadville, Colorado, is in silver. Within five years everybody will recognize this, and within ten years that region will be a constant wonder in its gold product. I do not own a cent of interest there, directly or indirectly. Railroads will be there in two years or less, and then machinery, supplies and all conveniences will be cheaper, so that the mines can be opened and worked extensively, and it will become more than ever a wonder-land, because it *is* known, and not because it is *not* known.

"Southeastern Dakota has an area of 35,000 square miles, nearly every square foot of which is rich. It is generally well watered, has a deep dark prairie loam soil, mixed in places with a very small per cent. of sandy loam. It nearly all slopes slightly to the south and receives the spring rains and sunshine, making its seasons early and its soil warm to germinate the spring seed. Its great crops are wheat and corn, men being divided as to which is the more profitable of the two. Its third great interest is cattle-raising. These three represent about equally the resources of the farmers. As we go farther north, wheat domi-

nates, as the country is newer, and this crop can be more quickly turned. Farther south, corn equals wheat in importance, and in some counties stock-raising is chief. Take Yankton, Clay and Union counties, and during the last year they have sold about 2,000 head of cattle each, mainly ready for beef or to be fed temporarily in Iowa. They have sold about 3,000 head of hogs each, and about one and a-half million bushels of wheat. These are the three oldest counties.

"Southeastern Dakota has twenty-three organized counties, a population of 90,000 people, with 430 miles of railroad in operation—perhaps 460 nearly so. It will have 700 miles by November 1, 1880. It has an excellent advance in schools, churches and all social organizations. Its population is consolidated and continuous, and it is law-abiding and enterprising. Its villages and towns are marked by newspapers, church edifices and school-houses.

"The climate is warmer than would be expected. Its summer is long, and corn matures and fully ripens every year. In winter there are occasional stormy days, which are sometimes severe; but usually the winters are fair, sunny and dry. The United States Signal Service reports will show temperature for a series of years at Yankton and Fort Sully—fair tests, except that Sully is on the west edge of the best agricultural lands.

"Did you ever observe the disappointments that meet people who go by rail to California, Nevada and Utah in the hope of a cure for lung and other diseases? I have seen them come back suffering greatly. The trouble is, the too great and too sudden change from the more damp sea-coast and lake climates, to that very dry air. But the men of '49, the early overland immigrants and travellers to California, were celebrated for robust health. Their journey improved and cured weak lungs, bronchial, catarrhal, and like diseases. Why? They went slowly from one to the other. They travelled by horses or with oxen across Iowa, Nebraska, Dakota, Wyoming, etc. They took a long period of out-door summer life in this intermediate region. The same treatment will produce the same results now. The region of the Missouri valley in Dakota is the best in the world for such

summer travel and sojourn, and should be taken before the transfer even to Colorado, though that is better than California at first. I do not extend this idea. Its statement will be understood, as the history of the early days gave the best proof of its value."

We add, on the opposite page, the meteorology of the two stations of the Signal Service Bureau in Southeastern Dakota, and as Fort Sully station was changed to Deadwood in December, 1877, we have completed the year from the Deadwood report, the latitude being nearly the same, though the altitude of Deadwood is considerably higher. We give a later meteorological report from Deadwood and Lead City farther on.

We come next to the smallest, but, in some respects, the most important section of Dakota, the mineral region known as "The Black Hills." Let Mr. Zimri L. White, the accomplished and judicious correspondent of the New York *Tribune*, who visited and explored the Hills in the summer of 1879, describe for us the topography and history of the region. We may say in passing, that the Black Hills extend westward into Wyoming Territory, and are between the 43d and 45th parallels of latitude and the 103d and 105th meridians of longitude.

"The Black Hills, or Cheyenne Mountains, are a detached spur of the Rockies lying between the two forks of the Cheyenne river (one of the largest tributaries of the Missouri), whose confluence is near their eastern boundary. The North Cheyenne, or Belle Fourche, flowing from a point in Wyoming Territory west of and nearly opposite the centre of the Hills, bears off to the northeast and then to the southeast, forming a sort of an ox-bow, while the South Cheyenne separates the Hills from the Southern plains. The area thus embraced is about 5,000 square miles, and may be divided into three parts—rugged mountains containing mineral veins and deposits, grass-covered foot-hills and prairies, capable of supporting enormous herds of cattle, and fertile valleys which, with or without irrigation, will produce all the grain, hay, potatoes and other vegetables that the future population of the Black Hills can consume.

"The mountains proper, as distinguished from the foot-hills,

Lat. 44° 39′ Long. 100° 40′. Elevation 1,867 feet. FORT SULLY AND DEADWOOD.								Lat. 44° 22′. Long. 103° 34′. Elevation 4,425 feet.	Lat. 42° 45′. Long. 97° 30′. Elevation 1,275 feet. YANKTON.						
	Months.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rainfall.	Barometrical Pressure.	Humidity.	Winds in order of frequency.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rainfall.	Barometrical Pressure.	Humidity.	Winds in order of frequency.
		°	°	°	in.				°	°	°	in.	in.		
	Year.	109	—8	43.3					96	—10	49.3	28.63	29.941	69.7	N. W., S. E., S., E.
Deadwood.	January...	54	—8	26.2	0.30	*25.303	61.7	S., N., S. W., N. W.	46	—10	21.8	0.20	30.090	74.1	N. W., S. W., S. E., N.
	February..	59	11	31.8	1.01	*25.214	66.9	S., N., Calm.	62	3	33.2	0.27	29.947	75.8	N. W., S. E., N.
	March....	66	10	37.3	3.85	*25.289	70.1	S., N., S. E.	77	21	43.4	0.93	29.888	63.0	N. W., S. E., N.
	April.....	65	26	41.6	8.77	*25.177	70.3	S., N., Calm.	80	27	50.5	5.14	29.722	64.6	N. W., W., E., S. E.
	May.....	68	30	45.9	7.80	*25.336	72.2	S., N., Calm.	78	28	54.5	4.04	29.901	64.9	N. W., E., S. E., S.
	June.....	92	37	61.5	4.67	29,747	57.4	S., N., S. E.	89	47	66.5	7.83	29.876	72.4	N. W., S. E., S., W.
Fort Sully.	July.....	109	48	74.9	3.69	29.726	57.7	N. W., S. E., S.	96	44	73.4	1.17	29.872	68.4	S. E., N. W., S., W.
	August....	100	48	72.7	0.84	29.803	52.8	S. E., N. W., Calm.	93	46	71.2	1.16	29.919	66.9	S., N. W., S. E., E., N.
	September.	95	37	64.7	0.44	29.762	49.8	S. E., N. W., Calm.	89	38	64.7	1.23	29.878	65.2	S., S. E., N., N. W., E.
	October...	71	21	45.0	1.11	29.980	65.2	N. W., Calm, S. E.	73	25	46.8	3 66	30.016	69.8	N. W., S. W., S. E., N. E., W.
	November.	66	3	36.7	3.63	.....	63.7	S., N. W., S. E.	57	—5	31.3	0.54	30.104	73.3	N. W., S. E., S., E.
	December.	46	3	24.5	....	30,170	....		57	—1	34.2	2.46	30.082	78.5	N. W., W., S. W., E., S. E.

* Corrected for temperature and instrumental error only.

cover about two-thirds of the area to which the name Black Hills applies. These are generally steep, covered with pine forests or the bare trunks of trees that have been killed by fires, and separated from each other by gulches and cañons through which small streams flow. These mountains are remarkably rich in minerals, although they have not been sufficiently explored to make it possible to estimate the value of their deposits. The gold mines are most developed, but there are silver mines rich enough, in promise, at least, to induce men who have capital and experience to purchase them and to invest their money in expensive mills for reducing the ores. Specimens of very rich copper ore have also been found, but I have heard of no mines being worked. Salt deposits have been uncovered, and machinery is now on the way to the Hills to enable the owner of one mine to try the experiment of manufacturing salt from the rock. Petroleum of excellent quality and in inexhaustible quantities has also been discovered, and many wells are already worked. Coal has been found in considerable quantities, and is now being tested in the gold mills near Deadwood. The gold mines exceed all others in value, and will probably continue to do so as long as there is mining in the Black Hills, but some of the other mineral deposits are of such character and promise as to invite capital and enterprise in their development.

"The foot-hills are covered with the richest and most nutritious grasses. Unlike the plains, where the grass-roots stand apart, leaving small spots of bare ground between them, the carpet is close and thick at the bottom, like the tame grass of a meadow in the East, and when cut shows a heavy swath, and cures either standing or as hay, retaining its bright, green color and its rich juices. These foot-hills, where the land is too dry for cultivation, and water for irrigation is not available, are excellently adapted for grazing. The grass furnishes good feed all winter, and the winds blow the snow off from the hills while it lies in the valleys, and the numerous cañons and bluffs afford shelter for the cattle during storms. No one now feeds or shelters his cattle in the winter; the value of individual animals that may die from exposure not being great enough to warrant

the extra expense of such care. At the same time I am inclined to think that in the end a little feeding and shelter would pay in the better condition the cattle would be in in the spring and the better prices that would be realized. It is estimated that there are now 100,000 head of cattle in the hills, but the grass seems hardly to have been touched. Stock-raising will eventually become one of the most important industries in the region.

"The arable lands of the Black Hills are from 500 to 600 square miles in extent, and consist of bottom lands along the streams and prairies and lower slopes of the foot-hills between the water-courses. The former generally need no artificial irrigation, but the latter require more water than the rains furnish and that is available in sufficient quantity in the brooks and creeks. The agricultural lands are of marvellous richness.

"The Black Hills were in the heart of the Sioux country until February, 1877, and were so jealously guarded by the Indians that white people who visited them did so at the peril of their lives. The Indians did not live in the Hills. They had a superstition that the Great Spirit never intended these mountains for the habitation of man. The terrific thunder storms which are frequent here, perhaps had something to do with this belief. They said that the Great Spirit had covered the Hills with trees to furnish the Indians with tepee poles, and filled the foot-hills with antelope and deer to supply him with food when the buffalo were scarce; and they frequently made excursions here, but never remained long. From one end of the Hills to the other, I am told, there are nowhere to be found the evidences of a long encampment of Indians. The Sioux have known of the existence of gold in the Black Hills for many years. A third of a century ago, it is said, they showed to Father De Smet, the Roman Catholic missionary, who spent his life amongst them, and in whom they had the most implicit confidence, large nuggets which they had picked up in the gulches. He warned them not to show these nuggets to white men, as it would arouse their cupidity and cause the Indians to be driven out of the country. Nevertheless, rumors of the mineral wealth of the Hills did get abroad, and evidences have been found that a few adventurers came here

in search of gold many years ago, and actually began to work the placers. They were probably all massacred by the Indians.*

"Several government expeditions were made into the Black Hills before that of General Custer, in the summer of 1874, and the report of each showed the presence of gold and other minerals. The first of these was that of Captain Bonneville, in 1834. General Harney came in here in 1855, and the highest peak in the Hills was named in his honor. Other expeditions led by Warren visited the Hills in 1856–'57, by Dr. Hayden in 1858–'59, and by General Sully in 1864. The dates of these visits I give on the authority of a resident of this city, as I have access to no records by which I can verify them. I have said that the explorations of each of these parties proved the presence of gold in these mountains; but no excitement was caused by their reports, because no one supposed that the precious metal existed here in sufficient quantities for profitable working. General Custer's expedition in 1874 is still remembered by most newspaper readers. The practical miners who accompanied him reported excellent 'prospects,' that is, that in washing out the gravel of the streams in pans they obtained gold in sufficient quantities to make it pay for working. The reports of these miners were received with incredulity in the East; and, during the winter of 1874–'75, the question was widely discussed whether there was gold in the Black Hills or not.

"So great was the public interest in the discoveries reported by those who accompanied General Custer that, in the summer of 1875, the Interior Department sent out an exploring expedition in charge of Professor Jenney, a young geologist. He came into the Hills with a train and escort, went pretty well over them, and made a map of the country. He discovered gold in many places, and more than confirmed Custer's reports of the previous year. Professor Jenney did not visit Deadwood and Whitewood gulches, the timber being so thick that he could not get to them with his train. But the adventurous placer-miners of the West did not wait for a scientific report upon the country,

* Mr. Robert E. Strahorn, in his "New West Illustrated," has traced the history of some of these parties who fell victims to their adventurous spirit. Some of them commenced operations in placer-mining as early as 1852.

but braving the hostility of the Indians and other dangers, they began to settle along the streams in the Hills in the summer of 1875, and to wash out the gold dust. The government forbade all persons to enter this country, and the President, I believe, issued a proclamation warning people against invading the territory that had been set apart for the Indians. But it is impossible to keep an old placer-miner out of gulches where there are 'pay streaks;' he will go through fire and water to reach new diggings. Hundreds of men came in here in spite of the proclamation and in spite of the orders to military commanders to arrest people found on the road or in the Hills. The soldiers even came to the Black Hills, and going up and down the gulches, gathered up the miners, confiscated their provisions, and took them to Fort Laramie or to the military posts on the Upper Missouri. But the adventurers came in here faster than the soldiers could take them out, and most of those arrested, even, as soon as they were released, as they all were when a military station was reached, came directly back if they had money enough to procure provisions. The government, having told the people through its exploring expeditions that there was gold in the Black Hills, could not keep them out without sending its whole army to guard the avenues of approach, and the policy of forcible removal was abandoned about the middle of November.

"The men who came to the Hills in 1875 and the following winter settled principally in the southern part, on Spring and French creeks. Custer City was the most important town, and Rockerville also became the centre of rich placer diggings. The mines in that region were all in the gulches, and during the first year considerable quantities of gold dust were taken out. I have not visited that region, but I have been told by a gentleman whose experience and scientific attainments cause one to have great confidence in him, that there are on Spring and French creeks the largest placer deposits in the world. He saw a man dig up a wagon-load of the gravel and haul it to a small creek where he washed out $46 worth of gold from it. This deposit, this gentleman says, he has examined for a distance of fifteen

miles in length and twelve miles in width. It is not all as rich, by any means, as the wagon-load of which he spoke. Gold always runs in streaks, but the extent of it is very great. It is not now available for the want of water.

"When the discoveries of gold in Deadwood and Whitewood gulches, on the site of this city, and above and below it, were made, the first workings were very rich, and the fame of them soon attracted the people here from all parts of the Hills. Custer City was almost deserted, and for a year or so Deadwood was one of the liveliest mining camps in the country. But, although the placer-mines in these two gulches and their tributaries paid well for a time, the prosperity they brought was only temporary, and, if quartz mines had not been discovered and opened, Deadwood would now be a deserted village. Out of fifty placer claims, a dozen or so are now being worked, chiefly by Chinamen who pay to the owners fifty cents a day royalty for each man who works. By carefully washing over the tailings and the gravel which was left because it was 'lean,' these Chinamen are able to earn from $1 to $1.50 a day, and with that they are contented.

"The existence of veins of quartz in the hills above Deadwood was known to the early miners here, but none of them seem to have appreciated their value. When they 'prospected' them they showed only from $2 to $15 worth of gold to a ton of ore, and nobody seemed to think that ore of that grade would pay for mining and milling. And the first attempts to reduce the quartz here were failures pecuniarily, and none of them can be said to have been really profitable until the California capitalists came here, developed the mines, and began to take out and reduce the ore on a large scale.

"Very few valuable quartz gold mines, or mines which by sufficient development have been proved to be valuable, have yet been discovered outside of the great belt above this town. One or two mines which promise well are said to have been opened in the Rockford District, about twenty-five miles south of here. I shall visit that region and probably write a letter from there. A new mine has also been discovered near Custer

City, from which some astonishingly rich ore has been taken. The reduction of about 800 pounds of that ore, and the obtaining from it of gold at the rate of $147 a ton, has caused considerable excitement in Deadwood.

"In closing this general description of the Black Hills, I may say that the country looks as though it had been settled ten years instead of three. In the mines it is difficult to realize the possibility of accomplishing as much as has been done in two years. The farms that are cultivated have already lost their appearance of newness, if they ever had it. Good roads have been built in every direction over and around the Hills, and travel is as safe upon them as upon a New England or New York turnpike. Two years ago (in 1877) camping equipage was a necessity for the traveller, now there are comfortable wayside inns every twenty-five miles, and frequently at shorter intervals. The game that abounded in the hills has disappeared, and civilization has already gained the mastery.

"The climate of the Black Hills is, on the whole, delightful. The elevation is sufficient (from 4,000 to 6,000 feet) to make the air pleasant without being too much rarefied for health or comfort. The midday sun is sometimes hot, but on no one of the past ten days (in the middle of July) has the heat been oppressive, and the nights are delightfully cool. I have slept under blankets every night since I came to Deadwood, and one or two evenings I found a light overcoat comfortable when going out upon the street. The winters here are rather long, the latitude being about that of St. Paul, Minnesota; but the towns are all situated in the cañons and surrounded by high mountains, which shield them from the cold winds and temper the rigor of the climate. During the last three years the summers have been long enough to ripen all kinds of grain and vegetables. During the first year after the settlement of Deadwood there was considerable sickness here, the prevailing disease being mountain fever. This was probably caused by digging up the gulches, the banks of which in many places were covered with a rank growth of vegetation. There is now probably no more healthful place in the United States than this city, and I know of few more comfortable ones in summer, if the climate alone is considered."

Sergeant J. O'Dowd, of the United States Signal Service at Deadwood, furnishes the following summary of the meteorology of that city for the year ending June 30th, 1879. The observations from July 1st to December, 1878, were taken at Lead City, two miles from Deadwood, and at several hundred feet higher altitude.

1878.	Mean Temperature.	Mean Humidity.	Highest Temperature.	Lowest Temperature.	Prevailing Wind.	Total rainfall, inches.	No. days rain or snow fell.
July	67.14	63.25	92	41	S.	5.77	16
August	65.85	62.80	85	46	S.	2.61	9
September	49.15	63.16	86	27	S.	2.06	8
October	39.58	60.50	72	6	N. W.	1.81	13
November	36.72	63.67	66	3	S.	0.75	3
December	18.26	72.47	54	—25	N.	3.63	11
1879.							
January	21.76	65.85	56	—24	S. W.	0.58	3
February	24.45	68.80	53	—12	S. W.	0.72	5
March	34.80	62.00	71	—5	S. W.	0.51	9
April	45.50	53.00	71	20	N. E.	7.69	8
May	53.80	63.20	81	29	N. E.	5.03	13
June	61.30	57.40	92	37	S.	4.67	18
Totals for year	43.19	63.01	92	—25		35.83	116

It will be observed that the heaviest rainfall, 23.16 inches of the 35.83, of the year was in the months of April, May, June and July—the months in which the crops would be most benefited.

The mines of the Black Hills yield both gold and silver, though the silver deposits were not discovered till some time after active mining for gold had made the region widely known. The gold mines may be included in four classes: 1. Placers. 2. Quartz veins between slate walls. 3. Quartz veins between porphyry walls. 4. Cement deposits.

The placers in the Black Hills are of great extent, and some of them have yielded very large sums. Elsewhere in this work we have described the methods of placer mining, the use of the pan, the rocker, the Tom, the sluice and the hydraulic pipe, flume and sluice, and, as placer mining is much the same in the Black Hills as elsewhere, it is not necessary for us to repeat what we have said of these processes. Two points, however,

may be noticed: 1st. That dry placers or gulches—that is, beds of clay or gravel containing a considerable amount of free gold, but at such a distance from water having sufficient head to wash the gold, and consequently requiring that the dirt should be brought to the water, or the water to the placer at considerable cost—are not usually considered very profitable to work unless the amount of gold is large. In the Black Hills these dry placers or gulches have proved so rich that the dirt has been brought from some of them by wagon loads to the water, and where they were more extensive, it has been found profitable to construct ditches or flumes of several miles' length, to bring a mountain stream to supply the pipes for hydraulic mining. These placers seem to be distributed all over the hills. The first were discovered near the southern border, on Spring and French creeks, near the present sites of Custer City and Rockerville. Others still more profitable have been discovered near Deadwood; and nearly all the gulches between the two points, a distance of fifty or sixty miles, yield rich pay-dirt, and most of them are profitably worked. These placers are so rich, and there are so many of them yet undeveloped, that placer mining will probably be conducted with profit here for many years to come. But second, it is the natural law of placers, that after a period of time, which may be longer or shorter according to their extent and depth, and the thoroughness with which they are explored, they are worked out and become worthless. To the penniless miner they offer the chance of acquiring a fortune; but no man should buy into a placer mine, with the impression that he has a permanent property. It is good so long as it lasts, and how long that may be it is hard to say. A placer claim in the Black Hills extends 300 feet along the gulch, and from rim to rim.

"The second class of gold mines found in the Black Hills—quartz in slate, or between slate walls—is represented by the great 'belt' above Deadwood, on which the mammoth mines of the Hills are situated. The country rock, that is the rock of which the mountains are formed, is micaceous slate which has been thrown up at an angle of about 50°. Between the walls of this slate is a vein of brown quartz containing free gold in

small quantities, and separated from the country rock on each side by a layer of chloritic slate often containing more gold than the quartz itself. The vein is of enormous width—from 40 to 150 feet—but is frequently divided by 'horses' of slate, or large bodies of that substance extending into or across the vein. The rock in these 'horses' is sometimes rich enough to work, but generally is quite barren.

"There are two theories of the formation of these veins; and while there seems to be sufficient ore in all the large mines for present purposes, the future of these properties may depend in great degree upon which of these theories proves to be the correct one. The first is that advanced by Professor Jenney, the young geologist who was sent to explore the Black Hills in 1875 for the Interior Department, and who is now a resident of Deadwood. He holds that these ledges of gold-bearing rock are true fissure veins—'interlaminated fissures,' he calls them, that is, fissures opened between the layers of the slate rock, and not across the line of stratification. The auriferous quartz, he says, has been formed by the water solutions which have come up from below. He accounts for the 'horses' of slate in the vein by likening the cleaving of the rock to the splitting of a piece of oak wood. When a wedge is driven into it, particles of the wood cling from side to side across the opening made by the wedge. So, he thinks, when the rock was opened, bodies of slate extended across from one wall to the other, and remained in that position when the aqueous solution from below came up, surrounded them, and deposited the gold-bearing quartz. He explains the fact that the slate walls and horses contain gold by saying that the slate, which had minute spaces between its layers, soaked up the mineral-bearing fluid, which in some cases replaced the particles of slate. As a rule, the impregnation of the slate becomes less as the distance from the wall of the vein increases. Believing the veins to be true fissures, Professor Jenney supposes that they extend into the earth for an indefinite distance, and probably grow richer in their lower portions. Professor Jenney believes that after these veins were formed the ocean covered what are now the Black Hills, and that by its

action it tore down the surface, scattering fragments of the vein all over the country. Evidences of marine action are easily to be found in the vicinity of the mines.

"The other theory held by several geologists of much learning and experience is that the vein matter was precipitated from an aqueous solution that covered it. Their explanation and argument is this: The foot-wall of these veins is slate, a formation which everybody knows is of aqueous origin. The vein of quartz is deposited on this slate parallel with its line of stratification, just as one layer of rock is deposited on another. Above the vein we also find slate, and above that, where it has not been carried away by the action of the elements, a cement formation also of aqueous origin. These facts point conclusively to a horizontal deposit of the vein matter on a slate bed. The precipitant was probably oxide of iron, and it is therefore very natural that those ores containing the largest proportion of oxide of iron should be the richest in gold, as they are. After all these deposits had been made, the hills were gradually thrown up in their present forms under water.

"If the true fissure vein theory is correct (and it is the one most generally accepted by the most experienced miners), then there is reason to believe that the ore extends far into the bowels of the earth. And even if the theory of an aqueous deposit or precipitation is accepted, the fields over which these deposits took place may have been so great that when turned up upon their edges they may be practically inexhaustible. These quartz veins between slate strata seem to be, in many respects, the analogues of the 'contact lodes' of silver in Colorado, and may have had a similar origin.

"The quartz veins between porphyry walls have not been sufficiently developed to make it safe to give an opinion in regard to them. Some of the best mines of this class are situated in Strawberry gulch, about seven miles east of Deadwood, and in some of them considerable bodies of ore have been found. In another year, when a few mills shall have been erected near them for the purpose of working their ores, and development has been pushed further, more will be known of their value. It

is an interesting fact that they have already attracted the attention of the rich California miners and capitalists who have developed the great 'belt' above Deadwood, and that it is possible that they may purchase one of the most promising of them and see what it contains.

"In many of the placer mines, a little below the bed of the stream but considerably above bed rock, a layer of hard cement, consisting of sand, gravel, and boulders, and carrying free gold held together in one hard, conglomerate mass by oxide of iron, has been found. This substance has been a great obstacle to gulch miners on some claims. They had no means of crushing it to free the gold, and to remove it in order to get at the auriferous gravel beneath was very expensive. On the hill-tops, which have withstood best the action of the elements, similar cement deposits have also been found, varying from one and a-half to twelve and eighteen feet in thickness. Some of these are very rich in gold and others very lean. A number of mines have been opened on the cement beds and are now working successfully, while others have already worked out their pay ore. The rock is reduced in the same manner as quartz, by stamping and amalgamating. A cement deposit may be very valuable as long as it lasts, and may bring to its owners large profits, but its value depends entirely upon its extent and character. Like a placer (and it is, in fact, nothing but a solidified placer), it will some day be worked out and become worthless. Attempts have been made to sell these cement beds and the mines opened on them as true fissure veins, which they are not. Very possibly the ore 'prospects' and 'mills' as high as it is represented; but the wrong done to the proposed purchaser consists in giving the impression that it is a true fissure vein, when it is in reality only a solidified placer and may and probably will soon become exhausted."

The gold mines, aside from the placers and cement deposits, in the Black Hills, have been again classified by the mining men as those on the Bonanza Belt in the neighborhood of Deadwood, and those not on the belt. The mines on the belt which have attained the greatest reputation are the Father De Smet, the

Deadwood, the Golden Terra, the Highland, the Homestake, the Grant and the Old Abe mines. The Roderick Dhu and the Pierce are also believed to be on continuations of this belt. The belt is about two miles in length and from 100 to 200 feet in width.

The mines not on the belt, in the vicinity of Deadwood, are the Caledonia, which comprises four claims, and covers in all territory 1,500 feet long and 1,100 in width, though in two parcels. Several deposit mines are also included in this class, and a number of smaller mines. There are also new mines of great promise at Rockford, about twenty-five miles east of Deadwood, and at Custer City and Rockerville, in the southern part of the Black Hills.

The silver mining thus far has been mostly at Galena, on Bear Butte creek, about twelve miles east of Deadwood. There are other silver deposits, but these are the most promising. The ores are chiefly sulphurets and chlorides, mixed with quartz, oxide of iron and manganese, antimony and arsenic. There are some rich carbonates, but they do not appear in very large quantities; there are also some specimens of horn silver and a little free silver. The ores average from 30 to 150 ounces of silver to a ton, the low-grade ores being most abundant. The immense cost of transportation ($40 a ton) has prevented the mining of low grade ores, and a small smelter, working imperfectly, has charged $75 per ton for reduction. These difficulties will soon cease, as railroads, and larger and better smelters come in.

A large proportion of the gold veins produce an ore which elsewhere would be regarded as of low grade; many of them running at from $9 or $10 to $13 or $15 per ton. But they are so favorably situated, that they can be run by chutes directly into the mill, without being handled at all. The large mills of 120 stamps or more are also run at much less proportional expense than the smaller ones, while they do ten times as much work. Gold can be mined and milled at these mines and mills at from $2 to $5 per ton, and the mines are so situated that the expense is not likely to increase for a long time to come. While the grade of the ores is low, the quantity seems to be inexhausti-

ble, and the quality improves slightly as the depth increases. Thus it comes to pass that ores yielding from $9 to $15 per ton pay a better profit, as well as a steadier one, than ores of much richer grade, which are more difficult to mine, less easily milled and which must be carried to greater distances to be marketed successfully. Mr. White states the yield of the Black Hills mines in 1878 as $3,500,000; in 1879 as about $4,500,000, and in 1880 as probably $6,000,000.

The Black Hills form the most elevated portion of Dakota, indeed the only portion which rises above 2,000 feet, or generally above 1,500 to 1,800 feet.

The following table gives the altitude of the principal summits and towns of this region, though some of the points named are in the Wyoming portion of the Hills:

Inyan Kara Peak	6,500	Harney's Peak	7,440
Bare Butte	4,800	Belle Fourche	3,734
Floral Valley	6,196	Castle Creek Valley	6,136
Crook's Monument	7,600	Dodge's Peak	7,300
Terry's Peak	7,200	Warren's Peak	6,900
Custer's Peak	6,750	Crow Peaks	6,200
Devil's Tower	5,100	Deadwood	4,425
Rapid City	3,175	Rockerville	4,125
Crook City	3,725	Pactola (estimated)	4,000
Rochford (estimated)	4,500	Custer City "	4,200

The present population of the cities and settlements of the Black Hills is hardly less than 30,000, and may exceed that. A year and a half since (in January or February, 1879), it was estimated at 18,000, and was probably divided very much as follows:

Deadwood	6,000	Rapid City	500
Golden Gate	700	Crook City	500
Lead City	2,500	Custer City	400
Rockerville	600	Spearfish City	250
Rochford	600	Hill City	200
Sturgis City	300	Galena	250
Sheridan	200	Pactola, Hayward and other settlements	2,500
Tigerville	200		
Central City	2,000		
Gayville	800	Total	18,000

The Black Hills region is primarily, then, a mining region; one which has been very largely taken possession of by capitalists, and its mining operations conducted on a scale which has been hardly equalled elsewhere in the West; its stamp-mills aggregating more than 1,500 stamps, and these generally of the largest and most powerful character, and its gold production larger than in the same number of mines elsewhere. This character of the region will be likely to continue and increase, for years to come. But it would be a great mistake to suppose, as some have supposed, that the Black Hills must be dependent wholly or mainly upon other regions for its supplies of food, clothing or manufactures. The valleys and foot-hills, as well as much of the hill country itself, are covered to a great depth with an exceedingly rich soil, and its production of grains, root crops and market garden vegetables and fruits will be ample ere long for the supply of the 50,000 or 75,000 people who will gather there. Those portions of the Hills and adjacent country which are not suited to mining or farming are admirably adapted to grazing, and even portions of the much berated "Bad Lands" are covered with rich and nutritious grasses. It is just the region for dairy-farming, and the mining towns will furnish a ready and profitable market for the milk, butter and cheese which can be produced. Sheep-farming will also prove profitable here, though perhaps the Cotswolds, Leicesters, Southdowns and Lincolns would pay better than the smaller wool sheep; for the market for mutton will be close at hand, and the combing wools will bring as good prices as the felting wools, though for other purposes. We see no reason why this may not become *the* region for the production of the best quality of mutton.

The fine water-powers in the vicinity, and the coal mines which are readily accessible, as well as the large deposits of copper, lead and iron which are awaiting development, must ere long make it an important manufacturing region, and in a few years we may expect to see the immense quantities of mining and agricultural machinery which are needed, as well as all the manifold manufactures of wool and iron which are needed there, produced on the spot instead of being, as now, brought from Chi-

cago, the capital of a treeless region, across 800 or 1,000 miles of prairie, to a region of forest growths.

For so new a country, the educational and religious institutions of this as of other sections of Dakota are of a high order. Not Deadwood alone, but all the new towns of the Black Hills have excellent schools and good churches. For these the whole Territory is largely indebted to the active exertions and excellent influence of the late Governor Howard and his efficient coadjutors. The social condition of all parts of the Territory is greatly higher than that of most new settlements. Mr. White writes of the towns of the Black Hills: "Deadwood is a remarkably quiet, orderly, law-abiding town. This is the more remarkable when it is remembered that at the time it was first settled this was an Indian reservation, over which the Territorial authorities had no jurisdiction.

"The people who came here organized a temporary government of their own, the only sanction of which was common consent, but its laws were recognized and obeyed for about a year and a half. When the treaty with the Sioux was completed in February, 1877, opening the hills to settlement, the government that had been improvised was dissolved, but the Territorial officers did not arrive here until forty days later, and in the meantime there was not even the semblance of a government, and yet order was preserved.

"There are public gambling-houses in Deadwood, but they are not numerous, nor do they thrust themselves upon the attention of the stranger by open doors or bands of music. The gambling is almost without exception conducted in back and second-story rooms, and the proprietors of the houses are not apparently having a prosperous time of it. There is one variety theatre here, and although I have not attended one of its performances, its programme contains nothing that seems to be objectionable as variety shows go. Its performances close at a seasonable hour. There is also one dance-house on Main street. Of drinking-saloons there are of course an abundance.

"On the other hand, Deadwood is a city of homes. Small but tastefully built cottages are springing up by scores on all the

residence streets, and people who are in business here have brought their families. Any newcomer will find intelligent, refined, cultivated society here for himself and family. Religious organizations have been established, schools founded; and remote as the Black Hills are, and difficult of access, no one need hesitate to make his home here through fear that he will not find good society. Even the people who are seeking their fortunes in the remote gulches are by no means barbarians. Many of them are well educated, and are respected in the distant homes they have left, although they may now have to rough it and put up with many privations. Straws show which way the wind blows, and here is one: I dined the other day with a miner who thinks he has made a 'great strike.' He lives in a log-house, miles out of town, but in one corner of the room, which serves as parlor and dining-room, stood a piano on which was a large pile of popular music, and I saw on the table the latest numbers of some of the popular magazines and illustrated journals."

We have spoken of the means of railroad communication in different sections of the Territory. These are constantly increasing in numbers and mileage till the Territory promises soon to be traversed by them in nearly all directions. The following list, prepared by Hon. Henry Espersen, United States Surveyor-General for Dakota, gives their condition in November, 1879, and we have added the facts so far as they can be ascertained of their present condition:

There is a very complete system of railways, built or building, into or through the Territory.

The Northern Pacific Railroad, extending from Fargo, on the eastern boundary, to the Little Missouri, 351 miles, and to be extended to the Yellowstone by January 1, 1881.

The Winona and Saint Peter's Railroad (Chicago and Northwestern), now running to Watertown, near Lake Kampeska, and located west to Dakota river.

The Dakota Southern Railroad, from Sioux City, Iowa, to Yankton, and projected northward up the valley of the Dakota river, completed to Brulé, on the James.

The Milwaukee and Saint Paul Railroad, with some eighty miles

built of a line from Canton to the Missouri river; completed in 1880 to the Missouri.

Also a line upon which work is now in progress from Eden to Yankton.

The Sioux Falls and Pembina Railroad, up the Big Sioux River valley, of which some seventy miles are in operation.

The Dakota Central Railroad, located from Garey to the Dakota river, upon which work is now progressing; completed to Huron, on Dakota river.

The Worthington and Sioux Falls Railroad (Saint Paul and Sioux City), of which about forty miles are built, having Yankton for its objective point; and

The Southern Minnesota Railroad, building from Flandreau to Sioux Falls.

The total length of road now in operation in the Territory is almost 1,200 miles.

Indian Tribes and Reservations.—The Indian reservations in Dakota, in January, 1880, still comprised about 42,000,000 acres, about seven-sixteenths of the entire area of the Territory. This vast area is cut up into several reservations in different parts of the Territory. As it is largely in excess of the needs of the Indians, arrangements are making by the government to purchase considerable portions of it, and to distribute the remainder in severalty to the Indians, giving them also the interest of the purchase-money of the lands which the government buys from them, as annuities. There were on these reservations in January, 1880, 26,530 Indians of all ages. Of these 25,237 were Sioux or Dakotas, of twenty-one different bands or sub-tribes; 1,393 (the Indians at the Fort Berthold Agency) were the remnant of other tribes formerly hostile to the Sioux, and were divided as follows: Arickarees, 720; Gros Ventres, 448; Mandans, 225. Since the severe punishment of Sitting Bull and his band for their massacre of General Custer and his troops, and their escape into British America, the remaining bands of Sioux have been peaceful and friendly to the whites. They are, for the most part, making decided progress in civilization. With the almost complete destruction of the

buffalo, they have very generally abandoned the chase, except a moderate amount of hunting and trapping of the fur-bearing animals, and with each year an increasing number of them are turning their attention to the raising of cattle and horses, to drawing freight, and to the simpler forms of agriculture. Very many of them have built for themselves comfortable log-cabins in the place of the tepees or lodges of skins in which they formerly dwelt. Of the Sioux 10,162, or more than two-fifths, have assumed and constantly wear citizens' dress. Of the Fort Berthold Indians, only one-twentieth have done this, but the number is increasing every year. Religious instruction as well as secular education is imparted to the Indians at each of the ten agencies, and the more promising Indian children are now in considerable numbers sent East to receive higher instruction, and on their return become not only teachers but leaders of their people in their progress toward civilization.

The present population of the Territory, including 26,148 tribal Indians, is 162,328; of which Northern Dakota has about 36,000, Central Dakota 10,000, Southeastern Dakota 74,000, Black Hills 16,000. The inhabitants of Northern Dakota are very largely of European birth, though there is a sufficient American element, mainly from New England, New York, Pennsylvania, and Ohio, to maintain American institutions. The Mennonites, Russians who have been associated with them in Russia, and who have come here for the religious and civil liberty they cannot enjoy there, Norwegians and Swedes, and some Germans; the Catholic colonies from Belgium, France, and Ireland, which have come over under the direction of the Catholic Emigration Societies—these make up the bulk of the settlers of the northern section. Considerable numbers have come from Manitoba, dissatisfied with the homestead laws there and with the lack of enterprise and push in that colony. The inhabitants of this section are not, for the most part, of the poorer class of emigrants. One company of Russians recently brought with them $490,000; and the Mennonites are usually men of property. In several cases they have bought large blocks of land, sometimes 100,000 to 200,000 acres, and settle on them so as to have entire communities of their own faith.

In Central Dakota the emigration is largely European, Norwegian, Swedish, and German, with a considerable admixture of American families. In Southeastern Dakota the American families predominate, though there are here also Mennonite, Belgian, German, and Irish colonies. The farming lands of this region are more generally in small holdings, and the class of immigrants who are occupying them are of a character superior to those who are settling in many other regions. It is a very desirable region for the best class of farming immigrants.

The character of the population of the Black Hills has been already described. They are, as a rule, superior to most mining populations. When the division of this Territory is accomplished, as it will be when railroad communication is established from the East with the Black Hills, the southern part will probably have for its northern boundary the forty-fifth parallel as a continuation of the line of Wyoming, and the new State may also have that portion of Wyoming which contains the western half of the Black Hills, as it will be desirable to have that region under one government. This region will have a sufficient population for admission into the Union as a State by that time. The northern part of the Territory, while the largest, will probably have no mineral products except coal, and possibly lead; but it will be a rich farming and grazing country, and accessible both by its rivers and railways to the best markets.

Churches and Religious Teachings.—The population of Dakota, though drawn from such diverse sources, has more of the religious element in it than is found in most of the States or Territories of the West. Several of the colonies, of which there are a considerable number in the Territory, are founded in part on religious principles. This is especially the case with the Mennonite settlements, in which there are from 10,000 to 20,000 people, and the Roman Catholic colonies, which are rapidly increasing in numbers and already give full employment to an active and energetic bishop. The Scandinavian immigrants are mostly Lutherans, and they bring their clergymen with them, and establish churches at once. The Germans, when not Catholics, are mostly rationalists, and not favorably disposed toward religion,

though some of them are very earnest in their Christian zeal. But the large numbers of immigrants from the Eastern States were mostly from Christian homes, and they manifest their remembrance of their early associations by rearing schools and churches at once in these new villages, even while they themselves may be living in a dug-out or a sod-house. All of the Protestant denominations seem to be very fairly represented, and all manifest much zeal in organizing churches and gathering congregations. The irreligious element is stronger in the Black Hills than elsewhere in the Territory, but from Mr. White's testimony already quoted, it seems that there is less Sabbath-breaking and open, unblushing vice there, than in most mining districts.

Taking it all in all, there is not at the present time a better region for the farmer or stock-raiser than Dakota, and those who prefer a mining region can be as well accommodated in the Black Hills as in any part of the West, especially if they do not propose to engage personally in mining.

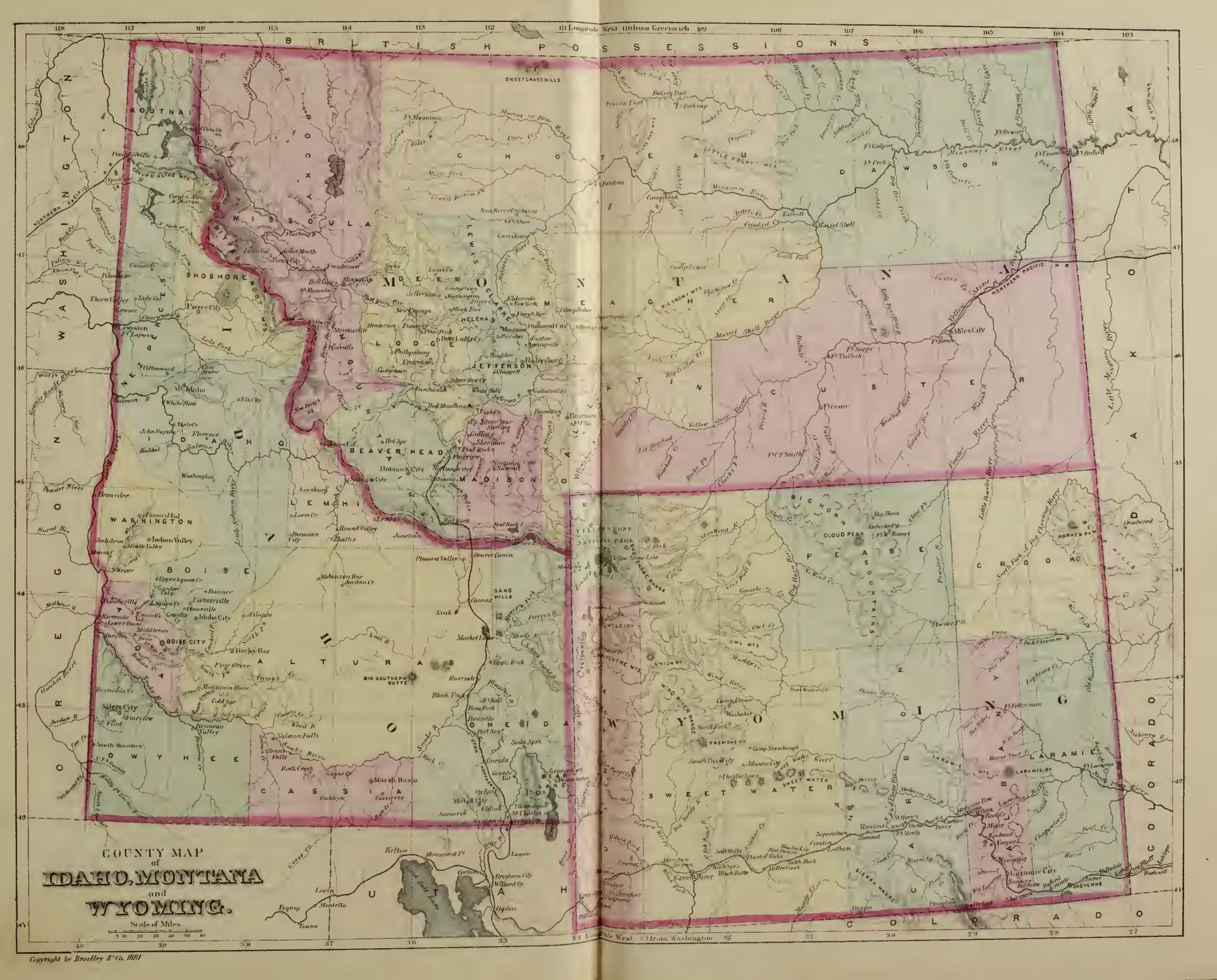
Other States and Territories may boast of greater natural wonders and more grand and delightful scenery, though, in both these particulars, Dakota has much to produce emotions of surprise, awe, and delight; but what gives this Territory its peculiar charm is its thorough adaptation for quiet and beautiful homes. The sun shines on no fairer land, and on none where so many circumstances combine to make a residence so home-like and delightful.

CHAPTER VI.

IDAHO TERRITORY.

TOPOGRAPHY—BOUNDARIES—LENGTH AND BREADTH—AREA—LATITUDE AND LONGITUDE—DISTRIBUTION OF AREA—ARABLE LANDS—GRAZING LANDS—TIMBER LANDS—MINING LANDS—DESERT LANDS—MOUNTAINS—LAKES—RIVERS—CLIMATE—METEOROLOGY OF BOISE CITY—GEOLOGY AND MINERALOGY—THE PRECIOUS METALS—OTHER METALS AND MINERALS—MINERAL SPRINGS—NATURAL WONDERS—SULPHUR LAKE AND DEPOSITS—SALT SPRINGS—SOIL AND VEGETABLE PRODUCTIONS—FOREST TREES—ZOOLOGY—MINES AND MINING—PRODUCTION OF GOLD AND SILVER SINCE 1862—PRESENT FALLING OFF—GREAT MINERAL WEALTH—STOCK-RAISING—SHEEP-FARMING—THE CULTURE OF ARABLE LANDS—OBSTACLES TO THE PROGRESS OF GROWTH OF IDAHO—THE LACK OF RAILROADS AND OF WAGON-ROADS—THE LACK OF CAPITAL—MORMON INFLUENCE THE GREATEST OBSTACLE OF ALL.

IDAHO TERRITORY is one of the central or interior Territories of the northern tier, in form much like a huge chair. Its northern and very narrow boundary (at the top of the chair) is British America, while the seat of the chair is bounded on the north by Montana. The Bitter Root Mountains, one of the principal ranges of the Rocky Mountains, form the eastern boundary between Idaho and Montana, and between it and Wyoming the boundary follows the 111th meridian west from Greenwich. On the south, following the 42d parallel, it is bounded by Utah and Nevada; on the west it is bounded by Oregon and Washington Territory, the line being the 117th meridian to the mouth of the Boise river, thence along the Snake river for 350 miles to Lewiston, and thence northward along the 117th meridian to British America. The southwest corner of Yellowstone Park is within the bounds of Idaho. The Territory lies between the 42d and 49th parallels of north latitude, and between the 111th and 117th meridians of longitude west from Greenwich. It is about 410 miles long from north to south, and a little less than 300 miles wide at its widest portion. Its area as stated at the Land Office is 86,294 square miles, or 55,228,160 acres. There are very diverse estimates of the proportions of this area in arable, graz-


COUNTY MAP
of
IDAHO, MONTANA
and
WYOMING.
Scale of Miles
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ing, timber and mining lands, and desert or worthless lands. Governor Brayman, with a somewhat imperfect acquaintance with the Territory, of which only one-eighth has yet been surveyed, makes the following estimate which those more familiar with the Territory regard as absurd: "An approximate estimate of the quality of these lands will afford, suitable for cultivation in their natural state, 15,000,000 acres; capable of reclamation by irrigation, 12,000,000 acres; grazing lands, 5,000,000 acres; timber lands, 10,000,000 acres; mining tracts, 8,000,000 acres; the 4,228,160 acres of desert are destitute of timber and minerals, and beyond the reach of irrigation. Large portions of the mining tracts bear timber also."

The Surveyor-General, Hon. W. P. Chandler, with a somewhat wider knowledge, writes at about the same time to the Land Office: "Any estimate of the number of acres of the various classes of land in this Territory, so broken in its surface and varied in its climate and altitude, can be only approximate. Of its total area of 55,228,160 acres, I believe 12,000,000 acres to be agricultural, either in its natural state or as it may be reclaimed by irrigation with the available water now flowing in the streams; 25,000,000 acres pasture lands; 10,000,000 acres timber lands; and the remainder, 8,228,160 acres, may be considered worthless, consisting of inaccessible mountain peaks and lava beds."

The surveyor-general would probably include the supposed 8,000,000 acres, or thereabout, of mining-lands in the 25,000,000 grazing and the 10,000,000 acres of timber lands. This last estimate is undoubtedly nearer the truth than the governor's, but in the amount of grazing lands which require always some water, it would seem to be somewhat excessive. A Territory whose average rainfall does not exceed twelve inches, and more than three-fourths of that in the winter and spring, leaving the entire summer and autumn parched and rainless, cannot well have more than one-fourth of its area arable land without irrigation. There are undoubtedly fertile valleys in Idaho, where with, and in some years, without irrigation, large crops can be raised, but these are the exception, not the rule. The Territory might become a moderately good grazing country, if its neighbors,

Montana, Wyoming, Oregon and Washington, were not so much better adapted to grazing.

It is primarily a mining country, and when the railroads now projected or in progress have given it access to a market at reasonable rates it may, if the Mormons and Indians will refrain from killing the immigrants, yield a large amount of the precious metals, and raise enough grain and root crops, beef and mutton to supply its own inhabitants, but there will be little of either to export, at least for some years to come.

Topography, Mountains, Lakes, Rivers, etc.—Idaho is a mountainous Territory, more so, perhaps, than any other of the States or Territories of "Our Western Empire," although there are no summits as lofty as those in Colorado, California, Oregon, Washington or Arizona. The altitudes range from 2,000 feet above the sea in the Snake River valley to nearly 10,000 feet at the summit of some of its loftiest peaks. Its general average of elevation is above 4,000 feet. On its northeast border from Lake Pend d'Oreille and Clark's fork of the Columbia river down to the Lewis or Snake river at the Wyoming boundary, the Bitter Root Mountains, one of the main ranges, though not the highest range, of the Rocky Mountains, separate it from Montana; almost parallel with these is an irregular range trending in general from northwest to southeast, known as the Salmon River Mountains, one of the outlying ranges of the Rocky Mountains. These traverse the central portion of the State. On the west, near the eastern bank of the Snake river, from the Weiser to the Salmon river, is a range of hills 5,000 or 6,000 feet in height. The southern part of the Territory, south of the Snake river, is an elevated plateau, and in the southwest an alkaline desert.

There are many valleys between these ranges of mountains and these elevated plateaux, some of them of considerable breadth and fertility; others broad but barren; others still narrow and fertile, and others yet mere rocky defiles and cañons. There are about twenty lakes of considerable size, and a great number of small lakes or ponds in the Territory. The largest are Lakes Pend d'Oreille, Cœur d'Alene and Kaniksu in the north, the Pay-

ette and Weiser lakes in the centre, Rocky, Bar, Market, De Lacy and Jackson's lakes in the east, and Bear lake in the southeast.

The whole of Idaho, except a very small tract in the southeast, belongs to the river system of the Columbia river and drains into the Pacific ocean. The exception is Bear river and lake in the southeast, the waters of which are discharged into the Great Salt lake. There is also a bare possibility that some one of the sources of the Green river, one of the constituents of the Colorado of the West, may rise in the mountains of the southeast, interlacing there with the sources of the Snake river or Lewis' fork. But more than 80,000 of the 86,000 square miles of the Territory are drained by the great tributaries of the Columbia and their affluents, and five-sixths of the 80,000 miles by the Lewis' fork or Snake river and its branches. The northeast corner is drained by the Kootenai, an affluent of the Columbia, which joins it in British Columbia, and the Pend d'Oreille or Clark's fork crosses the Territory a little above the forty-eighth parallel. The Spokane river, another of the tributaries of the Columbia, which flows through Lake Cœur d'Alene, drains a plateau thirty or forty miles in width, and below this the Snake river, the largest constituent of the Columbia, occupies the whole Territory. The Palouse, one of its principal affluents, in Washington Territory, drains a plateau south of the Spokane, and the Snake river itself, rising by several sources in Wyoming Territory, flows northwest, then southwest, west, northwest and north, having a course of about 1,100 miles in this Territory, receiving during its course between thirty and forty tributaries, some of them, like the Salmon, Boisé, Owyhee, Bruneau, Wood and Weiser, being themselves large rivers. The Salmon river drains the central part of the Territory. The Snake river, owing to its numerous falls and rapids, is not navigable in Idaho, but becomes navigable at Lewiston, the point where it leaves the Territory. At its headwaters, and for a considerable distance below, there are rich bottom lands, which, though 5,000 feet above the level of the sea, will, it is thought, prove productive. For 150 miles below these, it flows through a broad valley of moderately rich and fertile land. At or near the mouth of Bannack river it

enters a deep, rocky cañon, through which it passes for seventy-five miles. In this cañon are several very large falls, one of them the celebrated Shoshoné falls, exceeding Niagara in height (being 200 feet), and rivalling it in the volume of water and the grandeur of its surroundings.

Climate.—The meteorology of Idaho is somewhat meagre. The Signal Service Department has but one station in the Territory, that at Boisé City, and their deficiency has not been, so far as we are aware, made up by private observations. Boisé City is centrally situated, but its elevation is only 2,877 feet, and it gives but an indefinite idea of the temperature, rainfall, etc., of the more elevated tracts where nearly all the mines and many of the agricultural districts are situated. The following table and the appended note give all the particulars furnished by the Signal Service office:

METEOROLOGY OF BOISÉ CITY, IDAHO TERRITORY.

Latitude 43° 40′. Longitude 116° 6′. Elevation above sea-level 2,877 feet.

1877-1878. Months.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Mean Humidity.	Monthly and Annual Rainfall.	Monthly and Annual Mean Pressure.	Direction of Winds in the order of frequency.
1877.	°	°	°	°	per cent	in.	in.	
July	106	44	74.9	62	36.8	0.35	29.509	N. E., N., S. W.
August	98	43	73.9	55	33.3	0.09	29.572	N. E., S., N., N. W.
September	91	32	61.0	59	48.0	0.27	29.653	S., Calm, N. W., N., N. E.
October	74	21	49.0	53	57.1	0.85	29.792	S., Calm, W., N.
November	63	18	41.1	45	69.6	2.05	29.934	S., Calm, N. E., N.
December	54	8	30.9	46	67.9	0.01	30.074	Calm, W., N., S. W.
1878.								
January	55	7	34.3	48	66.2	1.73	30.081	S., Calm, W., N.
February	57	28	39.7	29	67.5	2.18	29.931	N. E., E., S., W., Calm.
March	75	26	48.0	49	62.0	1.63	29.997	S., Calm, W., N. E., E.
April	77	23	51.2	54	51.7	0.37	29.914	W., Calm, N. W., N., S. W., S.
May	86	29	58.8	57	49.9	1.18	29.961	N. W., N., N. E., W., S. E., E.
June	96	43	72.3	53	38.9	0.86	29.975	N. W., N. E., S., N. E.
Year	106	7	52.9	99	54.1	11.57	29.866	S., Calm, N., N. E., W., N. W.

The Signal Service Report for 1878–9 varies but very little from the above. The maximum temperature of the year was 103°, and the minimum 5°, the range, 98°, varying only one degree from the previous year, while the mean was 52.7°. The rainfall was for the autumn of 1878 1.10 inches; for the winter of 1878–9, 5.37 inches; for the spring of 1879, 4.38 inches, and for the summer of 1879, 1.46 inches, making 12.31 inches in all, or .74 of an inch more than the previous year. It is noticeable that 9.75 inches of this, or nearly four-fifths, fell in the winter and spring, and the proportion was about the same as the year before.

Geology and Mineralogy.—The geology of the Territory has been only partially investigated. The mountains, like the Rocky Mountains generally, are at their summits and on their western slopes, granitic or feldspathic, with, perhaps, some metamorphic rocks on their sides. The valleys are on their surface alluvial or diluvial—the result of the constant wear and erosion of the steep mountain slopes. Oftener perhaps than in other States and Territories, this débris from the mountains is a very fine dust—especially in the valleys of the Salmon and Snake rivers. The gold washed out of the veins or lodes in the mountains has been ground by attrition to the finest flour, so fine that although all the sand and the soil along those river valleys for many miles contain large quantities of it, it could not be separated by washing, and was only to be secured by running it very slowly over electro-plated silver plates, covered with mercury.

In the centre of the southern half of the Territory there is an extensive volcanic plateau, inaccessible and unexplored, destitute of soil or vegetation. The Bear river region, in Southeastern Idaho, as well as that bordering on the Yellowstone Park, is volcanic in its character. Among its minerals gold has been found in the fine impalpable powder already mentioned, in large grains and nuggets, and in gold veins and lodes along nearly the whole course of the Snake and Salmon rivers, in the Sawtooth or Salmon river range of mountains at almost all points, and at many points on the western slope of the Bitter Root mountains. On the east fork of Salmon river and about the sources, and indeed in nearly the whole length of Wood river and at the southern termination of the Sawtooth range, silver is very plentiful, and silver mining would be conducted with great success were the facilities of transportation of the rich ores less difficult.* Copper is found in very rich ores—sixty-five to seventy per cent., and also native copper of great purity in Bear Lake county, and in the

* This Wood river region, a district about eighty miles long and forty miles wide, is just now the scene of great excitement from the discovery of a number of rich silver lodes on both sides of Wood river. It is declared by some to be a second Leadville, and hundreds and perhaps thousands are flocking thither from Utah, Nevada, California and some from Northern Colorado. Whether they will come to stay remains to be seen.

Snake river copper mining district. It is also combined with silver in the Sawtooth range and the Wood river district.

Lead in the form of galena or sulphuret and carbonate of lead is found in all the silver mines, and an ore yielding about seventy-eight per cent. of pure lead is found in the Bear river. Iron is abundant and in all forms. Coal is found in great quantities and of excellent quality for coking and furnace purposes along Bear lake, and is also mined at Smith's fork and on Irvin creek. The Mammoth mine here shows a vein seventy feet thick of clear coal, and with adjacent veins, separated by thin veins of clay, will aggregate 200 feet in thickness. The Utah and Northern Railroad, which passes near, will soon open this great mine to a market. There is also a large bed of very good coal in Northern Idaho near Lewiston, and another in Boisé county, about twenty-five miles north of Boisé City. Antimony, arsenic and surphur are found in considerable quantities, the latter especially in the volcanic districts. In Bear Lake county, near the Bear river, there is a sulphur lake very heavily encrusted with sulphur, and a mountain eighty-five per cent. of which is pure sulphur. The "Soda Springs," now becoming a popular resort from Salt Lake City, are in the same vicinity, near the Bear river and the Utah and Northern Railroad.

Mr. Robert E. Strahorn, who has recently explored this wonderful region which gives so many evidences of volcanic action, past and present, thus writes of it in the *New West Illustrated* of December, 1879:

"Soda Springs, a hamlet of probably one hundred souls, is located within a stone's throw of Bear river, near the latter's 'big bend' in Southeastern Idaho, and thirty-five miles east of Oneida Station, Utah and Northern Railway. It takes its name from a group of noteworthy springs in the vicinity, and thrives mainly upon the latter's fast-increasing popularity.

"One spring is graced with a lively steam vent which finds its way upward through a massive boulder. Frémont named it 'Steamboat Spring,' on account of its measured puff which resembles that of an engine. The waters of this spring are utilized in a comfortable bath-house near by. A group of four of the other

springs have attracted particular attention on account of the curative properties of the waters. The strongly mineralized fluid is also ever bubbling up from the depths of pretty basins in Bear river, in Soda creek, along the streets of the village—in fact, everywhere in the vicinity—and is as pleasant as a beverage, as it has been found exhilarating and strengthening as a tonic. Invalids with some of the most deep-set and loathsome blood diseases claim to have found a perfect cure in these fountains. A mile distant are other and not less interesting springs, the waters of which are so thoroughly charged with calcareous matter as to quickly form a coating of limestone upon any object immersed in them.

"'V. de V.' thus humorously writes of the great Hooper Spring: 'Hooper Spring, one mile from the main town, is not surpassed in the world. Eight or ten springs all bubble up within a radius of ten or twelve feet, and all unite in one and flow off into Soda creek, in a stream six feet wide and four feet deep. This is the most powerful spring in the world. Its water is very highly charged. It is surprising how much people drink. Five pints is the usual draught; ten will blow a man up; and then, if you can find his mouth, twenty more will reunite the fragments, free him from disease and set him on his feet, regenerated and born again. The water from this spring is bottled and sold. It will when known become famous the world over. No mineral water I ever drank has such a delicious taste; none causes such an appetite. The men that drink it can't do without it; children cry for it; old people renew their youth at this fountain.'

"The Octagon Spring has received some attention from Captain Hooper, who has a handsome summer villa near by, and in summer we find scores of visitors seated under the rustic shade, drinking the life-saving fluid from early morn until late at night. We meet here the lame, the halt, and even some that are nearly blind, all testifying to the wonderful benefits they derive from these waters. The mineral constituents of these springs render them the best of alteratives, and very efficacious in scrofulous and glandular difficulties, and for all diseases of the skin. They

are also an excellent diuretic, and contain enough iron to make them of value as a tonic. One quart of the water from the 'Octagon Spring' contains:

	Grains.
Sulphate of magnesia	12.10
Sulphate of lime	2.12
Carbonate of lime	3.86
Carbonate of magnesia	3.22
Chloride of calcium	1.33
Chloride of magnesium	1.12
Chloride of sodium	2.24
Vegetable matter	.85

"There is sufficient carbonic acid gas to give the whole a power over disease. As a beverage these waters resemble in taste the famed Saratoga. A few minutes' walk away is a beautiful spring called the Ninety Per Cent. It is all soda save ten per cent. The water is delicious. It contains no iron.

"Four miles southeast of Soda Springs is Swan lake, one of the loveliest natural gems in the Wasatch chain. It reclines in an oval basin, whose rim is ten feet above the surrounding country. The shores are densely covered with trees, shrubs, and the luxuriant undergrowth native to that country. The outlet is a series of small moss-covered basins, symmetrically arranged, the clear water overflowing the banks, trickling into the nearest emerald tub, then successively into others, until it forms a sparkling stream and dances away to a confluence with the Bear river in the valley below.

"The rim is apparently formed by petrifaction, and extends down as far as the eye can penetrate the clear crystal water. Timber and bodies of trees coated with a calcareous substance can be seen in the depths, but no bottom has yet been reached in the centre, and it is supposed that it is fed by subterranean springs from the base of the mountain.

"Adjacent to this fit abode for water nymphs is the singular sulphur lake, out of whose centre liquid sulphur incessantly boils and coats the shores with thick deposits, looking as though it might be a direct out-cropping of Plutonian regions. Near by

is a mountain, eighty-five per cent. of which is pure sulphur. Mr. Williams is now hauling several tons of it to Oneida Station for shipment to Mr. G. Y. Wallace, of Salt Lake, who will experiment with it to ascertain whether it will pay to make it an article of commerce. The great sulphur deposit extends from the base of the mountain to an unknown depth, width and breadth. Remove the top crust anywhere near where it crops out and you find almost pure sulphur. The bed must be of immense area. You can load a wagon with your hands without pick or shovel as quickly as you could fill it with corn. You can take up a rock and touch a match to it and it will burn up, leaving a black substance which probably represents the impurity. A piece that weighs a pound will leave a lump of this about as large as a pea.

"Four miles from the village is the great ice cave, which a recent visitor describes as follows: 'This cave is situated very close to the roadside, on a level stretch of prairie about midway between the two crossings of the Bear river. We commenced the descent just as the heavens were reverberating with deep-rolling thunder and the rain pouring down in a perfectly reckless manner, thereby making us feel that it was an opportune time to shelter ourselves beneath the arching rocky cavern. Following our guide, we descended a rocky stairway some twenty feet to a level grassy rotunda some hundreds of feet in circumference, walled in by solid lava rocks. From this we descended still further over a rugged, rocky pathway, about twenty feet, when we found ourselves on the congealed floor of the immense ice cave, where ice can be found all the year round. While our guide was lighting our tallow dips, we surveyed the rocky walls which surrounded us. The roof, some ten feet above our heads, was filled with little niches or pockets, which had been utilized by cave swallows, while the side walls were as perpendicular and solid as though hewn by the hand of man out of solid rock. Coursing our way over the ice, which was apparently firm and solid for a distance of about 100 yards, we came to a huge pile of lava rock which had rolled from the roof and almost choked up the passage-way. Our guide bade us follow him, and we soon found ourselves once again in a clear open way, wide and

high enough to drive a six-horse stage-coach comfortably. This smooth tunnel we follow for probably 100 yards, when we again descend a rocky stairway, some ten feet or more, and stand upon what apparently was once the bed of a large river, with a perfectly solid sandy floor. The roof and side walls are here found to be covered with minute stalactites which, reflecting the light of our candles, lend a weird aspect to the surroundings. We now proceed onward several hundred feet through this perfectly symmetrical tunnel to the end, or what appears to be the end.'

"About two miles to the northwest of the ice cave is a slumbering volcano, out of which came part of the immense bodies of lava that cover this plain for miles around. The rim of the crater is almost circular, and stands up about 200 feet above the level of the plateau below. In the cooling process, the heart of the crater settled down about 100 feet below the rim, leaving a perfect representation to the student of nature of an immense extinct volcano. We have been able, during our short sojourn in this wonderland, to clearly trace nearly fifty immense extinct volcanoes, which appear, from the apparent age of the lava beds, to have been flowing about the same time.

"All kinds of game common to the western mountains can be found in the region surrounding Soda Springs. Bear, deer, elk, mountain lions, mountain sheep, sage hens, and ducks are especially plentiful. Trout fishing in Soda creek, Eight Mile creek, Bear river, and Blackfoot river, is of that character which can be appreciated even by the novice. Cast your hook in almost any of these waters, and prepare for a two or three pound trout as an almost instant result.

"The altitude of Soda Springs is 5,738 feet. The warmth of summer is tempered by the coolness of the nights. Blankets are not uncomfortable even in the warmest nights of August. The atmosphere is dry, like all mountainous regions, and is therefore very favorable to consumptives or those afflicted with pulmonary diseases. This was once the favorite resort of Brigham Young, and is still the regular summering place of numerous Salt Lake City merchants, who have built appropriate residences.

"Salt is also one of the Idaho minerals. The Salt Springs

which have been utilized since 1866, are in Oneida county, near the Wyoming border, about fifty miles northeast of the Soda Springs, on the Old Lander emigrant road leading from South Pass to Oregon. The road passes directly along the flat below the spring, where, before being concentrated in pipes, the water had spread out and, evaporating in the sun, formed large masses of salt crystals which attracted the attention of passers-by and led to the discovery of the spring flowing from the hillside above. It is clear and sparkling as the purest spring water, and never would be suspected of containing mineral. The valley in which it is situated is known now as Salt Spring valley, and is about ten miles long by an average of one mile wide; through it flows a rapid stream well filled with mountain trout.

"The Salt Springs were first taken up by B. F. White, Esq. (the present owner), and partner, in June, 1866, and works have since been in constant operation, every year witnessing an increase in the demand, until almost the entire stream flowing from the spring has been utilized. The salt is made by boiling the water in large galvanized iron pans, into which it is led by wooden pipes leading direct from the spring, thus insuring perfect cleanliness, and a uniformly white, clean and beautiful product. The water is kept constantly running into the boilers, and is kept at a boiling heat all the time. The salt is shoveled out once in every thirty minutes, and after draining twenty-five hours is thence thrown into the drying-house, there to remain until sacked and prepared for shipping. The most scrupulous cleanliness is observed in every operation, and when the immense banks of salt lie piled up in the drying-house, they resemble huge snow-banks more than anything one could imagine. It takes from two to four months for salt made in this manner to dry and ripen, and for this reason it becomes necessary to keep on hand a large supply, so that at any time a thousand tons of the purest and whitest salt in the world may be seen here in these far west 'Oneida salt works.'

"Following is an analysis of the Oneida salt, made by Dr. Piggot, the well-known analytical chemist, of Baltimore. It shows a higher percentage of pure salt than the celebrated Onondaga

brand, manufactured at Syracuse, while neither 'Liverpool,' 'Turk's Island' or 'Saginaw' salt approach it in purity, or are as white, clear or soluble in liquids:

Chloride of sodium (pure salt)	97.79
Sulph. soda	1.54
Chloride of calcium	.67
Sulph. magnesia	Trace
Total	100.00

"In 1866 only 15,000 pounds of salt were here manufactured; but the demand in Idaho, Utah and Montana has so steadily increased that the product has averaged about 600,000 pounds per annum up to 1877. In 1878 it ran up to 1,500,000 pounds, and in 1879 to nearly 2,000,000 pounds, much of the production of the last two years having been consumed in Montana smelting works. It is sacked in 5, 10, 25, 50 and 100 pound bags, and is laid down at points 200 miles distant by wagon transportation at from three to four cents per pound."

Soil and Vegetable Productions.—We have already stated our conviction that the amount of arable land in Idaho did not greatly exceed one-fifth of its surface, even including those lands capable of successful irrigation. Of course in a Territory of which not one-seventh, including mining lands, has been surveyed, such a conviction must rest partly on general principles. Our reasons are these: The Rocky Mountains, which form the eastern boundary of the Territory, present only their western face to it; and in the Rocky Mountains, the Sierra Nevada and other high mountain ranges on this continent having a general direction from north to south, the western face or slope is precipitous, and has very little arable land, though portions of the mountain below the snow-line may be covered with timber. But it is precisely these precipitous mountain sides which are oftenest the places of deposit of the precious metals. In Idaho we have not only the western face of the Rocky Mountains, but the long and bold spur of that range known as the Salmon River and Sawtooth Mountains, the latter name being given as characteristic of their precipitous faces. There is also a rocky wall overlooking the val-

ley of the Snake river for a long stretch of its course, and the deep, dark cañon through which it flows for seventy-five miles in the lava lands. There are furthermore the alkaline lands, a desert and dreary waste, the lofty *mesas* and plains, not irrigable, and unfit even for grazing without it, and the hillsides and foothills facing the east, which, though affording good pasture grounds in many instances for herds of cattle and flocks of sheep, are not adapted to cultivation. In short, it is only the river valley and bottom land, and not all of these, which can properly be called arable lands, and with an average rainfall of only twelve inches, more than three-fourths of it between November and April, even these must often, perhaps not always, be irrigated.

The soil, when irrigated, is generally fertile; perhaps not so rich as that of Montana, or California, or the Willamette valley, but it yields for a first crop from twenty-five to forty bushels of wheat, fifty bushels or thereabouts of barley, and fifty-five of oats. Corn does not do well, except in the river bottoms, the season being too short for it. Fruits are said to be raised with great success, especially in Northern Idaho.

The forest trees of Idaho are mainly those of the Pacific slope, but rather of Oregon and Washington, than of California. The various species of pine, including the piñon or nut pine, the *P. ponderosa* or yellow pine, and several other species of fir, spruce, tamarack and cypress, the red cedar, though not the "Redwood," the white cedar, the juniper, and some of the hardwood trees, as the oak of three or four species, chinquapin, hickory, etc., etc., are the principal trees of its forests. At full age, the pines, firs and cedars attain a height of about 150 feet. Like the Pacific States generally, it has very little sod, though the bunch grass is found on most of the grazing lands, and is so nutritious that cattle fatten upon it very readily. Wild flowers abound in the valleys, and many of them are of remarkable beauty. Lands upon which are found in luxuriant growth the bunch grass, larkspur and the wild sunflower of the Pacific coast, are well adapted to the growth of cereals, and these are the most common products of the plateaux of Northern Idaho. Wild fruits abound in Northern and Central Idaho, especially the wild

berries and wild cherries, though the wild cherry of the Pacific coast is a shrub, and not a tree. Its fruit is, however, more edible and pleasant than that of the East.

Zoölogy.—The wild animals of the Territory are, in general, those of Oregon and California. The grizzly bear is seldom seen, but has been found in the Territory. The black and cinnamon bear are common; the puma, cougar, panther or mountain lion (the beast is known by all four names) is troublesome, especially in the grazing lands; the gray wolf and the western coyote, all the fur-bearing animals, the martin, fisher, lynx, possibly the ocelot, the otter, mink, muskrat and beaver, as well as the smaller rodents; the marmot or gopher, sewellel and other species of mole are abundant. Moose (*Alces Americanus*) are found occasionally in Northern Idaho. Naturalists insist that the moose and true elk are identical; but the animal generally known as the elk or Wapiti (*Cervus Canadensis*) differs materially from the moose, and is the largest of the deer family in America; it roams over the whole Territory; two other species of deer are distinguished by the hunters; the bighorn or Rocky Mountain sheep is found in considerable numbers on the mountains and in the lofty valleys, and occasionally the Rocky Mountain goat or goat antelope is seen. The antelope of the plains is rare, if seen at all, west of the mountains, and the buffalo is not now, we believe, seen in this Territory, though said formerly to have been found here in vast herds. Of birds, there are considerable numbers, the *raptores* or birds of prey predominating, though the grouse, pheasant and ptarmigan families are abundant. Song-birds are not as abundant as in more southern climes. There are a few reptiles and serpents. The rivers and lakes abound with fish. Salmon trout, brook and lake trout and many other species of edible fish, among which the Red fish, found only in four lakes in the world, of which two are in Idaho, is the special boast of the people of the Territory, are abundant in the lakes and streams of the Territory.

Mines and Mining.—The product of the mines of Idaho from the first attempt at mining there to the present time, a period of about twenty years, is somewhat more than $70,000,000. More

than three-fourths of this has been from placer mining, and has been, of course, gold. The placers yielded, from 1866 to 1870 or 1872, from $7,000,000 to $10,000,000 per annum. In 1868 and 1869 there had been signs of the exhaustion or unprofitable working of the placers, and attention began to be turned to quartz and lode mining. It should be said that the success of the placer mining on the Snake river was greatly impeded by the fineness of the gold dust; it was, in the miner's language, flour gold, and pan, rocker and "Tom" could not separate it from the finely powdered clay in which it was found. A hundred pounds of pay dirt might contain, and often did, two or three pounds of gold or even more; but the old process of washing would hardly gain a quarter of an ounce. Of late new and better processes have enabled the miners at some points to secure the greater part of this gold previously wasted.

The gradual failure of the placers stimulated the prospecting for lodes of gold and silver, and from 1867 to the present time the discoveries of valuable mines have been very frequent, and some of them of veins which yielded remarkable quantities of gold and silver. Owyhee county, which had, in 1869, ten mines actively at work, and thirty or forty mining claims, and which was producing from $1,000,000 to $1,400,000 per annum, is now apparently almost deserted, very little having been done there since 1876, in consequence of the bad management and frauds of the officers of the largest mines and the failure of the Bank of California; while the greater attractions of the Salmon river gold fields, the Snake river gold fields, the gold and silver mines of the Sawtooth range and the Wood river district, the Yellow Jacket district, Yankee Fork, East Fork, Bay Horse, Custer City, Challis, Silver Star and other districts and mines have completely overshadowed them. A few mines are still worked in a small way in Owyhee county; a larger number in Alturas county, though not very profitably; most of these are silver and will be more profitable when transportation is cheaper. Boisé county has many mines, both of gold and silver, in course of development, the mines of the south part of the county being gold, while those of the northern part are both gold and silver. The Snake

river gold fields belong to placer mining. Lemhi county, in which is the Yankee Fork mining district, and the remarkable Charles Dickens, Challis and Custer Mountain lodes, gives promise of great productiveness for the next few years. In Idaho county, Northern Idaho, there are a large number of gold and silver-bearing veins, but no roads to bring in the machinery, no mills to work the ore, and nothing but pack-mules to carry the ore some hundreds of miles to points where it can be reduced. It requires ore of very high grade to pay such heavy expenses. Ada county, in which the capital, Boisé City, is situated, has many excellent silver lodes, but very poor facilities for reducing them cheaply. The production of gold and silver in 1878 was estimated at $1,878,000, and for 1879 at over $1,000,000.

There would be, if there were good roads to drive cattle to market, excellent opportunities to extend the grazing interest greatly in this Territory, for some of its grazing-lands are equal to those to be found anywhere, and a market could be found for them from Northern Idaho by the Northern Pacific, and from Central and Southern Idaho by the Utah and Northern and Union Pacific Railroads. There are perhaps 20,000 cattle sent out of the Territory yearly, but the business is not prosecuted with any energy, and amounts at the utmost to not more than $400,000 per annum. The wild animals are too numerous and fierce to make sheep-farming profitable at present.

The farming crops are limited by want of a farming population, good roads and good and easily accessible markets, and small as is the population of consumers, the production of grains and root crops does not more than consume it.

Indians.—There were formerly a considerable number of hostile and warlike Indians in this Territory, but by wars and outbreaks they have been reduced until there were in 1880 only 4,020 Indians in all in the Territory, viz.: 460 Bannocks, 1,040 Shoshones, 1,208 Nez Perces, 712 mixed Shoshone Bannock and Sheep-eater, 600 Pend d'Oreille and Kootenai. Their reservations amount to 2,748,981 acres, or more than a square mile to an Indian. About one-fifth of them have adopted citizen's dress and are partially civilized.

Surrounded on all sides by Territories in which the most intense activity and energy prevails, Idaho may be compared to a Sea of Sargasso, whose tranquil surface is ruffled by no wind, and over which are gathered vast masses of sea-weed and drift-wood, the home of foul birds of prey.

There is undoubtedly great mineral wealth in Idaho Territory, but with the exceedingly imperfect facilities now existing or likely to exist for some time to come, for reducing the ores, or sending the bullion to market, there can be very little inducement for capitalists to engage in mining operations. There is hardly a good wagon road in the Territory; most of the transportation of ores, machinery, farming implements, furniture, etc., is on the backs of pack-mules. The two railroads—the Utah and Northern, which passes near the eastern boundary into Montana, and the Northern Pacific, now being constructed across the extreme northern portion of the Territory—the Pend d'Oreille country—however much they may benefit other interests, are not so situated as to render any material aid to the mining interests of the Territory, or to diminish, except very slightly, the cost of transportation to reduction works and markets. If the projected Oregon division of the Utah and Northern Railroad, extending from Portneuf to Boisé City, and thence west into Oregon, were likely to be built, it would afford prospective relief; but it was projected to prevent the progress and completion of the Northern Pacific, and having failed in that, it will prove too unprofitable and too costly an experiment to be undertaken by so conservative an institution as the Union Pacific Railway.

There are, indeed, two projected branches of the proposed road of the Oregon Railway and Navigation Company from Wallula, on the Columbia, northeastward, to reach eventually Moscow, in Northwestern Idaho, near Lake Cœur d'Alene, and southeastward to Baker City in Oregon, a continuation of which might strike the mouth of Weiser river; but these will not be built for some years, if ever, and without connections in the Territory, would be of little or no value.

Meanwhile, all the interests of the Territory are suffering and are likely to suffer. She has not only the products of her mines,

but might have also considerable amounts of grain to sell to her own people, if it could be transported, and if there were inducements in the market, which would be afforded by a rapidly increasing population, the amount might be greatly increased. She might engage largely in stock-raising and dairy-farming, but she has no roads over which her agricultural and pastoral products could be sent to markets either within her own bounds or without them. It may be asked why does she not build wagon roads, which would at least facilitate inter-communication, and would in time lead to railroads? There are several reasons. The construction of wagon roads over so rough a country, if not impracticable, is very difficult and expensive. If application had been made in season probably the general government would have made some grants of lands for their construction, though that would not perhaps have effected its object; but the policy of the government has been for several years past decidedly opposed to land grants for either railroads or wagon roads. Private or corporate capital might do this, as it has in other States, but the obstacles are many, and capital is timid. The Indian tribes have been, until recently, more or less hostile. But perhaps a still stronger objection to the free immigration which would have forced the construction of these roads, has been the fact that for the last ten years it has been the settled purpose of the Mormon leaders in Utah to take possession of Idaho and of other adjacent Territories also, if possible. They have planted their colonies in every eligible position in Southern and Central Idaho, and have driven away, as far as possible, other immigrants, unless they would submit to their authority and dictation.

The result has been disastrous. The Mormon authority is an autocracy or an oligarchy; and free and independent men could not and would not submit to it. The Territory was settled much earlier than Montana or Dakota, but whereas it had in 1870 a population of 15,000, exclusive of Indians, it has now only 32,611, and this increase is very largely of Mormon colonists sent by the central authority at Salt Lake City to establish themselves there. There is no enterprise, no progress, and the Territory, with its great mineral wealth and its favorable position, is

likely to remain undeveloped and largely unpeopled as a consequence of Mormon greed and evil influence. In such a Territory we cannot invite immigrants to settle.

CHAPTER VII.

THE INDIAN TERRITORY.

MINUTE DETAILS CONCERNING THE INDIAN TERRITORY NOT NECESSARY AT THE PRESENT TIME IN THIS WORK—WHY?—A FEW GENERAL POINTS IN VIEW OF THE ULTIMATE POSSIBILITY OF A CHANGE, WHICH MAY PERMIT IMMIGRATION—TOPOGRAPHY—LENGTH AND BREADTH—LATITUDE AND LONGITUDE—AREA—BOUNDARIES—DIVISION INTO INDIAN RESERVATIONS OR NATIONS—AREAS OF MOST OF THESE—TRACTS NOT YET ALLOTTED, AND INDIAN BANDS NOT PERMANENTLY LOCATED—NUMBER OF INDIANS IN THE TERRITORY IN 1878—PRESENT NUMBER—THE FIVE LEADING TRIBES, CHEROKEES, CHICKASAWS, CHOCTAWS, CREEKS AND SEMINOLES—THEIR PROGRESS IN CIVILIZATION—THE CAPITALS OF THEIR RESPECTIVE NATIONS—THEIR FARM PRODUCTS IN 1879—THEIR LIVE-STOCK—VALUATION OF REAL AND PERSONAL ESTATE—SCHOOLS, CHURCHES, BENEVOLENT INSTITUTIONS—NEWSPAPERS—POST-OFFICES—THE SMALLER TRIBES AND BANDS LESS CIVILIZED—SURFACE OF THE COUNTRY—MOUNTAINS, RIVERS, LAKES—CLIMATE—METEOROLOGY OF FORTS GIBSON AND SILL—GEOLOGY AND MINERALOGY—SOIL AND VEGETATION—FORESTS—RAILROADS—THE CHARACTER OF THE POPULATION—REV. TIMOTHY HILL'S ACCOUNT OF THE TERRITORY—THE INDIAN TITLE TO THE TERRITORY—HISTORY OF THE REMOVAL OF THE FIVE TRIBES AND OTHER INDIANS—RE-PURCHASE OF SOME OF THEIR LANDS BY THE GOVERNMENT—EFFORTS TO DRIVE THEM FROM THIS TERRITORY—THE OUTLOOK FOR THE FUTURE—POSSESSION OF THEIR LANDS IN SEVERALTY THEIR ONLY HOPE—INDIAN ANNUITY FUNDS.

THOUGH comprised within the limits of "Our Western Empire," and probably destined eventually to form one of its States, when the Indians shall have become citizens, and the aggressive spirit of the Western settlers shall have ceased to covet their lands, or to propound the atrocious sentiment "that the only good Indian is a dead one"—yet, in the present condition of affairs, we should not be justified in going into minute details respecting the Indian Territory, inasmuch as it is by solemn treaties the exclusive home of the red man, and all explorations

or descriptions of it, having in view the promotion of white emigration thither, are strictly forbidden. We shall therefore only describe it; briefly give an account of its Indian inhabitants, their locations, condition, property and productions, and their probable future, and pass on to other States and Territories to which the immigrant may have free access.

The Indian Territory is situated between the parallels of 33° 35′ and 37° north latitude, and between the meridians of 94° 20′ and 103° west longitude from Greenwich. The greater part of the Territory is between 94° 20′ and 100° west; but a narrow strip thirty-five miles in width, and extending from the 100th to the 103d degree of longitude, separates Northwestern Texas from Kansas and Colorado, and that strip watered by the Cimarron and Canadian rivers, forms a part of the Indian Territory. Its length from east to west along the northern border is 470 miles, and south of latitude 36° 30′, 310 miles. Its breadth east of the 100th meridian averages about 210 miles. Its area is now stated as 69,304 square miles, or 44,154,240 acres. It is bounded on the north by Kansas and Colorado; on the east by Missouri and Arkansas; on the south by Texas, from which it is separated as far west as the 100th meridian by the Red river; west of that meridian by the parallel of 36° 30′. Its western boundaries are Texas and New Mexico. Not quite one-thirteenth of its surface is in forests; the remainder is prairie, deep ravines, or wider valleys, and pleasant mountain slopes.

Besides a considerable portion still unassigned, the Territory contains eighteen or twenty Indian reservations. The Cherokees have two tracts: one of 5,960 square miles in the northeast, east of the 96th meridian, and bordering on Kansas and Arkansas. They also own a strip containing about 8,500 square miles, about fifty miles wide along the Kansas border from the Arkansas river, west to the 100th meridian. The Choctaw reservation, 10,450 square miles, is in the southeast, bordering on Arkansas and Texas. The Chickasaw reservation, 6,840 square miles, joins this on the west, and is separated from Texas by the Red river. The Creek reservation, 5,024 square miles, is in the eastern central part of the territory, between the Chero-

kees and Choctaws. The Seminole reservation, 312.5 square miles, lies southwest of the Creeks, and north of this that of the Sacs and Foxes, 756 square miles. A tract of 900 square miles, lying west of the Seminole reservation, is set apart for the citizen Pottawatomies and the Absentee Shawnees. West of the Cherokees' second reservation, and bounded north by Kansas, and southwest by the Arkansas river, is the Osage reservation of 2,345 square miles; and northwest of this is the little reservation of the Kaws, 156 square miles in extent. These are late comers, though not the latest, having been removed from Kansas in 1873. The Kiowas, Comanches and Apaches occupy a tract of 5,546 square miles in the southwest, bounded on the east by the Chickasaw reservation. North of these the Arapahoes and Cheyennes have a tract of 6,205 square miles. Fragments of ten tribes, viz.: the Quapaws, the Confederated Peorias, Kaskaskias, Weas, Piankashaws and Miamies, the Ottawas, the Shawnees, the Wyandots and the Senecas, severally, have reservations, aggregating in all 297 square miles, in the northeast corner of the Territory, east of the Neosho river. There are eight affiliated bands of Wichitas, Keechies, Wacoes, Tawacanies, Caddoes, Ionies, Delawares and Penetethka Comanches, who are gathered around an agency on the Washita river, west of the Creek country, but they have no reservation. The Modocs, the remnant of Captain Jack's band, and about 400 Kickapoos and Pottawatomies, were sent to the Indian Territory in 1873, and the Modocs were placed temporarily on the Shawnee reservation, and the latter settled on a tract on the Kansas border west of the Arkansas river. The Poncas and some bands of the Sioux were sent into the Territory in 1876 and 1877; some of the Arizona Indians about the same time, and some bands of Utes still later.

In 1878 the Indian office reported the whole number of Indians in the Indian Territory as 75,479. The increase by births, and the additional bands which have been sent in since that time, may have increased the total number to 78,000. These are for the most part recognized as civilized or partly civilized Indians. The greater part of them wear citizen's dress, and a fair propor-

tion have farms or herds of cattle or sheep, and can read or write at least in their own language. This is especially true of the five leading tribes, the Cherokees, Choctaws, Creeks, Chickasaws and Seminoles. They are capable now of becoming citizens. They have churches and schools, legislatures of their own, and have for many years maintained self-government with perhaps no more failures than some of the States of the Union. The capital of the Cherokee nation is Tah-le-quah; of the Chickasaws, Tishemingo; of the Choctaws, Armstrong Academy; of the Creeks, Ok-mul-kee; of the Seminoles, We-wo-ka.

In 1878–9 these five civilized tribes cultivated 237,000 acres of land, and raised 565,400 bushels of wheat, 2,015,000 bushels of corn, 200,500 bushels of oats and barley, 336,700 bushels of vegetables, and 176,520 tons of hay. They own 45,500 horses, 5,500 mules, 272,000 head of cattle, 190,000 swine, and 32,400 sheep. Among other products of Indian labor during the same year were 8,100,360 feet of lumber sawed, 132,886 cords of wood cut, 200,600 shingles made, 387,000 pounds of maple sugar made, 164,000 pounds of wild rice gathered, 17,000 woollen blankets and shawls woven, 2,530 willow baskets made, 3,800 cords of hemlock bark peeled, 211,000 pounds of wool clipped for sale, and 3,600 barrels of fish sold. These tribes were much broken up during the late civil war, many of them having taken part in it, a majority probably on the side of the South, yet in 1872 they had so far recovered from its effects that their property, real and personal, was valued at $15,257,700, and is now estimated at over $20,000,000. The population of these tribes is about 55,000. In 1873 they maintained 164 schools with 182 teachers, and 4,300 scholars in average attendance. The number of churches is not known, but in 1872 there were 7,090 Indian members of the different churches. The Cherokees have an orphan asylum with ninety inmates. The Creeks have also an orphan asylum. There are three weekly papers published in the Territory, one English and Cherokee at Tah-le-quah, one English and Choctaw at New Bogy, and one English at Caddo. There are twenty-eight post-offices in the Territory.

Of course, many of the smaller bands of Indians, especially

those more recently sent there, have not attained to this measure of civilization, but for the most part they are improving and will continue to improve if under favorable influences.

Surface, Mountains, Rivers, Lakes.—The surface of the Territory, like that of Kansas, at the north of it, has a general declination toward the East. In the southwest the Wichita Mountains attain to a moderate elevation, and in the east there is a continuation of the Ozark and Washita hills from Arkansas; beyond these the country spreads out into rolling prairie lands rising gradually to the west, and in the north there are table lands rising from 3,500 to 4,500 feet above the sea. The Territory is well watered. The Red river, which forms its southern boundary, receives numerous affluents great and small on its northern bank: the Arkansas, which is the principal river of the Territory, has for its largest tributaries the Canadian, the north fork of the Canadian, the Cimarron or Red fork, and the Little Arkansas, on its south bank, and the Neosho, Verdigris, and Illinois on the north, and is itself a mighty stream where it enters the Territory from Kansas. Owing to the falls which obstruct it, the Arkansas is only navigable in the Indian Territory as far as Fort Gibson, where the Missouri, Kansas, and Texas Railway crosses it. The Red river is navigable for nearly the whole distance along the southern border of the Territory. None of the tributaries of the Arkansas are navigable for any great distance, though several of them are large streams and afford permanent water power. The Territory is well watered, surpassing Kansas in that respect.

Climate.—The climate is generally mild and salubrious, but inclined to be dry in the northwest. In the southwest there are tracts of marshy lands where intermittent and remittent fevers prevail. The mean annual temperature in the southeast is 60°, in the northwest 55°. The annual rainfall, which, in the southeastern extremity of the Territory is fifty-two inches, decreases to thirty-five inches in the central region, and is less than twenty inches in the northwest corner.

The following table gives the meteorological statistics of Fort Gibson, on the Arkansas river; at the mouth of the Neosho, and at Fort Sill, on Cache creek, in the southwest of the Territory.

METEOROLOGICAL TABLE OF STATIONS IN INDIAN TERRITORY IN 1877 AND 1878.

	FORT GIBSON. Latitude 35° 43′. Longitude 95° 16′. Elevation above sea 511 feet.								FORT SILL, Latitude 34° 40′. Longitude 98° 30′.				
Months and Year.	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Humidity.	Mean Pressure of Barometer.	Rainfall.	Winds in order of frequency.	Monthly and Annual Range of Temperature.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rainfall, Annual and Monthly.
	°	°	°	°	per ct.	in.	in.		°	°	°	°	in.
Year.	60.7	98	13	85	67.5	29.937	46.02	S., S. E., N., E., N. W.	87	99	12	57.5	50.31
1877.													
July	78.2	97	55	42	68.3	29.936	2.89	S., S. E., E., N.	43	99	56	77.5	4.49
August	77.1	98	53	45	67.1	29.945	3.78	S. E., S., N., E.	43	98	55	76.5	2.50
September	70.5	90	41	49	69.7	29.948	2.21	S. E., S., E., N.	49	98	49	73.5	5.98
October	60.5	87	34	53	71.5	29.952	6.36	S., S. E., N., N. W.	65	88	23	55.5	6.86
November	44.3	71	11	60	67.3	30.073	4.19	S., S. E., N., N. W.	62	74	12	43.5	4.65
December	48.0	69	14	55	67.9	30.107	3.00	S., N., N. W., S. E.	52	72	20	46.	6.97
1878.													
January	39.2	66	13	53	68.7	30.039	2.79	N., S., S. E., E., N. W.	54	67	13	40.	1.91
February	45.4	69	19	50	65.1	29.896	2.40	N., S. E., S.	57	79	22	45.5	1.83
March	57.3	81	29	52	56.2	29.886	1.44	S., N., S. E., E., N. W.	52	82	30	56.	0.35
April	64.4	87	36	51	64 0	29.726	2.83	S., S. E., E., N. W.	50	90	40	65.	1.85
May	68.5	90	44	46	71.0	29.804	7.52	S., S. E., N. W., N. E.	45	92	47	69.5	4.06
June	74.9	93	54	39	73.3	29.875	6.61	S., E., N. W., N., S. E.	34	92	58	75.	8.86

Geology and Mineralogy.—The geology of the Territory has not been very thoroughly explored. It seems to partake more of the characteristics of Kansas than of Arkansas, and some of

its formations extend across the Red river into Northern Texas. Some of its mountains have azoic rocks near the surface, while in others, especially those of the central part of the Territory, the cretaceous period seems to have been predominant. There are in the west and northwest extensive deposits of gypsum, and in the Cherokee country are found coal, iron, good brick clay, marble of fine quality, and a yellow sandstone suitable for building purposes. It is probable that there is copper, and perhaps salt in the southwest, as the beds of copper ores come to the Red river in Wichita and Clay counties, Texas,* and there are salt springs in the same vicinity. Salt also abounds in the northwest of the Territory, and many of the springs and streams are very salt. There has been no search for the precious metals in the Territory, and their existence is not known with certainty.

The coal beds are an extension of the coal deposits of Missouri and Arkansas. At McAllister, in the Choctaw country, a mine is worked by a large force of white men, who pay a royalty to the Choctaw government; and near Muscogee, in the Creek Nation, is a fine mine of rich coal. All the coal mined in the Territory is bituminous, and of the best quality.

Soil and Vegetation.—The valleys of the Wichita range are fertile and have good timber, water and grass, and generally the region south of the Canadian river possesses a fertile soil and is well adapted alike to cultivation and grazing. There are extensive forests in the northeastern portion of the Territory, but about three-fifths of the Cherokee country is rocky, and only fit for grazing. Between the 97th and 98th meridians there is a narrow belt of timber called the "Cross Timbers," extending from the Cimarron, or Red fork of the Arkansas, to and beyond the Texas border. The region west of this and north of the Canadian river is reported to be sterile, without trees or much grass, with only a few sickly shrubs and cacti, and the soil covered with an alkaline or saline deposit. This land will produce nothing without irrigation, and may require also a plentiful application of gypsum, but with these measures it may yield abundant crops. The principal forest trees are the cottonwood, oak of several

*Copper has been discovered, but not mined, at several points in the Territory.

species, sycamore, elm, hickory, ash, yellow pine, osage orange or *bois d'arc*, pecan and hawthorn. Wild grapes of excellent flavor abound. The arable lands of the Territory are well adapted to cereal and root crops, and the yield per acre of wheat, Indian corn and oats is large. In the hilly and broken country the fruits of the temperate zone do well. Apples, peaches, pears, plums, cherries, and small fruits of good quality are largely raised.

Railroads, etc.—Aside from the river navigation, there is one railway which crosses the eastern portion of the Territory from north to south, viz.: the Missouri, Kansas and Texas Railway, extending from Sedalia, Missouri, to Denison, Texas, where it joins other Texas roads. The Atlantic and Pacific Railway, from Pacific, Missouri, also enters the Territory from the northeast, and forms a junction with the Missouri, Kansas and Texas at Vinita, in the extreme northeast of the Territory. This road, the Atlantic and Pacific, had projected a route crossing the Indian Territory from east to west along the valleys of the Cimarron and Canadian rivers, but in the strife of the different transcontinental routes and the difficulty of obtaining the right of way through the Territory, we believe this project has been given up.

The Character of the Population.—Rev. Timothy Hill, D. D., long a missionary in the Indian Territory, and thoroughly conversant with the tribes which occupy it, thus describes them in a communication to the *New York Evangelist* in the summer of 1880:

"The present population is about 80,000. I have conversed with a large number of men, native and long resident there, and none have placed it less than the number given, and some have placed it as high as 100,000. There can be but little doubt of 80,000. Without any claim to absolute accuracy, I place the population as Indians and people of Indian extraction about 62,000; colored, 8,000; and whites, 10,000. The Indians are well classified into civilized and uncivilized. In the former class come the Cherokees, Creeks, Seminoles, Choctaws, Chickasaws, a remnant of Delawares, who are Cherokee citizens; a part of the Shawnees, Pottawatomies, and Senecas. We shall gain in definite

impression if we consider each of these tribes and classes by themselves.

"Easily foremost are the Cherokees. They occupy the northeast portion of the Territory (except a limited portion in the extreme northeast corner), with only one district or county south of the Arkansas river. The Cherokee government has a population of about 18,000, but only some 12,000 of them are Indians, the remainder are colored and white. These people all live in houses, some of them large and well furnished. They live comfortably, and are slowly gaining property and increasing the comforts of life around them. The war stripped them bare, and they are now only regaining some of their lost property. The language of the Cherokees is extremely difficult to acquire; but a large number of them speak English, and no difficulty would be found in travelling nearly all over their country without an interpreter. But to reach the full bloods, an interpreter will frequently be needed.

"2. The Creeks occupy a region directly west of the Cherokees. They are a lower type of men, less attractive in personal appearance, less keen in intellect, than the Cherokees; but they are more industrious than the Cherokees, and are probably making more rapid advances in civilization. The Creeks are greatly intermingled with the blacks. The Creek government has probably a population of about 13,000, of whom some 2,000 are blacks.

"3. Next to the Creeks are the Seminoles, a separate tribe of the same general origin as the Creeks, and speaking nearly the same language, but with a separate government. They are much mingled with the blacks, but are gaining in civilization rapidly. The long contest which they kept up with the United States in Florida, sufficiently attests their courage and general skill.

"4. The Choctaws occupy the southeast portion of the Territory. I have been among them but little, and from personal observation cannot say much. They are the strongest in numbers of the civilized tribes, numbering about 16,000 Indians. They refused to give the blacks—their former slaves—citizenship, as

the Cherokees, Creeks and Seminoles did. They are less advanced in the arts of civilized life than the Cherokees, but are gaining steadily.

"5. The Chickasaws are a small tribe of the same general origin as the Choctaws, and speaking nearly the same language. They are, in some things, in advance of all the other civilized tribes, as their land is sectionized, although not yet allotted in severalty, as they cannot do that without consent of the Choctaws. There are many white men living among them, probably a larger number than any other tribe, many of them intermarried with the half-breeds, and thus citizens, and others living among them as renters of land, mechanics, or hired laborers, of the Indians or Indianized whites.

"6. Besides the five civilized tribes who have a separate government, there are others quite as much advanced as any Indians. There is a remnant of the Delawares, who are well advanced in all the arts of life. They are more quiet and orderly than any other Indians cultivating their land.

"Added to the Delawares are the Ottawas, not long since resident in Kansas—a quiet people, supporting themselves by cultivating their land. The Pottawatomies, a small tribe recently from Kansas, are partially civilized, some of them United States citizens.

"All these civilized tribes live in houses, dress like other people, and many of them speak the English language well. I never saw a blanket-Indian among any of these people; and perhaps the only peculiarity that would be noticed in the dress, is a fondness for bright colors with the women, and a disposition to place a feather or plume of some sort in the hat of the men. But a trader, who has lived among them many years, recently said to me, 'The change in the character of goods now sold is very marked. We sell fewer beads and trinkets and cheap jewelry, and we sell in the place of these a much better quality of cloth, and much more substantial goods for woman's wear. The advance in these things has been quite marked.'

"The uncivilized Indians are the remnants of a large number of tribes gathered from widely different regions, and greatly

differing in character. I suppose them to amount to about 12,000. These remnants differ greatly in personal appearance and prospective importance. The Osages, Nez Percés and Modocs are fine-looking people, fair size, well formed, and interesting in personal appearance—at least some of them. The Poncas are less interesting in appearance, and the Kaws and Quapaws are vile in character, and far gone in physical ruin, in consequence of the diseases of crime and vice. With most of these bands I have no intimate acquaintance, but I have seen the Modocs, Poncas and Nez Perces, and have been in the Quaker school of the Quapaws.

"In looking at the present condition of the Territory, the negro has a prominent place. The civilized Indians were all slaveholders before the war, and some of them held large numbers. In the reconstruction that followed the war, the Cherokees, Creeks and Seminoles admitted their former slaves to citizenship; but the Choctaws did not, and I think also the Chickasaws. These negroes are more industrious, as a class, than the Indians, and more thievish.

"The prejudices of the Cherokees against the blacks are as intense as any white man's can well be, but the Creeks are much less prejudiced than the whites. I never saw a half-breed Cherokee and negro, but some of the most prominent families of the Creek and Seminole nations are of this mixed race, and it is not a very rare thing to find persons whose ancestry will be found in the three. A former politician of the Creek tribe, a man of honor and influence, possessed the general features and personal appearance of an Indian; but his African relationship was apparent in a woolly head, which he shaved, and covered with a wig of Indian hair.

"The white population is an element of great importance, and rapidly gaining in numbers and influence. This class consists of missionaries and teachers, and their families, aggregating quite a number; railroad employés, licensed traders, mechanics, and a large number who have intermarried in the Indian tribes. There is a large force of coal-miners at McAlister. The government officials are not numerous, but they are in positions where their

influence is strong, and in some instances extremely deleterious. The licensed traders are a numerous and influential body. The entire trade of all the Territory is in the hands of white men or half-breeds. I do not think a full-blood can be found behind a counter in all the Territory. These men remain long in the Territory, have their families there, and many of them intermarry with the educated half-breeds, and thus become citizens. From the contact I have had with this class of white men, I should place them higher in morals and influence for good than the average government officials. Another class of white men are scattered all over the Territory—those intermarried with the Indians. Many of them are respectable, honest and good men; but many others of them are abandoned men, outcasts from society. Wicked, corrupt and criminal, they become the teachers of crime and villainy, and the source of unmitigated evil to the Indians.

"A most important element in the estimate of this country, is the mixed race, commonly known as half-breeds. All persons who lay claim to any consanguinity with the Indians, are popularly designated half-breeds. This class is rapidly increasing, both by the frequent intermarriage of new-coming white men, and the raising of larger families by the native half-breeds than are usually seen among the full-bloods. It is said that in a given number of half-breed families, and an equal number of full-bloods, the children will be more numerous in the half-breed families. The number of births in the two classes of families would probably not be materially different, but a larger proportion of full-bloods will die in infancy and childhood. The full-blood father will take but little care of his babe, especially if it is sick; while the white or half-breed father will have more knowledge, and take better care of his child, so that the death-rate will be less. The half-breeds occupy the great majority of all the offices in the native governments; they are the law-makers and executive officers and teachers of the people. Some of them are well-educated gentlemen, and occasionally some of the young ladies possess a fair share of personal beauty."

The Indian Title to this Territory.—At the first settlement of

this country by whites, they found the whole continent peopled, sparsely it is true, by tribes of Indians. They were of diverse origin, and were not themselves in all probability the original inhabitants of the land. Every year brings us new evidence that one or two, possibly three, races had preceded them in the occupation of this vast continent. Yet at that time they had the right of possession, and had held, at least by that title, much of it for some hundreds of years. The whites, coming in by hundreds of thousands, pushed the Indian tribes westward step by step, and gained possession of their lands—sometimes by conquest, oftener by treaty, and, perhaps, oftener still by purchase.

As a result of these various methods there were, in 1825, two centuries after the advent of the whites in what is now the United States, east of the Mississippi, only some small fragments of tribes in New England, New York and Pennsylvania, some larger but not hostile bands in Michigan and the Northwest Territory generally, a considerable body of Indians in Wisconsin Territory, and the partially civilized but resolute tribes of Cherokees, Choctaws, Chickasaws, Creeks and Seminoles in Northern Georgia, Alabama, Mississippi and Florida. These tribes had once or twice been at war with our people, and though they had been defeated after a long and vigorous struggle, their defeat was not an inglorious one. The first four tribes were no longer nomadic; they occupied their own farms and dwelling-houses, had their own churches and schools, and were in many respects as fully civilized as most of the whites around them. But the white people of these States had looked with envious and greedy eyes upon their lands, and were determined to drive them out and take possession. Some of the streams running through these lands were discovered to carry gold in moderate quantities; the land in these mountain farms was rich, and the careful culture of the Indians put to shame the slovenly farming of the whites; though there were millions of acres of government lands in these States to be had at nominal prices, yet they seemed poor by comparison with these Indian farms, and it was these that they wanted and must have. Added to this was the argument so decisive with a class of Southern people: "The

owners of these lands were nothing but Indians, anyhow; and therefore had no rights which a white man was bound to respect." The claim of the whites to these lands, it should be said in justice to the State of Georgia, had been anticipated as early as 1802; for in that year the United States government entered into a compact with that State, covenanting for certain considerations, that as soon as it could be done peaceably and on reasonable terms, the title of the Cherokee Indians to land within the limits of Georgia should be extinguished. It was not until the administration of President Monroe (1817–1825), that the State of Georgia became clamorous for the fulfilment of this covenant, and very soon thereafter the other States, Alabama, Mississippi and Tennessee, though they had no such compact with the United States, added their clamor to hers, demanding, under threats of forcible ouster, the prompt removal of these tribes from their limits. In consequence of their persistence President Monroe sent a message to Congress, we think in 1824, in which he submitted a proposition for the removal of all the Indian tribes from the lands then occupied by them within the several States, and organized Territories east of the Mississippi, to the country west of that river, *i. e.*, to Louisiana Territory. At that time neither Texas nor any part of the region west of the summits of the Rocky Mountain range, below latitude 42° north belonged to us. In that message President Monroe said, that "experience had demonstrated that in the present state of these Indian tribes it is impossible to incorporate them, in such masses, in any form whatever, into our system. It has been demonstrated with equal certainty, that without a timely anticipation of, and provision against the dangers to which they are exposed, under causes which it will be difficult if not impossible to control, their degradation and extermination will be inevitable. The great object to be accomplished is the removal of these tribes to the country designated, on conditions which shall be satisfactory to themselves and honorable to the United States. This can be done by conveying to each tribe a good title to an adequate portion of land to which it may consent to remove, and providing for it there a system of internal government which shall protect

its property from invasion, and by regular progress of improvement and civilization prevent that degeneracy, which has generally marked the transition from one to the other state." President Monroe in this message overlooked two things, viz., that the lands to which he proposed to move these tribes were already held by other tribes whose title to them was better than ours; and that in our onward progress as a nation the time might come, as it has within little more than half a century, when the new lands to which he proposed to remove them would be demanded by the whites, and efforts made to drive them to some other region. Congress was not ready to act, and the matter went over to the administration of President John Quincy Adams. In 1826 the Secretary of War made a full and exhaustive report, in which he suggested many difficulties in carrying out such a project as President Monroe had advocated, and expressed his fears, "that should the removal be made, it would not be effective, since it was probable the same propensity which had conducted the white population to the remote regions which the Indians now occupy, will continue to propel the tide of immigration, till it is arrested only by the distant shores of the Pacific."

Notwithstanding these apprehensions, the Secretary of War felt it necessary to submit a plan and prepare a bill for the consideration of Congress, providing for this removal. Among the provisions of this bill were: that the country to the west of the Mississippi, to which the tribes should be removed, should be set apart for the exclusive abode of the Indians; that they should be removed as individuals or families, and not as tribes; and if circumstances should justify it, the tribal relation should eventually be dissolved, and the Indians amalgamated in one common nation, with a distribution, of the property among the individuals.

The great difficulty, that the Indian from past experience could not be induced to trust our promises, must in some way be obviated. Notwithstanding the urgency of the Southern people and the excited and anxious condition of the Indian tribes, no action was taken until 1830, the second year of General Jackson's administration, when Congress passed a law authorizing the President to cause the territory west of the Mississippi, to which

the original title had been extinguished, and which was not included within the limits of any State or organized Territory, to be divided into a suitable number of districts for the reception of such tribes or nations of Indians as might choose to exchange the lands on which they then resided, and to remove West. The law authorized the President to solemnly assure the Indian tribes with whom the exchange was made, that *the United States would forever secure and guarantee to them and their heirs or successors, the country so exchanged with them.*

The President, in pursuance of this law, offered the most solemn guaranties, on the faith of the nation, to the tribes that might be willing to make the exchange, and offered them transportation and certain annuities as a further inducement. Under this offer the larger part of the Cherokees, Creeks, Choctaws, Chickasaws, and subsequently the Seminoles, Delawares, Shawnees, Miamis, Kickapoos, Pottawatomies, Chippewas of Roche de Bœuf, Sacs and Foxes, Wees, Piankashaws, Kaskaskias, Peorias, and other tribes, made the exchange, and were told that these lands should be their *permanent homes forever.* Except the tracts which were granted to the Cherokees, Creeks, Choctaws, Chickasaws, and Seminoles, the remainder of the transplanted tribes were allotted lands within the boundaries of the present State of Kansas. Since the organization of that State, all these emigrant tribes have, notwithstanding these solemn guaranties and pledges, been removed to the Indian Territory, and their permanent homes taken from them.

The government purchased from the Creeks in 1867 a portion of their lands, which it still holds, as well as some other lands in the Territory, with the intention of placing other small bands of Indians there, when it has extinguished the titles to their lands elsewhere.

Efforts to Drive the Indians from their Territory.—Meanwhile, there has been a very strong pressure on the part of western adventurers, to enter upon these lands solemnly pledged to the Indians, with the ultimate purpose of crowding them out. During the last session of Congress, in May, 1880, a bill was introduced and strongly urged, for the organization of the Indian Ter-

ritory as a regular Territory under government control, by the name of Oklahoma. Thus far, the government has successfully resisted the encroachments of white settlers and adventurers upon this Territory, except the passage of one or two railways, and these, it is said, were asked for by the Indians; but the pressure is growing stronger every day, and unless the Indians agree to hold their lands in severalty or individually (under certain restrictions in regard to alienating them), it may require the whole military power of the nation to restrain these lawless adventurers from taking it by force. If the lands are allotted to the Indians in severalty, and they, as fast as they become civilized, become citizens, the surplus of their lands may be sold by the government as their guardian for their account and the amount received funded, furnishing a further annuity to each member of the tribes. There are now held by the United States Government funds invested for the Indian tribes to the amount of $5,180,066.84, besides $84,000 abstracted by officials at the beginning of the late civil war and not yet replaced. Of this amount $1,768,175.30 is held for the Cherokees; $1,308,-664.82 for the Chickasaws; $513,161.70 for the Choctaws; $467,501.62 for the Delawares; $76,993.66 for the Creek orphans, and the remainder for other tribes, some of them those removed from Kansas in 1867.

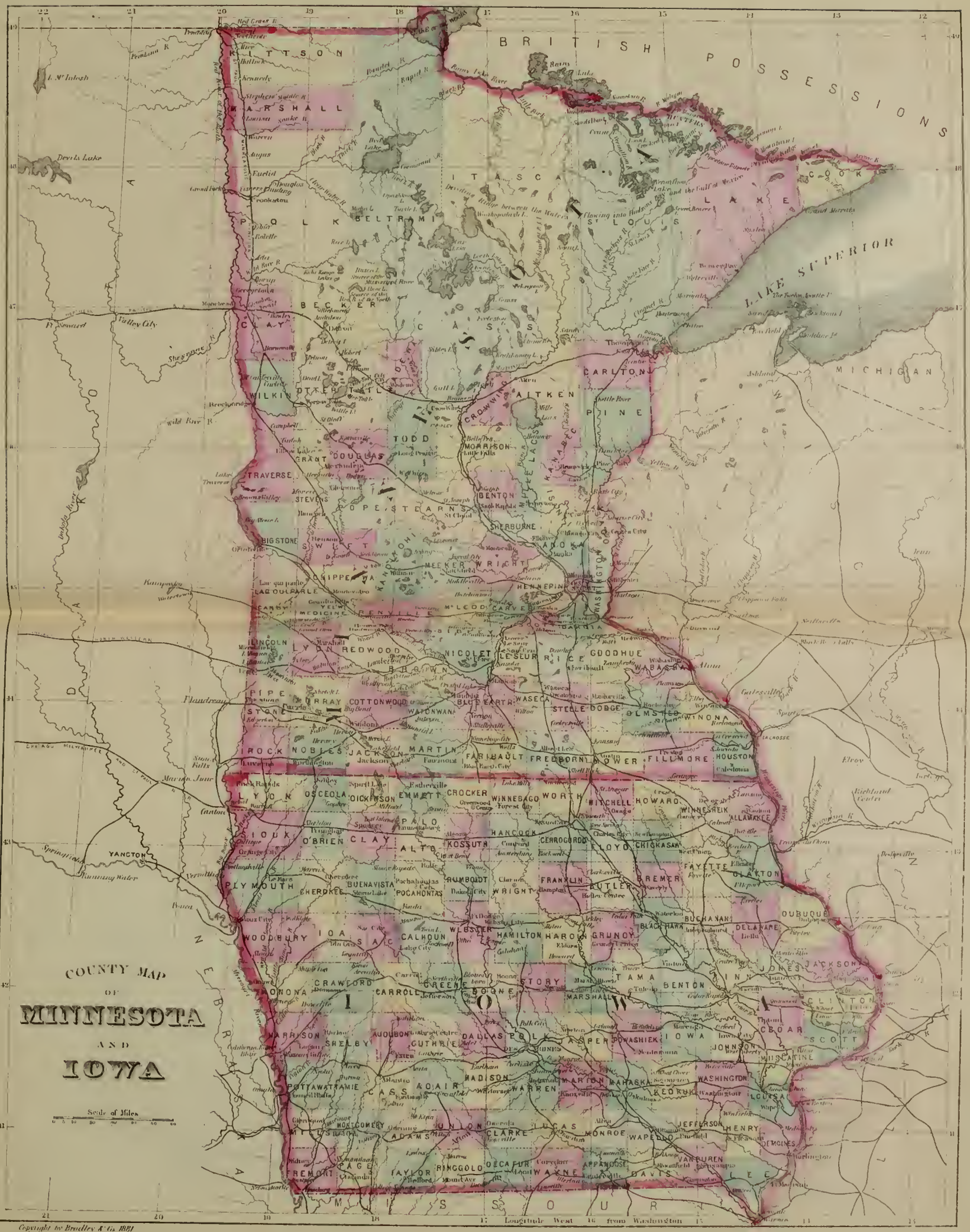
If these measures can be effected without injustice and wrong, the time may come when a part of this great Territory may be legitimately opened to white settlement, and the Indian farmers be led, by the sharp competition which will follow, to become better agriculturists and better citizens than they would under any other circumstances. But until that time shall come, and it must, in any event, be several years hence, we cannot consider the Indian Territory as either a legitimate or desirable field for immigration.

CHAPTER VIII.

IOWA.

THE SITUATION OF IOWA—MEANING OF THE NAME—MIGRATION OF THE PAU-HOO-CHEES THITHER IN 1690—CONTEMPORANEOUSLY CLAIMED BY THE FRENCH ON ACCOUNT OF FATHER HENNEPIN'S DISCOVERY—WARS OF THE PAU-HOO-CHEES, OR IOWAS, WITH THE SIOUX—FRENCH TRADING-POSTS ON THE RIVER—SALE OF THE PROVINCE OF LOUISIANA TO THE SPANISH IN 1763—RETROCESSION TO FRANCE IN 1800—SALE TO THE UNITED STATES IN 1803—SETTLEMENT OF JULIAN DUBUQUE—THE WARS OF THE IOWAS AND SIOUX—A NEW ENEMY—THE SACS AND FOXES ATTACK THEM, AND DRIVE THEM ACROSS THE MISSOURI, ABOUT 1828—GREAT REDUCTION IN NUMBERS OF THE IOWAS—WHITE SETTLEMENT COMMENCED IN 1832—DEATH OF BLACK HAWK—THE EVENTS IN CIVIL HISTORY OF IOWA TO ITS ORGANIZATION AS A STATE IN 1846—TOPOGRAPHY AND EXTENT OF IOWA—ITS SURFACE—RIVERS—LAKES—PRAIRIE AND TIMBER LANDS—BLACK WALNUT SHIPPED TO ENGLAND—GEOLOGY AND MINERALOGY—THE DRIFT, LOESS AND ALLUVIUM—CRETACEOUS ROCKS—COAL MEASURES—THE CHARACTER OF IOWA COAL—COMPARISON WITH EUROPEAN AND OTHER COALS—NO GOLD OR SILVER IN THE STATE—LEAD, IRON, COPPER AND ZINC—LIME—BUILDING STONE—GYPSUM CLAYS—SOIL—MINERAL PAINT—SPRING AND WELL-WATER—NATURAL CURIOSITIES—CLIMATE, GENERAL REMARKS—PROFESSOR PARVIN'S TABLES—THE SIGNAL SERVICE STATISTICS OF THE RIVER CITIES—ZOOLOGY—SOIL AND AGRICULTURAL PRODUCTIONS—IOWA AN AGRICULTURAL STATE—STATISTICS OF ITS CROPS—SPRING AND WINTER WHEAT—STOCK-RAISING—DAIRY FARMING—POPULATION OF IOWA AT DIFFERENT PERIODS—RAILROADS AND STEAMBOAT LINES—THE STATE EASY OF ACCESS—PUBLIC LANDS—RAILROAD LANDS—STATE LANDS—PARTIALLY IMPROVED FARMS—MANUFACTURES—IOWA AS A HOME FOR IMMIGRANTS—EDUCATION—CHURCHES—FUTURE PROSPECTS OF THE STATE.

IOWA, the name of one of the easternmost of the central belt of States and Territories composing "Our Western Empire," lying between the Mississippi and Missouri rivers. The name, which was that of a river within its bounds, and also of the Indian tribe which dwelt on the banks of that river, is said to mean, in the Indian tongue, "The Beautiful Land." The Indians who gave it and themselves this name were not the original inhabitants of this region, but migrated hither from the country of



COUNTY MAP OF

MINNESOTA AND IOWA

the great lakes (perhaps Michigan) where they had borne the name of the Pau-hoo-chees, about 1690. They increased in numbers and power here till they became the most formidable of the Indian tribes of the Northwest except the Sioux, with whom they were constantly at war. That portion of the State lying on the Mississippi is supposed to have been visited by Father Hennepin in 1680, and it was probably in consequence of his explorations that the French government soon after took formal possession of it and erected two or three trading-posts along the river. Their occupation of the Territory was, however, of so trifling a character as not to excite the displeasure of the Iowa chief, Mau-hau-gaw, or his successors, Mahaska I. and II. Their power remained undiminished, though the French title to this as a part of the province of Louisiana had passed to Spain in 1763, returned to France in 1800, and been purchased as Louisiana Territory by the United States in 1803. In this long interval, two or three French families had settled in the Territory. Notable among these was Julian Dubuque, who, in 1788, settled on the banks of the Mississippi, and commenced trading and mining lead there. Eleven years later another Frenchman, Louis Honori, established himself as a trader at the head of the "rapids of the river Des Moines." But the power of the Iowas was beginning to wane. They had fought off their old enemies, the Sioux, and held possession of most of the Territory, but a new enemy now came upon them. The Sacs and Foxes, Illinois tribes, finding civilization pressing hard upon them, crossed the river about 1824, and began to make encroachments upon the hunting-grounds of the Iowas. Conflicts followed, and finally, about 1828, a fierce battle was fought between the invaders and the invaded near the present village of Iowaville, in Davis county, in which, after a long and terrible struggle, the Iowas were vanquished and the Sacs and Foxes occupied their hunting-grounds along the Mississippi. The Iowas moved sullenly westward, and finally crossed the Missouri. When the whites began to settle west of the Mississippi, in what was then the Territory of Missouri, in 1831 and 1832, the Sacs and Foxes were the occupants of all the eastern and southern portions of

the Territory, while the warlike Sioux held undisputed possession of the northern portion, about the headwaters of the Des Moines and the lakes. At this time the Iowas, once so powerful and warlike a tribe, had been reduced, in their new home beyond the Missouri, by wars, whiskey and small-pox to about 1,300 souls.

After the close of the "Black Hawk War," in 1833, the power of the Sac chief, Black Hawk, waned, and his rival, Keokuk, who had favored peace with the whites, was recognized as the chief of the Sacs and Foxes. Black Hawk died in October, 1838, on the Des Moines river.

Let us now recapitulate its political or civil history, aside from any claim of Indian proprietorship, which in this case, as we have seen, was merely the right of the strongest.

1. It was first claimed by France in 1682 or 1683, by virtue of Hennepin's discovery.

2. In 1763, as a part of the province of Louisiana, it was ceded to Spain.

3. October 1, 1800, it was retroceded with the same boundaries by Spain to France.

4. April 30, 1803, France ceded the province of Louisiana to the United States.

5. October 31, 1803, a temporary government was authorized by Congress for the newly acquired Territory.

6. October 1, 1804, it was included in the "District of Louisiana," and placed under the jurisdiction of the territorial government of Indiana.

7. July 4, 1805, it was included as a part of the "Territory of Louisiana," then organized with a separate territorial government.

8. June 4, 1812, it was embraced in what was then made the "Territory of Missouri."

9. June 28, 1834, it became part of the "Territory of Michigan."

10. July 3, 1836, it was included as a part of the newly organized "Territory of Wisconsin."

11. June 12, 1838, it was included in, and constituted a part of the newly organized "Territory of Iowa."

12. December 28, 1846, it was admitted into the Union as a STATE.

Area and Extent.—Iowa is about 300 miles in length, east and west, and a little over 200 miles in breadth, north and south; having nearly the figure of a rectangular parallelogram. Its northern boundary is the parallel of 43° 30′, separating it from the State of Minnesota. Its southern limit is nearly on the line of 40° 31′ from the point where this parallel crosses the Des Moines river, westward. From this point to the southeast corner of the State, a distance of about thirty miles, the Des Moines river forms the boundary line between Iowa and Missouri. The two great rivers of the North American continent form the east and west boundaries, except that portion of the western boundary adjoining the Territory of Dakota. The Big Sioux river from its mouth, two miles above Sioux City, forms the western boundary up to the point where it intersects the parallel of 43° 30′. These limits embrace an area of 55,045 square miles; or, 35,228,800 acres. When it is understood that all this vast extent of surface, except that which is occupied by the rivers, lakes and peat-beds of the northern counties, is susceptible of the highest cultivation, some idea may be formed of the immense agricultural resources of the State. Iowa is nearly as large as England, and twice as large as Scotland; but when we consider the relative area of surface which may be made to yield to the wants of man, those countries of the Old World will bear no comparison with Iowa.

Surface.—The surface of the State is remarkably uniform, rising to nearly the same general altitude. There are no mountains, and yet but little of the surface is level or flat. The whole State presents a succession of gentle elevations and depressions, with some bold and picturesque bluffs along the principal streams. The western portion of the State is generally more elevated than the eastern, the northwestern part being the highest. Nature could not have provided a more perfect system of drainage, and at the same time leave the country so completely adapted to all the purposes of agriculture. Looking at the map of Iowa, we see two systems of streams or rivers running nearly at right

angles with each other. The streams which discharge their waters into the Mississippi flow from the northwest to the southeast, while those of the other system flow toward the southwest, and empty into the Missouri. The former drain about three-fourths of the State, and the latter the remaining one-fourth. The water-shed dividing the two systems of streams represents the highest portion of the State, and gradually descends as you follow its course from northwest to southeast. Low-water mark in the Missouri river at Council Bluffs is about 425 feet above low-water mark in the Mississippi at Davenport. At the crossing of the summit, or water-shed, 245 miles west of Davenport, the elevation is about 960 feet above the Mississippi. The Des Moines river at the city of Des Moines has an elevation of 227 feet above the Mississippi at Davenport, and is 198 feet lower than the Missouri at Council Bluffs. The elevation of the eastern border of the State at McGregor is about 624 feet above the level of the sea, while the highest elevation in the northwest portion of the State is about 1,400 feet above the level of the sea. In addition to the grand water-shed mentioned above, as dividing the waters of the Mississippi and Missouri, there are between the principal streams, elevations commonly called "divides," which are drained by numerous streams of a smaller size tributary to the rivers. The valleys along the streams have a deep, rich soil, but are scarcely more fertile than many portions of these undulating prairie "divides."

Rivers.—As stated above, the rivers of Iowa are divided into two systems or classes—those flowing into the Mississippi, and those flowing into the Missouri. The Mississippi, the largest river on the continent, and one of the largest in the world, washes the entire eastern border of the State, and is most of the year navigable for a large class of steamers. The only serious obstructions to steamers of the largest size are what are known as the Lower Rapids, just above the mouth of the Des Moines. The government of the United States has constructed a canal, or channel, around these rapids on the Iowa side of the river—a work which will prove of immense advantage to the commerce of Iowa for all time to come. The principal rivers which

flow through the interior of the State, east of the water-shed, are the Des Moines, Skunk, Iowa, Wapsipinicon, Maquoketa, Turkey and Upper Iowa. One of the largest rivers of the State is the Red Cedar, which rises in Minnesota, and flowing in a southeasterly direction, joins its waters with the Iowa river in Louisa county, only about thirty miles from its mouth, that portion below the junction retaining the name of Iowa river, although it is really the smaller stream.

The Des Moines is the largest interior river of the State, and rises in a group or chain of lakes in Minnesota, not far from the Iowa border. It really has its sources in two principal branches, called East and West Des Moines, which, after flowing about seventy miles through the northern portion of the State, converge to their junction in the southern part of Humboldt county. The Des Moines receives a number of large tributaries, among which are Raccoon and three rivers (North, South and Middle) on the west, and Boone river on the east. Raccoon (or 'Coon) rises in the vicinity of Storm lake, in Buena Vista county, and after receiving several tributaries, discharges its waters into the Des Moines river, within the limits of the city of Des Moines. This stream affords many excellent mill privileges, some of which have been improved. The Des Moines flows from northwest to southeast, not less than 300 miles through Iowa, and drains over 10,000 square miles of its territory. At an early day, steamboats at certain seasons of the year navigated this river as far up as the "Raccoon Forks," and a large grant of land was made by Congress to the State for the purpose of improving its navigation. The land was subsequently diverted to the construction of the Des Moines Valley Railroad. Before this diversion several dams were erected on the lower portion of the river, which afford a vast amount of hydraulic power to that part of the State.

The next river above the Des Moines is Skunk, which has its source in Hamilton county north of the centre of the State. It traverses a southeast course, having two principal branches—their aggregate length being about 450 miles. They drain about 8,000 square miles of territory, and afford many excellent mill sites.

The next is Iowa river, which rises in several branches among the lakes in Hancock and Winnebago counties, in the northern part of the State. Its great eastern branch is Red Cedar, having its source among the lakes in Minnesota. In size, Red Cedar is the second interior river of the State, and is of great importance as affording immense water-power. Shell Rock river is a tributary of Red Cedar, and is valuable to Northern Iowa, on account of its fine water-power. The aggregate length of Iowa and Red Cedar rivers is about 500 miles, and they drain about 12,000 square miles of territory.

The Wapsipinicon river rises in Minnesota, and flows in a southeasterly direction over 200 miles through Iowa, draining, with its branches, a belt of territory only about twelve miles wide. This stream is usually called "Wapsi" by the settlers, and is valuable as furnishing good water-power for machinery.

Maquoketa river, the next considerable tributary of the Mississippi, is about 160 miles long, and drains about 3,000 square miles of territory.

Turkey river is about 130 miles long, and drains some 2,000 square miles. It rises in Howard county, runs southeast, and empties into the Mississippi near the south line of Clayton county.

Upper Iowa river also rises in Howard county, flows nearly east, and empties into the Mississippi near the northeast corner of the State, passing through a narrow, but picturesque and beautiful valley. This portion of the State is somewhat broken, and the streams have cut their channels deeply into the rocks, so that in many places they are bordered by bluffs from 300 to 400 feet high. They flow rapidly, and furnish ample water-power at numerous points.

Having mentioned the rivers which drain the eastern three-fourths of the State, we will now cross the great "water-shed" to the Missouri and its tributaries.

The Missouri river, forming a little over two-thirds of the length of the western boundary line, is navigable for large-sized steamboats for a distance of 1,950 miles above the point (Sioux City) where it first touches the western border. It is, therefore,

a highway of no little importance to the commerce of Western Iowa. During the season of navigation last year, over fifty steamers ascended the river above Sioux City, most of which were laden with stores for the mining region above Fort Benton. We will now refer to the larger tributaries of the Missouri, which drain the western portion of Iowa.

The Big Sioux river forms about seventy miles of the western boundary of the State, its general course being nearly from north to south. It has several small tributaries, draining the counties of Plymouth, Sioux, Lyon, Osceola and O'Brien, in Northwestern Iowa. One of the most important of these is Rock river—a beautiful little stream running through the counties of Lyon and Sioux. It is supported by springs, and affords a volume of water sufficient for propelling machinery. Big Sioux river was once regarded as a navigable stream, and steamboats of a small size have on several occasions ascended it for some distance. It is not, however, now considered a safe stream for navigation. It empties into the Missouri about two miles above Sioux City, and some four miles below the northwest corner of Woodbury county. It drains about 1,000 square miles of Iowa territory.

Just below Sioux City, Floyd river empties into the Missouri. It is a small stream, but flows through a rich and beautiful valley. Its length is about 100 miles, and it drains nearly 1,500 square miles of territory. Several mills have been erected on this stream, and there are other mill sites which will doubtless be improved in due time.

Little Sioux river is one of the most important streams of Northwestern Iowa. It rises in the vicinity of Spirit and Okoboji lakes, near the Minnesota line, and meanders through various counties a distance of nearly 300 miles to its confluence with the Missouri near the northwest corner of Harrison county. With its tributaries it drains not less than 5,000 square miles. Several small mills have been erected on this stream, and others doubtless will be when needed.

Boyer river is the next stream of considerable size below the Little Sioux. It rises in Sac county and flows southwest to the Missouri in Pottawotamie county. Its entire length is about

150 miles, and drains not less than 2,000 square miles of territory. It is a small stream, meandering through a rich and lovely valley. The Chicago and Northwestern Railroad passes down this valley some sixty miles.

Going down the Missouri, and passing several small streams, which have not been dignified with the name of rivers, we come to the Nishnabotna, which empties into the Missouri some twenty miles below the southwest corner of our State. It has three principal branches, with an aggregate length of 350 miles. These streams drain about 5,000 square miles of Southwestern Iowa. They flow through valleys of unsurpassed beauty and fertility, and furnish good water-power at various points, though in this respect they are not equal to the streams in the northeastern portion of the State.

The southern portion of the State is drained by several streams that flow into the Missouri river, in the State of Missouri. The most important of these are Chariton, Grand, Platte, One Hundred and Two, and the three Nodaways—East, West and Middle. All of these afford water-power for machinery, and present splendid valleys of rich farming lands.

We have above only mentioned the streams that have been designated as rivers, but there are many other streams of great importance and value to different portions of the State, draining the country, furnishing mill-sites, and adding to the variety and beauty of the scenery. So admirable is the natural drainage of almost the entire State, that the farmer who has not a stream of living water on his premises is an exception to the general rule.

Lakes.—In some of the northern counties of Iowa there are many small, but beautiful lakes, some of which we will notice. They are a part of the system of lakes extending far northward into Minnesota, and most of them present many interesting features which the limits of our sketch will not permit us to give in detail. The following are among the most noted of the lakes of Northern Iowa: Clear lake, in Cerro Gordo county; Rice lake, Silver lake, and Bright's lake, in Worth county; Crystal lake, Eagle lake, Lake Edward, and Twin lakes, im Hancock county;

Owl lake, in Humboldt county; Lake Gertrude, Lake Cornelia, Elm lake, and Wall lake, in Wright county; Lake Caro, in Hamilton county; Twin lakes, in Calhoun county; Wall lake, in Sac county; Swan lake, in Emmet county; Storm lake, in Buena Vista county; and Okoboji and Spirit lakes, in Dickinson county. Nearly all of these are deep and clear, abounding in many excellent varieties of fish, which are caught abundantly by the settlers at all proper seasons of the year. The name "Wall Lake," applied to several of these bodies of water, is derived from the fact that a line or ridge of boulders extends around them, giving them somewhat the appearance of having been walled. Most of them exhibit the same appearance in this respect to a greater or less extent. Lake Okoboji, Spirit lake, Storm lake, and Clear lake are the largest of the Northern Iowa lakes. All of them, except Storm lake, have fine bodies of timber on their borders. Lake Okoboji is about fifteen miles long, and from a quarter of a mile to two miles wide. Spirit lake, just north of it, embraces about ten square miles, the northern border extending to the Minnesota line. Storm lake is in size about three miles east and west by two north and south. Clear lake is about seven miles long by two miles wide. The dry rolling land usually extends up to the borders of these lakes, making them delightful resorts for excursion or fishing parties, and they are now attracting attention as places of resort, on account of the beauty of their natural scenery, as well as the inducements which they afford to hunting and fishing parties.

Prairie and Timber.—One of the peculiar features of the topography of the northwest is the predominance of *prairies.* It has been estimated that about nine-tenths of the surface of Iowa is prairie. The timber is generally found in heavy bodies skirting the streams and lakes, but there are also many isolated groves standing, like islands in the sea, far out on the prairies. The eastern half of the State contains a larger proportion of timber than the western. The following are the leading varieties of timber: White, black, and burr oak, black walnut, of excellent quality, but now almost entirely picked out and shipped to England, butternut, hickory, hard and soft maple, cherry, red

and white elm, ash, linn, hackberry, birch, honey locust, cottonwood, and quaking asp. A few sycamore trees are found in certain localities along the streams. Groves of red cedar also prevail, especially along Iowa and Cedar rivers, and a few isolated pine trees are scattered along the bluffs of some of the streams in the northern part of the State.

The great demand for timber for railroad construction, for ties, stations, bridges, and for a time for fuel, as well as for dwellings, telegraph poles, for agricultural and mining machinery, and mine supports, has within the last decade nearly stripped Iowa of its most valuable timber; and the English movement for culling out all her valuable black walnut trees, working them up roughly by portable saw-mills, and shipping the timber at once, is likely to deprive the country of one of its best sources of supply of this valuable wood.

Nearly all kinds of timber common to Iowa have been found to grow rapidly when transplanted upon the prairies, or when propagated from the planting of seeds. Only a few years and a little expense are required for the settler to raise a grove sufficient to afford him a supply of fuel. The kinds most easily propagated, and of rapid growth, are cottonwood, maple, and walnut. All our prairie soils are adapted to their growth. Tree-planting is encouraged by national and State laws, and is now actively practised, but it will be long before these trees will, either in quality or quantity, supply the loss of those which have been so recklessly sacrificed.

Geology and Mineralogy.—The surface geology of Iowa, like that of Nebraska and partly of Kansas, is peculiar and very interesting from its relation to the soil of the State. Far back in the glacial period this whole region, including Iowa, Southeastern Dakota, Nebraska, and Eastern Kansas, was less elevated than it now is, and formed the bed of a vast lake at least 500 miles in length and nearly that in width. Through this lake flowed the Missouri, which had then received its greatest affluent, the Yellowstone. Its other principal tributaries at that time flowed into the lake. For ages numerous streams brought into the lake the *débris* of mountain and hill, and the glaciers added

their contribution from their moraines. At length there came a time of upheaval; this vast lake was drained till it became an immense marsh of soft and plastic mud; through this the rivers ploughed their way, cutting through the deposits of gravel, of silica, and of decayed vegetation easily, and left on either side high bluffs, which, however, having no rocky bond of union, often crumbled and fell into the streams. After another long period the marsh became dry land, and its surface, composed of drift or gravel, loess or bluff deposit, a very fine and rich silicious powder, and alluvium as the result of decayed vegetation, furnished the finest soil in the world. But beneath this surface, which is of varying, though everywhere of considerable thickness, the rivers, which have plowed their way through its lowest layers, reveal other important and economically valuable strata. The cretaceous beds underlie this vast alluvial and diluvial deposit, and below them we come to the coal measures of the carboniferous era, whose existence was first discovered from their outcrop in the river bluffs.

"The coal of Iowa is bituminous, and is a true coal, not a lignite. It covers an area of at least 20,000 square miles, and coal is successfully mined in more than thirty counties of the State. It is not of identical quality in all parts of the coal field, but that produced in Appanoose, Boone, Davis, Dallas, Hamilton, Hardin, Jefferson, Mahaska, Marion, Monroe, Polk, Van Buren, Wapello, Webster, and perhaps some other counties, is of excellent quality and easily raised.

"The great productive coal field of Iowa is embraced chiefly within the valley of the Des Moines river and its tributaries, extending up the valley from Lee county nearly to the north line of Webster county. Within the coal field embraced by this valley deep mining is nowhere necessary. The Des Moines and its larger tributaries have generally cut their channels down through all the coal measure strata.

"The coal of Iowa is equal in quality and value to coal of the same class in other parts of the world. The veins which have so far been worked are from three to eight feet in thickness, but it is not necessary to dig from one thousand to two thousand feet

to reach the coal, as miners are obliged to do in some countries. But little coal has in this State been raised from a depth greater than one hundred feet.

"Professor Gustavus Hinrich, of the State University, who also officiated as State Chemist in the prosecution of the State geological survey, gives an analysis showing the comparative value of Iowa coal with that of other countries. The following is from a table prepared by him—100 representing the combustible:

Name and Locality.	Carbon.	Bitumen.	Ashes.	Moisture.	Equivalent.	Value.
Brown coal, from Arbesan, Bohemia	36	64	3	11	114	88
Brown coal, from Bilin, Bohemia	40	67	16	00	123	81
Bituminous coal, from Bentheu, Silesia	51	49	21	5	126	80
Cannel coal, from Wigan, England	61	39	10	3	113	87
Anthracite, from Pennsylvania	94	6	2	2	104	96
Iowa coals—average	50	50	5	5	110	90

"In this table the excess of the equivalent above 100, expresses the amount of impurities (ashes and moisture) in the coal. The analysis shows that the average Iowa coals contain only ten parts of impurities for one part of combustible (carbon and bitumen) being the purest of all the samples analyzed except the anthracite from Pennsylvania.

"Twelve years ago (in 1868) the production of this coal in Iowa was reported as 241,453 tons, or more than six million bushels. It has increased steadily since that time, and in 1877 had reached over 1,500,000 tons, or about forty million bushels. It is still increasing, and is used in several of the adjacent States.

"*Peat.*—During the last thirteen or fourteen years large deposits of peat, existing in several of the northern counties of the State, have attracted considerable attention. In 1866, Dr. White, the State Geologist, made careful observations in some of those counties, including Franklin, Wright, Cerro Gordo, Hancock, Winnebago, Worth and Kossuth. In 1869, Hon. A. R. Fulton also visited the counties named, and from personal observation

was convinced that the deposits of peat were as extensive as represented by the State Geologist. It is estimated that the counties above named contain an average of at least four thousand acres each of good peat lands. The depth of the beds is from four to ten feet, and the quality is but little, if any, inferior to that of Ireland. As yet, but little use has been made of it as fuel, but when it is considered that it lies wholly beyond the coal-field, in a sparsely timbered region of the State, its prospective value is regarded as very great. Dr. White estimates that 160 acres of peat, four feet deep, will supply two hundred and thirteen families with fuel for upwards of twenty-five years. It must not be inferred that the presence of these peat beds in that part of the State is in any degree prejudicial to health, for such is not the case. The dry, rolling prairie land usually comes up to the very border of the peat marsh, and the winds, or breezes, which prevail through the summer season, do not allow water to become stagnant. Nature seems to have designed these peat deposits to supply the deficiency of other material for fuel. The penetration of this portion of the State by railroads and the rapid growth of timber may leave a resort to peat for fuel as a matter of choice, and not of necessity. It therefore remains to be seen of what economic value in the future the peat beds of Iowa may be. Peat has also been found in Muscatine, Linn, Clinton, and other eastern and southern counties of the State, but the fertile region of Northern Iowa, least favored with other kinds of fuel, is peculiarly the peat region of the State. Neither gold nor silver has been found in Iowa, except a very small percentage of the latter in the galena or lead ores.

"*Lead.*—Since the year 1833, large quantities of lead have been mined in the vicinity of Dubuque, and the business is still carried on successfully. From four to six million pounds of ore have been smelted annually at the Dubuque mines, yielding from sixty-eight to seventy per cent. of lead. So far as known, the lead deposits of Iowa that may be profitably worked are confined to a belt of four or five miles in width along the Mississippi, above and below the city of Dubuque.

"*Other Metals.*—Iron, copper and zinc have been found in

limited quantities in different parts of the State—the last-named metal being chiefly associated with the lead deposits.

"*Lime.*—Good material for the manufacture of quick-lime is found in abundance in nearly all parts of the State. Even in the northwestern counties, where there are but few exposures of rock 'in place,' limestone is found among the boulders scattered over the prairies and about the lakes. So abundant is limestone, suitable for the manufacture of quick-lime, that it is needless to mention any particular locality as possessing superior advantages in furnishing this useful building material. At the following points parties have been engaged somewhat extensively in the manufacture of lime, to wit: Fort Dodge, Webster county; Springvale, Humboldt county; Orford and Indiantown, Tama county; Iowa Falls, Hardin county; Mitchell, Mitchell county; and at nearly all the towns along the streams northeast of Cedar river.

"*Building Stone.*—There is no scarcity of good building stone to be found along nearly all the streams east of the Des Moines river, and along that stream from its mouth up to the north line of Humboldt county. Some of the counties west of the Des Moines, as Cass and Madison, as well as most of the southern counties of the State, are supplied with good building stone. Building stone of peculiarly fine quality is quarried at and near the following places: Keosauqua, Van Buren county; Mt. Pleasant, Henry county; Fairfield, Jefferson county; Ottumwa, Wapello county; Winterset, Madison county; Fort Dodge, Webster county; Springvale and Dakota, Humboldt county; Marshalltown, Marshall county; Orford, Tama county; Vinton, Benton county; Charles City, Floyd county; Mason City, Cerro Gordo county; Mitchell and Osage, Mitchell county; Anamosa, Jones county; Iowa Falls, Hardin county; Hampton, Franklin county; and at nearly all points along the Mississippi river. In some places, as in Marshall and Tama counties, several species of marble are found, which are susceptible of the finest finish, and are very beautiful.

"*Gypsum.*—One of the finest and purest deposits of gypsum known in the world exists at Fort Dodge, in this State. It is

confined to an area of about six by three miles on both sides of the Des Moines river, and is found to be from twenty-five to thirty feet in thickness. The main deposit is of uniform gray color, but large masses of almost pure white (resembling alabaster) have been found embedded in the main deposits. The quantity of this article is practically inexhaustible, and the time will certainly come when it will be a source of wealth to that part of the State. So far, it has only been used to a limited extent for paving and building purposes, if we except the fraud practised upon our Eastern cousins by those who manufactured from it that great humbug and swindle of the century, the 'Cardiff Giant!' Plaster-of-paris manufactured from the Fort Dodge gypsum has been found equal to the best in quality.

"*Clays.*—In nearly all parts of the State the material suitable for the manufacture of brick is found in abundance. Sand is obtained in the bluffs along the streams and in their beds. Potter's clay, and fire-clay suitable for fire-brick, are found in many places. An excellent article of fire-brick is made at Eldora, Hardin county, where there are also several extensive potteries in operation. Fire-clay is usually found underlying the coal-seams. There are extensive potteries in operation in the counties of Lee, Van Buren, Des Moines, Wapello, Boone, Hamilton, Hardin, and perhaps others.

"*Soil.*—It is supposed that there is nowhere upon the globe an equal area of surface with so small a proportion of untillable land as we find in Iowa. The soil is generally a drift deposit, with a deep covering of vegetable mould, and on the highest prairies is almost equal in fertility to the alluvial valleys of the rivers in other States. The soil in the valleys of our streams is largely alluvial, producing a rapid and luxuriant growth of all kinds of vegetation. The valleys usually vary in extent according to the size of the stream. On the Iowa side of the Missouri river, from the southwest corner of the State to Sioux City, a distance of over one hundred and fifty miles, there is a continuous belt of alluvial 'bottom,' or valley land, varying in width from five to twenty miles, and of surpassing fertility. This valley is bordered by a continuous line of bluffs, rising from one to two hundred

feet, and presenting many picturesque outlines when seen at a distance. The bluffs are composed of a peculiar formation, to which has been given the name of loess or 'bluff deposit.' It is of a yellow color, and is composed of a fine silicious matter, with some clay and limey concretions. This deposit in many places extends eastward entirely across the counties bordering the Missouri river, and is of great fertility, promoting a luxuriant growth of grain and vegetables.

"*Mineral Paint.*—In Montgomery county a fine vein of clay, containing a large proportion of ochre, was several years ago discovered, and has been extensively used in that part of the State for painting barns and out-houses. It is of a dark red color, and is believed to be equal in quality, if properly manufactured, to the mineral paints imported from other States. The use of it was first introduced by Mr. J. B. Packard, of Red Oak, on whose land there is an extensive deposit of this material.

"*Spring and Well Water.*—As before stated, the surface of Iowa is generally drained by the rolling or undulating character of the country, and the numerous streams, large and small. This fact might lead some to suppose that it might be difficult to procure good spring or well water for domestic uses. Such, however, is not the case, for good pure well water is easily obtained all over the State, even on the highest prairies. It is rarely necessary to dig more than thirty feet deep to find an abundance of that most indispensable element, good water. Along the streams are found many springs breaking out from the banks, affording a constant supply of pure water. As a rule, it is necessary to dig deeper for well water in the timber portions of the State, than on the prairies. Nearly all the spring and well waters of the State contain a small proportion of lime, as they do in the Eastern and Middle States. There are some springs which contain mineral properties, similar to the springs often resorted to by invalids and others in other States. In Davis county there are some 'Salt Springs,' as they are commonly called, the water being found to contain a considerable amount of common salt, sulphuric acid, and other mineral ingredients. Mineral waters are found in different parts of the State.

"*Natural Curiosities.*—Aside from its walled lakes and some very beautiful waterfalls, the State does not abound in natural wonders. The 'Ice Cave' at Decorah, in the northeastern part of the State, deserves notice. It is under a bluff on the north bank of the upper Iowa river, and has this wonderful peculiarity that while in winter no ice is to be found in it, it forms in spring and summer, and thaws out again upon the advent of cold weather. Nine miles east of Decorah, on Trout river, there is an underground stream navigable for canoes, and which has been explored for a long distance.

"*Climate and Meteorology.*—The average or mean temperature, from a series of observations taken at different points and in different years, is found to be 48°. The temperature of the winters is usually somewhat lower than that of the Eastern States, but that of the other seasons higher, so that all vegetation is forced forward rapidly to maturity. There is a somewhat less average amount of rain than that which falls in the States bordering on the Atlantic. The quantity which falls yearly in Iowa is found to average about forty and one-half inches, and of snow thirty inches—equivalent to three inches of rain, making a total of forty-three and one-half inches. There is occasionally a season which greatly exceeds the average in the fall of rain, but never one marked with such extreme drought as to occasion a failure of crops.

"The opinion may prevail to some extent that the climate, especially of Northern Iowa, is rigorous, and the winters long and severe. It is true that the mercury usually sinks lower than in the States farther south, but at the same time the atmosphere is dry and invigorating, and the seasons not marked by the frequent and sudden changes which are experienced in latitudes farther south. The winters are equally as pleasant and more healthful than in the Eastern or Middle States. Pulmonary and other diseases, arising from frequent changes of temperature and miasmatic influences, are almost unknown, unless contracted elsewhere. Winter usually commences in December and ends in March. The spring, summer, and fall months are delightful. Iowa is noted for the glory and beauty of its autumns. That

gorgeous season denominated 'Indian summer' cannot be described, and in Iowa it is peculiarly charming. Day after day, for weeks, the sun is veiled in a hazy splendor, while the forests are tinged with the most gorgeous hues, imparting to all nature something of the enchantments of fairyland. Almost imperceptibly, these golden days merge into winter, which holds its stern reign without the disagreeable changes experienced in other climes, until spring ushers in another season of life and beauty."

We have endeavored to obtain definite and detailed statistics of the meteorology of localities which should represent as fully as possible the differences of temperature and rainfall, etc., in different sections of the State. Our statistics are very full for the whole eastern border, and for some of the cities of the interior, but are defective for the western counties, though we know in general that as we proceed westward the average temperature on the same parallels is somewhat higher, the winters a little less severe, and the rainfall slightly diminished as compared with those on the eastern border. The following statistics of the meteorology of Muscatine and Iowa City are by Professor Parvin, and are from the averages of thirty years:

Table showing the Average, or Mean Temperature of the Seasons, for the years 1839 *to* 1869, *inclusive; also the Mean Temperature of the months nearest thereto, and the Extremes of Temperature.*

Seasons.	Temperature.	Months Nearest Seasons.	
Spring	47° 44′	April	48° 50′
Summer	70° 37′	August	70° 70′
Autumn	44° 52′	October	49° 50′
Winter	23° 37′	December	23° 25′
Year	47° 57′		

RANGE OF TEMPERATURE.

Highest	99° 00′	August 31st, 1854.
Lowest	−30° 00′	January 18th, 1857.
Range	129° 00′	

Table giving the Monthly Thermometrical Results in degrees for the years 1868 *and* 1869—*the observations being made at the door of the State University, Iowa City, by Prof. T. S. Parvin.*

Months.	1868.						1869.					
	7 A. M.	2 P. M.	9 P. M.	Monthly mean.	Maximum.	Minimum.	7 A. M.	2 P. M.	9 P. M.	Monthly mean.	Maximum.	Minimum.
	°	°	°	°	°	°	°	°	°	°	°	°
January.....	6.4	24.4	13.3	13.37	50	−16	18.9	34.1	24.9	26.02	48	−14
February	14.6	32.1	21.1	25.29	55	−27	19.9	34.7	27.4	27.00	62	− 8
March.....	33.3	48.4	43.0	42.69	75	3	22.3	39.2	29.7	30.26	72	−12
April.....	36.2	52.2	44.0	44.69	78	18	39.4	55.6	45.3	47.09	80	20
May.....	54.7	71.0	61.7	61.69	84	46	52.8	69.3	62.3	60.01	82	40
June.....	63.8	78.5	69.3	70.75	92	47	60.3	75.2	65.1	66.07	85	44
July.....	75.6	89.1	76.5	80.79	96	53	64.7	78.3	70.0	70.86	86	55
August.....	60.9	78.7	69.4	69.12	92	48	68.8	80.6	74.9	74.36	93	57
September....	52.2	66.2	59.6	58.76	81	32	56.1	72.7	62.3	63.23	88	33
October	42.9	58.4	48.3	49 84	73	30	34.7	53.1	40.8	42.72	78	16
November....	33.2	43.9	36.6	37.97	63	18	27.5	38.3	30.6	32.12	70	5
December	15.1	28.2	20.9	21.19	50	−18	21.6	29.9	25.3	25.46	46	− 2
Sums.....	488.9	673.1	563.7	576.15	889	234	487.0	691.5	557.0	565.20	890	234
Means.....	40.7	56.1	46.9	48.01	74	19	40.6	57.6	46.4	47.10	74	19

Table giving the Monthly and Annual Quantity of Rain and Snow reduced to water; the Maximum, Minimum, and Mean Amounts from 1848 *to* 1869.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September	October.	November.	December.	For the Year.
Mean	1.52	2.21	2.78	3.79	4.95	4.59	4.68	5.69	4.24	3.65	3.27	2.34	44.27
Least.....	.12	.38	.43	.55	1.42	.21	.80	1.36	1.13	.21	.19	.32	23.35
Greatest.....	4.19	5.80	8.60	11.80	12.60	14.30	8.60	14.00	9.92	9.16	5.76	6.25	74.49

Table showing the Monthly and Annual Quantities of Snow in inches, for the years 1848 *to* 1869, *inclusive, according to records kept by Prof. T. S. Parvin, at Muscatine and Iowa City.*

Years.	January.	February	March.	April.	October.	November.	December.	For the Years.
Means..... ...	6.70	6.73	3.93	.76	.40	4.73	9.21	33.23
Least.....	.00	.00	.00	.00	.00	.00	.10	7.90
Greatest.....	24.25	27.00	16.15	6.00	4.10	30.00	29.52	61.97

METEOROLOGY OF KEOKUK, DAVENPORT AND DUBUQUE, IOWA.

1877-78. Year and Months.	KEOKUK. Latitude 40° 23'. Longitude 91° 25'. Elevation 584 feet.								DAVENPORT. Latitude 41° 32'. Longitude 90° 38'. Elevation 603.4 feet.								DUBUQUE. Latitude 42° 30'. Longitude 90° 44'. Elevation 665 feet.							
	Temperature.				Mean Humidity.	Rainfall.	Mean Pressure of Barometer.	Winds in the order of frequency.	Temperature.				Mean Humidity.	Rainfall.	Mean Pressure of Barometer.	Winds in the order of frequency.	Temperature.				Mean Humidity.	Rainfall.	Mean Pressure of Barometer.	Winds in the order of frequency.
	Maximum.	Minimum.	Mean.	Range.					Maximum.	Minimum.	Mean.	Range.					Maximum.	Minimum.	Mean.	Range.				
	°	°	°	°	pr. ct.	in.	in.		°	°	°	°	pr. ct.	in.	in.		°	°	°	°	pr. ct.	in.	in.	
Year.....	96	5	55.9	91	70.3	42.86	29.916	N., S., N. W., S. E.	92	0	53.8	92	69.5	33.86	29.958	N. W., Calm, S. W., N. E.	95	-5	52.2	100	67.9	37.05	29,932	N. W., S., N., S. E., N. E.
1877.																								
July.....	96	58	76.7	38	69.0	7.06	29.889	S. E., S. W., N. W.	92	55	75.3	37	64.6	3 42	29.941	S. W., N. W., S. E., E., S.	95	54	74.7	41	63.1	2.90	29.904	N. W., S. E., S. W., W., S.
August...	94	54	74.4	40	69.9	2.52	29.908	Calm, N., S. E., S.	88	53	72.8	35	66.4	3.21	29.952	Calm, N. W., N., S. W.	91	53	71.9	38	63.5	3.96	29.921	N., N. W., S. W., W., S., S. E.
September	88	52	70.1	36	65.6	3.61	29.949	S., S. E., Calm, S. W.	86	47	67.3	39	65.9	1.45	29.986	S. W., Calm, S. E., S., N. W.	88	42	66.3	46	65.3	0.67	29.947	S., S. W., N. W.
October..	85	37	55.3	48	74.3	7.11	29.946	N. W., N. E., N., S.	82	34	53.7	48	74.7	4.88	29.993	N. W., S. W., Calm, N. E.	78	31	51.7	47	73.9	5.35	29.972	N. W., N., S., S. E., W.
November	62	8	39.6	54	71 7	3.05	30.026	N. W., N., S. E., W., S.	57	7	37.2	50	74.2	2.53	30.066	Calm, W., N. W., E., N.	55	7	35.2	48	77.3	3.31	30.040	N. W., S., S. E., N.
December	65	21	44.8	44	76.1	2.90	30.066	S. W., S., N., N. W., W.	63	20	42.7	43	77.4	2.32	30.087	S. W., Calm, N. E., W.	64	19	41.6	45	75.6	2.70	30.062	N., N. W., N. E., S.
1878.																								
January..	55	5	32.8	50	72.4	0.17	30.019	N. W., N., N. E., W., S. W.	49	0	30.0	49	75.4	0.36	30.059	N. E., N. W., W., S. W., S	45	-5	30.0	50	72.8	0.49	30.043	N. E., S., E., N.
February.	60	16	37.8	44	67.1	2.95	29.995	N., S., N. E.	58	17	36.9	41	72.1	1.09	29.960	N. E., S. W., N., S., C lm.	57.5	13	35.0	44.5	69.3	1.93	29.945	S. E., N., S., S. W., N. W.
March....	76	32	50.3	44	67.3	3.78	29.856	S. E., N., W., N. W., N. E.	73	29	48.4	44	66.6	2.21	29.901	N. W., S. E., E., N. E., S. W.	71	29	43.8	42	65.7	2.44	29.885	S. E., N., S. W., S., N.
April.....	80	41	57.5	39	69.1	2.31	29.714	N. W., N., S., N. E.	76	35	55.0	41	62.8	2.89	29.743	N. W., E., N., W., N. E.	79.5	35	53.8	44.5	61.1	4.34	29.716	N. W., N., S. E., E.
May.....	80	36	60.3	44	70.0	3.41	29.856	N. W., N., S., W.	81	36	57.7	45	67.2	5.14	29.901	N. W., Calm, E., W., N. E.	83	35	56.3	48	63.1	4.61	29.873	N. W., S. E., W., N. E.
June.....	89	50	70.7	39	71.3	3.93	29.856	N., N. W., S., E.	88	48	68.2	40	67.3	4.36	29.908	Calm, E., S. W., N. W., N. E.	91.5	45	67.2	46.5	64.4	4.35	29.881	S. E., W., N., S., E.

Table showing the Dates of the Earliest and Latest Frost and Ice for the years 1839 *to* 1869, *inclusive; also, the Time of Disappearance and Depth of Frost, and the Thickness of Ice from* 1856 *to* 1869, *according to records kept by Prof. T. S. Parvin, at Muscatine and Iowa City, Iowa.*

Years.	Frost.				Ice.		
	Latest.	Earliest.	Disappearance.	Depth—inches.	Latest.	Earliest.	Inches thick.
1839	Apr. 17	Sept. 12	.....	..	Mar. 25	Nov. 7	..
1840	Apr. 27	Sept. 28	.....	..	Apr. 18	Oct. 3	..
1841	Apr. 12	Sept. 11	.....	..	Apr. 14	Oct. 17	..
1842	May 4	Sept. 17	.....	..	Apr. 28	Oct. 19	..
1843	May 2	Oct. 8	.....	..	May 1	Oct. 8	..
1844	May 21	Oct. 10	.....	..	Mar. 30	Oct. 16	..
1845	May 25	Sept. 21	.....	..	Apr. 8	Oct. 5	..
1846	Apr. 15	Oct. 2	.....	..	Apr. 13	Oct. 18	..
1847	May 26	Oct. 9	.....	..	May 4	Oct. 14	..
1848	May 10	Sept. 23	.....	..	Apr. 26	Oct. 1	..
1849	May 1	Oct. 8	.....	..	Apr. 20	Oct. 13	..
1850	Apr. 23	Sept. 7	.....	..	Apr. 23	Sept. 29	..
1851	May 5	Sept. 28	.....	..	May 1	Oct. 15	..
1852	May 20	Sept. 26	.....	..	Apr. 22	Sept. 26	..
1853	May 25	Sept. 10	.....	..	May 13	Oct. 2	..
1854	May 2	Oct. 5	.....	..	May 2	Oct. 15	..
1855	May 6	Sept. 27	.....	..	May 6	Oct. 25	..
1856	Apr. 19	Sept. 24	Apr. 10	29	Apr. 19	Sept. 24	27
1857	May 20	Oct. 14	May 5	14	May 12	Oct. 20	12
1858	Apr. 26	Sept. 12	Apr. 1	12	Apr. 16	Oct. 7	10
1859	Apr. 23	Sept. 2	Apr. 1	11	Apr. 23	Oct. 6	10
1860	May 1	Sept. 11	Mar. 20	11	Apr. 2	Oct. 24	11
1861	May 4	Oct. 23	Mar. 12	20	Apr. 16	Sept. 24	21
1862	Apr. 24	Oct. 11	Apr. 1	20	Apr. 6	Oct. 25	20
1863	Aug. 25*	Aug. 29	Apr. 2	18	Apr. 8	Oct. 7	20
1864	May 11	Sept. 19	Apr. 17	18	Apr. 14	Oct. 18	20
1865	May 11	Oct. 2	Apr. 10	20	Apr. 6	Oct. 15	18
1866	May 2	Sept. 21	May 7	20	Apr. 6	Oct. 31	24
1867	May 6	Oct. 23	May 23	18	Apr. 6	Nov. 4	18
1868	Apr. 5	Sept. 17	Apr. 15	20	Apr. 8	Nov. 1	22
1869	May 19	Sept. 26	Apr. 7	21	Apr. 13	Oct. 13	20
Latest	May 26	Oct. 23	May 23	29	May 13	Nov. 7	27
Earliest	Apr. 5	Aug. 29	Mar. 12	11	Apr. 2	Sept. 24	10
Mean	May 4	Sept. 24	Apr. 10	18	Apr. 18	Oct. 15	18

On page 834 we give the Signal Service statistics for Keokuk, Davenport, and Dubuque, which, though a little differently

* The year 1863 was very cold, not only in Iowa, but throughout the country, and there was frost in every month of the year. It has only once or twice in thirty years seriously injured the corn crop. When the spring is late the fall is generally lengthened, so that the crop has time to mature.

arranged, give substantially the same particulars in regard to these cities; the chapter on Nebraska will give the meteorology of Omaha, which very fairly represents Western Iowa.

Zoölogy.—The wild animals of Iowa are rather those of the Mississippi valley than of the "Plains" or the Rocky Mountains. The buffalo and the antelope, which once coursed over its prairies, are not now among its wild game; and the elk (wapiti), if he ever had his *habitat* in the State, has it no longer. The Virginia deer is abundant in some parts of the State, the black-tailed or mule deer is seldom if ever seen east of the Missouri river. Bears, the black or brown species, are still found, though less numerous than formerly. The *felidæ*—panthers, wild cats and lynxes—and the *mustelidæ*—fishes, martens, minks, skunks (especially the last), and the muskrat and beaver—are sufficiently numerous to reward the hunter and trapper for his labors. The gray wolf is much less abundant than formerly, and so is the yelping prairie wolf, perhaps miscalled *coyote.* The common or red fox is still found in considerable numbers, especially in the northern, western and southwestern parts of the State. Marmots or gophers, woodchucks or ground-hogs, the porcupine, the raccoon, and more rarely the opossum, are among the other wild animals of the State. Rabbits and hares, squirrels of several species, brown and black rats, half a dozen kinds of mice and moles of several species, are the other principal mammals of the State. Of birds and especially game birds Iowa has its full share. Wild geese, many species of ducks, brant and teal, a half dozen or more species of the grouse tribe, including the prairie-hen, the quail, the partridge and the ptarmigan, many species of snipe, woodcock and other waders, pigeons and doves of several species. Song-birds are also in great variety, and the birds of prey, especially eagles, vultures, hawks and owls, are sufficiently numerous. There are not so many reptiles as in some States, though the number of serpents is considerably large, and includes with many harmless species three or four poisonous serpents, among which two species of rattlesnakes are the most numerous. There are several species of batrachians, but no true saurians in the State. The numerous rivers, streams

and lakes are well stocked with fish, mostly of edible species. There are many excellent trout streams, especially in the north and west of the State.

Agriculture, Soil and Productions.—We have already described the constituents of the soil of the State. It is only necessary to say, further, that a soil from four to ten feet deep composed of these substances and with such rocks underlying it as those which constitute the basis of the Iowa lands, and an abundance of water both in its streams and the rainfall, should not be surpassed in fertility by any soil on the globe. Yet bad farming may make even this soil less productive than it should be. If there is no rotation of crops, and the same fields are devoted to wheat or corn, or other cereals or root crops year after year, and the constituents thus drawn from the soil are not in any way returned to it; if there is very shallow plowing, no manuring, and little or no care to eradicate weeds, it will not be matter for surprise if the yield of wheat or corn grows less and less with each year.

In this neglect of deep plowing, rotation of crops, and the use of fertilizers, we do not mean to insinuate that Iowa farmers are sinners above the farmers of other States or Territories adjacent; on the contrary we believe that much of the Iowa farming is better than that of the neighboring States. It is now thirty-four years since her admission into the Union as a State, and her eastern counties have been long cultivated. In many respects in the diversity of her products, the excellence and perfection of her fruits, and the wide introduction of new varieties from Northern and Northeastern Europe, and the general thrift of her farming, she is entitled to high commendation. But with that magnificent soil, and the constant breaking of new land for wheat, the first crop of which is usually the largest, and on lands immediately adjacent, in Dakota and Minnesota, yields from twenty-five to forty bushels to the acre, we cannot but think there is something wrong, when the average wheat crop of the State, year after year, is only from thirteen to fifteen bushels per acre. In England, with a soil by no means so well adapted to wheat culture as that of Iowa, and after centuries of culture, the average crop is

thirty-four bushels to the acre. Spring wheat is a more certain crop than winter wheat, yields better, and brings a higher price. Iowa is not quite so well adapted to corn as Illinois, Nebraska or Kansas, an untimely frost sometimes, though rarely, injuring the crop; but in average years she might very easily produce a much larger amount to the acre than she does, and with the attention she is giving to earlier ripening varieties of both corn and sorghum, she might make sure of a crop sufficiently early to escape all danger of frost save in an exceptional year like 1863, when there was frost every month. The average crop of corn per acre in the State ranges from thirty to thirty-five bushels per acre, an amount which leaves very little if any margin of profit. The Agricultural College of the State at Ames, in the centre of the State, raised in 1879, on new land and in a somewhat unfavorable year, fifty-seven bushels to the acre on sixty-five acres. The superintendent insists that eighty bushels to the acre ought to be the minimum crop in an average season with fair culture. It is a matter of satisfaction that in 1879 there was a small advance in the average product per acre.

Oats are of excellent quality, but the yield is very much less per acre than it should be. In 1876 it was but twenty-three and a half bushels to the acre; in 1878 thirty-six and a third bushels to the acre, and in 1879 thirty-six bushels. All over the State there are farms, where, with ordinarily good culture, oats, in large fields, average year after year sixty to sixty-five bushels per acre.

Barley should yield somewhat more than wheat, especially on new lands, but the average yield, which should be from thirty-five to forty bushels, ranges from twenty to twenty-five bushels.

Rye and buckwheat are for the most part raised on the poorest lands, and seldom yield more than from nine to twelve bushels per acre, and are not therefore profitable crops to raise.

Potatoes, and the root crops generally, do well in Iowa, especially on the western or Missouri slope, the soil being admirably adapted to them, but the yield, though fair, is not so large as it should be. At the Agricultural College at Ames, in the centre of the State, the yield averages about 240 bushels of potatoes to

the acre; elsewhere it is much lower. With such a soil as that of Iowa, 350 bushels to the acre should be the minimum, in an ordinarily favorable year, and of turnips, beets, carrots, etc., from 600 to 750 bushels.

The following table shows the acreage, yield, quantity raised per acre, average price and total value of each of the principal crops of Iowa in 1878 and 1879, according to the United States Agricultural Department:

Crops and unit of measure.	The Crop of 1878.					The Crop of 1879.				
	Quantity produced.	Average yield per acre.	Number of acres in each crop	Value per bushel, pound, or ton.	Total valuation.	Quantity produced.	Average yield per acre.	Number of acres in each crop.	Value per bushel, or ton.	Total valuation.
Indian corn, bus.	175,256,400	37 4	4,686,000	$0 16	$28,041,024	191,600,000	40.	4,790,000	$0.24	$47,421,000
Wheat, "	30,449,960	9.4	3,238,400	.50	15,220,480	37,485,000	10.2	3,675,000	.92	34,486,200
Rye, "	431,600	16 6	26,000	35	151,000	437,250	15.6	27,500	.54	236,115
Oats, "	38,332,800	26.3	1,456,000	.13	4,983,264	37,008,000	36.	1,028,000	.23	8,511,840
Barley, "	5,088,000	24.	212,000	.33	1,679,040	4,796,000	22.	218,000	.45	2,158,200
Buckwheat, "	123,200	14.	8,800	.51	62,832	157,500	18.	8,750	.69	106,925
Potatoes, "	10,070,000	100	100,700	.26	2,618,200	8,901,000	86.	103,500	.32	2,848,320
Hay,* tons,	3,564,000	1.80	1,980,000	3.60	12,830,400	3,064,600	1.54	1,990,000	4.54	13,913,284
			11,307,900		$65,586,300			11,840,750		$109,681,884

Other crops have attained a considerable magnitude in Iowa. Among them we may name: *Sorghum*, which has been cultivated to a moderate extent for fifteen or twenty years, but in 1878, 1879 and 1880 has taken a new departure. The Early Amber Sorghum, though not the most profitable variety in the amount of its yield of the saccharine juice, is yet better adapted than most of the others to Iowa, in consequence of its early ripening, the ripening of the seed being the condition precedent to the production of the greatest amount of crystallizable sugar, and giving the additional advantage, that the seed and the leaves, both furnishing excellent food for cattle, can be preserved. The crops of 1879 and 1880 are both very large, and are likely to increase very greatly in the future.

Other plants of the *Zea* family, such as broom corn, Hungarian grass, the German and pearl millet and the dhurra and Egyptian

* This includes also hay from forage crops, Alfalfa, Hungarian grass, millet, etc.

rice corn, if these two are not, as some suppose, identical, are coming into somewhat extensive cultivation in the State, and will prove valuable additions to its forage crops, while the rice corn and pearl millet yield grains which are valuable for the food of man and animals, and the broom corn is always a profitable crop.

Iowa is well adapted to the culture of the castor-bean, and it proves a profitable crop when it is planted early and has time to *ripen* before the frost. This crop is one which will be more profitable if a sufficient number of farmers engage in its culture to furnish employment to an oil mill in the immediate vicinity, as they can then obtain a much better price for the beans. The pea-nut or ground-nut might be successfully cultivated, especially in Southern and Southwestern Iowa, and while the vines are excellent for forage, the nuts command a good price, and if there is an oil mill near, they may be ground for the oil at a good profit.

But notwithstanding its extremes of temperature, Iowa has become famous for its fruits. The soil is well adapted to these, and great attention has been paid to the production and culture of hardy varieties which would withstand the extreme cold of some of the winters. The efforts made for this purpose have been very successful. Many varieties of apples and pears have been imported from Northern Russia, Northern China and Japan, which, after acclimation, have proved the best of these fruits for summer, autumn and winter use. The peach does not flourish quite as well, though some of the more hardy varieties do well. The plum and cherry are very successfully cultivated.

The value of farm, market garden and orchard products reported in the State census for 1875, as gathered the preceding year, was $133,440,855. The census of the present year will probably show nearly double the amount.

But Iowa has been most successful, perhaps, in stock-raising. Her live-stock, as enumerated at the last State census, in 1875, was as follows. We give for the sake of comparison the statistics of the United States Department of Agriculture, January, 1880:

Live-stock according to Census of 1875.		Live-stock Report of U. S. Agricultural Department, 1880.		
Animals.	Number.	Number.	Price per Head.	Value.
Horses	700,617	778,407	$52.00	$40,477,164
Mules and asses .	36,820	44,702	66.00	2,950,332
Milch cows . . .	528,483	723,534	24.20	17,509,523
Other cattle* . .	1,405,582†	1,370,368	23.12	31,682,908
Sheep		454,410	2.50	1,136,125
Hogs	3,139,973	2,798,400	6.36	17,797,824
Hogs slaughtered and sold for slaughter in 1875 . . .	2,514,421			
		Total value		$111,553,876

Iowa has maintained the front rank in the production of pork, for which its agricultural products give it great advantages. The question has come to be one of mathematics entirely. Given corn, sorghum seed, rice corn or millet at a certain price per bushel, and also given a fixed price per 100 pounds for pork, either live or dead weight, which pays best, all things considered—to sell the corn or other grain, or to fatten hogs with it? We have seen in Part II. that in Kansas, with corn at from twenty to thirty cents a bushel according to locality, the farmers decided that there was more profit in using it to fatten hogs than in selling it. The Iowa farmers nearer the great markets have come to the same conclusion with corn at a somewhat higher price. But with the new demand for corn for glucose sugar, the price may be so much enhanced, that unless other grains can be substituted for corn for fattening purposes, such as sorghum seed, millet, rice, corn, etc., the quantity of pork made may be seriously diminished. The present year there seems to be no diminution in the quantity, but what there may be in the future remains to be seen.

Iowa is, we believe, sixth or seventh among the States and Territories of "Our Western Empire" in the number of her

* Except working oxen in the census of 1875. In 1880, working oxen are included.

† This includes 9,690 thoroughbred short-horns.

sheep. While the cost of rearing a sheep is somewhat greater than in Western Kansas, Colorado or New Mexico, care in the selection of the best breeds and in preserving them from disease and enemies makes it a fairly profitable pursuit. On this subject, facts are worth very much more than theories. We introduce therefore without apology the carefully tabulated results of five years of sheep-farming in Crawford county, Western Iowa, by one of a number of Holstein farmers who had been accustomed to the care of sheep all their lives, and who had emigrated to Iowa, and engaged in the business there.

As these farmers all started substantially alike in the business, they have followed the same course of feeding, and the results have been about the same. The staple of wool has been combing, delaine, medium, coarse and fine; it has been sold in the Philadelphia market at prices ranging from eighteen to twenty-eight and a half cents per pound, netting twenty cents per pound.

In feeding, they have found the blue joint grass most excellent, and ample for summer feed. In winter they feed corn in the stalk, cut for fodder. The ewes have sheaf oats after January 1st. The grain consumed per head is about five bushels, costing eight to ten cents per bushel, in the shape in which it is fed; as Mr. Henry Lehfeldt said: "The sheep husk their own corn and thresh their own oats, and the sheep farmer has nothing to do but be lazy." The theory of feeding is, as the food is cheap, to keep the sheep at all times in the very best condition; and to that end they are allowed all the grain they will eat. They are fed no hay. They found a little trouble in that the sheep sometimes ate too freely of corn and became over-heated. This they have learned to remedy. They also found it injurious to feed corn to ewes with lambs after the first of January; some losses were had from this cause. Straw sheds, open to the east, about four feet high, in a protected yard, are all that is used for shelter. We asked if any diseases affected the sheep. We received the emphatic reply, "No, none whatever."

These farmers are from Holstein, and are thoroughly intelligent in their business. They were raised shepherds. The

business of raising and fattening sheep for the Hamburg-London market they were brought up to. They handled Cotswolds in Holstein, and said Cotswolds did as well here as in Holstein, if not better. They prefer the Cotswold. The Southdown is good for mutton but deficient in wool. It was as profitable to raise and fat them here as in Holstein and more so.

COST.

Sept., 1875, cost of 500 ewes at $2.50		$1,250 00
Sept., 1875, cost of 15 bucks at $20 (Cotswold)		300 00
May, 1876, fed 50 acres corn and oats in sheaf at $5 per acre		250 00
Sept., 1876, cost of attendance 1 year		200 00
May, 1877, fed 100 acres of corn in stalk and oats in sheaf at $5 per acre		500 00
Sept., 1877, cost of attendance 1 year		250 00
May, 1878, fed 125 acres of corn in stalk and oats in sheaf at $5 per acre		625 00
Sept., 1878, cost of attendance 1 year		250 00
May, 1879, fed 125 acres of corn in stalk and oats in sheaf at $5 per acre		625 00
May, 1879, cost of attendance 1 year		190 00
Add for annual interest account—		
Sept., 1876, interest on $1,550 1 year at 10 per cent. per annum	$155 00	
May, 1877, interest on $250 1 year at 10 per cent. per annum	25 00	
Sept., 1877, interest on $1,855 1 year at 10 per cent. per annum	185 50	
May, 1878, interest on $775 1 year at 10 per cent. per annum	77 50	
Sept., 1878, interest on $2,200 1 year at 10 per cent. per annum	220 00	
May 30, 1879, interest on $1,477.50 13 months at 10 per cent. per annum	160 96	
May 30, 1879, interest on $2,769 9 months at 10 per cent. per annum	207 67	
Amount of interest charged		$1,040 63
Total cost of investment		$5,480 63

RETURNS.

May 30, 1876, sold 4,125 pounds wool, clip 1876, 500 ewes at 20 cents per pound net	$825 00

May 30, 1877, sold 8,992 pounds wool, clip 1877, 500 ewes, 525 yearlings, at 20 cents		$1,798 40
May 30, 1878, sold 8,992 pounds wool clip 1878, 500 ewes, 525 yearlings, at 20 cents		1,798 40
May 30, 1878, sold 525 fat sheep at $7.50, sold in March and April		3,937 50
May 30, 1879, sold 8,992 pounds wool, clip 1879, 500 ewes, 525 yearlings, at 20 cents		1,798 40
May 30, 1879, sold 525 fat sheep at $7.50, sold in March and April		3,937 50
May 30, 1879, on hand 500 ewes with lamb at $4.50 per ewe	$2,225 00	
15 bucks for service at $20	300 00	
525 yearlings (shorn) at $2	1,050 00	
		$3,525 00
Add for annual interest account—		
May 30, 1879, interest on $825 1 year at 10 per cent. per annum	$82 50	
May 30, 1878, interest on $2,705.90 1 year at 10 per cent. per annum	270 59	
May 30, 1879, interest on $8,712.30 1 year at 10 per cent. per annum	871 23	
Amount of interest credits		$1,224 32
Total returns from investment		$18,894 52
Net returns		$13,413 89

A large proportion of the stock-raising in Iowa consists in the purchase of "store cattle," as the English farmers call them, from Dakota, Montana, Colorado, Wyoming and Kansas, and fattening them either for exportation to England or for the Chicago, New York or Boston markets. The distance which the cattle are to be driven is somewhat less, the grain and forage somewhat cheaper, and the distance to a shipping port or to market about the same as from Central Illinois.

There is also a greatly increasing demand in Iowa for cattle for dairy farming. At the recent National Dairy fairs and congresses Iowa has taken the first prizes for the best butter, and has attained high rank also for the production of the best cheese. The demand for these products all over the West is constantly increasing and they command high prices.

Railroads and Steam Navigation.—Iowa is traversed from east to west by five railroad lines, which, with their branches, reach nearly all the counties; these are, beginning with the northern tier of counties, the Chicago, Milwaukee and St. Paul, the Iowa Division of the Illinois Central, the Chicago and Northwestern, the Chicago, Rock Island and Pacific, and the Chicago, Burlington and Quincy. As all these have Chicago for their eastern terminus, so all of them, either directly or by the intervention of north and south roads, centre at Council Bluffs and Omaha, on the western border of the State. Six railroads cross the State from north to south, many of them having branches. These are the Dubuque and Minnesota and its continuation, the Chicago, Clinton and Dubuque, the Davenport and St. Paul, the Burlington, Cedar Rapids and Minnesota, with which a northern branch of the Illinois Central forms a junction at Cedar Falls; the Central Railway of Iowa, the Fort Dodge, Des Moines and Keokuk, and the St. Paul and Sioux City, which hugs the eastern bank of the Missouri. The entire number of miles of railway in operation in Iowa, January 1, 1880, was 4,750. This was aside from sidings, double tracks, etc.

Population.—The growth of population in Iowa has been rapid, not quite equalling, perhaps, in its percentage that of some of its younger sisters, but sufficiently so for a healthy development. During the last decade, when the tendency of the inhabitants of the States of the Mississippi valley has been to migrate to the newer west, Iowa has not only held her own, but has increased twenty-six per cent. The following table shows the population at different periods of its history. The official figures of the population in 1880 have just been made public, and they give a total footing of 1,624,463.

In 1838	22,859	In 1854	326,013
1840	43,114	1856	519,055
1844	75,152	1859	638,775
1846	97,588	1860	674,913
1847	116,651	1863	701,732
1849	152,988	1865	754,699
1850	191,982	1867	902,040
1851	204,774	1870	1,194,020
1852	230,713	1880	1,624,463

There are large German and Scandinavian elements in the population, but the majority of the inhabitants are of American birth. There is one small Indian reservation of 692 acres, occupied by a band of the Sac and Fox Indians. It is on the Iowa river, in Tama county, and the Indians number 345; 164 males and 181 females. They have made considerable progress in civilization, own and occupy permanent houses of their own, cultivate their lands and raise horses. They have a considerable amount of property aside from their annuities, good schools, and many of them have adopted citizens' dress.

Counties.—There are ninety-nine organized counties in the State, the names of which follow:

COUNTIES.

Adair,	Davis,	Jefferson,	Pocahontas,
Adams,	Decatur,	Johnson,	Polk,
Allamakee,	Delaware,	Jones,	Pottawatomie,
Appanoose,	Des Moines,	Keokuk,	Poweshiek,
Audubon,	Dickinson,	Kossuth,	Ringgold,
Benton,	Dubuque,	Lee,	Sac,
Black Hawk,	Emmet,	Lind,	Scott,
Boone,	Fayette,	Louisa,	Shelby,
Bremer,	Floyd,	Lucas,	Sioux,
Buchanan,	Franklin,	Lyon,	Story,
Buena Vista,	Fremont,	Madison,	Tama,
Butler,	Greene,	Mahaska,	Taylor,
Calhoun,	Grundy,	Marion,	Union,
Carroll,	Guthrie,	Marshall,	Van Buren,
Cass,	Hamilton,	Mills,	Wapello,
Cedar,	Hancock,	Mitchell,	Warren,
Cerro Gordo,	Hardin,	Monona,	Washington,
Cherokee,	Harrison,	Monroe,	Wayne,
Chickasaw,	Henry,	Montgomery,	Webster,
Clarke,	Howard,	Muscatine,	Winnebago,
Clay,	Humboldt,	O'Brien,	Winneshiek,
Clayton,	Ida,	Osceola,	Woodbury,
Clinton,	Iowa,	Page,	Worth,
Crawford,	Jackson,	Palo Alto,	Wright.
Dallas,	Jasper,	Plymouth,	

Cities and Large Towns.—The following are the largest cities

and towns of the State, with the population of the first seven according to the census of 1880; the others according to the census of 1875:

Des Moines	22,408	Vinton	2,389
Dubuque	22,254	Indianola	1,884
Davenport	21,834	Pella	2,536
Burlington	19,450	McGregor	1,852
Council Bluffs	18,059	Charles City	2,269
Keokuk	12,117	De Witt	1,754
Muscatine	9,987	Hamburg	2,058
Clinton	7,028	Independence	3,424
Sioux City	4,290	Osceola	1,701
Ottumwa	6,326	Maquoketa	2,112
Mount Pleasant	4,563	Webster	2,262
Iowa City	6,371	Atlantic	1,832
Lyons	3,784	Albia	1,883
Cedar Rapids	10,104	Chariton	2,174
Cedar Falls	3,270	Mason City	1,703
Marshalltown	4,384	Boone	2,332
Waterloo	5,508	Winterset	2,433
Waverley	2,405	Newton	2,354
Washington	2,189	Lansing	2,280
Oskaloosa	4,263	Marion	2,047
Fort Dodge	3,537	Fairfield	2,343
Fort Madison	4,305	Decorah	2,597

Lands for Settlers.—The whole area of the State, which originally belonged to the United States, has been surveyed. Of the amount—35,228,800 acres—there have been granted to the State the School and University lands, and 3,449,720 acres selected (not all yet approved or patented) as swamp lands; to railroad companies in the State about 3,000,000 acres, or in all somewhat more than 10,000,000 acres of lands. The greater part of the desirable government lands have been taken up either by purchase or pre-emption, or under the Homestead or Timber-Culture Acts. There are, however, in the western part of the State, some lands, mostly alternate sections with the railroad land grants, still unsold. These are generally double minimum lands; that is, they are held at $2.50 per acre. In the fiscal

year 1879 the government disposed of 11,600 acres of these lands to actual settlers, 9,750 acres of which were under the Homestead or Timber-Culture Acts.

The State has a large amount of land yet for sale, including its School, University, Agricultural College, and swamp lands. The latter are for the most part only entitled to this name in a Pickwickian sense, being, in many instances, the best lands in the State. All the State lands are held at prices above the government rates, though varying with different localities or market facilities, the range of prices being generally from $3 to $10 or $12. The railroads have also a considerable quantity of land to sell, and most of it of very good quality. The railroad lands are all prairie, and are divided according to location, soil, etc., into grazing and farming lands; the grazing lands, though of fair quality for pasturing cattle or sheep, are not so rich or fertile as the farming lands. They are held at about $2.50 per acre, and where taken in considerable quantities are sold on a liberal credit. The farming lands bring from $3.50 or $4 to $10, according to locality, fertility, and convenience of access to markets. It is also often possible to buy partially improved farms at very reasonable prices. The long period of financial depression, the partial failure of the best crops from storms, cyclones, or other disasters, the grasshopper plague, the prevalence of the Colorado beetle, and epidemics of hog cholera, which greatly reduced their herds of swine for several years, have interfered with the prosperity of Iowa very sensibly in the past. About nine or ten years ago, the farmers of Iowa were very generally in debt either for their farms or their agricultural machines, and the ironclad notes, which the manufacturers' agents exacted from the farmers, gave a lien on the farms which resulted in the foreclosure of the mortgages in thousands of cases, and it seemed for a time as if the entire body of farmers would have to go into bankruptcy. It was at this time that the organization known as "Patrons of Husbandry" became very popular in the State. The granges, local, county, and State, were well managed, and, by associated action, they succeeded in rescuing the greater part of the farmers from their nearly bankrupt condition,

enabled them to procure their agricultural machines for cash at one-half (sometimes at one-third) of their previous credit price, and their farm supplies in the same way. This course pursued energetically for a series of years, has enabled the Iowa farmers very generally to redeem their lands from mortgages, and though they had a succession of poor or indifferent crops, and did not till their farms to the best advantage, they have emerged into a condition of comparative independence, and, with better crops and their ambition roused to attempt better culture, the future of agriculture in Iowa seems much brighter than a few years ago. It is no part of our purpose to chant the praises of the Patrons of Husbandry or any other secret organization. All of these organizations have their faults, and at times undoubtedly may exert a prejudicial influence on the interests of the State or nation; but, at the time of which we speak, their influence in Iowa, Kansas, Minnesota, and some other States was highly beneficial to the farmers.

In many instances, the settler of limited means, who has purchased a tract of Iowa prairie lands, has found himself compelled to wait for eighteen or twenty months before he could realize anything from his land, inasmuch as the thick, tough prairie sod beaten down for ages by the hoofs of the buffaloes and the Indian ponies, will not rot sooner than that time, sufficiently to yield a crop of any value. To such an immigrant, looking forward with anxiety and terror, to coming months of privation for himself and family, and ready to give way to despair, we beg leave to commend the following very practical suggestions from an Iowa farmer who knows by personal experience the success of the plan he recommends:

"How to bridge over the first year on a new piece of prairie has been one of the most difficult of problems for the settler of limited means to solve. The uncertainty of being able to support their families until a crop of grain could be raised, has prevented thousands from beginning the healthful and independent life of the farmer. Nature, though ever kind and bountiful, will allow no trifling with her requirements and processes. To raise grain successfully, the tough, thick prairie sod, the result of

untold years of luxuriant vegetation, must be thoroughly rotted. This will not take place the first season of breaking, and therefore, the most that can be hoped for that season, in the way of grain, is a crop of 'sod corn,' which, though sometimes excellent, is yet an uncertain and unreliable resource as a means of support.

"Is there any crop which can be planted the first season upon breaking of that year which will afford the farmer assurance of return for his labor from the very beginning of his operations? This question has occupied the most thoughtful attention of many of our best and most intelligent farmers, and a complete answer has been found during the past three or four years in the culture of flax upon new breaking. From the experiments made during several seasons, it may be considered as settled that the requirements for the growth and maturity of this crop are afforded as amply by new breaking, as by land previously cultivated. From many instances within our knowledge, embracing fields varying from 10 to 400 acres in extent, we select one, and give below the details. The net result in this case is not as favorable as in some others, but the selection is made because the details are complete, and have been verified by affidavit.

"Mr. Eugene Fuller, formerly of Sandwich, Ill., upon his farm near Storm lake, in Buena Vista county, Iowa, raised fifty acres of flax on new breaking last year (1878) with the following result:

Receipts.—275 bushels of flax-seed raised on 50 acres of breaking, sold at $1.25 per bushel		$343 75
Expenses.—Breaking 50 acres at $2 per acre	$100 00	
25 bushels seed at $1.25 per bushel	31 25	
Cost of putting in seed, 25 cents per acre	12 50	
Cost of cutting and stacking, 50 cents per acre	25 00	
Threshing, 9 cents per bushel	24 75	$193 50
Profit		$150 25

"It will thus be seen that the farmer doing his own breaking, seeding, and cutting would be at an expense of only $1.12 per

acre for seeding and threshing, and that the net result, after paying all expenses, is $3 per acre. Other cases reported to us have given the net profit as high as $5.50 per acre. Besides the profit on cultivation, the crop is a great advantage to the land for the succeeding crop, as it leaves it clean and in better condition than if permitted to remain idle.* The importance of this new departure in farming cannot be over-estimated, for it is nothing less than a year's gain in cropping, and that at the most important time to the settler, the beginning of his enterprise, when the call upon his resources is greatest. The man of limited means need no longer be deterred from buying a home by the fear that a year must be lost after breaking before the farm will yield returns."

Manufactures.—Iowa has always been regarded as an essentially agricultural State, yet she has from the first taken a deep interest in manufactures, for which her fine water-powers and her large production of excellent coal give her extraordinary facilities.

Her flouring mills are very numerous and on a large scale. She has also extensive smelting works, agricultural implements and machine works, carriage, wagon, and car works, creameries, cheese factories, plaster mills, sorghum mills and sugar refineries, cotton, woollen, and silk mills, etc. The growth of manufactures in the State has been very large during the last decade and is now rapidly increasing.† Until the returns of manufactures for the census of 1880 are received and published, it is useless to conjecture the present amount of these in the State; but, though the aggregate is certainly less than that of the great manufacturing State of Missouri, which joins Iowa on the south, yet it will reflect high honor upon its industry and enterprise.

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* The cortical fibre of the flax stalk, though nearly worthless as flax, is valuable for paper stock, after being run through a flax breaker, and will bring, anywhere within 100 miles of a good paper mill, from seventy to eighty dollars a ton, for that purpose. The best writing and map papers can be made from it.

† In 1874, the State census, which omitted all the small industries, and only enumerated nineteen kinds of manufactures, reported 3,203 establishments, employing 18,854 men, and producing goods valued at $39,263,310. The probability is that this sum was not at that time one-half of the actual production of that year; and the progress since 1854 has been enormous.

Educational Advantages.—The State has made ample provision from the first for the education of all its children and youth. Beginning with the higher instruction, it has a State University at Iowa City fully organized and under an able faculty, having 284 students in its collegiate and 232 in its professional departments, and taking rank with any State University in the country; a State Normal School at Cedar Falls, having a principal and five other professors and 237 teacher pupils in 1879; a State Agricultural College at Ames, well endowed, and with a faculty of 24 professors and teachers, and 305 students. There are also 99 Teachers' Institutes held every year, one in each county, where for from two to four weeks the teachers of the public schools are instructed by the ablest professors and teachers who can be obtained. Below these come the public schools, graded and ungraded. Of these schools there are now 10,951, occupying 10,791 school-houses, of which 10,719 are substantial buildings of frame, brick, or stone. The appraised value of these school-houses in 1879 was $9,066,145, an increase from $38,506 in 1849, thirty years before, of 241 times the amount. There were 21,152 teachers employed in these schools, viz.: 7,573 males, 13,579 females, and the average compensation for the whole State was $31.71 per month for males, and $26.40 for female teachers. The whole number of persons of school age of both sexes (between five and twenty-one years) in the State was 577,353, out of a total population of about 1,500,000; of these, 431,317 were enrolled on the school registers, and the average attendance was 264,702. The average cost of tuition per month was $1.49 per head. The total expenditure for school purposes annually was $5,051,478, or about $3.33 for each inhabitant of the State; of this amount $2,927,308 was for teachers' salaries, $1,149,718 for school-houses, apparatus, etc., and $979,452 for fuel and other contingencies. The permanent school fund amounts to $3,484,411, and is constantly increasing. The income from this, $276,218 in 1879, is distributed to the schools, but the remainder, $4,775,260, is raised by district taxation and local funds. The teaching is for the most part of a very high order.

Beside this liberal course of public instruction, the State has special schools for deaf mutes, the blind, and for orphans and deserted children, and reformatories for neglected, wayward, and vicious children. There are, moreover, fifteen or twenty colleges, and very many academies, collegiate schools and seminaries, mostly under the control of the different religious denominations. The immigrant coming to Iowa with his family need not fear that they will be deprived of the opportunities of gaining an education, whatever his own circumstances may be.

Religious Denominations.—The general tone of society in Iowa is eminently moral, and, to a considerable extent, religious. In no State west of the Mississippi are so large a proportion of the inhabitants connected with some religious denomination. The Methodists take the lead, both in the number of members and the adherent population; the Presbyterians, Catholics, Congregationalists, Baptists, German Reformed, Lutherans, Episcopalians, and minor sects follow after in about the order designated. Every village, even the newest, has one or more churches. The religious, like the secular teaching, is generally of a high order.

The immigrant coming to Iowa either with a large or small capital may not find the avenues to large immediate wealth so wide as in some of the newer States and Territories, but if temperate, industrious, and frugal, he is sure to acquire a competence in a few years; and, meanwhile, he has the advantages of established organizations, good society, excellent educational and religious institutions, a fertile soil, and easily accessible markets.

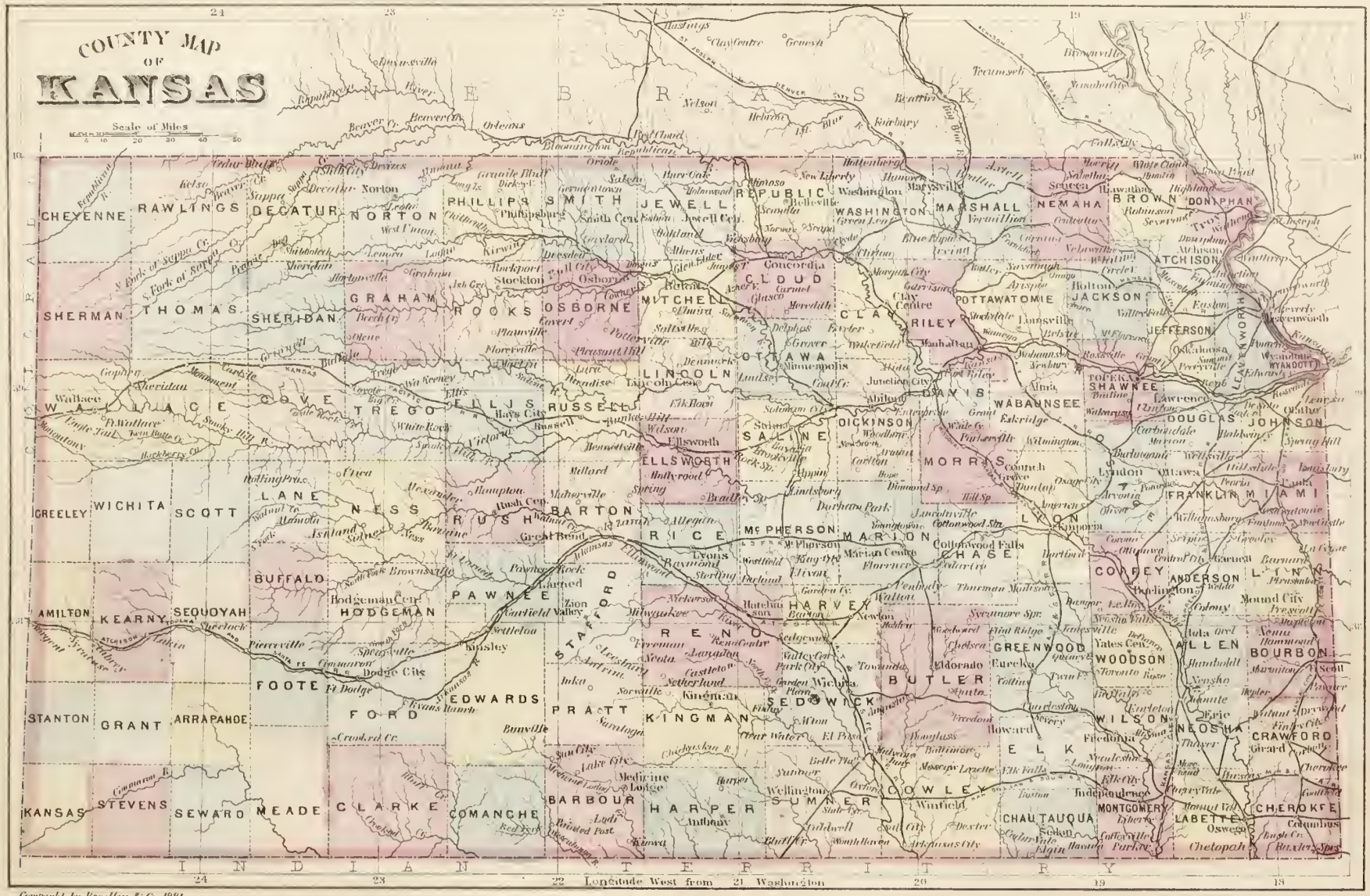
CHAPTER IX.

KANSAS.

KANSAS GEOGRAPHICALLY THE CENTRAL STATE—ITS BOUNDARIES—LATITUDE, LONGITUDE, LENGTH, BREADTH AND AREA—ITS SURFACE, DECLINATION AND ELEVATION AT VARIOUS POINTS—RIVERS—LAKES—HILLS—NO MOUNTAINS IN THE STATE—GEOLOGY AND MINERALOGY—THE GEOLOGICAL FORMATIONS—THE QUATERNARY, TERTIARY, CRETACEOUS AND CARBONIFEROUS AND LOWER CARBONIFEROUS SYSTEMS REPRESENTED—FOSSILS—GREAT VARIETY OF THESE—ECONOMIC GEOLOGY—COAL—SALT—LEAD AND ZINC—GYPSUM—BUILDING-STONE, ETC., ETC.—GAS OR BURNING WELLS—SOIL AND VEGETATION—NATIVE TREES—TREES PLANTED UNDER THE TIMBER-CULTURE ACTS—FLOWERS—ZOOLOGY—NATURAL CURIOSITIES AND PHENOMENA—CLIMATE AND METEOROLOGY—METEOROLOGICAL STATISTICS—RAINFALL—AGRICULTURAL PRODUCTIONS—TABLES OF PRODUCTIONS OF 1877, 1878, 1879—LIVE-STOCK—VALUATIONS OF REAL AND PERSONAL ESTATE—SCHOOL STATISTICS—NO MINES OR MINING EXCEPT COAL, LEAD AND ZINC—MANUFACTURES—POPULATION—INDIANS—SOURCES FROM WHICH POPULATION IS DERIVED—COUNTIES, CITIES AND TOWNS—SCHOOLS AND EDUCATION—CHURCHES—RAILROADS—KANSAS A HOME FOR IMMIGRANTS.

KANSAS is, geographically, the central State of the American Union, and one of the largest and most enterprising of the great States of the central belt of "Our Western Empire." It is bounded on the north by Nebraska, on the east by Missouri, on the south by the Indian Territory, and on the west by Colorado. It would be a perfect parallelogram, but that the Missouri river cuts off a slice of its northeast corner, and hands it over to Missouri. It is situated between the 37th and the 40th degrees of north latitude, and between the meridians of 94° 35′ and 102° of west longitude from Greenwich, and is 404 miles long from east to west, and 208½ miles wide from north to south. The latest Land Office Report makes its area 80,891 square miles, or 51,770,240 acres.

Topography and Surface—Rivers and Lakes—Plains, Prairies and Valleys.—The topography of the State shows an alternation of broad, level river valleys and high rolling prairies, the whole forming a series of gentle undulating plateaus, sloping at an



average inclination of seven and a-half feet per mile from the mountains toward the Missouri river. Thus at Monotony the altitude is 3,792 feet; at Wallace, Kansas, 3,319 feet; at Ellis, 2,135 feet; at Abilene, 1,173 feet; at Topeka, 904 feet, and at Wyandotte, 707 feet. The elevations of corresponding points in the Arkansas valley and on the Atchison, Topeka and Santa Fé Railway, are a little lower in the west, but a little higher as we go east, showing a moderate declination from north to southwest, as well as a more marked one from west to east; thus, Sargent, at the west boundary of the State, is 3,129 feet; Lakin, 3,013; Kinsley, 2,200; Newton, 1,433; Burlington, 1,055, and Fort Scott, 912 feet.

The principal rivers of the State are the Missouri, which washes its northeastern corner for a distance of forty or fifty miles; the Arkansas, which leaves the State near the 97th meridian, after traversing the whole southern and southwestern portion of it; the larger tributaries of this noble river, the North and South Forks of the Cimmaron, Salt and Red Forks of the Arkansas, Chikaskia, Verdigris and Neosho rivers on the south bank, and the Pawnee and Walnut creeks on the north bank; but most important of all for the State, the Kansas or Kaw river, one of the largest tributaries of the Missouri, with the Republican and Smoky Hill rivers, by whose union it is formed, and its numerous affluents, the Big Blue, the Solomon, the Saline, the Soldier, the Beaver, the Delaware, the Stranger, the Sappa, the Grasshopper and the Wakarusa. There are also a few smaller streams in the northeast, affluents of the Missouri, like the Nemaha, etc. These streams form one of the grandest systems of water-courses in the whole country.

Though the surface is rolling and attains so considerable an elevation toward the western border of the State, there are no mountains, nor hardly any ranges of hills in the State; occasionally the bluffs along the rivers are of considerable height above the streams, and in rare instances one or two isolated buttes, or masses of rock, like Castle Rock, in Gove county, the Twin Buttes, in Rooks county, or the Bluff, in Clarke county, attract attention. The State is not remarkable for lakes or ponds, but

rather for their absence. There are more in the comparatively arid western counties than in the eastern. The river valleys or river bottoms, as they are called, are very fertile, but except in the Arkansas valley, are sometimes flooded by the swelling of the streams from the melting of the snow.

Geology and Mineralogy.—Professor B. F. Mudge, the eminent State Geologist, has described at considerable length, and with maps and sections, the geology, general and economic, of the State. The following summary gives as good an idea of its very simple geological formations as can be obtained without a geological map. As we have already said, the surface has a gradual but double descent to the east and to the south, or south-southeast. The streams follow the same general direction. The surface, for the most part, is a gentle rolling prairie, with few steep hills or bluffs, and the ravines are not often precipitous or deep. The soil which forms the surface of the whole State, in both valley and high prairie, is the same fine, black rich loam, so common in the Western States. The predominating limestones, by disintegration, aid in its fertility, but the extreme fineness of all the ingredients acts most effectively in producing its richness. On the high prairie it is from one to three feet deep; in the bottom it is sometimes twenty feet. There are a few exceptions to this general fertility in the most western and southwestern counties, but they constitute only a small proportion of the whole. The State is so well drained that there are very few valleys with stagnant ponds, and there is not a peat swamp of fifty acres within its boundaries. The lands toward the Colorado border are often spoken of as alkaline lands, but Professor Mudge says that they are not so. In fifteen years of exploration he had never found but two springs containing alkalies, and had never seen ten acres of land in one place which had been injured by it.

Professor Mudge says that there is nowhere to be seen in the State any violent disturbance of the strata, marks of internal fire, or even any slight metamorphic action in any of the deposits. The uplifting of this State and the adjoining country from the level of the ocean must have been slow, uniform and in a perpendicular direction, which has left all the strata in a nearly hori-

zontal position. He believes, from his knowledge of western geology, that this took place after the rise of the Rocky Mountains, and probably did not come to a close until the Drift Period. A general vertical section of all the formations seen in Kansas would be, in descending series, as follows:

I. QUATERNARY SYSTEM.

Alluvium. The surface deposit all over the State, from five to fifty feet deep in the river valleys, and forming the richest soil.

Bluff or Loess. Found most largely in the eastern part of the State, particularly on the banks of the Missouri and for some distance back from it. It is the same deposit seen in Iowa, Missouri, and Nebraska.

Drift. Mostly in the form of boulders found on the tops of bluffs and high prairies along both sides of the Kansas river, especially on the north side from the Missouri nearly to the Republican river.

II. TERTIARY SYSTEM.

Pliocene. Seen only in the northwestern portion of the State, where it covers an area of about 9,000 miles. It occupies the greater part of seven counties along the Nebraska border beginning at the Colorado line, and a part of ten other counties in the northwest and west. The following are the names of these counties: Cheyenne, Rawlins, Decatur, Norton, Phillips, Smith, Jewell, Sherman, Thomas, Sheridan, Graham, Wallace, Greeley, Wichita, Scott, and small tracts of Gove and Ellis. Ten of these counties are yet unorganized. The material of the Pliocene deposits consists of sandstone of various shades of gray and brown, with occasionally a small admixture of lime. The total thickness of it is about 1,500 feet. When it appears on the surface it resembles coarse gravel. It is seldom seen above the alluvium except where it caps the hill-tops in Wallace and Sheridan counties.

III. CRETACEOUS SYSTEM. This system covers an area of over 40,000 square miles, or more than half the surface of the State. It extends from the Colorado border in the west and southwest as far east as Marshall and Morris counties, touching the Nebraska line in Jewell, Republic, Washington, and Marshall counties; the Indian Territory in Kansas, Stevens, Seward, Meade, and Clark counties, and the Colorado line in Wallace, Hamilton, Stanton, and Kansas.

Niobrara Group. The Niobrara occupies a belt of the country next adjoining the Pliocene, about thirty miles in width in the northern part of the State, but gradually widening to more than twice that extent in the Smoky Hill valley. It is composed of chalk and chalky shales. This is said to be the only genuine chalk in North America. It ranges from seventy-five to two hundred feet in thickness. The shales sometimes contain fine crystals of calc spar. The soil overlying this group is rich and fertile and admirably adapted both for culture and grazing.

Fort Benton Group. This group is composed of a white or yellowish limestone, about sixty feet in thickness, a bluish black or slate-colored shale of about the same thickness, and shales interstratified with limestone layers containing an abundance of fossil shells, and ranging from 50 to 140 feet in thickness. There are some thin impure beds of lignite in the lower strata, but of little value. The Fort Benton occupies the central and northeastern portions of the tertiary system in the State.

Dakota Group. This group occupies mostly the southwestern portion of the State. There are no triassic or jurassic rocks in the State, and the Dakota group rests directly on the Permian. The maximum thickness may be 500 feet. It is almost wholly composed of sandstone. The soil overlying this formation is regarded as the best in the State, being admirably adapted to wheat, easily drained, and very fertile. It is also an excellent fruit district, especially adapted to pear culture.

The whole thickness of the cretaceous formations in the State is estimated to be 960 feet.

IV. CARBONIFEROUS SYSTEM—*Permian Group.—Upper Carboniferous.*

These two groups may be described together. They cover wholly or in part thirty-eight counties, and an area of nearly 20,000 square miles with a thickness of about 2,000 feet. The strata are nearly horizontal, though dipping slightly to the northwest in most cases. The deposits consist of limestones, clay shales, sandstone, and, in the upper portions, gypsum and chert beds. In the lower strata the limestones are more compact and uniform and the chert beds less numerous. This limestone contains from three to five per cent. of magnesia. The soil which overlies them is good, and the underlying limestone helps to fertilize it. Some of the oldest and best counties in the State are in these formations.

Coal Measures. The area embraced in the coal measures is about 9,000 square miles, and seventeen counties in the southeastern and eastern part of the State lie wholly or in part within its limits. All these counties are in some degree supplied with coal. How large a portion of this territory may be so situated as to give the opportunity for working profitable mines cannot at present be decided. Most of the mines which have been opened yield good and some of them largely profitable returns. The material of the deposits of the coal measures, in which seams or veins of coal are found, are similar to those of the Upper Carboniferous, but more varying. The blue clay shales and other shales are in some locations very thick and soft—sometimes 1,000 feet or more. The sandstones are firmer, and are used for flag and grindstones.

Professor Mudge believes that the indications show that this part of Kansas was under the ocean, and then raised to dry land at least sixty times during th· period of the coal measures.

V. Lower or Sub-Carboniferous System.

Keokuk Group. The only representation of the Lower Carboniferous in Kansas is to be found in a small triangle in the extreme southeast, in Cherokee county. Here alone in the entire State of Kansas there is some evidence of local disturbance of the strata, which, however, may have taken place gradually, as there seems to be no evidence of volcanic action.

This little tract seems to be allied to the adjacent region of Missouri, which contains some of the richest mines of lead and zinc in that State. Both metals, or rather their ores, have been found *in paying quantities* in this corner of Kansas, along Short creek, and nowhere else in the State, except in most insignificant amounts.

The thickness of the stratified rocks of Kansas is in all estimated by Professor Mudge as 5,210 feet.

All these groups and formations contain more or less fossils, and some of them are very rich in them. In the *Bluff or Loess* are a few fresh water and land mollusks, the *mastodon giganteus*, the *elephas Americanus*, a gigantic horse, probably *equus excelsus*, and several small mammals. In the Pliocene there are numerous fossils, most of them silicified. Among them are bones of deer, beaver, a large animal of the ox kind, two and possibly three species of the horse, one three-toed and of very small size, another very closely allied to the present horse, a wolf, ivory and bones from the elephant or mastodon, bones of the rhinoceros and camel, etc. There have also been found the bones and carapace of a large fresh water turtle, five feet in length, smaller turtles and mollusks.

But the great field for fossils is in the *cretaceous system*, and especially in the Niobrara group, where from the mollusks and fishes to the saurians, Pterodactyls and birds with jaws and teeth, the palæontologist is constantly stumbling upon new wonders. Fossil sharks, nearly fifty species of fossil fish, of which many hundred specimens have been collected, half a dozen of marine turtles, between thirty and forty species of crocodiles and other saurians, some of monstrous size, one seventy feet long with a head six feet in length, huge Pterodactyls of forms and size hitherto unknown, and birds with teeth and vertebræ like a fish.

The Fort Benton group is more noted for the number and variety of its Ammonites, and has also a few fish and saurian remains.

The Dakota group has a few fossil mollusks and fish, and one saurian, but is most noteworthy for its fossil flora and plants, especially dicotyledonous plants. Professor Lesquereaux found over seventy species, mostly dicotyledons, in Kansas, and all in this formation. Among these are four sequoias, closely allied to the gigantic redwoods of California, one or more pines, and eight other conifers, five poplars, six willows, eight oaks, six buttonwoods, seven species of sassafras, five magnolias, two figs, one palm, two cinnamon trees and a considerable number of extinct genera and species. Intermingled with these were numerous ferns, some of gigantic size. Professor Gray thinks all these plants migrated hither from Greenland, which once had a sub-tropical climate.

In the Permian and upper carboniferous groups there are land plants and a considerable number of mollusks and corals.

In the coal measures are found fossil ferns and calamites, crinoids and trilobites, numerous species of fish, and especially fossil sharks, one with nearly 2,500 teeth in the lower jaw, and footprints of reptiles and saurians equal to the famous ones of the Connecticut valley.

Economic Geology and Minerals.—Coal is the first mineral in this State in point of importance. It is mined at many points in the region of the coal measures; and though differing somewhat in quality, it is in general a good bituminous coal, coking well and yielding from 8,000 to 9,000 cubic feet of gas to the ton, but requiring more than average care in the purification. That mined at Leavenworth is of the same class as the rest, a shaft over seven hundred feet in depth having been sunk to the coal measures. About 1,500,000 bushels (45,000 tons) are raised here annually, and about 120,000 tons in all the region.

Lead and zinc are found in paying quantities in Cherokee county, in the extreme southeast of the State. About 6,000,000 pounds of lead ore are raised at Short creek, and zinc is smelted at New Pittsburg, in Crawford county.

Kansas possesses salt springs and saline deposits of sufficient strength and purity to supply the whole Mississippi valley if necessary. In the southwestern part of the State, below the great bend of the Arkansas, there are extensive beds of salt from six to twenty-eight inches in depth, caused by the drying up of salt ponds, or the salt branches of the Cimmaron river; but as this region is not yet settled or easily accessible, it will be some time before it is ready for market. A more accessible region is that in the Republican and Saline valleys, where there are extensive salt marshes, yielding a brine of great purity. The magnesia in the brine just as it comes from the marsh, is only from three to five-tenths of one per cent.

Gypsum is found in many places in Kansas; in the western part of the State, in Wallace county, in most beautiful compound crystals; in Seward and Mead counties, in the southwest, near the Cimmaron river, there are beds of selenite crystals of great extent. In Marshall county, in the north, there is a heavy bed of it underlying at least four townships. It is manufactured at Blue Rapids. In Saline county is another bed of nearly equal extent. It is in demand both as a fertilizer and for building purposes.

Lime and hydraulic cement are produced at Leavenworth, Lawrence and Fort Scott. Kansas has a great variety of excellent building stone, limestone, sandstone and gypsum, and all are extensively quarried.

There are numerous gas or burning wells in the eastern part of the State. There is probably a deposit of petroleum somewhere in the coal measures, but borings to the depth of 1,000 feet have failed to reach it, though they have yielded a permanent supply of gas. A well at Iola yields 10,000 cubic feet daily. These wells are at Wyandotte—one there yielding 48,000 cubic feet daily—at Fort Scott, Rosedale and many other places. The illuminating power is about seven-tenths that of the best coal gas.

Soil and Vegetation.—From what has been said under the head of geology, the reader will naturally and correctly infer that there is very little poor land in Kansas; *i. e.*, land which cannot

by proper cultivation and irrigation be made to yield good crops. This is true. Aside from the barren salt basins and desert lands of Southwestern Kansas on both sides of the Cimmaron (if, indeed, that is wholly an exception), and some few gravelly patches in the northwest, both together not amounting to a single county, there is a smaller quantity of barren land in Kansas than in any State in the Union. We say this with a full knowledge that the counties west of the hundredth meridian are generally unorganized as yet, that the amount of rainfall is less than in the Eastern counties, and that where the land is as yet unbroken, the sage-brush and the bunch-grass grow, and but little else, and that except in the valleys of the streams, or when planted by man, there are very few trees, and the winds rush down from the Rocky Mountains with terrific force. We are not disposed to conceal or diminish any of these apparently untoward facts; yet we adhere to our declaration.

This soil, beaten down by the hoofs of buffaloes for centuries, is not now their pasture-ground, and when the hard-packed roots of the bunch-grass and the sage-brush are broken up by the plow, and loosened so that air and moisture can get in, the rainfall increases, the soil drinks it in instead of letting it run away, and as the soil is broken up again, and planted or sown with wheat, or corn, or flax, or turned over to the blue joint grass, the moisture continues to increase, and in three or four years the rain, which comes most largely in May, June, July, and August (four-fifths of the whole falling in those months), pushes forward large crops, while the trees which have been planted for about the same length of time, break the fierce winds, and help to increase the amount of rain. Of five towns beyond the ninety-ninth meridian—Fort Hays, McPherson, Kinsley, Dodge City and Fort Wallace—the rainfall, which has hitherto been about twelve to fourteen inches, was as follows in the order in which they are named, in 1879: 16.26 inches; 32.05; 15.03; 15.43; 16.58.

The season of the year at which the rain comes makes an immense difference; the growing crop has the moisture just when it needs it, and it grows thriftily in consequence. This

rainfall will continue to increase, and will make this portion of the State as fruitful in its crops as any other. But if there should be a lack of rain, it is easy, with the constantly increasing elevation of the land and the rivers and streams westward, to irrigate all these lands when once broken to the plow, and then their yield will demonstrate that they are indeed the most fertile lands upon which the sun shines. Land which will yield thirty-five to forty bushels of wheat or a hundred bushels of corn, eighty bushels of oats and fifty of barley, or 250 to 300 or more bushels of potatoes to the acre, cannot be called barren land, even if it requires irrigation to enable it to do this.

Along the banks of the rivers of Kansas and elsewhere there are now many trees, those not on the river banks having been very generally planted. The practice of using the Osage orange for hedges in place of any other fence is very common, and adds very greatly to the beauty of the farms as well as to the protection of the crops and stock from the high winds.

The trees planted under the Timber-Culture Act and under State laws have been possibly to a larger extent than was desirable, the quickly growing trees, such as the white and yellow cottonwood, willows, box elder, honey locust, ailantus, soft maple, and basswood or linden; the State Agricultural Society have strongly urged the addition to the list of the elms, black walnut, white and other oaks, hickories, pecan, coffee bean, several species of ash, the red cedar, the sugar or hard maple, and the western catalpa (*catalpa speciosa*), a fine, hardy, and handsome tree.

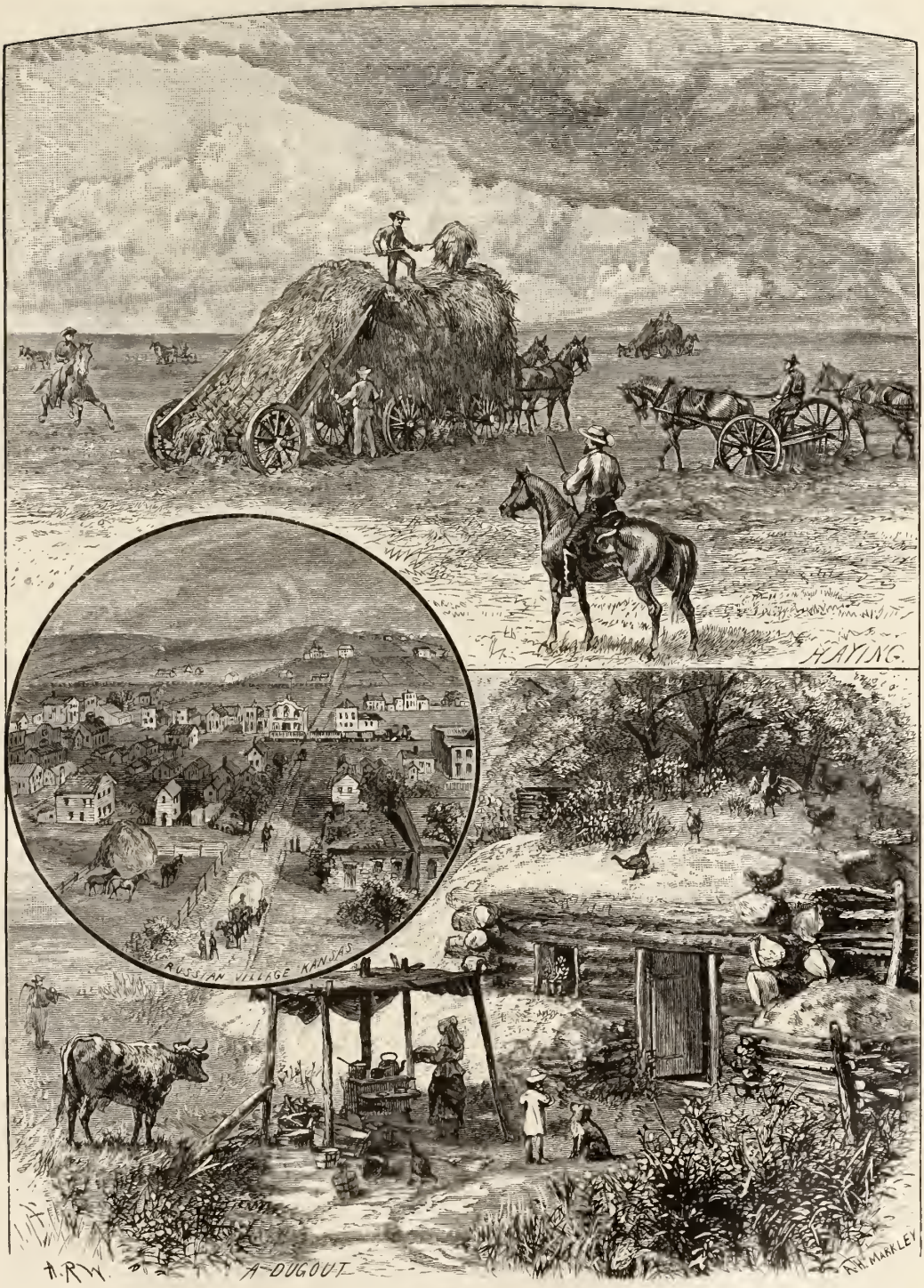
The native flowers of Kansas are very abundant and beautiful, and deck the broad prairies with a glory which must be seen to be fully appreciated.

Zoölogy.—The wild animals of Kansas are those of the plains, not those which are peculiar to the Rocky Mountains, still less those of the western side of the Great Divide. The buffalo or bison are not plenty anywhere in these days, but the remnants of the vast herds which formerly shook the solid earth by their steady, heavy gallop still pass at some seasons of the year over Southwestern Kansas and thence into the Indian Territory and

Western Texas. The antelope of the plains is also found in large numbers in Western and Southwestern Kansas. We doubt if the elk is now to be found in Kansas, though some years ago he occasionally appeared in the western counties. Deer are plenty, and the smaller game, hares, rabbits, squirrels, and the rodents generally. Of beasts of prey the black and brown bear, the panther or cougar, lynx, wild cat, opossum, raccoon, weasel, fisher, marten and skunk, are most common. The gray or black wolf is not abundant in the State, and the coyote or the prairie wolf is found mainly in the central and western counties. Game-birds are very abundant in the west and southwest, ducks, brant, teal, mallards, and wild geese being found in great numbers in their season on the Arkansas river as well as on the Republican and Smoky Hill. On the plains the prairie hen still exists in moderate numbers; if it had been as plenty as formerly the "grasshoppers" or Rocky Mountain locusts would never have reached the farm lands. Other members of the grouse family are quite abundant, especially sage-hens, quails, and ptarmigan. Song-birds are numerous, and many of them of fine plumage.

The native edible fish of Kansas are several species of perch, sunfish, catfish, roach, black bass, one or two species of trout, etc. Shad, salmon, salmon trout, grayling, an eastern species of black bass, etc., have been introduced through the Fish Commission, but the success of these introductions is not yet fully demonstrated. The reptiles are much the same as those of Arkansas and Missouri.

Natural Curiosities and Phenomena.—In a prairie State like Kansas there are comparatively few of these. The most remarkable are the Monument Rocks in Gove county, the Pulpit Rock in Ellsworth county, the Rock City, and the Perforated Rock near by, in Ottawa county, the Table Rock in Lincoln county, and the masses of gypsum and selenite in the gypsum beds. Some of the fossil bones of vertebrates in the tertiary had been so thoroughly silicified as to be converted into moss agates of great beauty. This is particularly the case in Wallace and Sheridan counties. The moss agates of that region, not fossils, are very perfect.



RUSSIAN VILLAGE, KANSAS—A DUG-OUT—HAYING.

Climate and Meteorology.—No State in the Union, certainly none in "Our Western Empire," has been so thorough in recording its climatic changes as Kansas. This has been due largely, indeed almost entirely, to the persistent and untiring efforts of the excellent Secretary of the State Board of Agriculture, the late Hon. Alfred Gray, to whom not only the State but agriculturists and scientists everywhere owe a debt of gratitude which can never be fully repaid. His admirable reports, prepared with so much labor and with such accuracy and completeness amid great bodily suffering and wasting disease, attest alike his philanthropy and his devotion to his work. We may say in general that the climate of Kansas is a very desirable one. The summer months are in most parts of the State rather hot, the average mean temperature being for June about 75°, for July about 84.5°, and for August about 77.5°. The extremes of the winter months are sometimes very great, though not of long continuance; the average minimum of December is about —12°, that of January about the same, while February was about +7°. The mean temperature of December was about 31°, of January about 24.5°, and of February 34.5°. These extremes are very great, but the air is so pure, and the extreme heat and cold are so tempered by it that the climate is a very healthy one. There are, as in all prairie States, at times, very high winds, sometimes accompanied with storms, though oftener not; and these winds are sometimes destructive, and oftener annoying, but their general effect is purifying and healthful. The rainfall is increasing, and may, at some not very remote day, become excessive. A marked characteristic of it is that it is much larger in the months of May, June, July, and August than in all the rest of the year, and that the month of June has from one-third to one-half of the whole rainfall of the year. With these general remarks we submit the meteorological tables of fifteen places in different parts of the State for 1877–1880.

Stations.	November, 1877.				December, 1877.				January, 1878.				February, 1878.			
	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.
Baxter Springs	42°.64	68°	10°	3.05	46°.26	68°	14°	5.30	36°.75	64°	10°	2.10	43°.23	64°	20°	3.97
Lawrence	39 .23	64	9	1.47	44 .43	68	10	2.21	33 .97	55	7.5	3.05	40 .22	66	15.5	2.86
Leavenworth..	39 .5	64	9	2.44	44 .2	67	13	3.18	33 .80	56	6	2.34	40 .20	66	18	2.94
Manhattan....	38 .70	65	2	1.90	.....	.....	.....	1.65	33 .09	55	0	2.35	39 .18	68	6	1.44
Independence.	44 .90	73	10	2.07	47 .20	71	15	3.10	37 .70	64	10	2.69	42 .80	68	18	3.98
Fort Hays....	37 .66	68	10	1.28	38 .00	72	4	3.50	33 .00	57	—1	1.24	37 .33	70	8	.78
Fort Larned.	37 .06	66	—2	.20	37 .66	72	8	2.44	30 .31	58	5	.51	36 .75	68	13	.80
Salina	41 .00	66	9	1.38	45 .00	66	10	2.50	31 .88	56	6	1.25	38 .47	72	14	1.29
Osborne.....	37 .71	64	2	.57	39 .78	62	15	1.35	35 .00	60	7	.13	40 .00	73	8	1.75
McPherson...	.....	....	....	1.50	.....	....	....	2.65	30 .50	....	....	2.60	.....	....	....	.40
Kinsley.....	.....	....	....	.93	.....	....	....	2.70	30 .61	54	3	.50	36 .84	64	16	.69
Dodge City...	38 .60	71	0	.56	39 .00	68	10	4.36	.....	64	—1	.21	34 .90	70	12	.13
Fort Wallace..	36 .31	73	—6	.06	28 .11	75	8	2.15	32 .00	57	9	.....	38 .20	70	18	1.13

Stations.	March, 1878.				April, 1878.				May, 1878.				June, 1878.			
	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.
Baxter Springs	54°.17	80°	34°	3.00	63°.35	86°	40°	4.60	67°.33	88°	48°	6.80	74°.41	90°	60°	5.90
Lawrence.....	50 .90	81	27	2.67	58 .60	82	36	5.48	62 .60	85	38.5	5.06	69 .79	89	50	5.67
Leavenworth..	50 .90	80	28	2.35	58 .80	80	35	2.86	62 .30	85	37	5.28	70 .50	91	49	5.47
Manhattan. .	49 .29	81	17	1.77	57 .77	85	27	2.02	64 .07	85	33	4.04	67 .21	87	41	5.62
Independence.	51 .10	87	26	3.13	61 .70	....	....	3.50	66 .80	90	48	10.06	74 .50	94	60	8.13
Fort Hays....	.....	....	....	.68	57 .33	86	23	.82	62 .43	94	37	1.68	70 .74	91	53	9.33
Fort Larned..	49 .42	80	25	1.20	56 .79	85	34	.61	63 .17	94	35	4.65	72 .50	95	50	11.22
Great Bend ..	50 .00	87	28	.88	57 .77	84	28	1.37	65 .00	91	40	1.95	73 .00	91	48	8.69
Salina	54 .00	87	31	1.70	62 .00	88	30	1.55	.....	.....	....	1.64	.....	....	....	4.79
Gaylord.....	.... .	...	....	.52	.....	....	....	.70	61 .80	86	38	1.96	69 .56	92	50	4.19
Osborne.....	49 .75	80	31	1.00	57 .07	82	36	.50	.....	.....	....	4.15	.....	....	...	10.30
McPherson..	.....	.. .	....	1.95	.....	....	. ..	2.30	. ....	.....	....	5.18	.....	....	...	5.37
Kinsley	.....	....	....	1.65	.....	....	....	.60	59 .37	91	33	1.65	69 .27	95	54	6.57
Fort Wallace..	45 .70	74	24	1.48	53 .71	84	34	.44	60 .70	91	38	5.32	70 .30	91	50	6.72
Creswell.....	48 .90	81	30	5.08	58 .15	88	30	2.42	67 .94	89	46	7.09	74 .91	95	57	4.97
Cedar Vale....	.....	....	....	4.35	.....	....	....	3.16	61 .91	93	36	4.63	70 .50	95	48	2.19
Dodge City...	49 .31	79	26	1.01	55 .88	84	30	1.06	.....	.....	.. ..	.....	.....	....	....	....

Stations.	July, 1878.				August, 1878.				September, 1878.				October, 1878.			
	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.
Baxter Springs	80°.76	100°	70°	3.00	.....	....	...	.....	.....	.....	....	.....	.....	...	...	.....
Lawrence .. .	78 .45	98	58	4.30	77°.14	98°	56°	2.22	67°.58	94°.50	41°	2.51	55°.55	87°	20°	.44
Leavenworth..	80 .30	100	61	3.08	78 .90	99	58	3.31	67 .80	93	41	2.64	55 .20	86	20	1.16
Manhattan...	78 .09	95	52	12.71	76 .88	97	47	2.66	66 .96	93	37	3.22	50 .36	89	17	1.06

Stations.	July, 1878.				August, 1878.				September, 1878.				October, 1878.			
	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.
Independence	81°.70	102°	65°	2.93	81°.50	101°	64°	.72	71°.30	101°	46°	1.95	58°.10	89°	24°	1.53
Fort Hays	.....	...	...	.....	.....	...	...	.....	.....	.....	...	...	....	....	...	.....
Fort Larned	79 .00	103	58	3.35	81 .50	106	50	1.08	65 .50	94	33	.45	55 .00	90	20	1.26
Great Bend	82 .00	102	60	2.75	82 .00	105	58	2.52	72 .00	97	39	2.25	60 .00	93	17	.19
Salina	.....	...	...	8.86	.....	...	...	3.41	.....	.....	...	1.46	.....	....	....	.60
Gaylord	78 .74	97	62	12.05	78 .83	98	62	3.58	68 .65	94	46	1.10	6 .66	86	21	.21
Osborne	.....	...	...	5.35	.....	...	...	2.00	.....	.....	....	2.15	....	....	...	4.70
McPherson	.....	...	....	5.75	.. ...	....	....	1.25	....	.....	....	1.10	.....	...	...	Spr.
Kinsley	80 .49	106	58	3.26	79 .62	102	60	1.00	63 .97	95	42	2.53	52 .00	91	12	.39
Fort Wallace	79 .40	99	62	3.67	79 .10	99	64	3.94	66 .22	95	44	2.40	55 .60	88	17	4.06
Creswell	82 .54	100	65	3.81	81 .63	100	64	4.27	72 .40	97	47	1.08	.....	..	....	.....
Cedar Vale	80 .00	102	54	1.61	79 .02	101	56	4.48	67 .87	93	39	.76	54 .04	88	10	.09

Stations.	January, 1879.				February, 1879.				March, 1879.				April, 1879.			
	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.
Lawrence	23°.49	53°	-16°	.37	34°.06	74°	5°	.41	48°.22	87°	11°	.37	56°.40	84°	20°	4.18
Leavenworth	23 .63	56	-14	1.16	32 .93	69	....	.54	46 .42	84	9	.32	55 .37	83	19 .50	3.57
Manhattan	21 .25	58	-14	.75	.....	....	....	.....	46 .64	85	10	.02	55 .70	78	18	3.21
Independence	27 .80	70	-8	2.03	36 .30	74	11	1.30	51 .50	86	16	.85	58 .70	90	26	4.76
Great Bend	24 .55	63	-14	1.07	35 .55	76	6	.25	47 .61	90	10	.05	57 .03	86	21	4.05
Salina	24 .00	64	-18	1.35	35 .00	81	7	.12	52 .00	92	12	.30	59. 00	88	19	4.62
Gaylord	25 .05	70	-20	.75	.....	....	....	.....	.....	....	....	.....	.....	....	.....	3.67
Osborne	22 .87	64	-11	1.00	29 .64	70	2	.10	46 .00	89	13	.....	55 .96	85	20	4.02
Kinsley	.....	...	....	.85	.....	....	....	.38	.....	....	....	.....	.....	...	.....	.87
Fort Wallace	20 .42	68	-8	.45	30 .95	84	2	.36	42 .58	86	12	.....	53 .76	86	25	.75
Creswell	24 .11	55	-12	1.55	30 .12	78	6	.45	44 .30	90	11	.15	53 .18	84	24	6.49
Cedar Vale	29 .70	63	-3	2.12	37 .94	78	12	.88	.....	....	....	.....	61 .68	90	26	4.98
Dodge City	23 .86	61	-9	.87	32 .54	74	6	.08	47 .72	....	....	.17	59 .97	87	19	.40
Fort Hays	.....	...	....	.....	.....	....	....	.....	.....	....	....	.....	60 .79	83	.....	2.80
McPherson	.....	....	....	1.50	.....	....	....	.....	.....	....	....	.....	.....	....	.....	4.25

Stations.	Latitude.	Longitude.	Altitude.	May, 1879.				June, 1879.				July, 1879.			
				Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.	Mean Temperature of Month.	Maximum Temperature of Month.	Minimum Temperature of Month.	Rainfall for Month.
Lawrence	38° 58′	95° 16′	884	69°.50	93°	43°	1.60	73°.22	97°	45°	7.14	79°.14	97°	62°	3.66
Leavenworth	39 21′	94 54′	896	68 .96	92	41	3.04	73 .35	93	46	9.90	79 .85	97	61	4.99
Manhattan	39 12′	96 40′	1,200	68 .57	95	44	1.79	72 .80	93	52	8.48	79 .20	98	67	4.91
Independence	37 8′	95 37	830	69 .30	91	51	.92	76 .90	102	50	3.54	85 .90	104	70	3.26
Great Bend	38 22′	98 38′	1,845	68 .53	98	40	.31	77 .00	100	33	2.65	80 .00	98	62	6.79
Salina	39 00′	98 00′	1,243	71 .00	103	39	1.38	75 .00	103	43	8.79	90 .00	103	62	6.72
Gaylord	39 45′	98 50′	1,800	.....	....	....	1.58	.....	....	....	4.17	.....	.. .	.....	4.07

Stations.	Latitude.	Longitude.	Altitude.	May, 1879. Mean Temperature of Month.	May, 1879. Maximum Temperature of Month.	May, 1879. Minimum Temperature of Month.	May, 1879. Rainfall for Month.	June, 1879. Mean Temperature of Month.	June, 1879. Maximum Temperature of Month.	June, 1879. Minimum Temperature of Month.	June, 1879. Rainfall for Month.	July, 1879. Mean Temperature of Month.	July, 1879. Maximum Temperature of Month.	July, 1879. Minimum Temperature of Month.	July, 1879. Rainfall for Month.
Osborne	39° 30′	98° 45′	2,000	67° .82	96°	50°	2.65	73° .60	94°	48°	3.83	79° .57	100°	63°	3.37
Kinsley	37 58	99 46	2,226	.....	....	....	2.00	.....	....	....	3.6	.....	...	.....	2.31
Fort Wallace	39 00′	101 34′	3,318	63 .17	100	42	2.44	77 .48	108	52	1.08	80 .92	108	59	7.01
Creswell	38 20′	97 11′	1,375	66 .22	95	46	.84	75 .40	100	52	6.93	80 .80	100	67	7.88
Cedar Vale	37 8′	96 27′	1,000	72 .99	92	52	1.48	77 .93	102	53	6.37	84 .20	102	72	2.86
Dodge City	37 45′	100 00′	2,600	63 .09	98	42	.90	76 .00	....	....	4.40	80 .40	...	.....	3.90
Fort Hays	38 59′	99 00′	2,107	69 .89	100	25	.50	78 .34	100	20	2.60	90 .37	105	44	7.04
McPherson	38 20′	97 40′	1,557	.....	...	....	1.70	.....	....	....	7.00	.....	....	.....	6.25

Stations.	August, 1879. Mean Temperature of Month.	August, 1879. Maximum Temperature of Month.	August, 1879. Minimum Temperature of Month.	August, 1879. Rainfall for Month.	September, 1879. Mean Temperature of Month.	September, 1879. Maximum Temperature of Month.	September, 1879. Minimum Temperature of Month.	September, 1879. Rainfall for Month.	October, 1879. Mean Temperature of Month.	October, 1879. Maximum Temperature of Month.	October, 1879. Minimum Temperature of Month.	October, 1879. Rainfall for Month.	November, 1879. Mean Temperature of Month.	November, 1879. Maximum Temperature of Month.	November, 1879. Minimum Temperature of Month.	November, 1879. Rainfall for Month.
Lawrence	75° .73	99°	49°	1.03	65° .40	92°	42°	3.57	60° .46	87° .5	25° .5	2.81	44° .26	76° .5	16°	5.15
Leavenworth	77 .70	96	52	.18	65 .90	90	43	3.41	62 .10	84 .5	26 .0	4.25	44 .60	73 .5	16	7.85
Manhattan	77 .56	99	61	1.61	66 .30	92	40	4.32	61 .13	86 .0	24 .0	2.63	49 .50	70 .0	13	7.83
Independence	77 .30	104	58	4.12	70 .50	92	53	1.34	62 .80	91 .0	31 .0	2.49	49 .40	80 .0	18	3.30
Great Bend	77 .50	101	53	1.65	65 .25	97	32	.35	59 .20	88 .0	27 .0	.10	40 .00	76 .0	14	2.00
Salina	79 .00	107	58	2.10	71 .00	100	42	1 95	65 .00	90 .0	25 .0	1.80	46 .00	75 .0	16	4.89
Gaylord	.....	....	....	.23	.....	....	....	1.30	.. ...	....	.....	.23	. ....	.....	.....	1.90
Osborne	77 .74	103	60	1.90	66 .45	94	47	2.30	61 .60	91 .0	24 .0	.15	41 .04	78 .0	17	2.77
Kinsley	.....	....	..	3.37	.....	...	....	.2	.....	.....	....	.40	.....	....	....	.75
Fort Wallace	75 .98	105	56	2.24	64 .15	98	38	.97	56 .25	91 .0	16 .0	...	37 .56	77 .0	8	1.26
Creswell	75 .23	101	62	2.10	69 .23	95	38	1 37	58 .20	....	.....	2.16	37 .24	67 .0	14	4.99
Cedar Vale	80 .38	104	63	5.69	71 .07	94	48	1 49	64 .28	90 .0	31 .0	2.87	47 .57	80 .0	15	2.43
Dodge City	75 60	....	...	3.75	66 .17	95	38	.8	59 .50	76 .7	45 .5	....	40 .7	72 .0	7	.04
Fort Hays	81 .88	102	35	3.02	62 .17	98	24	.3	58 .79	91 .0	10 .0	....	....	. ...	....	....
McPherson	.. ...	....	....	4.20	.....	...	....	1.2	.....	.....	.....	.60	.....	.....	...	4.55

Stations.	December, 1879. Mean Temperature of Month.	December, 1879. Maximum Temperature of Month.	December, 1879. Minimum Temperature of Month.	December, 1879. Rainfall for Month.	January, 1880. Mean Temperature of Month.	January, 1880. Maximum Temperature of Month.	January, 1880. Minimum Temperature of Month.	January, 1880. Rainfall for Month.	February, 1880. Mean Temperature of Month.	February, 1880. Maximum Temperature of Month.	February, 1880. Minimum Temperature of Month.	February, 1880. Rainfall for Month.	March, 1880. Mean Temperature of Month.	March, 1880. Maximum Temperature of Month.	March, 1880. Minimum Temperature of Month.	March, 1880. Rainfall for Month.
Lawrence	26° .23	65° .5	—9°	2.39	41° .23	67°	20° .5	1.80	.....	...	...	....	42° .38	79°	2.5°	2.03
Leavenworth	26 .70	63 .0	—8	2.34	41 .40	64	20 .0	2.00	37° .90	67°	7°	1.40	42 .90	76	4.0	2.22
Manhattan	28 .75	74 .0	—10	.62	37 .16	61	15 .0	.56	36 .62	67	4	.05	41 .04	80	—2.0	.50
Independence	32 .90	64 .0	—4	5.17	45 .80	74	21 .0	1.54	42 .30	77	14	.47	47 .00	78	5.0	1.46
Great Bend	32 .00	74 .0	—10	.65	40 .25	73	16 .0	.45	37 .50	70	5	.25	41 .50	84	—1.0	.54
Salina	28 .00	79 .0	—8	.35	43 .00	70	15 .0	.75	41 .00	74	6	....	46 .00	86	—3.0	.90
Gaylord	.....	58 .0	—19	....	.....	....	....	....	....	....	....	....	40 .32	83	3.0	.75
Osborne	23 .16	57 .0	—13	....	38 .89	67	12 .0	.25	36 .46	68	5	....	.....	....	.....	.....
Kinsley	.....	....	....	.25	.....	...	.....	Spr.	....	....	....	Spr.	.....	....	.....	.10
Fort Wallace	23 .39	72 .0	—16	.02	.....	....	.....	....	37 .50	71	—0	....	.....	.....	.....	.....
Creswell	23 .60	78 .0	—10	1.58	36 .12	62	10 .0	.58	37 .10	68	5	.68	40 .10	78	—4.0	.68
Cedar Vale	29 .38	66 .0	—8	2.00	41 .60	71	15 .0	1.65	38 .30	79	10	.67	44 .97	82	7.0	1.42
Dodge City	25 .70	70 .0	—13	.12	38 .20	68	8 .0	....	30 .48	70	—4	....	28 .90	85	—8.0	.04
Fort Hays	.....	.....	....	.. .	.....	....	.....	....	.....	....	....	....	.....	...	.....	.....
McPherson	.....	.....	....	.15	.....	....	.....	1.20	.....	....	....	.30	.....	...	.....	1.60

SUMMARY OF RAINFALL FOR YEAR ENDING OCTOBER, 1878.

FIRST, OR EASTERN BELT.

Stations.	Latitude.	Longitude.	Altitude.	November, 1877.	December, 1877.	January, 1878.	February, 1878.	March, 1878.	April, 1878.	May, 1878.	June, 1878.	July, 1878.	August, 1878.	September, 1878.	October, 1878.	Total for Year.
Baxter Spr'gs.	37° 3′	94° 37	820	3.05	5.30	2.10	3.97	3.00	4.60	6.80	5.92	3.00	.....	.....	.....	37.74
Lawrence.....	38 58	95 16	884	1.47	2.21	3.05	2.86	2.67	5.48	5.66	5.67	4.30	2.22	2.51	.44	38.54
Leavenworth..	39 21	94 54	896	2.44	3.18	2.34	2.94	2.35	2.86	5.28	5.27	3.08	3.31	2.64	1.16	36.85
Manhattan....	39 12	96 43	1,200	1.90	1.65	2.35	1.44	1.77	2.02	4.04	5.02	12.71	2.66	3.22	1.06	39.84
Independence.	37 8	95 37	800	2.07	3.10	2.69	3.98	3.13	3.50	10.06	8.13	2.93	.72	1.95	1.53	43.79

SECOND, OR MIDDLE BELT.

Great Bend...	38° 22′	98° 38′	1,845	1.11	2.28	1.25	1.29	.88	1.37	4.65	11.22	3.35	1.08	.45	1.26	30.19
Salina.....	39 00	98 00′	1,127	1.38	2.50	2.70	1.75	1.70	1.55	1.95	8.69	2.75	2.52	2.25	.19	29.93
Osborne.....	39 30′	98 45′	2,000	.57	1.35	1.01	.63	1.00	.50	1.96	4.19	12.05	3.58	1.10	.21	28.21
McPherson...	38 20′	97 40′	1,557	1.50	2.65	2.60	2.15	1.95	2.30	4.15	10.30	5.35	2.00	2.15	4.70	41.80
Creswell.....	38 20′	97 11′	1,375	....	....	2.84	2.04	5.08	2.42	5.32	6.72	3.67	3.94	2.40	4.06	38.49

THIRD, OR WESTERN BELT.

Gaylord.....	39 45	98 50	1,800	....	....	.13	.40	.52	.70	10.64	4.79	8.86	3.41	1.46	.60	31.51
Kinsley.....	37 58	99 46	2,226	.93	2.70	.50	.75	1.65	.60	5.18	5.37	5.75	1.25	1.10	Spr	25.78
Fort Wallace..	39 00	101 34	3,318	.06	2.15	.08	.13	1.48	.44	1.65	6.37	3.26	1.00	2.53	.29	19.44
Dodge City...	37 45	100 00	2,600	.56	4.36	.21	1.13	1.01	1.06	4.63	2.19	1.61	4.48	.76	.09	22.09

RECAPITULATION.

	November, 1877.	December, 1877.	January, 1878.	February, 1878.	March, 1878.	April, 1878.	May, 1878.	June, 1878.	July, 1878.	August, 1878.	September, 1878.	October, 1878.
First, or Eastern Belt.....	2.19	3.09	2.51	3.04	2.88	3.60	6.49	5.83	4.97	2.64	2.28	1.05
Second, or Middle Belt....	1.00	2.49	1.42	1.18	1.63	1.21	4.44	7.58	5.97	2.54	1.56	1.57
Third, or Western Belt...	.60	2.75	.53	.67	1.08	.68	4.29	5.37	6.31	2.74	1.39	.24

Mean for 12 months—First, or Eastern Belt ..... 37.58 inches.
" " " " Second, or Middle Belt ..... 27.89 "
" " " " Third, or Western Belt ..... 21.73 "

SUMMARY OF RAINFALL FOR 1879.

FIRST, OR EASTERN BELT.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Lawrence.....	.37	.41	.37	4.18	1.60	7.14	7.14	1.03	3.57	2.81	5.15	2.39	32.68
Leavenworth.....	1.16	.54	.32	3.57	3.04	9.90	9.90	.18	3.41	4.25	7.85	2.34	41.55
Manhattan.....	.75	....	.02	3.21	1.79	8.48	8.48	1.61	4.30	2.63	7.83	.62	36.45
Independence.....	2.03	1.30	.85	4.76	.92	3.54	3.54	4 12	1.34	2.49	3.30	5.17	33.08
Cedar Vale.....	2.12	.88	....	4.98	1.48	6.37	6.37	5.69	1.49	2.87	2.43	2.00	33.17

SECOND, OR MIDDLE BELT.

Great Bend.....	1.07	.25	.05	4.95	.31	2.65	6.79	1.65	.35	.10	2.00	.65	20.82
Salina	1.35	.12	.30	4.62	1.38	8.79	6.72	2.10	1.95	1.80	4.89	.35	34.37
Gaylord	.75	....	....	3.67	1.58	4.17	4.07	.23	1.30	.23	1.90	.00	17.90
Osborne.....	1.00	.10	....	4.02	2.65	3.83	3.37	1.90	2.30	.15	2.77	.00	22.09
Creswell.	1.55	.45	.15	6.49	.84	6.93	7.88	2.10	1.37	2.16	4.99	1.58	36.49

THIRD, OR WESTERN BELT.

Stations.	January	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Kinsley.....	.85	.38	....	.87	2.00	3.65	2.31	3.37	.20	.40	.75	.25	15.03
Fort Wallace.....	.45	.36	....	.75	2.44	1.08	7.01	2.24	.97	.00	1.26	.02	16.58
Dodge City.....	.87	.08	.17	.40	.90	4.40	3.90	3.75	.80	.00	.04	.12	15.43
Fort Hays..... ..	....	....	....	2 80	.50	2.60	7.04	3.02	.30	....	...	....	16.26
McPherson.....	1.50	....	....	4.25	1.70	7.00	6.25	4.20	1.25	.60	4.55	.75	32.05

Agricultural Productions.—Kansas is pre-eminently an agricultural State, and the efforts of her State Agricultural Board and of her railroad companies to develop her agricultural interests have been crowned with the most wonderful success. Her race for the supremacy in agricultural products has been rapid beyond all precedent. Take wheat as an example: In 1872 she produced 2,155,000 bushels; in 1878, 32,315,358, leading all the States in winter wheat. In 1879 the season was unfavorable for winter wheat, but favorable for the spring wheat, and the wheat crop in Kansas fell off to 20,551,000, but the crop of 1880 more than makes up all deficiencies.

The following official statement shows what were the agricultural crops of 1877, 1878, and 1879:

Crops.	Number of Acres	Amount of Product.	Value of Product.	Average Yield per Acre.	Average Price per Bushel, Gall., Lb. or Ton.	Average Value per Acre.
Winter Wheat.....bu.	857,125.00	10,800,295.00	$ 9,662,508.20	12.60+	$0.89+	$11 27+
Rye.....bu.	119,971.00	2,525,054.00	806,092.81	21.05-	.32-	6.72-
Spring Wheat.....bu.	206,868.00	3,516,410.00	2,577,620.52	17.00-	.73+	12.46+
Corn.....bu.	2,563,112.00	103,497,831.00	20,206,184.92	40.38-	.20-	7.88+
Barley.....bu.	79,704.00	1,875,323.00	582,977.32	23.53-	.31+	7.31+
Oats.....bu.	310,226.00	12,768,488.00	2,050,001.77	41.16-	.16+	6.61-
Buckwheat.....bu.	4,112.37	57,974.41	46,380.53	12.64-	.80+	11.28-
Irish Potatoes.....bu.	45,018.00	3,119,684.00	2,056,078.80	69.29-	.66-	45.67+
Sweet Potatoes.....bu.	1,726.23	201,423.50	201,928.94	116.68+	1.00+	116.91-
Sorghum.....gall.	20,783.75	2,390,131.25	1,195,065.63	115.00	.50	57.50+
Castor Beans.....bu.	50,845.25	578,356.00	578,356.00	11.37+	1.00	11.37+
Cotton.....lbs.	597.62	101,595.40	10,159.54	170.00	.10	17.00
Flax.....bu.	27,735.37	291,369.57	305,875.05	10.50+	1.05	11.03+
Hemp.....lbs.	1,801.70	1,657,564.00	99,453.84	920.00	.06	55.20
Tobacco.....lbs.	717.35	530,839.00	53,083.90	740.00	.10	74.00
Broom Corn.....lbs.	21,147.14	16,917,712.00	634,414.20	800.00	.04-	32.00
Millet and Hungarian...tons.	164,529.00	427,602.25	1,765,583.59	2.60-	4.10+	10.73+
Timothy.....tons.	25,212.50	40,318.29	225,262.89	1.60-	5.59-	8.93+
Clover.....tons.	9,796.66	18,337.04	107,362.19	1.87+	5.85+	10.96-
Prairie Hay.....tons.	503,612.00	741,763.60	2,432,660.57	1.47+	3.28-	4.83
Timothy Pasture.....acres.	4,202.25					
Clover Pasture.....acres.	1,445.49					
Blue-grass Pasture....acres.	21,299.31					
Prairie Pasture, under fence "	553,717.00					
Total.....	5,595,304.99	.....	$45,597,051.21			

Showing the Number of Acres, Amount and Value of each Product of Principal Crops of the Farm, for 1878.

Crops.	Acres.	Product.	Value of Product.	Average Yield per Acre.	Average Price per Bu., Lb. or Ton.	Average Value per Acre.
Winter Wheat.....bu.	1,297,555.00	26,518,955.00	$15,6[illegible]8,466.87	20.44–	$ .59+	$12.06–
Rye .....bu.	127,842.00	2,722,[illegible]08.00	[illegible]16,602.40	21.29+	.30	6.39–
Spring Wheat.....bu.	433,257.00	5,796,403.00	2 782,599.97	13.38+	.48+	6 71+
Corn .....bu.	2,405,482.00	89,324,971.00	17,018,968.79	37.13+	.17–	6.31+
Barley.....bu.	[illegible]6 255.00	1,562,793.00	562,260.33	27.78+	.36–	9.98–
Oats .....bu.	444,191.00	17,411,473.00	2.9[illegible]7,900.63	39 12–	.16+	6.28–
Buckwheat .....bu.	4,[illegible]82.66	85,928.20	[illegible]63,742.56	18.08–	.80	14.46+
Irish Pot toes.....bu.	51,2[illegible]9.00	4,256,336.00	1,683,936.00	83.07–	.39+	32.42—
Sweet Pot.toes.....bu.	2,266.93	269,083.57	224,846.61	118.69+	.84–	99.70+
Sorghum.....gall.	20,291.88	2,333,566.20	1,1[illegible]6 783.22	115.00	.50	57.50
Castor Beans .....bu.	30,928.75	358,894.75	448,618.38	11.60+	1.25	14.50
Cotton .....lbs.	[illegible]9.30	86,581.00	7,792.36	170.00	.09	15.30
Flax .....bu	37,001.70	424,770.88	424,77[illegible].88	11.48–	1.00	11.48–
Hemp .....lbs.	529.79	487,4[illegible]6.80	29 244.40	920.00	.06	5[illegible].20
Tobacco .....lbs	553.15	409,331.00	40 933.10	740.00	.10	74.00
Broom Corn .....lbs.	20,220.17	16,065,566.00	6[illegible],458.76	794.53+	.04–	29.79+
Millet and Hungarian...tons.	144,081.00	432,243.00	1,782,555.30	3.00	4.12+	12.36+
Timothy Meadow .....tons.	40,121.12	64,553.76	[illegible]62,241.52	1.61–	5.61+	9.03+
Clover Meadow.....tons.	12,429.42	24,229.52	137,154.45	1.95–	5.66+	11.04–
Prairie Meadow .....tons.	667,503.00	986,963 00	3,157,557.85	1.48–	3.19+	4.72+
Timothy Pasture.....acres.	8,820.00					
Clover Pasture .....acres.	3,770.25					
Blue-grass Pasture.....acres.	27,876.73					
Prairie Pasture.....acres.	701,421.00					
Total.....	6,538 727.85	.....	$49 914,434.38			

The value of farm products for the year 1878 is as follows:

Field products	$49,914,434.38
Increase in farm animals	6,401,871.30
Products of live-stock	10,415,339.32
Produce of gardens marketed	247,510.29
Apiarian products	55,141.15
Horticultural products	2,642,770.87
Total valuation of farm products for 1878	$69,677,067.31
Total valuation of all other property	231,164,684.95
Grand State Total	$300,841,752.26

Number of Acres, Amount and Value of each Product of Principal Crops of the Farm, for 1879.

Crops.	Acres.	Product.	Value of Product.	Average Yield per Acre.	Average Price per Bu., Lb., or Ton.	Average Value per Acre.
Winter Wheat. .....bu.	1,520,659.00	17,56[illegible],259.00	$ 6 87,403.69	11.55–	$ .92–	$10.63–
Rye .....bu.	43,675.00	66[illegible],4 9.00	264,163.60	15.12+	40	6.05–
Spring Wheat.....bu.	412,139.00	2,99[illegible],677.00	2 [illegible]61,3[illegible]7.45	7.25+	.79–	5.73–
Corn .....bu.	2,995,070.00	108,7[illegible]4,927.00	26,562,674 46	36.29+	.24+	8.71–
Barley.....bu.	45,851.00	720,[illegible]92.00	[illegible]60,046.00	15.70+	.50	7.85
Oats .....bu.	573,982.00	13,326,637.00	3,397,416.33	23.22–	.25+	5.81–
Buckwheat .....bu.	2,817.00	41,[illegible]66.40	[illegible]37,175.84	15.00	90	13.50
Irish Potatoes.....bu.	62,6[illegible]1.00	3,324,129.00	2 177,564.55	53.10+	.66–	35.05–
Sweet Potatoes .....bu.	2,728.21	197,4[illegible]7.29	197,4[illegible]7.29	72.36–	1.00	72.36–
Sorghum .....gall.	23,664.86	2,721,458 9[illegible]	1,224 6[illegible]6.57	115.00	.45	51.75
Castor Beans.....bu.	68,179.07	766,143.37	766,143.37	11.24–	1.00	11.24–
Cotton .....lbs.	197.58	33,588.6[illegible]	[illegible]3,623.06	170.00	.09	15.30
Flax .....bu.	69,383.17	622,[illegible]6.02	622,256.02	8.97–	1.00	8.97–
Hemp .....lbs.	606.39	557,878.8[illegible]	33,472.72	920.00	.06	55.20
Tobacco .....lbs.	752.37	556,753.80	55,675.38	740.00	.10	74.00
Broom Corn .....lbs.	14,273.15	8,095,145.28	283,330.15	567.16–	.03½	19.85+
Millet and Hungarian....tons.	174,890.00	494,962.00	2,042,275.75	2.83+	4.13–	11.69–
Timothy Meadow.....tons.	57,481.13	86,884.98	483,812.15	1.51–	5.57–	8.41–
Clover Meadow.....tons.	14,769.83	25,822.90	152,503.92	1.75–	5.91–	10.34–
Prairie Meadow.....tons.	672,994.00	943,653.60	3,017,472.43	1.40–	3.19+	4.47–
Timothy Pasture.....acres.	14,212.38					
Clover Pasture.....acres.	7,007.30					
Blue-grass Pasture.....acres.	36,166.82					
Prairie Pasture.....acres.	955,826.00					
Total.....	7,769,926.26	.....	$60,129,780.73			

The following statistics show the number and increase of live-stock in the State from the close of 1875 to the close of 1879:

LIVE-STOCK.

	Horses.		Mules and Asses.		Milch Cows.	
	Number.	Value.	Number.	Value.	Number.	Value.
Total in 1875	207,376	$9,875,245.12	24,964	$1,622,660.00	225,028	$5,747,215.12
Total in 1878	274,450	16,467,000.00	40,564	3,042,300.00	286,241	7,442,266.00
Increase	67,074	$6,591,754.88	15,600	$1,419,640.00	61,213	$1,695,050.88
Per cent. of increase in 5 years	32.34	.....	54.7–	.....	27.20+	.....
Total in 1878	274,450	$16,467,000	40,564	$3,042,300	286,241	$7,442,266
Total in 1879	324,766	17,537,364	51,981	4,158,480	322,020	8,964,540
Increase	50,316	$1,070,364	11,417	$1,116,180	35,779	$1,522,274

	Other Cattle.		Sheep.		Swine.	
	Number.	Value.	Number.	Value.	Number.	Value.
Total in 1875	478,295	$9,039,775.50	106,224	$247,501.92	292,658	$2,077,871.80
Total in 1878	586,002	12,423,242.40	243,760	731,280.00	1,195,044	6,094,724.40
Increase	107,707	$3,383,466.90	137,536	$483,778.08	902,386	$4,016,852.60
Per cent. of increase in 5 years	22.52–	.....	129.48–	.....	308.34+	.....
Total in 1878	586,002	$12,423,242	243,760	$731,280	1,195,044	$6,094,724
Total in 1879	654,443	15,706,632	311,862	1,091,517	1,264,494	7,586,964
Increase	68,441	$3,283,390	68,102	$360,237	69,450	$1,492,240

The following statistics show the amount not only of agricultural products but of other products of the State, valuations of real and personal estate, etc., as well as school statistics for 1879:

SUMMARY FOR THE STATE.

	1878.	1879.
Field products	$49,914,434 38	$60,129,780 73
Increase in total value of farm animals	6,401,871 30	8,504,684 20
Products of live-stock	10,415,339 32	11,507,715 46
Products of market gardens	247,510 29	307,292 48
Apiarian products	55,141 15	94,789 30
Horticultural products	2,642,770 87	488,594 88
Total	$69,677,067 31	$81,032,857 05
Increase during the year		$11,355,789 74

Total valuation of products of 1879, $81,032,857.05; assessed valuation of property, March 1, 1879, $144,930,279.69; real valu-

ation of assessed property, $241,550,466.51; total valuation of all property, $322,611,187.86. Value per capita of products of 1879, $97.80—; real valuation per capita of assessed property of 1879, $286.21+; valuation per capita of products of 1879, together with the real valuation of assessed property, $384.01+. Increase in cultivated area for year ending March 1, 1879, 1,270,492.82; number of farm dwellings erected during the year ending March 1, 1879, 15,952; value of farm dwellings erected during year ending March 1, 1879, $2,802,053. Tax on each $100 of assessed valuation, $3.56+. Number of school districts, 5,575; number of school-houses, 4,934; value of school buildings and grounds, $3,916,931; number of teachers employed during the year, 6,707; average wages paid, $27.09; total school expenses, $1,590,794.30.

The tables given above are instructive in many particulars. They show the rapidity with which the arable lands of the State are brought under cultivation, an increase of acreage of about 1,350,000 yearly, and a total of 7,757,130 acres sown with these prominent crops in 1879. At this rate of increase, and it is likely to be exceeded, the year A. D. 1900 will see all or nearly all the arable land of the State under culture. They show also that while, as a new State, Kansas must of necessity devote herself to the cultivation of the cereals, corn and potatoes, as her principal crops, and those which would bring the readiest and surest return, she has also been very active in diversifying her productions by the cultivation of other crops. In 1879, more than one-seventh of her cultivated acreage was devoted to the culture of such crops as millet, pearl millet, Hungarian grass, rice corn, flax, broom corn, castor beans, sorghum, sweet potatoes, and small ventures in cotton, hemp, tobacco, etc.

Kansas has generally done better on winter wheat than spring wheat, and hence of her large wheat area about four-fifths is winter wheat, and the remainder spring wheat. The States farther north have found that spring wheat was a much surer crop, owing to their long and severe winters and their short but quick-growing and intense summers. The warm season is so much longer, and the general cold of winter so much less severe in Kansas,

that winter wheat is a tolerably sure crop, and its average yield is more satisfactory than the spring wheat.

The culture of the castor bean, of flax, of the rice corn, and of the broom corn is larger in proportion to the whole farming crop than in any other State. That of sorghum and of the pearl millet is increasing. All of these crops under proper conditions have proved profitable, and some of them in future will be much more so. This is especially true of the castor bean, rice corn, flax, and sorghum. The new discoveries which enable the manufacturer at very moderate cost to produce a perfectly crystallized sugar from sorghum, when cut at the time the seeds are hardening, will cause a great increase in the cultivation of some of its numerous varieties. The demand for the flax fibre for paper stock when the seed has ripened will increase the production of flax as yielding a double crop of seed and lint, and the recently demonstrated fact that it is the most profitable crop to be used on land of new breaking will also increase its production.

We should not lose sight in this connection of the important interest which Kansas has in the rearing of live-stock. In 1879, she had 324,766 horses and 51,981 mules reported by the assessors, a very fair amount for a new State; the number of milch cows was 332,020, and of other cattle 654,443, making together 986,463 neat cattle, and allowing for omissions in the assessors' reports the actual number must have exceeded 1,000,000. The dairy products of the State for the year ending March 1, 1879, were 1,059,640 pounds of cheese, and 14,506,494 pounds of butter, of the total value of $3,759,078.50. To this should be added a large sum for milk sold. The number of sheep was 311,862, not very large, but a ten-fold increase from 1870. In the production of swine, Kansas stands eleventh in the United States, and fourth in "Our Western Empire," only Iowa, Missouri, and Texas having a larger number. In the quality of the pork only Iowa surpasses her. In addition to her 1,264,494 swine at the end of 1879, which were valued at $7,586,964, there were in 1879 animals slaughtered or sold for slaughter (of which the swine formed much the largest portion) to the value of $8,665,543. Western Kansas furnishes such abundant pasturage for

cattle and sheep, and such vast crops of corn, rice corn, etc., that the raising, and especially the fattening of cattle and sheep for market, ought to be and will be one of its largest industries.

The orchard and vineyard products of Kansas are remarkable for a State so recently settled. In March, 1879, there were reported, 1,867,192 apple trees in bearing, and 3,979,062 which had not yet borne their first crop; 58,482 pear trees in bearing, and 154,265 not yet in bearing; 4,784,076 peach trees in bearing, and 4,049,801 not yet in bearing; 169,940 plum trees in bearing, and 264,968 not yet in bearing; 432,726 cherry trees in bearing, and 678,426 not yet in bearing. The climate is favorable to fruit-growing, and great care is taken to obtain choice varieties. Not so much attention has been paid to viniculture, but there were 3,419 acres of vineyards in the State in 1878, and 84,079 gallons of wine were made that year.

Apiaculture, or the raising of bees, has been from the first a favorite pursuit in Kansas. In 1879 there were 31,190 stands of bees reported in the State, which had produced 370,398 pounds of honey, and 10,949 pounds of wax.

Prices of Necessary Merchandise.—The question is often asked by intending emigrants: Are not the prices of everything we have to buy in these new States and Territories enormously high? We can buy land cheaply enough, and the prices of horses, cattle and sheep are reasonable, but is not this cheapness more than made up by the exorbitant price put upon everything we have to eat, drink, or wear, upon our furniture, agricultural or mining tools, lumber, etc., and is not the price of board and lodging very high?

We answer, No. The average prices of most articles are not higher and some of them not quite so high as those at the East. The following list of prices prepared by the late Hon. Alfred Gray, late Secretary of the Kansas State Board of Agriculture, with great care, shows the average prices in Kansas, in the autumn of 1879. They have not materially changed since. The prices of board are given as at Topeka, Lawrence and other cities of the State. In the country villages and on farms, they are materially lower.

PRICES OF MERCHANDISE, ETC.

DRY GOODS.

Prints.

Merrimac, per yard	6c. to 8c.
Cocheco	7c. to 9c.
Ordinary	5c.

Muslin—Bleached.

Lonsdale, per yard	10c.
Fruit of the Loom	10c.
Great Falls, Q	10c.
Wamsutta	12½c.

Brown.

Indian Head, per yard	9½c.
Atlantic, A	9½c.
Atlantic, P	7c.
Dwight Star	9½c
Booth Mills	8½c.

Jeans, etc.

Salem, all wool filled, per yard	45c.
Tricot	25c.
Farmers'	30c.
Farmers' and mechanics' cassimere	25c.
Cheviot shirtings	10c. to 12½c.
Ticking, best feather	20c. to 25c.
Ticking, best straw	10c. to 12½c.

GROCERIES.

Sugar. (*For one dollar.*)

10½ pounds A.
10½ pounds Granulated.
11½ pounds Coffee, "C."
15 pounds Brown.

Coffee. (*For one dollar.*)

4 pounds Java.
5 pounds best Rio.
8 pounds good Rio.

Tea. (*Per pound.*)

Japan	$0 25 to $0 80
Gunpowder	60 to 1 00
Imperial	50 to 80
Oolong, choice	60

Miscellaneous.

Rice, per pound	$0 08
Codfish	8
Mackerel, per kitt	70
Bacon—Shoulders, per pound	6
Bacon—Hams, canvassed	$0 11
Hams, plain	8
Sides	8
Apples, per bushel	1 00 to 1 20
Potatoes	70 to 80
Sweet potatoes	70
Butter crackers, per pound	6¼
Coal oil, per gallon	25

Flour and Feed.

XXX, per 100 pounds	$2 75
XXXX	3 25
Patent	3 75
Corn meal	80
Bran	60
Shorts	70
Corn, per bushel	25
Oats	30
Hay, per ton, loose	3 00
Hay, per ton, baled	8 00

FURNITURE.

Chairs.

Windsor, set of 6	$3 50 to $6 50
Cane seat	6 00 to 18 00
Splint bottom	4 50
Easy, each	7 50 to 20 00

Tables.

Kitchen	$2 50
Breakfast	3 00 to 4 50
Extension, oak, ash and walnut, per foot	1 15

Bedsteads, etc.

Cottage	$3 00
Walnut	5 00 and upwards
Bureaus	12 00 and upwards

Rocking Chairs, etc.

Common wood	$1 00 to $1 50
Cane seat	2 50 to 6 00
Washstands	2 00 to 2 50
Commode and drawer stands	4 50 to 6 50
Kitchen safes	4 00 to 7 50

Lounges, etc.

Carpet	$8 00 to $30 00
Wood, extension	2 25 to 4 50
Sofas	15 00
Bedroom suits	35 00 to 150 00
Parlor suits	40 00 to 100 00

CARPETS.

Hemp, per yard	$0 20	Tapestry	$0 90 to $1 25
Rag	40	Body Brussels	1 50 to 2 00
Ingrain, cotton chain	25 to 50	China straw matting	18 to 35
Two-ply, all wool	55 to 90	Rattan matting	35 to 75
Three-ply, all wool	90 to 1 10	Oil-cloth, per square yard	35 to 75

MISCELLANEOUS.

Stoves.

Cooking, complete	$17 00 to $50 00
Heating	5 00 and upwards

Harness, etc.

Farm, double	$22 00 to $26 00
Carriage, double	25 00 to 75 00
Buggy, single	12 00 to 50 00
Saddles, men's	2 50 to 25 00
Saddles, women's	$5 00 to $ 25 00
Collars	60 to 4 00
Halters	50 to 2 00
Horse blankets	1 10 to 10 00

Shoeing Horses.

Putting on set of all-new shoes	$1 50
Resetting old shoes	80

BUILDING MATERIAL.

Common boards, per M	$22 50	Blinds, per lineal foot	$0 35
Studding and joist	22 00	Cedar posts	17 to 20
Fencing	22 50	Lime, per bushel	25
Flooring	25 00 to 35 00	Plastering hair, per bushel	20
Siding	18 00 to 25 00	Brick, per M	7 00 to 8 00
D stock	25 00	Plaster Paris, per barrel	3 50
Shingles	3 00 to 4 00	Nails, per pound, by the keg	4½
Lath	4 00	Stone, per cord, delivered	3 50 to 4 00
Finishing lumber	30 00 to 60 00	Stone, laid in the wall, per foot	8
Doors	1 25 to 3 00		
Sash, glazed, per window	90 to 2 50		

Building hardware is sold at Eastern prices, with freight added.

AGRICULTURAL IMPLEMENTS.

Plows, etc.

Wood beam, stirring, from 10 to 16 inches	$10 00 to $16 00
Steel beam, stirring	12 00 to 20 00
Iron beam, stirring	11 00 to 18 00
Prairie breakers	18 00 to 25 00
Sulky, 12 to 16 inches	38 00 to 45 00
Riding sulkies, for plow attachments	20 00 to 35 00
Corn planters	45 00
Cultivators, walking or riding	$19 00 to $27 00
Harrows, Scotch	6 00 to 8 50
Harrows, vibrating	9 50 to 10 50
Hay rakes, sulky	22 00 to 24 00

Wagons.

Farm two-horse	$60 00 to 70 00
Spring	90 00 to 125 00

Buggies.

Covered	$90 00 to $275 00
Open	60 00 to 150 00

WOODEN AND WILLOW WARE.

Two-hoop buckets	17c.	Medium willow clothes basket	75c.
Three-hoop buckets	20c.	Large willow clothes basket	90c.
No. 1 washtubs	50c.	Washboards	15c. to 25c.
No. 2 washtubs	65c.	Half-bushel market baskets	10c.
No. 3 washtubs	75c.	Half-bushel feed baskets	30c.
Small willow clothes basket	65c.	Bushel baskets, stave	40c.

FRESH MEATS.

Beef.		*Mutton, etc.*	
Boiling pieces, per pound	5c. to 6c.	Chops per pound	10c. to 12½c.
Roasting pieces	10c. to 12½c.	Roast	10c. to 12½c.
Steak, round	10c.	Leg	12½c.
Loin	12½c.	Pork	8c. to 10c.
Porterhouse	12½c.	Corned beef	8c.
		Pickled pork	10c.

WAGES.

Carpenters, per day	$1 50 to $2 50	Tinners	$1 50 to $3 00
Stone masons	2 00 to 2 25	Saddle and harness makers, per week	9 00 to 14 00
Bricklayers	3 00	Printers, per M	25 to 30
Blacksmiths	1 50 to 2 25	Printers, per week	12 00 to 15 00
Machinists	1 50 to 2 25	Laborers, per day	1 00 to 1 50
Moulders, iron	2 00		

Boarding.—Board may be obtained at private houses for from $4 to $5 per week; at boarding houses, for $4.50 to $6; and at first-class hotels, at from $1.50 to $3 per day.

Railroads and River Navigation.—The amount of river navigation in the State is not large. The Missouri is navigable for the entire distance (some seventy miles), in which it forms the northeastern boundary of the State, but none of its tributaries in Kansas possess any considerable value in that respect. The Kaw or Kansas, the largest of these, has been ascended in flood time by steamboats as far as the junction of the Smoky Hill and Republican rivers, but ordinarily no boats would be able to navigate it. The Arkansas is not navigable in Kansas, except in flood time.

But this lack of navigable rivers is more than made good by the abundance of its railway facilities. Sixty-five of the 103 counties of the State (organized and unorganized) are traversed by railroads, and many of the others are accessible to them, by their passage near their borders. Directly or indirectly, all the railroads which spread out over the State like a spider's web start from Kansas City, Missouri, so that the emigrant is sure of not going wrong if he buys his ticket at the East for that great railroad centre.

We might go farther, and say that with the exception of a sin-

gle great trunk road (and how long that may be an exception it is hard to say), all the railroads which traverse Kansas in any direction are under the control of the Wabash Railway, and most of them form parts of the great Union Pacific system. This is especially the case with all the railways running west or northwest from Kansas City, Atchison, and St. Joseph, Missouri, but it is true, so far as the Wabash is concerned, of those in the eastern part of the State which extend southward and southwestward to the Indian Territory and Texas. The Atchison, Topeka and Santa Fé Railway, though having its eastern termini at Kansas City and Atchison, has thus far maintained its independence of these grand combinations and pursued its own plans to their consummation. So far as Kansas is concerned it will probably continue to do so; but what may be the outcome of its recent arrangements for reaching the Pacific and Gulf coasts does not concern us in this connection. Kansas had at the beginning of 1880, about 3,121 miles of railroad in operation in 65 of its 103 counties, and has materially increased the amount during the present year. It ranks third among the States and Territories of our western empire, only Iowa and Missouri surpassing it, though Minnesota is not far behind in the race. Only eight of the States of the Union have exceeded this State in the extent of their railroad development.

The following list we believe comprises all the Kansas railways; their length cannot be given, as it is so constantly changing.

KANSAS RAILROADS.

St. Joseph & Denver Railroad (formerly St. Joseph & Denver City Railroad).—Eastern terminus, St. Joseph, Mo.; western terminus, Hastings, Neb.

Atchison & Nebraska Railroad.—Southern terminus, Atchison, Kas.; present northern terminus, Seward, Neb.

Central Branch Union Pacific Railroad.—Eastern terminus, Atchison, Kas.; western terminus, Kirwin, Kas.; with branches from Greenleaf northwest to Washington; from Concordia north to Scandia; and from Downs southwest to Osborne.

Atchison, Topeka & Santa Fé Railroad.—Eastern termini,

Atchison, Kas., Kansas City, Mo., and Pleasant Hill, Mo.; western termini, Pueblo, Col., and Santa Fé, N. M.; with branches from Emporia south to Eureka; from Florence south to Eldorado; from Florence northwest to McPherson; and from Newton south to Winfield and Wellington.

Missouri Pacific Railway.—Eastern terminus, St. Louis, Mo.; northern terminus, Atchison, Kas., via Kansas City.

Kansas Central Railroad.—Eastern terminus, Leavenworth, Kas.; western terminus, Onaga, Kas.

Kansas Pacific Railway.—Eastern termini, Leavenworth, Kas., and Kansas City, Mo.; western terminus, Denver, Col.; with branches from Junction City northwest to Concordia; from Solomon City northwest to Minneapolis; and from Salina south to Lindsburg.

Missouri, Kansas & Texas Railway.—Eastern terminus, Hannibal, Mo.; southern terminus, Denison, Texas; with branch from Parsons, Kas., northwest to Junction City, Kas.

Osage Division of Missouri, Kansas & Texas Railway.—Eastern terminus, Holden, Mo.; western terminus, Paola, Kas.; connecting at Holden with Missouri Pacific Railway, and at Paola with Kansas City, Fort Scott & Gulf Railroad.

St. Louis & San Francisco Railroad.—Eastern terminus, St. Louis, Mo.; present western terminus, Cherryvale, Kas.; with branch from Carl Junction, Mo., northwest, to Girard, Kas.

Memphis, Kansas & Colorado Railway.—Eastern terminus, Messer, Kas.; western terminus, Parsons, Kas.; connecting at Messer with St. Louis & San Francisco Railroad, and at Parsons with Missouri, Kansas & Texas Railway.

Kansas City, Lawrence & Southern Railroad.—Northern termini, Lawrence, Kas., and Kansas City, Mo.; southern terminus, Coffeyville, Kas.; with branch from Cherryvale southwest to Independence.

Kansas City, Burlington & Santa Fé Railroad.—Northeastern terminus, Ottawa, Kas.; southwestern terminus, Burlington, Kas.; connecting at Ottawa with K. C. L. & S. R. R., and at Burlington with M. K. & T. Rly.

Kansas City, Fort Scott & Gulf Railroad.—Northern terminus, Kansas City, Mo.; southern terminus, Joplin, Mo.

Manufactures.—There are no statistics of manufactures in the State since 1870 which even approximate accuracy. In 1870, with a population of 373,299, the census report, always imperfect on manufactures, gave the following statistics: 1,477 manufacturing establishments; $29,456,939 capital employed; $54,800,087 of annual product. In the ten years since that time, the population has increased three-fold, the assessed valuation certainly three and a half times, and the true valuation from $188,892,014 to $447,611,187.54. The annual product of manufactures in the State cannot fall short of $200,000,000, and may exceed that. Though there are no cities of the first or second class in the State, there are many active and growing towns and cities which are actively engaged in manufactures of all kinds.

Lands for Immigrants.—With the immense influx of immigration in the past four years the greater part of the government lands east of the 98th meridian have been taken up, the exceptions being for the most part, those lands which were at too great a distance from railroads or markets, or those which were less fertile, or swampy in their character. West of this meridian, the government lands are yet to be bought of good quality, and at the usual rates, $1.25 per acre outside of railroad limits, or $2.50 inside. These lands can also be secured under the Homestead or Timber-Culture Acts or pre-empted; and some of those west of the 100th meridian under the Desert Land Act. If the lands are to be immediately cultivated we would suggest to the immigrant that he should not go beyond the frontier of settlement; because the rainfall, which, though increasing, is yet scanty, will not have as beneficial an effect upon the newly broken lands which are isolated, as on those where the new breaking is continuous; and if, as may be the case, irrigation is required, it is better and less expensive that it should be undertaken by many farmers than by one. If the lands are intended for grazing, it makes very little difference where the selection is made, so that there are streams for watering the stock, and the settler plants his trees so as to afford them shelter from the winds and cold. Bunch grass will afford good pasturage, and as the land is broken, blue joint and other tame grasses will spring up.

There are school, university and so called swamp lands belonging to the State, to be had on favorable terms, in almost all of the counties. The railway companies all have lands to sell, along their lines, throughout the State, at prices varying from $3 or $4 to $12 per acre, according to location, and on very favorable terms of credit. We have spoken of these at length elsewhere.

If the immigrant has some capital he can often buy partially improved farms on better terms than to break up new land. The soil is good enough to insure good crops every year; but he should be sure of his title. Very many restless spirits, burdened with debt, are anxious to dispose of their farms at even less than the cost of the improvements in order to begin again under more favorable circumstances, and there are many cases in which a shrewd settler with a little capital can come into possession of an excellent farm with the hard labor of the early work on it done to his hand by the man of whom he buys it.

Population.—The following table shows the population of the State at different dates since 1860, and other particulars:

Year.	Population.	Males.	Females.	Valuation for Purposes of Taxation. 60 per cent.	Of School Age. Between 5 and 21 years.	Enrolled in School.
1860	107,206	59,178	48,028	$31,327,895	37 423	2,310
1865	135,807	.....	.....	36,126,000	45,441	26,409
1870	373,299	202,224	162,175	92,125,861	109,742	63,218
1874	539,367	246,939	228,875	128,906,520	199,010	135,598
1875	575,156	.....	.....	121,544,000	199,986	142,636
1878	708.497	.....	.....	138,698,811	266,575	177,806
1879	849,978	.....	.....	144,930,280	283,326	188,884
1880	995,966	536,725	459,241			

The population, which has so rapidly increased within the last decade, counts 109,705 of foreign birth and twice that number of foreign parentage. In the beginning, there were two distinct immigrations, one from New England, New York and the Northern States, and the other from the South, struggling fiercely and bitterly for the supremacy. The settlers from the North triumphed, and made it a free State. Of the influx since 1870 probably a fifth has been of foreign birth; Mennonites and their co-religionists from Russia, Germans, Scandinavians, French, Italians, English, Scotch, Welsh and Irish; and with these have come also large

numbers from all the Atlantic States, Canadians, Mexicans, and of late negroes, making their exodus from the Southern States to Kansas, as pre-eminently the land of freedom.

The Indian population, which in 1870 amounted to over 10,000, occupying several large reservations, has, by the action of the United States government in obtaining their lands by treaties and annuities and removing them to the Indian Territory, been greatly reduced. There are now only 690 tribal Indians in Kansas, all of the Pottawatomie and Kickapoo tribes. The Indian reservations still include 102,026 acres, but the title to a part of this will soon be extinguished.

Counties.—There are 104 counties in the State, 78 of which were organized and 26 unorganized, in March, 1880. Their names, area and population in 1879 were as follows:

Counties.	Area in Square Miles.	Population March 1, 1879.	Counties.	Area in Square Miles.	Population March 1, 1879.	Counties.	Area in Square Miles.	
1. Leavenworth	455	30,283	40. Chautauqua	651	10,537	79 Arapahoe	576	Unorganized counties. Population estimated in 1879 at 15,000.
2. Shawnee	558	22,632	41. Harvey	540	10,440	80. Buffalo	576	
3. Atchison	409	21,700	42. Nemaha	720	10,267	81. Cheyenne	1,020	
4. Douglas	469	20,530	43. Marion	954	10,154	82. Clark	1,170	
5. Cherokee	589	18,535	44. Allen	504	10,116	83. Comanche	1,155	
6. Bourbon	637	18,310	45. Coffey	648	10,077	84. Foote	720	
7. Labette	649	18,171	46. Osborne	900	9,445	85 Grant	576	
8. Cowley	1,122	18,157	47. Elk	651	8,787	86. Greeley	8.6	
9. Sedgwick	1,008	17,613	48. Ottawa	720	8,757	87 Gove	1,080	
10. Marshall	900	17,189	49. Jackson	658	8,732	88. Hamilton	986	
11. Butler	1,428	17,006	50. Greenwood	1,155	8,202	89. Kansas	810	
12. Johnson	480	16,012	51. Phillips	900	7,956	90. Kearney	864	
13. Montgomery	636	15,979	52. Rice	720	7,501	91. Lane	576	
14. Doniphan	379	15,459	53 Lincoln	720	7,448	92 Meade	924	
15. Osage	720	15,369	54. Riley	617	7,419	93. Ness	1,080	
16. Miami	588	15,161	55. Morris	700	7,197	94. Rawlins	1,080	
17. Sumner	1,188	15,090	56. Pawnee	756	7 023	95. Scott	720	
18. Lyon	858	15,073	57. Ellsworth	720	6,741	96. Sequoyah	864	
19. Wyandotte	153	15,046	58. Anderson	576	6,616	97. Seward	648	
20. Crawford	592	14,622	59. Russell	900	6,521	98. Sheridan	900	
21. Linn	637	14,586	60. Waubaunsee	804	6,245	99. Sherman	1,080	
22 Jewell	900	14,161	61. Davis	407	6,087	100. Stanton	684	
23. Franklin	576	14,073	62 Woodson	504	6,058	101. Stevens	648	
24. Mitchell	720	14,034	63 Rush	720	5,282	102. Thomas	1,080	
25. Jefferson	665	13,872	64 Ellis	900	5,240	103. Wallace	2,010	
26. Pottawatomie	848	13,791	65. Rooks	900	5,104	104. Wichita	744	
27 Neosho	576	13,594	66 Norton	900	4 797			
28. McPherson	900	13,196	67 Chase	768	4,743			
29 Dickinson	851	13,005	68. Ford	1,080	2,832			
30. Cloud	720	12,656	69 Edwards	972	2,801			
31. Saline	720	12,424	70. Kingman	648	2,599			
32. Barton	900	12,333	71. Stafford	720	2,364			
33. Republic	720	12,193	72. Trego	900	2,310			
34. Reno	1,260	12,042	73. Harper	1,026	2,158			
35. Wilson	576	11,901	74. Pratt	792	2,084			
36. Washington	900	11,900	75. Barbour	1,134	2,016			
37. Smith	900	11,498	76 Hodgeman	864	1,738			
38. Brown	576	10,790	77. Decatur	900	750			
39. Clay	660	10,658	78. Graham	900	1,500			
						Population of State in 1879		849,978

Cities and Towns.—As already stated, none of the cities of Kansas have yet attained to the second rank, but many of them are growing rapidly; not so fast indeed as the mushroom cities of the mining regions, which to-day may have a population of 5,000 and next week not 200. In the West every settlement is a city, whether it has 100 or 100,000 inhabitants, and most of them go through the farce of having a municipal organization. The following are all the cities which, in 1879, had over 1,000 inhabitants:

Leavenworth, Leavenworth county	16,550	Hutchinson, Reno county	1,709
Topeka, Shawnee county	15,451	Clay Center, Clay county	1,600
Atchison, Atchison county	15,100	Manhattan, Riley county	1,593
Lawrence, Douglas county	8,478	Empire City, Cherokee county	1,591
Wichita, Sedgwick county	5,235	Mound City, Linn county	1,497
Fort Scott, Bourbon county	5,010	Humboldt, Allen county	1,456
Wyandotte, Wyandotte county	4,612	Concordia, Cloud county	1,441
Emporia, Lyon county	4,061	Great Bend, Barton county	1,430
Ottawa, Franklin county	3,507	Marysville, Marshall county	1,420
Salina, Saline county	3,383	Garnett, Anderson county	1,252
Parsons, Labette county	3,130	Osage Mission, Neosho county	1,216
Independence, Montgomery county	2,829	Girard, Crawford county	1,184
Newton, Harvey county	2,539	Hiawatha, Brown county	1,078
Junction City, Davis county	2,345	Wamego, Pottawatomie county	1,071
Olathe, Johnson county	2,260	Baxter Springs, Cherokee county	1,069
Beloit, Mitchell county	2,194	Minneapolis, Ottawa county	1,045
Winfield, Cowley county	2,103	Holton, Jackson county	1,044
Osage City, Osage county	2,003	Seneca, Nemaha county	1,036
Paola, Miami county	1,973	Larned, Pawnee county	1,031
Burlington, Coffee county	1,740		

Education.—Kansas occupies among the newer States the very first rank in her facilities for education. Her school fund has been wisely husbanded, and she has yet 2,200,000 acres of school lands unsold, which, by judicious management, may be made to realize $5 per acre. If this is accomplished the fund will eventually reach more than $13,000,000, the interest of which will be annually distributed to the schools. But this income, amounting in 1878 to $314,380, is only a small item in the amount annually raised for the support of public schools. In 1878 the amount raised and expended for common schools in the State was $1,261,459.14, of which $980,435.07 was paid as wages to the teachers, the male teachers receiving $32.99 per month,

and the female teachers $26.04. There were 6,359 of these teachers in 1878, and the number had increased to 6,707 in 1879. The whole number of scholars enrolled was 188,884, and the average attendance about 113,000. In the latter year there were 5,575 school districts, and 4,934 school-houses, and the value of school-buildings and grounds was $3,916,931. Besides these schools and the graded and high schools of the cities and larger towns, there are four normal schools, with about 800 teacher pupils; a State Agricultural College, near Manhattan, well managed and largely attended; the University of Kansas, at Lawrence, one of the most efficient of the Western State universities, and eight other colleges, sustained by different religious denominations (two of them Roman Catholic), with about 50 professors and nearly 1,000 students. There are also many collegiate schools and seminaries, generally denominational, which are for the most part well sustained. The immigrant to Kansas may feel fully assured that his children, if he has any, will not suffer for the want of advantages of education.

Churches and Religious Denominations.—In 1878, with a population of 708,497, the aggregate membership of the nine leading denominations was 135,713, nearly one-fifth of the entire population. Their church edifices and other church property was valued at $2,037,508. Of these the Catholics had the largest membership (as they include as members all their adherent population), reporting 63,510 adherents to 223 organizations. The Methodist Episcopal Church came next, though with many more church organizations, having 1,018 churches and 33,767 members. The Baptists were next, with 334 churches and 16,083 members. These were followed by the Presbyterians, with 229 churches, 8,961 members; the Congregationalists, with 157 churches, and 5,620 members; the Lutherans, with 58 churches and 4,560 members; the United Presbyterians, with 43 churches and 1,469 members; the Protestant Episcopal Church, with 36 parishes and 1,389 members; and the Universalists, with 16 congregations and 354 members. There are also Mennonite churches, churches of the Disciples or Campbellites, and a considerable number of other minor denominations. In the order

of the valuation of their church property, the different denominations stand as follows: the Methodists first, then consecutively the Presbyterians, the Catholics, the Congregationalists, the Baptists, the Episcopalians, Lutherans, United Presbyterians, and Universalists.

Such, so far as we have been able to present them, are the advantages which Kansas offers to the immigrant;—a fertile soil, an agreeable though rather warm climate in its summer half, with a very wide range of temperature between winter and summer; land easily tilled, and a ready and sure market for all that is produced; a wider range of production than most of the States; an intelligent, enterprising and liberty-loving population; good schools and churches, and an abundance of both. The people who have migrated to this State are not given to longings to go back either to the Eastern States or Europe.

We cannot close this sketch of Kansas without paying a tribute of respect and honor to one man who has passed away while this work was in progress, but who had done more to make Kansas what it is to-day than any hundred men in it. The Hon. ALFRED GRAY, for fourteen years either Director or Secretary of the State Agricultural Society or the State Board of Agriculture, was born at Evans, Erie county, New York, December 5, 1830, of English parentage. His early education was obtained in his native village. Filial duty led him to endeavor at the early age of fourteen to support his widowed mother by his own labor. At the age of nineteen, after the death of his mother, he commenced a course of study which culminated six years later in his graduation from the Albany law school and his successful practice of law for two years.

In 1857 he removed to Quindaro, Kansas, and soon abandoned the law for farming, a pursuit for which he had a passion. His farm, gardens and herd were the finest in the State. He was called to fill many offices of honor and trust in the State, and was a member of its Legislature. From 1862 to 1864 he served as Regimental, Brigade and Division Quartermaster in the Union army, and gave proofs of extraordinary ability in the discharge of his duties. In 1866 he was made a director in the

State Agricultural Society, and continued in that position promoting its interests till it was merged in the State Board of Agriculture, when he became its Secretary, and selling his farm moved to Topeka. Here, though in failing health, he was incessant and unremitting in his labors. He was the organizer and soul of that unsurpassed exhibit of Kansas at the Centennial. He had a genius for statistics, and everything bearing upon agriculture was the object of his careful solicitude; no State Agricultural reports in the country bear any comparison to his in fulness or in perfection of detail. While wasting away with pulmonary consumption, he remained in the harness to the last. A letter to the writer, dated but three days before his death, makes no allusion to his personal condition, but is filled with important information relative to the condition of his beloved Kansas. He died January 23, 1880. Happy may Kansas well be if she can replace him with a man of like ability and industry.

CHAPTER X.

LOUISIANA.

LOUISIANA NOT WHOLLY WITHIN "OUR WESTERN EMPIRE"—ITS LOCATION—ITS EXTENT AND AREA—ITS SURFACE AND TOPOGRAPHY—RIVERS, LAKES AND BAYOUS—GEOLOGY AND MINERALOGY—IRON, SALT, SULPHUR—OTHER MINERALS—SOIL AND VEGETATION—FOREST TREES—ZOOLOGY—THE JAGUAR OR AMERICAN LEOPARD OR TIGER, ALLIGATORS AND CROCODILES—CLIMATE—MALARIAL FEVERS IN THE DELTA—THE UPLANDS HEALTHY BUT HOT—METEOROLOGY OF NEW ORLEANS AND SHREVEPORT—AGRICULTURAL PRODUCTIONS—COTTON, SUGAR, RICE, AND CORN—THE SOIL FERTILE, BUT THE FARMING POOR—LIVE-STOCK—MANUFACTURING AND MINING INDUSTRIES—COMMERCE—THE GREAT FACILITIES ENJOYED BY THE STATE FOR FOREIGN AND COAST-WISE COMMERCE—RAILROADS—FINANCES—POPULATION—HISTORY AS BEARING ON POPULATION—MIXED RACES LARGELY PREVALENT—THE STATE NOT LARGELY INCREASED BY RECENT IMMIGRATION—PARISHES OR COUNTIES—PRINCIPAL TOWNS—EDUCATION—CHURCHES—NOT SPECIALLY ATTRACTIVE TO IMMIGRANTS AT PRESENT.

ONLY about two-thirds of Louisiana lie within the bounds of "Our Western Empire." Its commercial and political capital,

New Orleans, the chief city of the Southwest, is on the east bank of the Mississippi river, as are several other considerable towns. Its boundaries are: On the north, Arkansas and Mississippi; on the east, Mississippi, and for the greater part of the distance the Mississippi river and Sound; south and southeast, the Gulf of Mexico; and on the west, Texas, the Sabine river being the boundary for about three-fourths of the distance. It is situated between the meridians of 89° and 94° W. from Greenwich, and between the parallels of 28° 56′ and 33° N. latitude. Its extreme length from east to west is 298 miles, and its extreme breadth from north to south 280 miles. Its area is 41,346 square miles, or 26,461,440 acres.

Surface and Topography, Rivers, Lakes, Bayous, Sounds and Gulfs.—The highest land in the State, the hills in its northern and northwest portions, does not exceed 240 feet in height. From these uplands there is a gentle slope both towards the Mississippi river and the Gulf. The delta of the Mississippi, especially below New Orleans, is below the level of the Mississippi at the spring floods; and at least 8,450 miles, or one-fifth of the area of the State, is only protected from annual submergence by the levees. With the exception of a tract in Southeast California, once a part of the bed of the ocean, the greater part of the State of Louisiana is the lowest land in "Our Western Empire." The rivers are the Mississippi, which has a course of about 590 miles within the State, and is now, through the labors of Captain Eads, navigable not only for the largest steamers but for all ocean steamships of the first-class, from its mouth to and beyond the northern boundary of the State; the Red river, one of its largest tributaries, which enters the State near its northwest corner and crosses it diagonally to the 31st parallel, where it joins the Mississippi; the Washita, the largest affluent of the Red river, which comes into the State from Arkansas, and with its two large branches, the Tensas and Boeuf, drains the northern parishes of the State; the Dugdemona, the Saline Bayou, and the Bistineau river and lake, all tributaries of the Red river. The Sabine river, as we have already noticed, forms a part of the western boundary of the State, but receives no considerable af-

fluents on the east bank. The Calcasieu and Mermenteau are considerable rivers, both having several tributary bayous or sluggish streams. East of the Mississippi are the Pearl river, with its tributary, Bogue Chitto, the Tangipahoa, Tickfaw and Amité. There are, besides these, several large estuaries or bayous, which are really secondary mouths or outlets of the Mississippi, which in flood-time convey a large portion of its waters to the Gulf, and at other times drain the greater part of Southern Louisiana. Among these are: Atchafalaya Bayou with its series of lakes and inlets; Vermillion Bayou, Bayou Teche which connects with it, Bayou de Large, Bayou la Fourche, and the lakes, bays and estuaries which discharge their waters into Barataria bay. In the ordinary sense of the term there are no lakes in Louisiana, all that are so called being either estuaries, bayous or expansions of rivers. Thus Lake Pontchartrain is a land-locked estuary whose waters are salt and rise and fall with the tide; Lake Maurepas is closely connected with Lake Pontchartrain, and partakes of its character; Lake Borgne is only a sound or bay; Sabine lake, Calcasieu lake, Lake Mermenteau, Grand lake, Marsh lake, Lake Charles, Grand Cheniere, Caillon, Lake Washa, and the rest are all estuaries connected with rivers or bayous. In the northern part of the State there are ten or fifteen so called lakes which are mere expansions of the Red river, or some of its tributaries. There are numerous bays and sounds along the coast, indenting the alluvial delta of the Mississippi in all its borders.

Geology and Mineralogy.—Three-fifths of the State, including the Mississippi basin and delta, the Red river region and basin, and the Bluff or Loess region, which comprises nearly all of Calcasieu, St. Landry and Lafayette parishes, and a long but narrow strip east of the Mississippi river, belong to the alluvial and diluvial formations. The Mississippi delta proper covers over 12,000 square miles, and its deposits are from thirty to forty feet in depth and of wonderful fertility. The remaining two-fifths of the State is, for the most part, tertiary, the formations in the northwest and west-northwest parts of the State being subdivisions of the eocene. There are occasional small outcrops of

cretaceous strata in the northwest, west and central parts of the State, and in these are found limestone, gypsum, and salt-bearing strata. Below the alluvium and tertiary in the southern part of the State, there are deposits of sulphur, and at one point between the Sabine and Calcasieu rivers, the boring of an artesian well demonstrates that, beginning 428 feet below the surface, there is a deposit of sulphur 112 feet thick, which will yield from sixty to ninety-six per cent. of pure sulphur. Of other minerals and metals Louisiana has not a great variety. Brown coal (lignite) is found in the tertiary in considerable quantities and of moderately good quality. Iron (bog ore, probably) and salt are plentiful in this region, and on Petit Anse island salt has been mined to a depth of sixty feet below the level of the Gulf, fifty-eight feet of it through solid rock-salt of the purest quality. This was in great demand during the late civil war. In the cretaceous rocks, ochre, marl, gypsum, lead, sulphate of soda, sulphate of iron, and a very pure carbonate of lime are found. Petroleum has also been discovered, but not in sufficient quantity to pay for working. Copper and quartz crystals, agates, jasper, cornelian, sardonyx, onyx, feldspar, of fine quality, meteoric stones and numerous fossils have been found in the tertiary.

Soil and Vegetation.—The alluvial and diluvial soils are of extraordinary and unsurpassed fertility. The delta lands are admirably adapted for the culture of sugar-cane, cotton, rice, wheat, barley, sweet potatoes, figs and oranges. The orange is quite as successful, and of flavor fully equal, to those grown in Florida. The Sea island or long staple cotton is grown on the islands of the delta, but on the main land the upland or short-stapled cotton is most generally cultivated. The tertiary region has not so rich a soil, but with proper culture yields good crops. Indian corn yields better there than on the alluvial soils, and cotton is successfully cultivated. A portion of the tertiary region is covered with pine forests, which are heavy but not dense, and these lands, though healthful, are not productive. About one-fifth of the area of the State is too swampy and marshy for cultivation, and much of it is covered with lofty cypress trees, from which the Spanish moss hangs in graceful festoons. The other

forest trees of the alluvial region are the sweet-gum, ash, black walnut, hickory, magnolia, live-oak, Spanish, water, black, chestnut, white and post oaks, tulip-tree (*liriodendron*), linden, Florida anise, lance-leaved buck-thorn, four or five species of acacia, wild cherry, pomegranate, holly, arbor-vitæ, tillandsia, lime, pecan, sycamore, white and red cedar, and yellow pine; in the tertiary lands, sassafras, mulberry, poplar, hackberry, red elm, maple, honey-locust, black locust, dogwood, tupelo, box elder, prickly ash, persimmon, etc. Along the river banks, the inevitable cottonwood, willow-basket elm, palmetto, wild cane, pawpaw, wild orange, etc., are found. Of fruit-trees, the peach, quince, plum, fig, orange, pawpaw, olive and pomegranate are cultivated with great success; the apple and pear do not thrive so well. Local topographers classify the lands of the State as "good uplands;" "pine hill lands," usually not very fertile; "alluvial tracts;" "Bluff or Loess regions;" "marsh lands;" "the prairie regions;" and "the pine flats." The grazing in the uplands generally is excellent; in the Attakapas country, along the Atchafalaya and Bayou Teche, the pasturage is unsurpassed in quality.

Louisiana is a land of fragrant flowers, and the sweet perfume of its orange blossoms, magnolias, jessamines, oleanders, virgin's bower, its innumerable varieties of roses and its thousands of other sweet-scented semitropical and tropical flowers, which grow wild upon its rich alluvial lands, feast the senses with perpetual delight.

Zoölogy.—The wild animals of Louisiana are for the most part the same as those of Texas, though there is a greater preponderance of reptiles. The jaguar or American tiger, the most formidable of the North American *Felidæ*, is found in the cypress swamps in this State, and in Texas and Arizona. The cougar, puma, panther or American lion, is also an inhabitant of the swamps, and this wild-cat and perhaps some of the other *Felidæ* are also found. The black and brown bear are more common in the uplands; while the raccoon, skunk, opossum, otter and most of the rodents are abundant.

Alligators of great size and ferocity abound in all the bayous, and are destructive of cattle and sometimes of human beings.

It is believed that the crocodile exists in the cypress swamps here as well as in Florida. There are several species of marine turtles and land-tortoises and terrapins. The lizard tribe is largely represented; the gecko, chameleon, lizards of all kinds and sizes, as well as a great variety of batrachians, the horned and common frog, many species of toads; and of ophidians, rattlesnakes, vipers, moccasins, horned snakes, and a great variety of harmless serpents are common. There are many birds of prey: among them are the bald and gray eagle, the king-vulture, the turkey-buzzard and other vultures, kites, owls, hawks, gulls, and, very numerous in the bayous and in the gulfs, bays and sounds west of the Mississippi, the pelican, which has been recognized as the patron bird of the State, which very generally bears the name of "the Pelican State." Cranes, herons, ibises, flamingoes and other waders are found only in this State and Texas of "Our Western Empire;" and wild geese, many species of wild ducks, brant, teal, and some swans are inhabitants of its lakes, bayous and bays in their season. The game birds, wild turkeys, pigeons, partridges and several species of grouse are plentiful in the uplands. Birds of gay plumage, including the macaw and paroquet, and many others, and a great variety of song-birds, among which are the mocking-bird, the cedar bird, several of the finches and tanagers, a great variety of humming-birds, and orioles are abundant in the forests.

Climate.—The climate of New Orleans and of the lower portion of the delta is somewhat malarious, and bilious and congestive fevers, remittent and intermittent, are prevalent. The yellow fever is seldom entirely absent from this region in summer, but becomes epidemic only about once in four or five years. Strict sanitary supervision is maintained, but the drainage is difficult. By careful attention to cleanliness the city is healthier than formerly. The yellow fever made fearful ravages in 1878, and reappeared in a milder form, in 1879: 1880 has been generally healthy. The cholera has at times made fearful ravages here. The water is so near the surface in New Orleans and most of the adjacent region, that all burials are made in cells of vaults, built above the surface. The climate of the upland region is

healthy though warm, and that of the delta is so in winter. The table on next page, giving the meteorology of New Orleans, which represents fairly the region of the delta and of Shreveport, in the northwest of the State, which shows that of the upland country, will exhibit more satisfactorily the climate of the two sections than any general description. Not only from its climate, but from the habits and customs of its people, its productions, markets, etc., Louisiana will be a more agreeable region for immigrants from Southern and Southwestern Europe and from the Southern Atlantic and Gulf States, than for those from more northern climates. The French, Spanish, and Italians, and the Swiss and South Germans will do better here than the North Germans, Scandinavians or inhabitants of Great Britain.

Agricultural Productions.—The staple productions of Louisiana are cotton, sugar, corn, together with a moderate quantity of rice and the cereals. The cotton production of 1878 was 214,483,050 pounds, from 1,348,950 acres, a yield of only an average of 159 pounds to the acre, or about one-third of a bale, a very small return for land so rich as that of Louisiana. The yield of 1879 was not quite so large, though a trifle more per acre, being 175 pounds. At the price per pound in 1878 this yielded but $13.97 per acre, including all the cost of cultivation, picking and ginning, and of course was unprofitable; the price in 1879, ten cents, gave $20.20 per acre, but even this is not profitable. There is no land in Louisiana devoted to cotton which ought not to yield at least a bale (480 pounds) to the acre, and of the delta lands there are none which should yield less than two bales to the acre. The farming of Louisiana is, however, for the most part very slovenly and careless. The sugar crop in favorable years, of which 1878 was a good example, does better, yielding 250,000,000 pounds, an average of 1,700 pounds to the acre (a fair crop is stated to be from 2,500 to 5,000 pounds), which at the current price of that year was worth $93.50. The drawbacks on the cultivation of sugar-cane are that, it is an exotic and never comes to perfection here; that the only way of propagation is by layers, which after a few years run out and require new stock; that it is only about one crop in three that

NEW ORLEANS.									SHREVEPORT.								
Year and Months.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Mean Humidity.	Rainfall.	Mean Barometrical Pressure.	Winds in order of frequency.	Year and Months.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Mean Humidity.	Rainfall.	Mean Barometrical Pressure.	Winds in order of frequency.
	°	°	°	°	per ct.	in.	in.			°	°	°	°	per ct.	in.	in.	
The Year.....	96.5	33	69.3	63.5	68.5	73.31	30.005	S.E., S., N., S.W., N. E.	*The Year*..	99	19	65.9	80	69.3	63.30	29.998	Calm, S.E., S., N.E., N., E., S.W.
1877.									1877.								
July	96 0	70	83.7	26.0	67.4	6 41	30.000	S. E., N. E., N. W., E.	July..	99	64	81.8	35	67.4	2.37	29.979	N., S., S. E., E., Calm.
August.....	96.5	73	83.1	23.5	65.9	2.54	29.981	N. E., N., E., W., N. W.	August....	99	65	82.2	34	59.4	0.20	29.972	N., S. E., E., Calm, S., N. E.
September	92	63	78.4	29	74.6	13.21	29.945	E., N., N. E., S. E.	September..	98	51	75.6	47	72.9	9 93	29.970	N., Calm, E., S. E.
October.....	84	53	70.2	31	73.5	9.15	30.011	N., E., S.E., N.W., N E.	October	88	43	65.4	45	77.7	9.30	30.008	S. E., Calm, E., S. W.
November..	78	38	58.3	40	67.8	6.58	30.106	N., N. W., E., N. E.	November.	72	19	51.7	53	71.2	3.76	30.133	N., S., Calm, W., N. W.
December.....	71	34	55 5	37	69.9	4 96	30.157	E., N. W., N., N. E.	December..	74	22	51.2	52	73.3	3.75	30.182	Calm, N. W., S., S. E., N.
1878.									1878.								
January.....	73	33	51.0	40	65.2	5.36	30.095	N W., N., W., S E., E.	January....	67	25	46.6	42	73.6	5.29	30.101	W., Calm, N. W., S. E.
February.....	72	37	55.5	35	64.1	3.50	29.971	N.W., E., W., S.E., S.W.	February..	71	28	50.4	43	71.6	2.67	29.968	W., S., Calm, S. E., N.
March	82	46	66.4	36	65.0	4.63	29.979	S. E., E., S W., N. E	March.....	87	45	64.5	42	55.0	5.70	29 961	S., W., Calm, E., S. E.
April.....	84	50	71.5	34	67 9	1.51	29 849	S. E., W., S. W., N. W.	April.....	88	44	69.0	44	64.2	5 64	29 815	Calm, S., S. E., N. W.
May	89	60	75.5	29	69 8	8 11	29.995	S. E., S., N. E., S. W.	May	91	53	73.9	38	69.9	7.04	29.956	S., Calm, S. E.
June.	92	71	82.0	21	71.2	7.35	29 952	S. W., Calm, S. E.	June	94	66	79.0	28	75.2	7.65	29 934	S., S. E., Calm, N.

It is a singular fact in regard to all these Southwestern States, that November, especially the latter part of it, is colder than December, and generally has colder days than any in the winter.

is successful; that the great fluctuation in price makes the profit uncertain; and that the first plant or outlay for a sugar plantation with sugar-house complete is enormous, and only possible where there is large capital at command. The crop of corn, though considerable in amount and covering a large acreage, gives equally conclusive evidence of indifferent and slovenly farming; the yield ranges from fifteen to twenty bushels per acre, where thirty-five to forty bushels ought to be the minimum. The total yield of 1878 was 16,875,200 bushels, which at sixty cents, the current price of that year, brought $10,125,120. The crop of 1879 was of smaller amount, and yielded only fifteen bushels to the acre, but the higher price, seventy-six cents, made the money value somewhat greater.

Oats, which might be a profitable crop, give an average yield, one year with another, of but fourteen bushels to the acre. Rice is cultivated more than formerly, and the Louisiana rice crop forms a very considerable portion of the whole rice product of the United States, ranging from twelve to fifteen million pounds. There is some wheat and barley grown; a small amount of very excellent tobacco, and hay and forage grasses in increasing quantities. Fruits and market-garden vegetables are cultivated to a considerable extent, mainly by Creoles; but the cultivation of fruits might be almost indefinitely enlarged.

The amount of live-stock in Louisiana in 1879 was: 79,300 horses, worth about $4,000,000; 80,600 mules, worth about $5,080,000; the number of horses and mules is slowly increasing. There were 110,900 milch cows, a moderate increase from 1875, previous to which time there had been a decided decrease. These were worth $1,864,800. Of oxen and other cattle, there had been a marked decrease, 118,700 against 168,650 in 1875, and their value did not exceed one million dollars. The number of sheep was only 127,500, and their value about $250,000. There were 360,500 swine, worth about $1,250,000. Both sheep and swine had largely increased in numbers since 1875. The total value of live-stock was about $13,363,000, and of agricultural products somewhat more than $50,000,000.

Manufacturing and Mining Industries.—Louisiana is not a

manufacturing State. She produces raw sugar on her sugar plantations, gins her cotton, produces a small amount of refined sugar, about three-fourths of a million dollars worth of flour and meal, a million and a half dollars worth of lumber and timber, cotton-seed oil, machinery, clothing, tobacco and cigars, and malt liquors. Her entire manufactured products do not much exceed thirty million dollars. The mining industry of the State consists of some coal mines (lignite), not very efficiently worked, a small quantity of iron mined, the salt mine at Petit Anse island, and a sulphur mine at Calcasieu springs.

Commerce.—Louisiana has a very large commerce, both foreign and domestic. In the amount of her exports she is second only to New York; in imports she falls behind New York, Massachusetts, Maryland, Pennsylvania and California. In the year ending June 30, 1880, her domestic exports were $90,238,503; her foreign exports $203,516; and her imports, $10,611,353. Considerable amounts are imported and trans-shipped without appraisement to interior ports on the Mississippi river and in the Mississippi valley, the aggregate being several millions—while the cotton, rice and sugar exported from Louisiana are not all produced in the State, the cotton especially being largely the product of Arkansas and Mississippi, while some comes also from Tennessee, Alabama and Texas. The amount of exports has been fluctuating for several years past, having reached its highest point in 1870, when it was $107,658,042; and its next highest in 1873, when it was $104,329,965. The export of 1879 was the smallest since 1868. Its imports have fallen off in still greater proportion since 1873, when they were $19,933,344, the largest amount since 1860. The exports of foreign merchandise show a still greater proportion of diminution, falling from $1,301,700 in 1872 to $187,187 in 1879.

It is difficult to say whether the coast-wise and interior trade of Louisiana has fallen off in any similar proportion. In 1874 it was estimated at $250,000,000. It has hardly amounted to that sum in the more recent years.

Railroads.—Besides its immense traffic on the Mississippi and Red rivers by steamer, New Orleans, the commercial capital of

Louisiana, is connected to the northwestern and northern States by one line of railroad, with numerous connections, and with the Atlantic and northeastern States by another. These are both east of the Mississippi. West of that river there are three comparatively short routes: one from New Orleans to Brashear, which connects there with Morgan's steamship line to Galveston, a line from Vicksburg, Mississippi, to Monroe, which may at some time possibly be extended to Shreveport, and one from Shreveport west, forming a part of the Texas Pacific line. The entire railroad lines operated in the State have a length of only 495 miles.

Finances.—The State is heavily in debt, but has repudiated a considerable part of her debt and scaled the remainder, reducing the interest. The financial management has been deplorable for some years. The amount of debt acknowledged and not repudiated was, January 1, 1879, $12,136,166.24. $3,971,000 were repudiated; and the bonds which were acknowledged were reduced forty per cent. in order to bring them to $12,136,166. A part at least of the interest on these is in default.

Population.—The following table gives the population at different dates:

YEARS.	TOTAL POPULATION.	WHITES.	FREE COLORED.	SLAVES.	NATIVES.	OF FOREIGN BIRTH.	OF SCHOOL AGE.	OF VOTING AGE. MALES.
1810	76,556	34,311	7,585	34,660				
1820	152,923	73,383	10,476	69,064				
1830	215,529	89,231	16,710	109,588	.....	.....	*31,903	
1840	352,411	158,457	25,502	168,452	.....	.....	*51,904	
1850	517,762	255,491	17,462	244,809	448,848	68,233	*84,283	*86,590
1860	708,002	357,456	18,647	331,726	627,021	80,975	*122,141	*98,143
1870	726,915	362,065	364,210	None.	665,088	61,827	226,114	174,187
1880	940,263	455,063	483,898	"	886,119	54,144		

The great increase from 1870 to 1880 has given rise to the suspicion of error in the enumeration, and it will be investigated before its final acceptance.

Of this population a very large proportion are natives, not only of the United States, but of the State. This is due to the

* Whites only.

circumstances under which the State was settled. Discovered by the French in 1541, the first permanent settlement in the Colony or Province of Louisiana was made in 1699 by the same nation. It remained a French province and largely peopled by the French till 1762, when it was secretly ceded by France to Spain, and remained till 1800 under the control of that power, a considerable influx of Spanish settlers migrating to its rich lands. In 1800 it was retroceded to France, and in 1803 was purchased from France by the United States for $15,000,000, of which $3,750,000 was allowed to be set off by the assumption of the claims of citizens of the United States against France growing out of French spoliations upon American commerce. This, though assumed by the government, has never been paid to the sufferers or their heirs. The Province of Louisiana as thus purchased, comprised nearly the whole of the present States of Louisiana, Arkansas, Missouri, Iowa, Minnesota, Dakota Territory, Nebraska, most of Kansas, and the Indian Territory, part of Colorado, most of Wyoming, and the whole of Montana, Idaho, Oregon, and Washington Territory. Most of that part of Louisiana lying east of the Mississippi was purchased from Spain in 1810, and annexed the same year to the Territory of Orleans, as Louisiana itself was called. It became a State in April, 1812, with its present name and boundaries. The population of Louisiana is very largely composed of descendants of French emigrants, with a considerable percentage of mixed blood; these people are usually termed Creoles, whether of pure or mixed blood. There are also a moderate number of old French and Spanish families of pure blood, and somewhat exclusive manners. The remainder of the population are of American stock, with some admixture of Irish, English, Germans, and Italians. The Negroes and mixed races form a large constituent (about one-half) of the population. There have never been any great accessions from immigration, and except in the large towns there are not likely to be. The Creole population are intensely wedded to old ideas, and while friendly and good humored, do not encourage immigration. The prevalence of malarial fevers and occasional epidemics of yellow fever deter

many from settling in the State, and neither its financial nor its political condition since the war has had a tendency to attract immigrants. With a good and honest State government, a prompt and efficient collection and disbursement of its revenues, the protection of the lowlands from overflow, by good and sufficient levees, a stringent, vigilant, and effective Health-Board, and the banishment of its corrupt and self-seeking politicians, of all parties, to some point so remote that they could not return in a hundred years, Louisiana might become a healthful, prosperous, and wealthy State, with a noble record for honesty and integrity.

The State has 57 parishes, answering to the counties in other States. Its principal towns and cities are New Orleans, with a population, in 1880, of 216,140 and many attractive buildings and streets, the principal commercial port of the Southwest; Baton Rouge, with 7,000 or 8,000 inhabitants; Shreveport, with a little more than 11,000; Thibodeaux, Monroe, Donaldson, and Opelousas, about 2,500 each; New Iberia, Natchitoches, and Plaquemines, nearly 2,000 each.

Education.—There is a moderately efficient public school system in the State originating since the war; but the amount of illiteracy is frightful. The schools of New Orleans have generally maintained a fair standing. Considerable efforts are now making to educate the Freedmen. There are thirty-five or forty collegiate schools for both sexes, and besides, a State University at Baton Rouge, which is not very efficient; there are six other so-called colleges or universities, three of them for the education of Freedmen for preachers and teachers, and two others Roman Catholic, one a Female College. Out of 900 students in these institutions, 558 are in the preparatory schools. There is one Theological, one Law, one Medical, one Dental, and one Scientific school in the State.

Churches.—There were, in 1875, 867 churches or congregations, with 744 church edifices. Of these 124 were Roman Catholic, with an adherent population loosely estimated at 200,000. After these the Baptists had 371 churches with 309 church edifices and 20,734 members; the Methodists 255 churches,

221 edifices, and 23,271 members, including probationers. The other leading denominations were Presbyterians, Episcopalians, Jews, Congregationalists, and Lutherans. All the Protestant denominations reported a membership of about 58,000, and an adherent population of about 263,000.

Under existing circumstances Louisiana is not likely to attract a very large number of immigrants either from Europe or the Atlantic States.

CHAPTER XI.

MINNESOTA.

MINNESOTA THE CENTRE OF NORTH AMERICA—ITS SITUATION, BOUNDARIES, DIMENSIONS, AND AREA—SURFACE OF THE COUNTRY—THE THREE SLOPES—RIVERS, LAKES, ETC.—THE LAKE STATE—SEVEN THOUSAND LAKES—GEOLOGY AND MINERALOGY—SOME GOLD AND SILVER, MORE IRON AND COPPER—MINNESOTA AN AGRICULTURAL STATE—SOIL AND VEGETATION.—RICH SOIL—FORESTS—THE BIG WOODS—THE PRAIRIE LANDS—TREE-PLANTING IN MINNESOTA—FRUITS—ZOÖLOGY—CLIMATE—ITS SALUBRITY—ADVANCE OF THE ANNUAL TEMPERATURE AS THE COUNTRY IS SETTLED—PECULIARITIES OF THE CLIMATE—METEOROLOGY—NAVIGABLE RIVERS AND RAILWAYS—MORE THAN 3000 MILES OF RAILROAD IN THE STATE—PROJECTED RAILWAYS—LAND GRANTS—AGRICULTURAL PRODUCTS—THE CROPS OF 1878, 1879, AND 1880—SPECIAL CROPS—GEN. LE DUC'S EFFORTS TO INTRODUCE THE AMBER CANE—STATISTICS OF CROPS—GRAZING LANDS—LIVE-STOCK—STATISTICS OF LIVE-STOCK—DAIRY FARMING—STATISTICS OF BUTTER AND CHEESE—MANUFACTURES—LUMBER AND FLOUR, THE LEADING ARTICLES—IMMENSE QUANTITIES OF BOTH PRODUCED—OTHER MANUFACTURES—VALUATION AND WEALTH—POPULATION—STATISTICS OF INCREASE IN THIRTY YEARS—NATIONALITIES—THE INDIAN POPULATION—EDUCATION—SCHOOL FUND—PUBLIC SCHOOLS—UNIVERSITIES, NORMAL SCHOOLS, ETC.—COUNTIES AND CITIES—VALUATION—POPULATION OF CITIES AND TOWNS AT DIFFERENT PERIODS—RELIGIOUS DENOMINATIONS—HISTORY—CONCLUSION.

IF, as is often said, Kansas is the central State of the United States, and Colorado the central region of "Our Western Empire," Minnesota may fairly claim the higher honor of being the central State of the North American Continent. Its boundary at the north is British America, Manitoba abutting upon it at the northwest; at the northeast, for about 120 miles, Lake Su-

perior forms its boundary; on the east it joins Wisconsin, being separated only by the St. Croix and Mississippi rivers; on the south it is bounded by Iowa, and on the west by Dakota Territory, with which it shares the rich and fertile valley of the Red river of the North. It is just about equidistant from the capes of the peninsulas which send off their annual icebergs into the Arctic Ocean, and the narrowing neck of land which, by its volcanoes, lights alike the Pacific Ocean and the Caribbean Sea, from Newfoundland on the east and Vancouver Island on the west. It lies between the parallels of 43° 30′ and 49° N. latitude, and between the meridians of 89° 29′ and 97° 5′ W. longitude from Greenwich. The extreme length of the State from north to south is 380 miles, while its breadth varies from 337 miles, about the 48th parallel, to 262 miles on the south line, and 183 at about 45° 30′. Its area is estimated at the United States Land Office at 83,531 square miles, or 53,459,840 acres. From this area must be deducted 2,900,000 acres of water surface, lakes, etc. (not including that part of Lake Superior which lies within its limits), leaving 50,759,840 acres of land, including the Indian reservations. This is nearly equal to the combined areas of Ohio and Pennsylvania, and a little more than that of Kentucky and Tennessee.

Surface of the Country.—From its location it was inevitable that Minnesota should be the water-shed or divide for all the great streams which traverse the continent east of the Rocky Mountains. It has not, it is true, anywhere within its area, any range of mountains or very high hills, but its general elevation in the northern part of the State, except in the river valleys, is from 1,500 to 1,550 feet above the sea. Across this table-land, in or near the parallel of 47° 40′, is a low, curved line of drift hills, not much, if at all, above 100 feet in height, and extending westward to the bluffs of the Red River valley, when it turns southward, and separates the waters of the affluents of the Mississippi from those of the Red river of the North. In these low hills three great river and lake systems have their sources, viz.: the Mississippi river proper and its northern tributaries; the St. Louis river and its numerous branches, which together form the

head and fountain of those waters which, through the great lakes, find their way to the St. Lawrence, and through its broad expanse to the northern Atlantic Ocean; and the affluents of the Red river as well as those of Rainy Lake and Lake of the Woods, all of which finally discharge their waters into Hudson's Bay and into the Arctic Ocean. There is but one other point in the whole of our Western Empire, or for that matter, in the United States, where rivers flowing to such distant and diverse points have their sources so near together, and that is the point near the Yellowstone Park, where the sources of the Missouri, the Columbia, and the Colorado of the West are found within a mile or two of each other.

There are then three distinct slopes, differing in soil, vegetation, and geological character, in the State. The northern slope, including not only the Red river valley, but the valleys and streams draining into the Rainy Lake chain, and into the Lake of the Woods; the eastern slope, occupying the valley of the St. Louis river, and declining gently toward Lake Superior; and the southern slope, drained by the Mississippi and its affluents, comprising about two-thirds of the State, and extending into, and forming part of, the great Mississippi valley. The descent from the summit of the divide, which has an elevation in lat. 47° 45′ to 48° of about 1,680 feet, to the southern line of the State, lat. 43° 30′, is not far from 930 feet; but except in the successive terraces at and near the Falls of St. Anthony, the declination is very gradual, not exceeding two and a half or three feet to the mile. Three-fourths of the State may be described as generally rolling prairie, interspersed with frequent groves, oak openings, and belts of hard-wood timber, dotted with numberless small lakes, and drained by numerous clear and limpid streams. The remaining fourth includes the hills which form the divide, the extensive mineral tract reaching to Lake Superior, and the heavy timbered region ("The Big Woods") lying around the sources of the Mississippi and the Red river of the North.

Rivers, Lakes, etc.—The greater part of the State, all of it, indeed, except two or three of the northern, and as yet unorganized counties, which are watered by streams falling into the Rainy

Lake chain—is drained by the affluents of the St. Louis, the Mississippi, and the Red river of the North. The St. Louis has fourteen or fifteen tributaries, several of them streams of considerable size; the Mississippi has about fifty—two of them, the St. Croix and the Minnesota, being themselves large rivers; only the affluents of the Red river on the eastern bank belong to Minnesota, but there are fourteen or more of these, of which the Red Grass, Red Lake, Sand Hill, Wild Rice, and Buffalo rivers are considerable streams.

The Rainy Lake river forms a part of the northern boundary, and its affluents, the Big and Little Fork, and the Vermilion river, which flows into the same chain of lakes, are streams of moderate size. There are fifty or more creeks flowing into Lake Superior, which aid in watering and fertilizing this northeastern slope.

Minnesota is emphatically the *Lake* State. In the surveyed area of the State there are upwards of 7,000 lakes; their average extent is about 300 acres, but a number of them exceed 10,000 acres, and others are still larger; Lake Minnetonka covers 16,000 acres; Lake Winnebagoshish, 56,000 acres; Leech Lake, 114,000 acres; Mille Lacs, 130,000; Red Lake, at least 350,000, and Lake of the Woods and the Rainy Lake Chain, which form part of the northern boundary, are still larger. Not content with these, Minnesota claims a considerable slice of Lake Superior as her property. Many of the smaller lakes are very deep, and all are well stocked with fish. Ordinarily their shores are dry and firm down to the water's edge, except at their outlets, and the waters are clear, cool and pure. The bottoms are generally sandy or pebbly. The water of Minnesota, whether obtained from lake, spring or well, is of excellent quality. The beautiful scenery around many of these lakes, and the cascades, rapids and falls at the outlet of others, have made them very pleasant resorts. Among these Minnetonka and White Bear Lakes, and the Falls of Minneopa and Minnehaha have perhaps the widest reputation.

Geology and Mineralogy.—The greater part of the State is covered with a rich and fertile alluvium, or, as in the highlands,

by an older and less fertile drift, which, however, sustains a noble forest growth. Beneath this drift there is, along the northern shore of Lake Superior, and extending southward on both sides of the St. Croix to its junction with the Mississippi, and below that point along the eastern and western banks of that river below the southern line of the State, a broad belt of metamorphic slates and sandstones intermingled with volcanic rocks, traps and porphyries; these are of the Silurian epoch, and many dikes of greenstone and basalt are interjected in the strata. Occasionally deposits of marl-drift and red clay are found above these rocks. This is the principal mineral region of the State. Near the southern boundary of the State, or, rather, in the southeast quarter, between the 92d and 94th meridians, is a small tract of Devonian rocks; west and northwest of the Silurian slates and sandstones, the underlying rocks are eozoic, hornblende and argillaceous slates, and granite, gneiss and metamorphic rocks. In the western and northwestern part of the State, between the 94th and 96th meridians, but not extending below the 46th parallel, and underlying the low hills which form the divide between the affluents of the Mississippi and those of the Red river of the North, is another belt of Silurian rocks, upper Silurian, in the northern portion, and lower Silurian, nearer the Mississippi. These are mostly limestone, and like those of the same epoch farther east are almost entirely devoid of fossils. West of these, and forming the underlying strata of the Red River valley, we find a broad belt of cretaceous rocks, mostly of the Niagara, Galena and Trenton limestones, with smaller outcrops of St. Peter and perhaps Potsdam sandstones. Lastly, in the southwest corner of the State, in and near the valley of the Big Sioux, the eozoic rocks again approach the surface, and some of them are mineral-bearing rocks. The Lake Superior region yields, in large quantity, iron of the same character and purity as that found in the upper peninsula of Michigan, and copper ores identical with those of Ontonagon; but neither have been as yet extensively worked. Gold and silver exist in moderately paying quantities near Vermilion lake, in the northern part of St. Louis county; but the region is yet so wild and inaccessible that the mines are

not now worked. Salt springs occur at various points in the State, and salt of excellent quality is manufactured in the Red River valley, and at Belle Plaine, on the Minnesota river. Among the other minerals of the State are: slates (both building and writing), lime, white sand for glass-making, building stone, peat, marl, tripoli, etc. The red pipe stone, of which the Indians made their pipes, is found in large quantities in the southwest, and is quarried and used for many purposes.

Soil and Vegetation.—The three slopes named under the heading of *Surface of the Country* have each a different soil and vegetable growths. The northern, along the Red River valley, and the basins of the lakes and rivers which form the northern boundary of the State, is a rich alluvial deposit admirably adapted to the growth of cereals and to grazing. The Red River valley, from sixty to seventy miles in width, though but half of it is in Minnesota, is unsurpassed in fertility, and may well become the granary of the world in the production of wheat. While it is cultivated more carelessly than it should be, and averages only about twenty-two or twenty-three bushels of wheat to the acre, it is capable of doing much better than that, and instances are not wanting on land, within twenty months from its first breaking, in which fifty, sixty, eighty, and even one hundred and two bushels of wheat to the acre have been raised, and that not on a single acre only, by any trickery, but on broad fields of sixty or eighty acres. This region has forests of oak, beech, elm and maple, though the greater part is a gently undulating prairie. The eastern slope has much broken land, and is a better mineral than agricultural region; though the soil yields fair crops, especially of roots, much of this slope, as well as the highlands or divides, is covered with a heavy growth of pine, spruce, and other coniferous trees, of great value as lumber, though the soil beneath them, when cleared, is comparatively barren. This region occupies about twenty-one thousand square miles. The southern slope, which comprises all of the State below the highlands, is composed of alternate rolling prairie and woodland, and has a very rich and fertile soil. About one-third of the surface of Minnesota is woodland, and her citizens have wisely taken meas-

ures to renew the forest growth, and not suffer the land to become dry and sterile for the want of forests. They have planted already nearly thirty millions of trees, to replace those which have been cut off. By this wise precaution they have secured to their State its forest supplies, without material diminution. In the southern slope there are detached groves and copses of great beauty sprinkled everywhere among the prairies and around the numerous lakes, while growths of dwarfed oaks skirt the prairies and are known as oak openings. There is also a tract on both sides of the Minnesota river, over one hundred miles in length, and of an average width exceeding forty miles, comprising an area of five thousand square miles, known as the "Big Woods," which is covered with a dense and magnificent growth of hard-wood timber. This is said to be the largest forest of deciduous timber between the Mississippi and Missouri rivers. In this, as well as in the smaller groves, are found almost every species of deciduous trees native to the States and Territories north and east of the Rocky Mountains.

The indigenous flora of the State is a combination of the Canadian, or sub-alpine, which is found along our northern frontier, with the Appalachian or Mississippian of the upper portion of the Great Valley. Owing to the great number of small lakes, streams and marshes in the northeast, the aquatic plants of the sub-alpine flora predominate—wild rice, reeds, callas, and water-loving plants generally. In the northeast part of the State it is estimated that there are 256,000 acres of cranberry marsh, which yield abundantly. Wild fruits come to great perfection, and, in cultivated fruits, all except the peach and the later grapes are produced of remarkable excellence and in great quantities. The apples, pears, plums, cherries, early grapes, strawberries, raspberries, currants, blackberries, whortleberries and gooseberries of Minnesota are not surpassed anywhere.

Zoölogy.—The forests abound with wild animals and beasts of prey, but these are not as numerous in the prairie regions. The bear, panther or cougar, wild cat and lynx, and the gray wolf, as well as the marten, fisher, otter, mink, beaver, and muskrat, skunk, raccoon, fox, woodchuck, gopher, hare and squirrel, and other

rodents are sufficiently numerous, and the coyote or prairie wolf hunts in packs in the open lands. Of the larger game there are the elk, two species of deer, and possibly the moose. The buffalo is rarely seen, and the antelope, if ever an inhabitant of this region, north and east of the Missouri, is so no longer. Of game birds, land and aquatic, there is no end. Wild turkeys, pigeons, grouse of several species, and partridges, frequent the woods, and wild geese, several species of ducks, brant, teal, etc., are found in their season in great numbers, around the hundreds of larger lakes. Birds of gay plumage, and those of melodious song, make the woods, lakes and rivers vocal with their sweet notes or brilliant with their varied and beautiful hues. The reptile tribes are not so numerous as elsewhere. There are three or four poisonous, and a considerable number of innocuous serpents, large and small. The batrachians pour forth their music in the northern marshes, but the lizard family are missing. Fish abound in all the waters of the State, and the State Fish Commission, in co-operation with the United States Fish Commission, have been stocking the larger lakes and streams with choice species of edible fish. This work is still progressing.

Climate.—A great deal has been written about the climate of Minnesota, both in its praise and dispraise. From its central situation and the curving northward of the isothermal lines, as well as from its very moderate elevation, the climate is undoubtedly milder than that of States or countries farther east in the same latitude. The mean average temperature of the State has been given as 44.6° Fahrenheit. This is not yet true, though it may become so in a few years. Its present average annual mean, from observations made at many different points for from eight to twelve years past, does not exceed 42.9° Fahrenheit, and this is a very decided advance from the mean of eight or ten years since. As the country is settled, the annual temperature rises, and though there may be occasional severe winters like those of 1877–78, and of 1879–80, when the temperature sinks to —53°, or —60°, yet it is gradually advancing to a milder temperature. The air is very dry and bracing; the rainfall is not as great as it is farther east, and probably averages

one year with another for the whole State, about 27.5 inches; but it is one of the peculiarities of Minnesota and Dakota, that three-fourths of it falls between April and October, and more than one-half between the 1st of May and the 15th of August—the season when the growing crops most require it. The summer is hot, and everything (including weeds) grows with the greatest rapidity. When the harvest is gathered, winter comes, sometimes with abundant snows, but oftener without them; and the frost-king reigns from November to April, but the dryness of the air renders the intense cold more endurable, and the winter is a season of activity. The climate is healthful, the death-rate low, and malarious diseases unknown. The climate is regarded as a desirable one for consumptives from its dry and bracing air. It is certain that many of those who come to the State with weak lungs, when the disease is not too far advanced, do recover and enjoy good health. The table on page 909 prepared with great care and labor, gives all the necessary particulars for determining the climate of all parts of the State. The temperature, rainfall, humidity, etc., are averages from observations continued for from five to ten years, and are more satisfactory than any statement of the temperature, rainfall, etc., of a single year, which may be exceptional in its character.

Railroads and Steam Navigation.—There are none of the Western States which have made more rapid progress in railroad construction than Minnesota, and none which possess greater facilities for travel and transportation. Let us begin with the navigable waters. The Mississippi, interrupted only by the Falls of St. Anthony, Sauk rapids, and Little Falls, is navigable to the foot of Pokegama Falls, distant but 236 miles from its source. As far as to the Falls of St. Anthony, about 175 miles from the point where it enters the State, it is navigable for large steamers, at all seasons of the year, since the recent improvements made by the United States government; and above Minneapolis, there is navigation for smaller steamers for 400 miles, except the obstructions mentioned above. On the Minnesota river, in good stages of water, boats run to Granite Falls, a distance of 238 miles from its mouth. That fertile Nile, called the

MINNEAPOLIS. Latitude 44° 56′ N. Longitude 93° 13′ W. Altitude about 850 feet.							DULUTH. Latitude 46° 48′ N. Longitude 92° 6′ W. Altitude 642.7 feet.						BRECKENRIDGE. Lat. 46° 16′ N. Lon. 76° 38′ W. Alt. 966 feet.						ST. VINCENT. Latitude 49° N. Longitude 97° 5′ W. Altitude 790 feet.					
Year and Months.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Mean Humidity.	Monthly and Annual Rainfall.	Mean Barometrical Pressure.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Mean Humidity.	Monthly and Annual Rainfall.	Mean Barometrical Pressure.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Mean Humidity.	Monthly and Annual Rainfall.	Mean Barometrical Pressure.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Mean Humidity.	Monthly and Annual Rainfall.	Mean Barometrical Pressure.
	°	°	°	per ct.	in.	in.	°	°	°	per ct.	in.	in.	°	°	°	per ct.	in.	in.	°	°	°	per ct.	in.	in.
Year.	93.25	-28.6	42 72	68.66	27 766	29.933	91.	—24.	41.8	73.0	32.44	29.952	101.	—33.	37.0	76.0	25.33	29.957	92.3	—42.3	36.0	72.1	23.81	29.972
January..	37.	-25.	10.53	67.	1.015	30.003	44.6	—19.	16.4	76.9	.90	30.066	33.	—32.	-0.9	84.7	0.06	30.072	37.6	—42.3	1.13	76.9	0.12	30.084
February .	43.7	-18.4	15.94	69.1	.745	29.905	49.3	— 5.	25.4	75.6	.48	30.141	53.	—18.	21.5	85.5	0.13	30.133	41.	—25.	12.80	77.0	0.30	30.194
March....	52.6	- 8.5	25.51	70.3	1.355	29.838	50.3	1.	27.6	71.5	1.43	30.040	43.	—14.	15.2	76.3	2.00	30.026	50.3	—11.	17.00	73.8	2.24	30.192
April.....	74.	18.75	42.97	62.5	2.649	29.651	64.6	13.3	41.0	70.8	2.79	30.015	67.	3.	40.5	71.0	3.91	29.936	75.	3.6	38.20	67.7	2.32	29.904
May	85.4	35.3	58.15	60.8	3.717	29.823	78.3	28.3	49.6	64.4	4.60	29.955	83.	31.	58.4	65.2	2.48	29.831	80.6	23.	53.10	66.6	4.41	29.876
June	89.3	48.1	66.45	69.9	4.570	29.818	84.3	38.3	57.3	72.3	4.80	29.828	89.	30.	58.9	75.2	5.10	29.766	87.6	34.7	60.00	69.4	5.62	29.766
July.....	93.25	57.1	71.85	69.7	2.400	29.830	91.0	47.6	66.8	70.3	2.69	29.854	95.	47.	70.9	71.1	3.19	29.934	91.	44.	66.80	69 3	2.72	29.901
August ...	89.3	52.1	69.37	71.8	4.061	29.857	87.0	48.3	66.4	65.3	3.86	29.887	101.	37.	67.6	71.2	4.17	29.843	89.5	34.	64.10	68.9	3.20	29.858
Sept.....	88.3	35.6	59.37	64.5	2.838	29.848	79.0	37.0	56.3	73.3	4.55	29.896	76.	24.	53.8	69.9	2.19	29.956	84.7	26.	53.30	68.1	0.95	29.970
October ..	74.6	22.	44.67	70.5	1.909	29 935	69.3	29.6	42.9	76.8	3.22	29.961	72.	8.	38.1	72.8	1.44	29.956	74.7	9.	38.20	71.4	0.70	90.967
Nov.....	57.7	- 7.5	27.30	73.8	1.156	29.987	51.3	—10.	29.3	77.9	1.84	30.021	60.	—23.	18 7	81.8	0.18	30.028	53.3	—23.7	17.40	75.9	0.55	30.049
Dec.....	44.	-28.6	14.49	69.2	0.857	29.995	45.3	—14.3	22.9	78.8	1.31	30.026	42.	—33.	-0 1	87.9	0 48	29.9-8	43.	—28.	9.70	79.9	0.69	29.906

Red river of the North, gives 380 miles of navigable water on the western boundary of the State. The St. Croix furnishes fifty-two miles of navigable water on the eastern border. Lake Superior gives 167 miles of shore line to the northeastern section of the State, and the St. Louis river, the principal stream of that section, adds twenty-one miles of navigable waters to the extreme west end of Lake Superior. To sum up, Minnesota has 2,796 miles of shore line of navigable waters—one mile of coast line to every thirty square miles of surface.

Of railroads there were over 3,140 miles completed and in operation on the 1st of September, 1880. The Northern Pacific Railroad crosses the State from Duluth to Fargo and the Northwest, and its principal feeders, the St. Paul and Pacific and the St. Paul and Duluth, connect it with the two chief cities of Minnesota, Minneapolis and St. Paul, and with the more distant cities of Milwaukie and Chicago, also; these three lines, with their various branches and extensions, include about 975 miles in the State, and have three lines crossing the State from east to west, and two, the Duluth road and the St. Vincent extension, from north to south. The other four roads which cross the State from east to west at lower points are, the Hastings and Dakota Division of the Chicago, Milwaukie and St. Paul, which also operates two roads running southward to the State line (the River Division and the Iowa and Minnesota Division); the Winona and St. Peter's; the Sioux City and St. Paul, with its extensions; and the Southern Minnesota. These are crossed in every direction by local railways as well as by two important lines, the Minneapolis and St. Louis, the Rochester and Northern Minnesota, and the St. Paul and Sioux City, and the Milwaukie, Minneapolis and St. Paul, now the Iowa and Minnesota Division of the Chicago, Milwaukie and St. Paul Railway.

All these roads, or all except a single narrow gauge road, are run in connection with, and controlled, more or less, by one of three great railways, viz.: The Northern Pacific, the Chicago and Northwestern, and the Chicago, Milwaukie and St. Paul. In January, 1880, there was no town or village in the State, except in the great unorganized counties in the north, which was more

than twenty-five miles from a railway station. When it is remembered that the first railroad in the State was built in 1862, and that at the end of that year there were but ten miles of railroad in operation, while by the close of 1880, eighteen years later, there will be at least 3,500 miles, in thirty different lines, and that the earnings have risen from about $15,000 in 1862 to $8,156,846 in 1879, some idea may be formed of the rapid increase of the commercial wealth of Minnesota. This rapid development is destined still to go on. Among the projected roads, already in progress, is one to connect St. Paul and Minneapolis with the Grand Trunk road at Manitowoc, on Lake Michigan; another to connect Duluth with the Sault Ste. Marie, and at that point with the Canadian Central; while a third is already contracted for to tap the Canadian Pacific from Duluth. The two latter will open up the vast mineral country of the north and northeast, and may make the gold and silver region of Vermilion lake, and the copper and iron of the Lake Superior region as famous as any of the mining districts of the States and Territories farther west. Most of the roads in the State hold land grants from the United States Government, and the commendable enterprise which they have displayed in making known to emigrants from other lands and States the advantages which Minnesota had to offer to settlers, was undoubtedly prompted in part by the desire to sell their own lands, and to develop the region through which their route passed, so as to build up a large way traffic. It can be said, however, with truth, of most of them, that they have readily furnished information to settlers in regard to securing Government lands by purchase, by preemption, and by the Homestead and Timber-Culture Acts.

Agricultural Products.—The rapid increase of agricultural production has kept pace with the development of railways and other means of transportation for the crops which were raised. This progress has been greatly accelerated within the past three years. This is due in part to the penetration of railways into new districts, where the land is amazingly fertile, and in still greater measure to the discovery that the lands of the Red River valley were better adapted to the cultivation of spring wheat than any

other lands yet sown with that grain on this continent. This discovery, widely heralded, was immediately followed by the construction of railways through that valley and across it, which secured to every wheat-grower an immediate cash market for all the wheat he could raise. The great immigration to that region since 1877, and the immense quantity of land which has been broken there for wheat, has had a wonderful effect in bringing this new State into the front rank of grain-producing States. Yet only a very small portion of the vast territory of Minnesota has, up to this time, come into cultivation. Of its 53,459,840 acres, or somewhat more than 50,000,000 after deducting the water surface, not quite one-ninth is yet tilled; and this not because the land is worthless or difficult of tillage, but because it is so extensive that men enough cannot be brought there to till it as rapidly as the demand for the grain requires. In 1850, thirty years ago, there were but 1,900 acres in the whole territory cultivated; in 1860 there were 433,267; in 1870 there were 1,863,316; in 1877 there were 2,914,654; in 1879, 4,090,039; in 1880, a little more than 6,000,000. There is every reason to believe that 30,000,000 acres yet remain of lands as fertile as any that have been purchased and broken by the plow, besides an area of about 15,000,000 of acres of grazing and timber lands. In all, probably nearly 30,000,000 acres have been disposed of, including the lands certified to railroads—something like 8,500,000 acres—and the lands sold and granted to actual settlers—over 15,000,000 acres more—and the swamp lands, school, university, internal improvement and other lands held by the State—but as we have said only a little more than 6,000,000 acres of the whole have yet been brought into cultivation. And what are the crops produced on these 6,000,000 acres? The reports of the crops of 1880 are, of course, not yet at hand. We only know that the wheat crop of the summer of 1880 was not less than 44,000,000 bushels, and probably reached 48,000,000 bushels.

Of the crops of 1879 we have more definite information. There were, it will be remembered, only 4,090,039 acres under cultivation that year, and of this 2,769,369 acres were in wheat. But 1879 was not, in Minnesota, a particularly good wheat year;

the average yield throughout the State was only 12.3 bushels to the acre. Of course the Red River valley did much better than this, the yield there being over twenty-two bushels to the acre; but other parts of the State fell below the twelve bushels; yet with this really half-crop, the State reported 34,063,239 bushels of wheat; 19,518,450 bushels of oats, which yielded thirty-five bushels to the acre; and 12,764,955 bushels of corn, which also yielded thirty-five bushels to the acre. The other principal crops were barley, sorghum (of which the Minnesota amber cane was most largely cultivated), potatoes, hay, of which a large proportion is what is known as "wild hay," and is derived either from the native grasses, some of which are of excellent quality, or from the nutritious wild rice which abounds in the vicinity of the lakes, and furnishes a valuable substitute for hay, much relished by cattle and sheep. There is, in the older counties, a disposition to cultivate to some extent the forage grasses; but the State has not yet made such progress in the rearing of live-stock as to make the cultivation of forage plants and grains on a large scale indispensable. The cultivation of sorghum, especially of the early amber variety, which ripens usually before frost comes, is becoming very general in the State, and mills or factories for grinding the cane and making sugar on a large scale are already numbered by the score. For the promotion of this new agricultural industry not only in this but in other States, the public is indebted to Hon. William G. LeDuc, the present Commissioner of Agriculture, who is himself a citizen of Minnesota. Mr. LeDuc has labored earnestly, zealously and persistently to bring about this great change from the importing of cane sugar to the raising and producing our own sugar from the sorghum. The success which seems now to be within reach within the next five or ten years, means an increase of our agricultural production to the annual amount of eighty to one hundred millions of dollars, the diminishing of our importations to the same amount or even more, since the cheapening of the price of sugar will cause an increased consumption and the diminution of the duties to the extent of about forty millions of dollars.

We have not the complete statistics of the crops of 1879 and

1880, but the following table gives the amount and value of the principal crops, with the yield per acre and the price:

Crop.	Year of production.	Amount of crop in bushels, tons, pounds or gallons.	Yield per acre.	Number of acres in crop	Price per bushel, ton, pound or gallon.	Total value of crop.
Wheat.....bu.	1879	37,153,842	13.5	2,762,521	.94	$34,924,612
	1880	45,931,538	15.5	2,963,325	.98	45,012,907
Oats.....bu.	1879	21,114,666	37.25	567,371	.23	4,854,442
	1880	27,536 630	40.00	688,415	.29	7,985,614
Corn.....bu.	1879	12,892,563	34.00	379,766	.27	3,480,992
	1880	16,398,504	36.04	455,514	.35	5,739,476
Barley.....bu.	1879	2,413,199	24.88	96,951	.43	1,037.676
	1880	3,565,680	30.00	118,856	.70	2,495.976
Rye.....bu	1879	172,887	15.00	11,534	.49	84.715
	1880	204,540	17.5	11,683	.75	153.405
Buckwheat.....bu.	1879	33,163	9.81	3,380	.62	20,561
	1880	33.359	10.5	3,177	.63	21,016
Beans.....bu.	1879	24.434	11.35	2,156	1.40	34,208
	1880	25,200	12.00	2,105	1.65	41,679
Flaxseed..... bu.	1879	99,378	7 7	12,966	1.25	124,223
	1880	407,124	9 00	45,236	1.30	529,261
Potatoes.....bu.	1879	3,915,890	103.3	37,910	.25	978.973
	1880	4,203.963	103.7	40,618	.50	2,101,982
Sorghum Syrup....gal.	1879	446,946	89.3	5,033	.30	134,083
	1880	775,602	106.1	7,317	.32	248,193
Tame Hay.....tons.	1879	194,994	1.35	145,150	4.74	924,272
	1880	205,730	1.42	146,928	5.30	1,090,210
Wild Hay.....tons	1879	1,200,506	.....	.....	3.50	4,201,771
	1880	1,270,000	.....	.....	4.00	4,908,000
Wool.....pounds	1879	948,184	.....	.....	.26	246,528
	1880	925,278	.....	.....	.30	277,583
Totals.....	.....	.....	.....	8,507,917	.....	121,652,358

Live-Stock.—Minnesota is too new a State, and has too much arable land and timber, and too many other interests calling for her special attention to allow her, as yet, to become largely engaged in rearing stock. By and by, when her great northern counties become accessible as grazing lands, and when her ample production of hay, corn, oats, and the forage grasses and nutritious seeds, such as millet, pearl millet, rice corn, etc., gives her ample facilities for it, she will receive immense herds of cattle and flocks of sheep to fatten for the foreign markets. We do not mean to be understood that the young State has not a respectable showing in the way of live-stock, or that it is not increasing; but only that, as compared with States where the rearing of cattle, sheep and swine has been made a specialty, and where much of the land is better adapted to grazing than to cultivation, its numbers may appear relatively small. It is, at most, only another indication of the variety of agricultural and pastoral pursuits of which "Our Western Empire" is capable. The following table shows

the number and value of the live-stock of Minnesota in January, 1879, and January, 1880, according to the reports of the Agricultural Department:

Animals.	Number in Jan., 1879.	Price.	Value.	Number in Jan., 1880.	Price.	Value.
Horses	247,300	$63.01	$15,582,373	274,170	$88.34	$24,220,178
Mules and Asses	7,000	79.02	553,140	7,350	100.00	735,000
Milch Cows	278,900	19.10	5,326,990	304,110	20.16	6,132,885
Oxen and other cattle	316,100	17.28	5,462,208	322,422	30.00	9,672,660
Sheep	307,500	2.11	648,825	369,000	2.50	922,500
Swine	196,200	3 70	725,940	196,000	6.11	1,197,560
Totals	1,353,000	.....	$28,299,476	1,473,052	.....	$42,880,783

Dairy farming has been constantly increasing in Minnesota during the last decade. In 1871 there were produced 7,356,768 pounds of butter, and 469,147 pounds of cheese; in 1872, 8,828,030 pounds butter, and 772,630 pounds cheese; in 1873 there were 10,140,316 pounds of butter, 1,031,510 pounds of cheese; in 1874, 10,916,942 pounds of butter, 1,090,238 pounds of cheese; in 1875, 12,000,000 pounds of butter, 1,250,000 pounds of cheese; in 1876, 12,348,971 pounds of butter, 1,052,348 pounds of cheese; in 1877, 13,443,195 pounds of butter, and 829,075 pounds of cheese; in 1879, 15,639,069 pounds of butter, and 586,448 pounds of cheese; in 1880, 16,000,000 pounds of butter, and 600,000 pounds of cheese. Great attention is paid to securing the best cows for dairy purposes, and all the improved apparatus for butter and cheese-making is promptly obtained. The great extension of the cultivation of forage plants has been stimulated largely by the growing zeal of the farmers of Minnesota to become large producers of the best butter and cheese. The increase of 26,000 milch cows in a single year is a strong indication of the energy and enterprise of the dairy farmers.

Manufactures.—Few States of the Union, certainly none in the valley of the Mississippi, equal Minnesota in manufacturing capacities. In none is there a more advantageous distribution of water-power with reference to supplies of raw material and accessibility to markets. Here the great rivers take their rise which gather contributions from half the continent and afford

the marvellous interior navigation of the North American continent. Yet the abrupt descents which give manufacturing power are in close proximity to the levels which afford navigation to the heart of the continent. The Mississippi itself lends the State a shore line of one thousand miles, half of which it contributes to purposes of manufactures and the other to those of commerce. The Mississippi originates at an elevation of 836 feet above the mouth of the Minnesota. In its descent from the summit level to this, its water line is broken at long intervals by falls and rapids, which form extensive and valuable water-powers. Pokegama Falls, Little Falls, Sauk Rapids, and St. Anthony Falls are among those on the main river, besides numerous others on all the tributary streams, especially those on the eastern slope of the Mississippi, which have a much more rapid descent than this, and form numerous cascades and rapids. St. Anthony Falls, on which Minneapolis is situated, forms one of the most magnificent natural seats of manufactures in the country.

The St. Croix affords navigation to the falls and rocky abutments which are capable of vast power. The Minnesota river is navigable to the granite obstructions, where busy industry is already in full career. The St. Louis river descends to the level of Lake Superior through a series of jagged falls of incalculable power. Fergus Falls, on Red river, the several falls on the Zumbro, on Cannon, Root, Cottonwood, Redwood, and other streams exhibit the distribution of water-power throughout the State. A small fraction only of this manufacturing force is yet made available. Considering its vastness and diffusion, the capacity of the surrounding country for feeding it with raw material and the illimitable field for the consumption of the products, it is difficult to limit the industrial progress which may be reasonably expected of the future.

The leading staples of manufacturing industry in Minnesota are flour and lumber—one the manufactured product of its vast areas of fertile soil, the other of the pine forests which cover a large part of Northeastern Minnesota above latitude 46° 30′. The pine belt is intersected by the St. Croix and its affluents and by the upper Mississippi and its numerous tributaries, which furnish

convenient channels for floating the logs cut upon their banks in winter, upon the high spring waters to Minneapolis and Stillwater, which are the principal depots of lumber manufacture, though lumber is manufactured extensively at Marine Mills and other points on the St. Croix, and also at Hastings, Red Wing, Winona, which receives extensive supplies of logs from the Chippewa river, and indeed almost all the river towns. A first-class boom was constructed in 1879 at St. Paul, and two or three large saw-mills were erected in 1880. The pine forests which clothe the head waters of the three great river systems which have their sources in Minnesota are a part of the vast belt of pine which stretches across Northern Wisconsin. The immense areas of prairie country which stretch west, southwest and south of this pine zone, comprising about three-fourths of Minnesota, and all of Iowa, Dakota, Nebraska and Kansas, afford an illimitable market for this lumber, which is constantly increasing with the rapid growth of population, and its extension over the naked plains of the West. The railroad system which centres at St. Paul and Minneapolis, and which extends throughout all this vast region, the vast supplies of lumber manufactured at Minneapolis, Stillwater, Menomonie, Eau Clare, Chippewa Falls, and at other points in Minnesota and Wisconsin, are distributed throughout this great prairie region, and the transportation of lumber forms a very important item in the business of these railroads. Immense supplies of logs are annually floated down the Mississippi from the St. Croix river and its Wisconsin tributaries, to be sawed into lumber at different river points, especially at St. Louis. A great proportion of the lumber supply of Western Iowa and Nebraska has heretofore been derived from Chicago and St. Louis; but arrangements have recently been entered into by the railroads connecting the Wisconsin pineries with those penetrating these prairie States whereby the cost of transportation has been considerably reduced. They have formed an organization known as the lumber line, with its head-quarters at St. Paul, by which lumber is transported without change of cars from the seats of its manufacture in Wisconsin to the most distant western markets upon such terms as will give them the control of the lumber

traffic over an immense region of country in Iowa, Nebraska and Kansas.

But the chief manufacturing industry of Minnesota, measured by the amount of capital invested and the value of its product, is flour. Flour mills are distributed all over the State, but the principal seat of this industry is at Minneapolis, which has in a few years past witnessed an enormous development of this interest. Minneapolis has now more than twenty saw-mills, which in 1880 produced over 165,000,000 feet of lumber, besides the proportionate amount of lath and shingles. Its lumber product alone exceeded $4,500,000. Its flouring mills, including three erected during the year, were twenty-seven, several among them being the largest flouring mills in the world. They all make the so-called "New Process" flour, which can only be made in perfection from spring wheat, the only wheat grown to any extent in Minnesota. These mills have the capacity for producing 17,500 barrels of flour per day, or 5,250,000 barrels in the year of 300 days—the equivalent of 25,000,000 bushels of wheat annually. There are also a great number of flour mills—many of them of the highest rank—along the numerous water-powers of the Cannon, the Zumbro, the Root and other streams of Southeastern Minnesota. Red Wing, Faribault, Cannon Falls, Stillwater, Rochester, Winona, and nearly every village in Houston and Fillmore are thriving seats of flour manufacture. There are almost as many run of stone employed in the mills along the Cannon river or along the Root as at Minneapolis.

The number of saw-mills in the State is about 200, and of flouring mills not less than 450, though, of course, of varying capacity. The amount of lumber produced in the State cannot be accurately stated, but is not less than 1,000,000,000 feet, and is increasing. Most of it is pine, though the mills in the southwest of the State run on the logs from the "Big Woods," which are mostly hard woods. The flour production is more than 10,000,000 barrels, equal to 50,000,000 bushels of wheat, and the Millers' Association, which has its head-quarters in Minneapolis, by its admirable organization and management, has been able to command not only the greater part of the wheat

grown in Minnesota, but also most of that produced in Eastern Dakota and Northern Iowa. The flour manufacture in Minnesota has an annual product of from thirty-five to forty millions of dollars.

But though these are the leading manufactures of Minnesota, they are by no means the only productions of manufacturing industry in the State. There are a number of iron works and several boiler, stove, harvester, plow and other agricultural machine factories, woollen mills, cotton mills, paper mills, linseed oil mills, wood.ware, furniture, fence, sash, door and blind factories, foundries, car wheel works, boot and shoe factories, clothing factories, creameries, cheese factories, wagon factories, soap and glue works, broom factories, brick yards, breweries, coopers' shops, confectionery, large printing and book manufacturing establishments, etc., etc. The entire annual products of manufacturing industry in the State are estimated to exceed seventy-five millions of dollars.

Increase in Wealth and Taxable Valuations of the State.—The only available measure of the increase of wealth in Minnesota is that afforded by the valuations of real estate and personal property for taxation—a very unreliable one, since real estate is generally valued at much less than its market value, while personal property, even that small portion of it which is visible or listed, is generally valued in the assessment list at less than one-third, frequently at one-fourth or fifth, its actual value. Besides this, under the laws of Minnesota, all public school-houses, academies, colleges, their furniture and libraries and grounds, all churches and the lots on which they stand, all public buildings of State, county or city, all public hospitals or institutions of charity, all public libraries, etc., and in addition to these the personal property of each person liable to taxation, to the amount of one hundred dollars, are exempt from taxation or assessment. But, though these valuations are not even approximations to the true value, they will answer very well for purposes of comparison. The following table will show the growth of taxable property and population in Minnesota since June, 1849:

	Valuation.
1849	$514,936
1850	806,437
1860	36,738,410
1870	87,179,257
1879	248,283,215

Population.—The increase of population in Minnesota has been exceedingly rapid from the first. In 1850, the first time when there were a sufficient number of white settlers to be enumerated, and when all the region west of the Mississippi was still occupied and held by the Indians, the number reported by the census was, by a singular coincidence, precisely that of the Indians now resident in the Territory—6,077. In five years it had increased more than ten-fold; in ten years, almost thirty-fold; in twenty years, seventy-five-fold; in twenty-five years a hundred-fold; and in thirty years, a hundred and thirty-one times. The following table gives some additional particulars of interest in regard to this population. The enumerations of 1870, 1875 and 1880 include the tribal Indians resident in Minnesota:

Year of Enumeration.	Total Population.	Males.	Females.	Natives.	Foreigners.	Colored and Indians.	Density Inhabitants to Square Mile.	Rates of Increase, Per cent.	Of School Age, both sexes, 5 to 20.	Of Military Age, males, 18 to 45.	Of Voting Age, males, 21 and upwards.
1850	6,077	3,716	2,361	4,100	1,977	39	.04	.....	1,751	1,378	1,449
1855	68,812	....	.....	.....	.....	.....	.85	883			
1860	172,023	93,084	78,939	113,295	58,728	2,628	2.10	250	52,731	41,226	48,186
1865	250,099	....	.....	.....	....	....	3.04	45.3	87,244		
1870	446,056	235,299	204,407	279,079	160,697	7,799	5.26	78	157,913	94,238	114,739
1875	609,777	316,076	281,331	379,978	217,429	14,901	7.24	36.8	228,362	128,374	150,916
1878	700,000*	.....	.....	444,748	255,252	15,175†	8.38	14.9	262,328	147,370	175,817
1880	787,005†	... .	.....	.....	.....	‡	9.40	12.3§	294,780	.....	196,639

* Estimated from State census of 1875 and Assessors' returns.
† Of which number 5,047 were tribal Indians.
‡ Of which number 6,198 were tribal Indians.
§ For the decade, 77 per cent.

From whence are the people who constitute the present population of this rapidly growing and thrifty State? An investigation made in 1878 showed that about five-eighths were born in the United States, a trifle more than one-third being born in Minnesota, and about twenty-nine per cent. in other States; one-ninth, or eleven per cent., were natives of some of the German States; fourteen per cent., or about one-seventh, were from Norway and Sweden; three and a half per cent. were from Ireland; about

three per cent. from the British provinces, and one and one-half per cent. from England and Wales, while three per cent. were from other countries. The Scandinavian emigrants have very generally preferred Minnesota to other States and Territories from a real or fancied similarity between its climate and their own, and, in some of the counties, Norse is the language of a majority of the inhabitants. There are a number of newspapers printed in the Swedish and Norwegian languages, and at one time the laws of the State were published in these languages.

The Indian Population.—In its earlier history, even after it became a State, the Indians were very troublesome neighbors. They originally claimed the whole Territory, and their title to lands east of the Mississippi was not extinguished till 1838; in 1851 the Indian title to lands between the Mississippi and the Red river of the North was extinguished, except the reservations. The southwest and part of the western portion of the State was still occupied by the Sioux, and in 1862, taking advantage of the absence of most of the able-bodied men in the civil war, these treacherous savages made an irruption upon the new settlements and murdered about 1,000 persons, slaughtering whole families, burning and plundering villages, etc. Vengeance came swiftly upon the savages; they were pursued, defeated, conquered and expelled from the State, and the most guilty publicly executed. The only Indians now in the State are the Chippewas, 6,198 in number, who have reservations at Leech lake, Red lake and White Earth. Their reservations comprise 4,761,112 acres, which include, however, a large amount of lake surface, probably more than 3,200,000 acres, as only 1,553,960 acres are reported as tillable. This tribe has always maintained peaceful and pleasant relations with the whites.

Minnesota is fully alive to her educational interests. Her school lands consist of two sections, the sixteenth and thirty-sixth, in every surveyed township, and amount to 2,969,990 acres, which, by a provision of the constitution introduced at the suggestion of Governor Ramsey, the present Secretary of War in the United States War Department, cannot be sold for less than $5 per acre. Of these lands there have been already sold 602,873

acres, at an average price of $6.10 per acre, or a little more than one-fifth; $3,678,472 have been derived from this source for the school fund; and the addition of other items, stumpage, the sale of timber from the unsold school lands, etc., there had been realized up to August 31, 1879, the sum of $4,067,517, which constitutes the principal of the school fund. The remainder of the school lands are not inferior in quality to those already sold, and will probably yield in all from $18,000,000 to $20,000,000; but the interest from the school fund, which is now nearly $250,000 and constantly increasing, forms only a small part of the total annual expenditure for public schools. In 1878 this expenditure was $1,322,949.07, or $8.40 to each scholar reported for apportionment. It is now probably at least $200,000 more. The excess over the current school fund is raised by county and local taxation. The following statement gives some particulars in regard to the condition of the public schools of the State for the year ending the 31st of August, 1879, the latest report yet published, which does honor to the enterprise and educational zeal of this youthful State: Permanent school fund, $4,067,517; current school fund, $246,942; enrolment of pupils, 171,945; school houses, 3,416; school districts, 4,001; average months of school, 46; male teachers, 1,797; female teachers, 3,210; total teachers, 4,907; total of teachers in 1878, 4,872; average wages, males, $35.78;* average wages, females, $27.23;* amount paid for teachers' wages, including board, $920,121.38; value of school-houses and sites, $3,382,351.85. Besides these public schools, there were seventy-nine graded schools and sixteen high schools in the State, in all of which advanced studies were pursued. This was in 1878. The number is now increased largely. These graded schools were erected at a cost of over $1,500,000. But the public schools are only a part of the educational facilities afforded by the State. There are three normal schools in the State, at Winona, Mankato and St. Cloud, all established since 1859, and having buildings erected at a cost of $239,932, and receiving an annual appropriation of $30,000 from the State. These schools

* This is a slight falling off from the wages of the previous year, which were for males $37.52; for females, $28.12.

had respectively eleven, seven and nine professors and teachers, and an enrolment of 407, 215 and 209 students in each. The graduates are in demand for the public schools of the State.

There is also a State University at Minneapolis, which includes also the Agricultural College, and has a faculty of about twenty professors and teachers, and had in 1879 about 250 students. It has an endowment fund from the sales of lands granted to it by Congress and the Agricultural College grant. This fund now amounts to about $450,000, and nearly one-half the lands remain unsold, and have appreciated so much in value that the fund will probably amount to over a million dollars. Its buildings are very fine and commodious, and are unencumbered, and it has the proceeds of a State tax of one-tenth of a mill, which amounts to upwards of $20,000 a year. It admits both sexes, and its teaching is of a high order.

There is also an institution for the deaf, dumb and blind at Faribault, which has fine buildings and grounds, costing $150,000, and capable of accommodating 200 pupils.

There are also two or three colleges and seven or eight collegiate schools of high order in the State under denominational control. Some of these are equal to any schools of their class in the country.

Counties and Cities.—There are seventy-six counties in the State, of which seven were not organized in 1878. Several of the northern counties, as Polk, Beltrami, Cass, Itasca and St. Louis are of immense extent, and some of them have yet extensive Indian reservations within their limits. The assessed valuation of the taxable real estate of these counties (a large amount escapes taxation for a variety of causes) in 1878 was $183,615,738. This was nominally on a valuation of sixty cents on the dollar, but really not more than fifty per cent. The assessed value of personal property (probably less than one-sixth of the real value) was $46,175,304, and adding the two we have an assessed valuation of personal and real estate of $229,791,042; in 1879 this valuation had reached $248,283,215, and the real value undoubtedly exceeded $500,000,000.

The principal cities and towns are:

	Cities and Towns.	Counties in which they are located.	Population in 1860.	Population in 1870.	Population in 1875.	Population in 1880.
1	St. Paul	Ramsey	10,401	20,030	33,179	41,498
2	Minneapolis	Hennepin	5,821	18,079	32,721	46,887
3	Winona	Winona	2,464	7,192	10,737	10,208
4	Stillwater	Washington	2,380	4,124	5,750	8,500
5	Red Wing	Goodhue	1,156	4,260	5,630	7,150
6	Faribault	Rice	1,568	3,745	5,525	6,950
7	Mankato	Blue Earth	1,559	3,482	5,416	7,075
8	Rochester	Olmsted	1,444	3,953	4,344	5,125
9	Hastings	Dakota	1,653	3,458	3,644	4,500
10	Duluth	St. Louis	71	3,131	2,953	3,170
11	Owatonna	Steele	609	2,570	2,799	4,250
12	St. Peter	Nicollet	980	2,124	2,680	
13	Austin	Mower	200	2,039	2,599	
14	Lake City	Wabasha	866	2,618	2,432	3,500
15	New Ulm	Brown	635	1,310	2,180	
16	Northfield	Rice	867	2,278	2,149	
17	St. Cloud	Stearns	.....	2,161	2,080	
18	Wabasha	Wabasha	894	1,737	1,866	
19	Shakopee	Scott	1,133	1,349	1,820	
20	Waseca	Waseca	191	551	1,325	
21	Rushford	Fillmore	477	1,245	1,240	
22	St. Charles	Winona	659	1,151	1,202	
23	Spring Valley	Fillmore	723	1,279	1,870	
24	Hokah	Houston	309	525	1,021	1,308
25	Anoka	Anoka	662	1,498	2,420	
26	Albert Lea	Freeborn	262	1,167	1,897	
27	Beaver Falls	Renville	.....	.....	634	1,276
28	Hutchinson	McLeod	94	440	1,581	
29	Chaska	Carver	759	847	767	
30	Watertown	Carver	.....	.....	.....	1,175
31	Sauk Centre	Stearns	.....	1,155	1,178	
32	Redwood Falls	Redwood	.....	691	1,177	
33	Le Sueur	Le Sueur	218	1,009	1,120	
34	Glencoe	McLeod	237	487	1,001	
35	St. Vincent	Kittson	.....	.....	.....	1,059
36	Moorhead	Clay	.....	.....	.....	1,500

Religious Denominations.—The Lutherans (of whom there are at least six different and not entirely harmonious organizations) are the most numerous of the religious denominations in Minnesota, having an actual membership in 1877–78 of 112,705, to which large additions have since been made by immigration and otherwise.

The Catholics claimed a Catholic population estimated at 114,000 in 1877; but though they have some strong colonies in the State, there is a large minority of the estimated Catholic population in these new States, which drifts away from that church, and cannot fairly be reckoned as under its control. The Methodist churches come next, with about 24,000 members, and are succeeded in the following order by Baptists, Congregationalists, Presbyterians, Episcopalians, Mennonites, Free Will Baptists, Universalists and several minor denominations. The following table, which does not give the number of churches or church edifices, except the Catholics, gives some other particulars of interest concerning them in 1877–78. Two years have undoubtedly wrought many

changes, but have hardly greatly disturbed their relative proportions:

Membership of the Various Religious Bodies, Value of Church Property, and Benevolent Contributions in the State.

Denomination.	Membership.	Value of Church property.	Membership of Sunday-Schools.	Contributions to benevolent objects.
Norwegian-Danish Evangelical Lutheran	47,469	$120,000	5,000	
Methodist Episcopal	20,160	757,925	20,265	$671.94
Baptist	6,430	224,150	5,415	10,046,26
Congregational	6,223	255,000	10,430	10,595.87
Presbyterian	6,158	420,000	9,279	7,265.00
German Evangelical Lutheran	22,000			
Episcopalian *Reformed	19	2,000		
Episcopalian Protestant	4,298	278,245	4,766	*5,069.00
Evangelical Association	3,801	96,575	3,690	6,566,71
Unitarian	150	.....	80	
Friends	160	5,000	75	400.00
Universalist	966	190,225	560	730.00
Swedenborgian	80	8,000		
Hebrew	54	4,000	20	
Freewill Baptists	1,280			
Mennonite	1,408			
			No.ofsch'ols	
Norwegian and Danish Conferents	13,966	.....	70	
Other Lutheran Societies	5,000			
			No.ofscho'ls	
*Swedish Evangelical Lutheran	22,268	175,000	100	10,904.91
*Norwegian Lutheran Augustain	2,000	10,000		
			Number of Associations	
Y. M. C. A. of Minnesota	2,358	6,000	15	18,000.00

* CATHOLICS.

Colleges	1
Religious Orders	18
Academies (Female)	7
Charitable Institutions	5
Priests	118
Churches	188
Hospitals	1
Asylums	3
Catholic population	114,000

History.—Father Hennepin, a Franciscan priest, was the first European who is known to have visited Minnesota. In 1680 he ascended the Mississippi with a party of fur traders to the Falls of St. Anthony, to which he gave the name which they still bear. Some French traders and their descendants settled around the falls, but they soon lapsed into Indian customs and modes of life. In 1763 the country subsequently known as the Northwest Ter-

* Report of 1877.

ritory was ceded to Great Britain. In 1766 Jonathan Carver, a native of Connecticut, explored that part of Minnesota extending from the present southern border to the sources of the Mississippi. In 1783 it was transferred to the United States as a part of the Northwest Territory. In 1805 a tract of land was purchased from the Indians at the mouth of the St. Croix river, including the present site of Hastings, and another at the mouth of the Minnesota river, which includes the Falls of St. Anthony. In 1820 Fort Snelling was built, and in 1822 a small grist mill was erected on the present site of Minneapolis for the use of the garrison at Fort Snelling. In 1823 the first steamboat visited Minnesota. Between 1823 and 1830 a small colony of Swiss settled near St. Paul. The Indian title to lands east of the Mississippi was extinguished in 1838. In 1843 a settlement was commenced at Stillwater, on the St. Croix. The Act of Congress establishing the Territory of Minnesota was passed March 3, 1849, and the Territory was organized in the following June. It extended to the Missouri river, and thus included nearly all of Eastern Dakota. Its population was then between 4,000 and 5,000. In 1851 the Indian title to the lands lying between the Mississippi river and the Red river of the North, except the reservations, was extinguished. Immigration at once commenced, though considerably hindered by the very general impression that the region was too cold to produce any crops. Governor Ramsey, the first Territorial Governor, now United States Secretary of War, says that when he came to Washington, and brought with him some ears of corn and wheat raised in the vicinity of St. Paul, he was accused of trying to deceive, for it was said that it was impossible that anything should grow in such an Arctic climate. But the Territory grew, and in 1857 had about 150,000 inhabitants; and on the 26th of February in that year, Congress passed an enabling act, providing for its admission as a State. It was admitted into the Union May 11, 1858. In 1860 it had a population of 172,023. General H. H. Sibley, one of its pioneer settlers, was its first State Governor, and was succeeded in 1860 by Governor Ramsey. In 1862 occurred the Sioux massacre, to which we have

already alluded. Nearly a thousand of the inhabitants of the State were subjected to the most cruel outrages and butchered in cold blood. It seemed at first that this would paralyze the young State, and prevent its growth for a long time. But it had just the contrary effect. The summary and terrible punishment inflicted on the Sioux for their atrocious crimes and their prompt ejectment from the State, encouraged immigration, and in the eighteen years which have since elapsed, the State has grown with wonderful rapidity. The railroad controversy, involving the power of the State to limit and reduce the charges for freight, to which all the States of the Northwest were in a greater or less degree participants, was less severe or protracted in Minnesota than in some of the other States, and was amicably settled. In the extent and fertility of her soil; in the cheapness of choice lands, whether purchased from the United States, the State or the railways; in the accessibility of every settled county of the State to the best markets, thereby securing high prices for her products; in her abundant water and all the facilities for successful manufacturing; in the excellence of her educational system and its expansion over the whole State, and in the moral and religious character of its inhabitants, the immigrant will find Minnesota, as a home for himself and his children, unsurpassed by any State or Territory in "Our Western Empire."

CHAPTER XII.

MISSOURI.

MISSOURI'S SITUATION, BOUNDARIES AND EXTENT OF LATITUDE AND LONGITUDE—FACE OF THE COUNTRY—MOUNTAINS AND HILLS—VALLEYS—RIVERS AND LAKES—GEOLOGY AND MINERALOGY—ECONOMIC MINERALS—LEAD—ZINC—COPPER—IRON—COAL—BARYTA—CABINET MINERALS—BUILDING MATERIALS—MINERAL SPRINGS—ZOOLOGY—CLIMATE—METEOROLOGY—SOIL AND VEGETATION—AGRICULTURAL PRODUCTS—TABLES OF CROPS, 1878 AND 1879—NOTES ON THE CROPS—LIVE-STOCK—TABLES, 1879, 1880—ADAPTATION OF MISSOURI FOR GRAZING AND DAIRY-FARMING—MANUFACTURES—

MINING PRODUCTS—RAILROADS—POPULATION—NOTES ON POPULATION—COUNTIES AND CITIES—TABLE OF CITIES—ST. LOUIS—KANSAS CITY—LANDS FOR IMMIGRANTS—IMMIGRATION IN THE PAST—WHY IT HAS LARGELY PASSED BY MISSOURI—THE STATE NOW A DESIRABLE ONE FOR IMMIGRANTS—EDUCATIONAL ADVANTAGES—PUBLIC SCHOOLS—NORMAL SCHOOLS—UNIVERSITIES—COLLEGES AND PROFESSIONAL SCHOOLS—SPECIAL INSTITUTIONS—RELIGIOUS DENOMINATIONS AND CHURCHES—HISTORICAL DATES.

MISSOURI is one of the central belt of the States of "Our Western Empire," having the Mississippi for its eastern boundary, and the Missouri in part for its western. It extends (including a small tract lying between the Mississippi and the St. Francis rivers) from the parallel of 36° to that of 40° 30′ north latitude, and from the meridian of 89° 2′ to that of 95° 44′ west longitude from Greenwich. Its greatest length from north to south is about 309 miles; its greatest breadth from east to west 318 miles, and its average breadth about 244 miles. It is bounded on the north by Iowa, the parallel of 40° 30′ forming the dividing line from the Missouri river to the Des Moines, and thence down the channel of that river to the Mississippi; on the east it is bounded by the Mississippi river, which separates it from Illinois, Kentucky and Tennessee; south by Arkansas, on the line of 36° from the Mississippi to the St. Francis river and from the St. Francis to the meridian of 94° 38′, the parallel of 36° 30′; on the west by the Indian Territory, Kansas and Nebraska, following the meridian of 94° 38′, from the Arkansas line to the mouth of the Kansas river, and from that point to the parallel of 40° 30′, the channel of the Missouri river. Its area is 65,370 square miles, or 41,836,931 acres, the whole of which has been surveyed.

Face of the Country.—The State is divided into two unequal portions by the Missouri river, which crosses it from west to east, and also forms its northwestern boundary. The portion south of the Missouri, which forms about two-thirds of the territory of the State, has a very varied surface. In the southeast, the region lying between the Mississippi and the St. Francis rivers, as far north as near the parallel of Cape Girardeau, is very low and swampy and subject to frequent overflow by the Mississippi and its tributaries. This comprises all the land lying opposite to Tennessee, Kentucky, and most of Alexander county,

Illinois. Above this, a little below Cape Girardeau, the highland bluffs commence, and extend up to the mouth of the Missouri. Between St. Genevieve and the mouth of the Meramec these bluffs, which are solid masses of limestone, rise from 250 to 360 feet above the river, and extend westward across the State, but are less precipitous and rugged as they approach the Osage river. In the south and southwestern portion of the State, the Ozark mountains, or, rather, hills, occupy a considerable portion of the country; they form no continuous or systematic ranges, but render the whole region exceedingly broken and hilly, the isolated peaks and rounded summits (*buttes* they would be called farther west) sometimes rising from 500 to 1,000 feet above their bases, and then sinking into very beautiful and often very fertile valleys. Though not distinctly defined, the general course of this hilly region is slightly north of east from the southeastern border of Kansas, where it enters the State to the Mississippi river. Beginning as a broad arable plateau, it slopes gently to the water courses on either side, and with fine farming lands even on its highest levels. For one-third of the distance across the State it possesses no characteristic of a mountain range, and from thence as it extends eastwardly its ridges become gradually more irregular and precipitous, until near the centre of the range they begin to break up into a series of knobs and hills, which finally attain their highest elevation at Iron Mountain and Pilot Knob, in the eastern portion of the State. The numerous river bottoms formed by the tributaries of the Osage and Missouri rivers are generally fertile, but most of them are subject to overflow. Farther north, in the basin of the Osage and above it, the land is mostly rolling prairie with occasional forests; the immediate valley of the Missouri is a rich alluvial valley of great fertility, and abounding in forest trees of magnificent size and circumference.

North of the Missouri the country is generally either rolling or level prairie, though with considerable tracts of timber; it forms a part of that great bed of the prehistoric lake more than 500 miles from shore to shore, through which the Missouri formerly flowed, and which included the greater part of Iowa and Eastern

Nebraska, and its surface soils, for many feet in depth, are composed of loess or silty deposits; the tributaries of both the Mississippi and Missouri have worn deep channels through the rocks, and the valleys of erosion thus made, as well as the surface and soil of this entire region north of the Missouri, are very similar to those of Iowa. The river bottoms are exceedingly rich and productive.

Rivers and Lakes.—The Mississippi river forms the entire eastern boundary of the State, for a distance of 540 miles. The Missouri river flows along its western boundary, separating it from the States of Nebraska and Kansas, for a distance of 250 miles, and then flows eastwardly entirely across the State, until it joins the Mississippi upon the eastern boundary, twenty miles above St. Louis, a distance of 450 miles; thus giving the State a shore line upon these two great inland arteries of commerce of upwards of 1,550 miles. The tributaries of the Mississippi on its west bank in this State are, with the exception of the Missouri, mostly small and of no great importance. The St. Francis and its largest tributary, the Little river, as well as the White with its numerous branches, forks, and its tributaries, the Black, Current, Paint and Spring rivers, all belong to Arkansas, and enter the Mississippi in that State. The Meramec and its principal tributary, the Big river, is the only considerable affluent of the Mississippi in the State south of the Missouri. North of that river, Salt river is the largest affluent, but the Cuivre or Copper river, North river, South, Middle and North Fabius, Wyaconda and Fox rivers, are streams of considerable size. The Missouri receives numerous large affluents in the State. On the south side are the Lamine river, the Osage (a large and beautiful stream), with its tributaries, the Little Osage, Marmiton, Sac river, Grand river, Pomme de Terre, Big and Little Niangua, Auglaize, and Marie's creek; and Gasconade river, with its Osage, Lick and Piney Forks. On the north side there are the Nishnabatona, the Big and Little Tarkio, Nodaway, Platte, Grand (with fourteen considerable tributaries), Chariton (with seven or eight), Rocher Perché, Cedar, Muddy and L'Outre creeks. In the southwest the Neosho, an affluent of the Arkansas, with its tributaries, drains six or eight

counties. Wherever the Great American Desert may be, it is certain that no part of it is in a State whose every county is so abundantly watered by large and small streams as Missouri. There are comparatively few lakes in the State. In the southeast there are extensive swamps, overflowed at seasons of high water like those on the Atlantic coast. In St. Charles county, between the Missouri and the Mississippi, there are a number of small lakes. In the northwestern part of the State, in Platte, Buchanan and Holt counties, there are several lakes of considerable size. The Missouri, as well as the Mississippi, at times widens into a wide expanse of water dotted with islands.

Geology and Mineralogy—The geology of Missouri may be briefly summed up as follows: 1. Quaternary (alluvium, bluff, and drift or loess) deposits, found in greater or less degree all over the State, but especially deep and thick in the southeastern counties, Ripley, Butler, Dunklin, Pemiscot, New Madrid, Mississippi, Scott, Stoddard, and portions of Carter, Wayne and Bollinger, as well as through the immediate valley or bottom lands of the Missouri, to the point in the northwest at which it enters the State. There are no tertiary, cretaceous, triassic or jurassic groups in the State, but we come below the quaternary immediately upon—2. The upper carboniferous, which with—3. The lower carboniferous, covers 23,000 square miles of the State. There are in these two formations, the upper, middle and lower coal, and the Clear creek sandstone of the upper carboniferous, and six successive deposits of the lower carboniferous, comprising an unclassified sandstone, and the St. Louis, Keokuk and Chouteau groups of limestones and sandstones, most of them rich in fossils. This great coal field occupies in general the western, northwestern and northern portions of the State.

Next in order, and for the most part immediately adjacent to the coal measures, are—4. Three considerable tracts of Devonian rocks, one in the southwest, another in the northeastern part of the State, and the third a narrow belt which follows the eastern edge of the carboniferous deposits in all their devious lines, and extends southeast to the immediate vicinity of St. Louis. The only strictly Devonian rocks in the State are the Hamilton and Onondaga groups, both mainly limestones.

5. The upper and lower Silurian formations come next in order; they occupy a tract almost 200 miles in width, and extending from the Missouri river to the southern line of the State, and also crop out in the immediate bottom lands of the Mississippi above the mouth of the Missouri. The groups of the upper Silurian found here are Oriskany sandstone, lower Helderberg or Delthyris shale, Niagara group, and Cape Girardeau limestone. Of the lower Silurian formation there are three groups belonging to the Trenton period, viz.: The Cincinnati, Galena and Trenton groups, composed mainly of shales and limestones; and three groups of the magnesian limestone series, consisting of magnesian limestones, saccharoidal and other sandstones, and Potsdam limestones, sandstones and conglomerates.

6. Below these, around the head waters of the affluents of the St. Francis and White rivers, there are frequent outcrops of eozoic or archaic rocks—greenstone, porphyry and granite. Much of the limestone of the coal measures, as well as some of the other formations, is cavernous, and there are numerous caves of great extent and beauty in the central and western portions of the State.

Missouri has a great variety of minerals, and in those of greatest economic value is hardly surpassed by any State or Territory of "Our Western Empire." Gold has thus far been discovered only in the drift in Northern Missouri in placers overlying the coal measures, and therefore without hope of veins or lodes; these placers are, as they are situated, too lean for profitable working, yielding only from thirteen cents to $2.51 per ton. Silver has been diligently sought in the lead ores which abound in the State, but they are not, to any profitable extent, silver-bearing. In August, 1879, argentiferous galena was discovered in the eozoic rocks in Madison county, one of the eastern counties of the State, about twelve miles east of Ironton, and perhaps fifteen miles southeast of Pilot Knob. What is the value of these lodes is not stated, but they are sufficiently rich to have drawn about twenty companies there, who are now at work, and are very sanguine that these lodes also contain gold and platinum. The first attempts to reduce the ores were made by the wet amalgamation process, and not by smelting.

But if the precious metals (so called) have not hitherto yielded much wealth to Missouri, her mines of lead, copper, zinc, and, above all, of coal and iron, have made ample amends for any lack of the others. Iron is found in some form in every county in the State—bog ores in Southeastern Missouri; limonite, or brown hæmatite, in most of the southern counties: gœthite, a variety of the brown hæmatite in Adair county; red hæmatite throughout the coal measures; red and yellow ochres in many counties; spathic ores in the coal measures and in Phelps county; the specular oxide, in vast masses, such as the Iron mountain, Shepherd mountain, Pilot Knob, Simmon mountain, Iron ridge, the Meramec mines, in Phelps county, and numerous other deposits in eight or ten other counties; sulphurets (iron pyrites) throughout the coal measures, and sulphate of iron (copperas) in the coal measures and abandoned coal mines. Some States and Territories have perhaps an equal abundance of iron ores, but lack smelting coals to reduce them; but Missouri has an abundance of excellent smelting coals and fluxes in close proximity to her beds of iron ores.

After iron, lead is the metal most largely produced in Missouri, her product of that metal being greater than that of all the rest of the United States. Our latest complete statistics of the lead produced in the State are for 1879, when the St. Louis Merchants' Exchange reported a production of 56,868,960 pounds. This was a very decided falling off from the product of 1878, which was 60,348,560 pounds, and still more from that of 1877, which was 63,202,240 pounds. About one-third of the whole was exported. The consumption as well as the production of lead has largely increased within the past five years, and while Colorado, Montana, Utah, Nevada and California are sending into market large amounts of lead parted from silver, and New Mexico and Arizona are preparing to do the same, the production in Missouri, Iowa and Kansas has also increased and kept pace with them. There are two great lead fields—one in Southeastern and the other in Southwestern Missouri. It is also found in smaller quantities in many counties outside of these lead fields; galena, or sulphuret of lead, and cerussite, or the carbon-

ate, are the principal ores, though some deposits of the phosphate (pyromorphite) are found. Zinc in the form of blende is abundant in the same regions as the lead—in Southeastern and Southwestern Missouri, and the silicates and carbonates, also, while zinc bloom sometimes occurs. The production of zinc in Missouri is about one-third of that in the entire United States, and is exceeded only by that of Illinois. Copper in the form of blue and green carbonates (malachite) and sulphurets, is found in large quantities in Shannon, Crawford, Jefferson, Franklin and Madison counties, and in smaller quantities in a dozen other counties. For many years copper mining was successfully carried on in the State, and even now small quantities are produced; but the yield of copper in the ores ranges only from twenty-two to twenty-six per cent., and the Lake Superior ores are so much richer, and their mines contain so much native copper as to render the business generally unprofitable. The sulphate of cadmium (greenockite) is associated with the zinc blende in many of the mines. Nickel and cobalt are found in paying quantities at Mine La Motte, in Madison county, and in the St. Joseph mines, and the beautiful hair-like crystals of sulphuret of nickel (Millerite) in the vicinity of St. Louis. Wolfram occurs in Madison county, and manganese and manganiferous iron in Iron and other counties.

Of minerals, not ores, there is a great variety; carbonate of lime (calcite), arragonite, pearl spar, fluor spar, quartz in all forms; heavy spar (sulphate of baryta), mainly used in the adulteration of white lead; gypsum, mainly in the form of selenite; pickeringite, feldspar, mica, hornblende, asbestos, bitumen or mineral tar (throughout the coal measures), fire-clay, potter's clay and kaolin; an excellent glass sand from the saccharoidal limestone; lime of several qualities; hydraulic lime and cement; polishing stone, saltpetre, building stones of granite, sandstones, limestones and marbles, grindstones, millstones, slates, and numerous fine varieties of colored marbles are the principal of these. But of all the minerals not metallic, coal is the most important in Missouri. The coal fields underlie an area of about 26,000 square miles in the State. The coal includes deposits belonging to the upper, middle and lower coal measures, and is of various quali-

ties, some being common bituminous, some very rich in carbon, and developing excellent results under the coking process, while some will not coke; some is equal in quality to the Liverpool cannel coal. The percentage of fixed carbon varies from thirty to sixty per cent., the average being not far from fifty per cent. Among the coal beds already worked are many which produce excellent smelting coals, though perhaps a larger number yield a coal better adapted to the use of locomotives and stationary engines. The coal mines are usually easily worked, and do not require deep shafts or expensive machinery, and coal is very cheap. There are many mineral springs in the State, sulphurous, saline and chalybeate, but none of national reputation. There are also brine springs in Howard county, which yield from two to three ounces of very pure salt to the gallon.

Zoölogy.—Having extensive forests, Missouri has an abundance of wild animals. They are mostly those of the Mississippi valley and of the plains. Bears (the black and cinnamon), cougars or panthers, wild cats, lynxes, wolves, both the gray wolf and the coyote, foxes, raccoons, opossums, skunks, beavers, martens, minks, muskrats, gophers, woodchucks, and nearly all the rodents and burrowing animals. The buffalo and the elk have disappeared from Missouri, though they were formerly abundant there; but there are two species of deer, antelopes (rare), rabbits and hares. Wild turkeys, quails, pigeons, partridges, prairie hens (though these are not as numerous as formerly), and other grouse exist in great abundance. The birds of prey, eagles, vultures, hawks, owls, etc., destroy great numbers of game birds and rodents; wild geese, ducks, brant, teal and snipe are found in their season on the rivers and in the marshes, and with them herons, swans, divers, and more rarely ibises. Snakes, lizards, frogs, toads, turtles, etc., are numerous.

Climate.—The climate of Missouri is generally healthy, except in the river bottoms and the marshy districts of the southeast; but it is a climate of frequent changes and of great extremes. The months of July and August are marked by extreme heat, and there are periods of equally intense cold in January and February. The autumn and spring are very mild and pleasant, though with occasional days of intense cold or heat.

The following table, carefully compiled from the Signal Service, Military telegraph, and Agricultural reports, gives the averages of a series of years, at six different points in different parts of the State, in the temperatures of the different seasons and the rainfall.

METEOROLOGY OF MISSOURI.

Meteorological Data.	St. Louis. Lat. 38° 37′ 28″ N. Lon. 90° 15′ 16″ W. Altitude 543.54 feet.	Jefferson City. Lat. 38° 30′ N. Lon. 92° 10′ W. Altitude about 600 ft.	Rolla. Lat. 37° 55′ N. Lon. 91° 45′ W. Altitude about 900 ft.	Harrisonville. Lat. 38° 36′ N. Lon. 94° 25′ W. Altitude ab. 1,000 ft.	St. Joseph. Lat. 39° 42′ N. Lon. 94° 46′ W. Altitude ab. 1,030 ft.	Bolivar. Lat. 37° 35′ N. Lon. 93° 22′ W. Altitude about 880 ft.
1. *Temperature.*	°	°	°	°	°	°
Annual mean	56.3	53.8	53.3	51.8	53.9	55.9
Highest temperature of the year	98.3	96.	93.	94.	95.	95.
Lowest temperature of the year	−4.0	4.	1.	0.	2.	1.
Annual range of temperature	102.3	92.	92.	94.	93.	94.
Mean temperature of Spring	56.9	53.	51.9	51.1	52.8	53.6
Highest temperature of Spring	88.	86.	86.	84.	86.	83.
Lowest temperature of Spring	22.0	6.	10.	0.	6.	7.
Range of Spring temperature	66.0	80.	76.	84.	80.	76.
Mean temperature of Summer	76.8	73.7	73.6	74.	76.7	77.6
Highest temperature of Summer	98.3	96.	93.	94.	95.	95.
Lowest temperature of Summer	52.3	50.	46.	50.	54.	50.
Range of Summer temperature	46.0	46.	47.	44.	41.	45.
Mean temperature of Autumn	56.8	52.	49.9	50.	52.2	54.3
Highest temperature of Autumn	88.7	85.	86.	84.	85.	84.
Lowest temperature of Autumn	21.7	19.	18.	20.	18.	23.
Range of Autumn temperature	67.0	66.	68.	64.	67.	61.
Mean temperature of Winter	34.6	35.7	37.9	32.1	33.7	38.
Highest temperature of Winter	67.3	72.	76.	64.	68.	70.
Lowest temperature of Winter	−4.0	4.	1.	0.	2.	1.
Range of Winter temperature	71.3	68.	75.	64.	66.	69.
2. *Rainfall.*	inches.	inches.	inches.	inches.	inches.	inches.
Rainfall in Spring months	10.55	11.13	13.21	9.31	10.89	12.85
Rainfall in Summer months	11.58	15.69	12.06	14.17	24.46	9.71
Rainfall in Autumn months	9.75	8.42	9.89	5.31	5.35	6.81
Rainfall in Winter months	6.97	6.71	5.25	7.31	5.46	9.85
Total rainfall of year	38.85	41.95	40.41	36.10	46.16	39.22

We give below the following additional items in regard to the meteorology of St. Louis, taken from the Signal Service Reports.

Months 1878.	Monthly and annual mean actual pressure of barometer, corrected for temperature, etc.	Monthly and annual mean relative humidity.	Monthly and annual Rainfall.	Prevalent winds and their direction each month.
	Inches.	Per cent.	Inches.	
January.....	29.462	66.4	2.36	N. W., S., W., N., E.
February.....	29.361	65.2	1.69	N., S., N. W., N. E., S. E.
March.....	29.353	56.6	2.79	S., N. W., S. E., W., N.
April.....	29.201	55.5	6.74	S. E., N., N. W., S., S. W.
May.....	29.362	63.1	4.63	S., N. W., N., S. E., N. E.
June.....	29.366	60.8	2.40	S.,N.,S.E.,N.W.,W.,N.E.
July.....	29.398	62.9	3.92	S., N., N. E., E., S. W.
August.....	29.372	64.2	4.75	S., N., S. W., N. W., N. E.
September ...	29.503	59.9	3.42	S., N., S. E., E., N. W.
October.....	29.475	60.6	3.27	S., N., N. W., W.
November....	29.467	61.7	1.38	S.,N.W.,W.,N.,S.E.,N.E.
December....	29.562	74.0	3.48	W., N. W., S. E., N., S., E.
Year.....	29.476	62.6	40.83	S.,N.W.,N.,S.E.,W.,N.E.,E.

According to a well-known authority, Dr. Engleman, of St. Louis, the mean annual temperature on a line passing across the State from east to west, not far from its northern border, is 50° Fahrenheit; a little south of the middle, including St. Louis, 53° Fahrenheit; at about middle, including St. Louis, summer mean 75° Fahrenheit; somewhat north of southern border, also including St. Louis, winter mean 32° Fahrenheit. The Doctor states that the climate on the whole is dry and rarely overloaded with moisture, and that it yields an unusual amount of fair weather.

Such meteorological conditions are highly conducive to health, since they admit of and encourage active out-door life at all seasons. Missouri presents such a diversity of surface that all can find localities within its boundaries suitable to their peculiarities of constitution. The Signal Service Reports do not vary greatly from Dr. Engleman's meteorological estimates, but they exhibit one feature which he does not particularly notice, viz.: the great range of the thermometer in the winter, spring and autumn months. The annual range is about 93°; the range of

the spring months averages 80°; of the summer, about 45°; of the autumn, about 65°; and of the winter, a little more than 70°.

The average rainfall all over the State is 40.5 inches, and contrary to the popular belief is greater in the western than in the eastern part of the State, being 46.16 at St. Joseph, and only 37.83 in the same years at Jefferson Barracks, on the Mississippi.

Soil and Vegetation.—The Hon. Andrew McKinley, President of the Missouri State Board of Immigration, a man thoroughly familiar with the soils and productive capacity of the Missouri lands, thus classifies and describes them:

"When the territory now embraced within the boundaries of Missouri emerged from the waters that covered it, the marls of the bluff formation were the upper stratum beneath the soil, of all that section of the State lying north of the Osage and Missouri rivers, and also of the county of St. Louis and other counties lying on the Mississippi river, to the southern boundary of the State. This formation furnishes a deep, porous, flexible and imperishable sub-soil, that absorbs moisture like a sponge and enables the soil to endure greater excesses of rain or drouth than any other. It rests upon the ridges and river bluffs and descends along their slopes to the lowest valleys. Reposing on this surface is a great variety of soils, each in its kind of unsurpassed fertility and productiveness. From time to time animal remains and decayed vegetable matter, in vast profusion, but in just proportions, were added, until the soil formation became complete, and now exhibits all of the essentials for the fullest nourishment of the vegetable kingdom. In the process of the formation of the upper soil, a rank vegetation of grasses, plants and trees sprang up, which was suppressed in the dryer portions by fires that overrun the country. Along the streams, and where there was a scarcity of vegetation, the fires failed to destroy the young trees, which grew apace until strong enough to resist, and then they began to encroach upon the prairies; this they continued to do until more than one-half of the State was appropriated by our magnificent forests.

"The margins of the rivers first received the most extensive deposits of soil matter from floods, which carried down the wealth

of the vast regions they drained, and, upon the subsidence of the waters, deposited it on the lower levels. Each flood furnished its new supply, adding to the height of the bottom lands until, after the lapse of time, they became, for the most part, sufficiently elevated to be above danger of overflow. No rivers of the world can boast of more extensive bottom lands than can the Missouri and Mississippi, and none have soils with ingredients richer, better combined, or more productive.

"For practical purposes, the best classification of the soils of Missouri is that adopted by Professor Swallow, which, after defining them in general as forest, prairie and alluvial lands, indicates their great variety by the kind of timber which is most abundant on them, or, where timber is wanting, by the grasses and plants of the prairie. Following this classification those known as *Hackberry Lands* are first in fertility and productiveness. Upon these lands also grow elm, wild cherry, honey locust, hickory, white, black, burr and chestnut oaks, black and white walnut, mulberry, linden, ash, poplar, catalpa, sassafras and maple. The prairie soils of about the same quality, if not identical, are known as *Crow Foot Lands*, so called from a species of weed found upon them, and these two soils generally join each other where the timber and prairie land meet. Both rest upon a bed of fine silicious marls, and even under most exhaustive tillage will prove perpetually fertile. They cover more than 7,000,000 acres of land. On this soil white oaks have been found twenty-nine feet in circumference and one hundred feet high; linden twenty-three feet in circumference and quite as lofty; the burr oak and sycamore grow still larger. Prairie grasses, on the Crow Foot Lands, grow very rank and tall, and by the old settlers were said to entirely conceal herds of cattle from the view. These lands alone are capable of sustaining a population greater than that now occupying the State of Missouri.

"The *Elm Lands*, whose name is derived from the American elm, which here grows magnificently, are scarcely inferior to the hackberry lands, and possess very nearly the same growth of other timber. The soil has about the same properties, except

that the sand is finer and the clay more abundant. The same quality of soil appears in the prairie known as the *Resin Weed Lands.*

"Next in order are *Hickory Lands*, with a growth of white and shellbark hickory, black, scarlet and laurel oaks, sugar maple, persimmon and the haw, red-bud and crab apple, trees of smaller growth. In some portions of the State the tulip tree, beech and black gum grow on lands of the same quality. Large areas of prairie in the northeast and southwest have soils of nearly the same quality called *Mulatto Soils.* There is also a soil lying upon the red clays of Southern Missouri similar to the above. These hickory lands and those described as assimilating to them, are highly esteemed by the farmers for the culture of corn, wheat and other cereals. They are admirably adapted to the cultivation of fruits, and their blue grass pastures are equal to any in the State. Their area may be fairly estimated at 6,000,000 acres.

"The *Magnesian Limestone Soils* extend from Callaway county south to the Arkansas line, and from Jefferson west to Polk county, an area of about 10,000,000 acres. These soils are dark, warm, light and very productive. They produce black and white walnut, black gum, white and wahoo elms, sugar maple, honey locust, mulberry, chestnut, post laurel, black, scarlet and Spanish oaks, persimmon, blue ash and many trees of smaller growth. They cover all the country underlaid by the magnesian limestone series, but are inconvenient for ordinary tillage when they occupy the hillsides or narrow valleys. Among the most fertile soils in the State, they produce fine crops of almost all the staples, and thrifty and productive fruit trees and grape vines evince their extraordinary adaptation and fitness to the culture of the grape and other fruits. Large, bold springs of limpid, pure and cool waters gush from every hillside and flow away in bright streams, giving beauty and attraction to the magnificent forests of the elm, the oak, the mulberry and the buckeye, which often adorn their borders. The mining regions embraced in this division of the soils are thus supplied with vast agricultural wealth and a large mining, pastoral and agricultural population may here be

brought together in relations scarcely to be found in any other country in the world. Blue grass and other succulent and nutritious grasses grow luxuriantly, even on the ridges and hillsides of the upland forests, in almost every portion of Southern Missouri. The alfalfa grass (*medicago sativa*), so highly prized in California, has been introduced into this part of Missouri, and proves a valuable addition to the forage grasses, yielding eight tons of the best of hay at four cuttings, withstanding summer droughts, and furnishing excellent pasture in October and November.

"On the ridges, where the lighter materials of the soil have been washed away, or were originally wanting, *White Oak Lands* are to be found, the oaks accompanied by shellbark and black hickory, and trees and shrubs of smaller growth. While the surface soil is not so rich as the hickory lands, the sub-soil is quite as good, and the land may be greatly improved by turning the sub-soil to the surface. These produce superior wheat, good corn and a very fine quality of tobacco. On these lands fruits are abundant and a sure crop. They embrace about 1,500,000 acres.

"*Post Oak Lands* have about the same growth as the white oak lands, and produce good crops of the staples of the country, and yield the best tobacco in the West. Fruits of all kinds excel on this soil. These lands require deep culture.

"The *Black Jack Lands* occupy the high flint ridges underlaid with hornstone and sandstone, and under these conditions are considered the poorest in the State, except for pastures and vineyards. The presence, however, of black jack on other lands does not indicate thin or poor lands.

"*Pine Lands* are extensive, embracing about 2,000,000 acres. The pine is the long leaf variety, grows to great size, and is marketable. It is accompanied by heavy growths of oak, which takes the country as successor to the pine. This soil is sandy, is adapted to small grains and grasses, and carries fertilizers well.

"The bottom lands of the southeast are now being rapidly reduced to cultivation by the common effort of the lumberman and settler. A more extensive system of scientific drainage is now

authorized by the State, and effective measures are determined upon. They are of the *Hackberry* variety of soils, and bear the heaviest of timber. The strength of soils is such as to produce great crops with regularity, proved in many fields by more than fifty years of cultivation without rotation of crops."

Agricultural Products.—In 1870 somewhat more than one-half the area of the State—21,707,220 acres—was included in farms, of which, however, only 9,130,615 acres were under cultivation; within the last decade, the amount of improved lands has greatly increased. The culture of the grape and the production of wine has been largely developed, and the vineyards of Missouri are favorably known. The State possesses some advantages for the production of excellent wines, which are not surpassed by those of any other State in the Union, and not equalled by any except California. Two classes of grapes—those which produce the best wines—the *Æstivalis* or summer grapes, and the *Ripara* or river grapes, attain their greatest perfection on her soil; and many of the best varieties of these are either native Missouri grapes or seedlings from them. Of the *Æstivalis* class the "Norton's Virginia" and its seedlings, the Hermann and the White Hermann, the Cynthiana, a grape of wonderful excellence, and the Neosho, a native grape, produce the finest red wines, Burgundies, sherries, clarets and white wines, in the world. Of the river grapes, the Taylor, and especially its seedlings, the famous Elvira, the Amber, the Pearl and others, are of the greatest value for the production of the choicest hocks, still wines and champagnes. Most of these, also, are very fine table-grapes. A wide field is open to the State and to immigrants from wine-growing countries for the production of pure wines of the highest qualities. There are six native varieties of grapes, and they are all, so far as known, proof against the *phylloxera*, that deadly enemy of the grape-vine. Among other special crops are sorghum, now largely cultivated, both for sugar and syrup; flax and hemp, both for fibre and seed; cotton and sweet potatoes in the southern counties, hops and the larger fruits. Apiaculture is also very popular in some portions of the State, and large quantities of honey and beeswax are exported. The following

tables show the production of agricultural staples in the years 1878 and 1879, and also the amount of live-stock, which is a large and rapidly increasing interest in Missouri:

The Principal Crops of Missouri.

Crops, 1878.	Quantity produced in 1878.	Average yield per acre.	No. of acres in each crop.	Price per bushel, pound or ton.	Value of each crop.
Indian corn, bu.....	93,062,400	26.2	3,552,000	$ .26	$24,196,224
Wheat, bu.....	20,196,000	11.	1,836,000	.67	13,531,320
Rye, bu.....	732,000	15.	48,800	.41	300,120
Oats, bu.....	19,584,000	30.6	640,000	.18	3,525,120
Buckwheat, bu.....	46,400	16.	2,900	.52	24,128
Potatoes, bu.....	5,415,000	75.	72,200	.38	2,057,700
Tobacco, pound.....	23,023,000	770.	29,900	.05	1,151,150
Hay, ton.	1,620,000	1.62	1,000,000	6.43	10,416,600
Totals.....	.....	.....	7,181,800	.....	$55,202,362

Crops, 1879.	Quantity produced in 1879.	Average yield per acre.	No. of acres in each crop.	Price per bushel, pound or ton.	Value of each crop.
Indian corn, bu.....	153,446,400	40	3,836,160	$ .25	$38,361,600
Wheat, bu.....	18,984,240	14	1,356,016	1.01	19,174,082
Rye, bu.....	688,080	17	40,475	.61	419,729
Oats, bu.....	15,077,680	25	603,107	.26	3,807,114
Buckwheat, bu.....	46,864	20	2,871	.63	29,524
Potatoes, bu.....	6,570,200	91	72,200	.48	3,153,696
Tobacco, pounds.....	21,411,390	663	32,595	.06	1,284,684
Hay, tons.....	1,012,500	1.06	955,200	9.43	9,547,875
Totals.....	.....	.....	6,898,624	.....	$75,778,304

Missouri is remarkably adapted for grazing and stock-raising generally, and has within her own borders markets so accessible and of such boundless capacity that she can increase her live-stock to any extent without fear of glutting the market. In swine husbandry she is very close to her northern neighbor, Iowa, and no other State, except Illinois, equals these two in the number and quality of its swine. In the number of its sheep it ranks below Texas, California, Oregon, New Mexico and Colorado, but with more enterprise it might easily pass the last three, as it has ranges for sheep equal to any in the world. Her beeves, whether shipped to Europe or to the New York markets, have an excellent reputation, and she is a formidable competitor with Iowa for the excellence as well as the abundance of her dairy products.

Barley, though not named among the crops in above tables, is

raised to the amount of a million bushels or more annually. The average yield is about twenty-eight bushels to the acre, and the price in 1879 was sixty-seven cents per bushel. The production of cotton is confined to the southern counties of the State, and seldom exceeds 1,500 bales. The sorghum crop is becoming a very important one for the State. The following statistics show the number, price and value of the live-stock in the State in January, 1879, and January, 1880:

Live-stock in Missouri, Jan., 1879.				Live-stock in Missouri, Jan., 1880.		
Animals.	Number.	Price.	Total value.	Number.	Price.	Total value.
Horses	627,300	$39.89	$25,022,997	639,846	$45.52	$29,115,790
Mules and asses	191,900	43.38	8,324,622	192,000	57.05	10,953,600
Milch cows	516,200	17.80	9,188,360	526,524	19.21	10,114,526
Oxen and other cattle	1,632,000	14.94	24,382,080	1,648,300	23.33	38,455,306
Sheep	1,296,400	1.59	2,061,276	1,322,328	2.00	2,644,656
Swine	2,817,600	22.1	6,226,896	2,620,368	4.02	10,533,978
Totals			$75,206,231			$101,817,757

Manufactures.—Missouri possesses greater advantages for extensive and successful manufacturing than any other State of "Our Western Empire" and she has improved them in part. In 1870 Missouri ranked as the fifth State in the Union in the annual product of her manufactures, and St. Louis in 1876 was the third manufacturing city in the Union. Within the last decade the State, outside of St. Louis, has nearly tripled, and the city of St. Louis has more than doubled the amount of its manufactures. Great manufacturing centres have sprung up in different sections of the State; St. Joseph, Kansas City, Hannibal, St. Charles, Springfield, Palmyra, Union, Jackson, Columbia, Lexington, Moberly, Sedalia, Boonville and Rolla, are all manufacturing centres of considerable importance. About three-fourths of the manufactures of Missouri are produced in St. Louis, which reported in 1879 manufactured articles of the value of $275,000,000. For the whole State the products of manufactures the same year were estimated in round numbers at $335,000,000. The principal lines of manufacture were approximately as follows: Flouring mills, $40,000,000; carpenters and builders, $20,000,000;

meat packing, $20,000,000; tobacco, including cigars, $14,000,000; iron and castings, $15,000,000; liquors, $10,000,000; clothing, $11,000,000; lumber, $10,000,000; bags and bagging, $7,000,000; saddlery, $7,000,000; oil, $6,000,000; machinery, $6,000,000; printing and publishing, $5,500,000; molasses and sugar, $10,000,000; boots and shoes, $5,000,000; furniture, $5,000,000; paints and painting, $4,500,000; carriages and wagons, $4,500,000; marble, stone-work and masonry, $4,000,000; bakery products, $4,000,000; bricks, $4,500,000; tin, copper and sheet iron, $4,000,000; sash, doors and blinds, $3,250,000; cooperage, $3,000,000; blacksmithing, $3,000,000; bridge building, $2,500,000; agricultural implements, $2,000,000; patent medicines, $2,500,000; soap and candles, $2,500,000; plumbing and gas-fitting, $2,000,000.

Mining Products.—The principal of these now profitably worked are—1. *Lead*, of which the receipts at St. Louis from 1863 to July, 1879, are given in pigs in the following table. (N. B.—A pig of lead is eighty pounds.)

YEARS.	RECEIPTS.	INCREASE.	
	Pigs.	Pigs.	Per cent.
1863	79,823		
1864	93,035	13,212	16.56
1865	116,636	23,601	25.36
1866	149,584	32,948	28.25
1867	144,555		
1868	185,823	41,268	28.55
1869	228,303	42,480	22.86
1870	237,939	9,636	4.23
1871	229,796		
1872	285,769	55,973	24.36
1873	356,037	70,268	24.60
1874	479,448	123,411	34.66
1875	579,202	99,754	21.00
1876	665,557	86,355	14.91
1877	790,028	124,471	18.70
		DECREASE.	DECREASE.
1878	754,357	35,671	4.50
		INCREASE.	INCREASE.
1879	817,594	63,237	8.30

The lead industry of St. Louis amounts annually to over $5,000,000. This includes pig lead, white lead, shot, pipe and sheet lead.

2. *Iron.* With ample facilities for making, at the lowest possible prices, iron enough to supply the whole continent, Missouri has fallen far below her proper position in the production of iron. In 1872 the iron ore mined amounted to 509,200 tons, of which 291,200 tons were exported, and the remainder smelted in Missouri. The same year 87,176⅔ tons of pig iron were produced and shipped to St. Louis. In 1879 the iron product of St. Louis was over $12,000,000.

3. In 1872 11,582,440 pounds of zinc ore were raised and shipped to St. Louis. Of this 10,000,000 pounds were smelted for zinc, yielding 1,727,450 pounds, and the remainder was used for the manufacture of white oxide of zinc. The same year 10,437,420 pounds of barytes were shipped to St. Louis. In 1879 Kansas City alone shipped 15,931,793 pounds of zinc; 32,371,059 pounds of lead, and 55,709,497 pounds of ore.

4. Copper is not now produced except incidentally in connection with other metals. Nickel is shipped to St. Louis from several mines to a large and annually increasing amount.

5. The output of *coal* in the State was, in round numbers, 900,000 tons in 1877, and 1,000,000 tons in 1878. In 1879 the amount was 36,978,150 bushels, or about 1,100,000 tons.

The products of the quarries consist of building-stone of many kinds, granite, sandstones, limestones, marbles, white, black and colored, slate of all kinds, millstones, grindstones, polishing stone, hydraulic lime, glass sand from the saccharoidal sandstone, etc. The amount of quarry products is known to be very large, but we have no statistics of it.

Railroads.—The State is traversed by 3,627 miles of railway. The greater part of the railroad lines are great trunk routes, connected with the Union Pacific, the Northern Pacific, the Atchison, Topeka and Santa Fé, or some of the routes to Texas and the Gulf. Of those traversing Northern and Western Missouri, the Chicago railway kings have obtained and hold possession, greatly to the grief of St. Louis, which is, nevertheless, a great

railroad centre, having nineteen trunk lines radiating from it. The Chicago roads include the Chicago and Northwestern, the Chicago and Rock Island, Chicago and Alton, the Wabash, the Chicago, Burlington and Quincy, the Missouri, Kansas and Texas. The principal roads going westward or southward from St. Louis are the St. Louis, Kansas City and Northern, the Missouri Pacific, made up of several lines, the St. Louis and San Francisco, the St. Louis, Keokuk and Northwestern, and the St. Louis, Iron Mountain and Southern. Hannibal, Louisiana, Quincy, Illinois, St. Joseph and Kansas City are also points at which several important railways originate. There are also a few merely local railways. Of the 115 counties in the State, it is stated that only seventeen are without railroads. The actual cost of road and equipment for the roads within the State has been about $160,000,000. Of course, their stock and debts represent a still larger sum. Recently combinations have been formed with great railway companies holding possession of trunk lines, by which much of the railroad property of the State will become more profitable.

Population.—With the exception of Louisiana, Missouri is the oldest State of "Our Western Empire," having organized as a State in 1820, and having been admitted into the Union in 1821. The following table exhibits its population at various dates of its history, their condition of race, color, birth, etc.:

POPULATION OF MISSOURI.

Census year.	Total population.	Males.	Females.	White.	Free colored.	Slaves.	Natives.	Foreigners.	Density of population to square mile.	Ratio of increase.	Of school age. (Both sexes.)	Of military age, 18 to 45 (males).	Of voting age, 21 years and upwards. Males.
1810	20,845	11,390	9,455	17,227	607	3,011	.....	.....	.32	.....			
1820	66,586	36,544	30,042	55,988	376	10,222	.....	.....	1.02	219.43			
1830	140,455	74,128	66,327	114,795	569	25,091	.....	.....	2.17	110.94			
1840	383,702	203,095	180,607	323,888	1,574	58,240	.....	.....	5.87	173.18			
1850	682,044	357,832	324,212	592,004	2,618	87,422	604,522	76,592	10.44	77.75	273,157	138,248	262,157
1860	1,182,012	622,201	559,811	1,063,489	3,572	114,931	1,021,471	160,541	18.09	73.30	446,397	249,243	293,778
1870	1,721,295	896,347	824,948	1,603,146	118,071	none	1,499,028	222,267	26.34	45.62	577,803	352,998	408,206
1880	2,168,804	1,127,424	1,041,380	2,023,568	145,236	none	1,937,564	211,240	36.34	38.			

There are several things worthy of notice in this table. One

is, the marked disproportion at each census between males and females. This is very singular in a State as old as Missouri. Another is that Missouri, having been a slave State until 1863, there should have been so small a proportion of the African race there, never much exceeding ten per cent. of the entire population, and that after their emancipation their number actually decreased. A third is that while the State is so great a thoroughfare for immigrants and offers such inducements to them, so small a proportion of its inhabitants should be of foreign birth, never more than thirteen per cent., and that the actual number is decreasing.

Counties and Cities.—There are 115 counties in the State, which had in 1870 a true valuation of $1,284,922,897. Their present true valuation would probably exceed $2,000,000,000.

The following table gives the principal towns and cities of the State, with their population in 1870 and as far as reported in 1880. St. Louis is considerably the largest city in "Our Western Empire," although somewhat less populous than its enterprising inhabitants hoped. Kansas City has grown very rapidly, and is now the second city in the State.

CITIES.	Population in 1870.	Population in 1880.	CITIES.	Population in 1870.	Population in 1880.
St. Louis	310,864	350,522	Booneville	3,506	
Kansas City	32,260	55,813	Independence	3,184	
St. Joseph	19,565	32,484	Jefferson City	4,420	
Hannibal	10,125	11,074	Warrensburg	2,945	
St. Charles	5,570		Canton	2,363	
Springfield	5,555		Columbia	2,236	
Sedalia	4,560		Palmyra	2,615	
Lexington	4,373		Pleasant Hill	2,554	
Chillicothe	3,978		Rolla	1,354	
Cape Girardeau	3,585		Mexico	2,602	
Louisiana	3,639		Iron Mount	2,018	
Macon	3,678		Moberly	1,514	6,000

St. Louis is a city of great enterprise, largely engaged in manufactures and in the sale of mining products, dairy products, meats and provisions, mining, agricultural and railroad machinery,

locomotives, cars, wagons, Concord coaches, hollow-ware, and generally articles of steel and iron. Its schools and some of its institutions of higher learning are models in their way, and it has a deservedly high reputation for morality and business probity and honor. Its growth during the past decade has been somewhat retarded by various causes, but it is now increasing with great rapidity.

It is the point of departure for the great volume of travel and immigration to the Western and Southwestern States and Territories, and with its rapidly growing daughter, Kansas City, on the western border, and St. Joseph on the northwestern, manages to secure for Missouri by far the largest part of the passenger and freight traffic of the Great West.

Kansas City, as we have elsewhere said, has concentrated within its own bounds all the principal lines traversing the West, Northwest and Southwest. Its growth has been very rapid, rising from 32,361 in 1870 to 56,946 in 1880, and its schools, churches, public buildings and general improvement have kept pace with its growth in population. Much the same can be said of St. Joseph, Hannibal and Sedalia. They are all railroad centres of considerable importance, and are having a rapid growth.

Lands for Immigrants.—Immigrants coming to the State of Missouri, who desire to buy and improve lands, will have their choice of the following, namely:

1. There are 1,000,000 acres yet belonging to the United States, subject to sale and homestead entry. These lands lie principally south of the Missouri river, in counties heavily timbered, well watered, and are among the best fruit and pasture lands in the United States. It is desirable that these lands should be taken as homesteads by the poorer classes, who will improve them, and add to the taxable wealth of the State. These lands can be purchased at $1.25 per acre where they are not within ten miles of a land-grant railway, and at $2.50 or upwards where they are inside of that limit. They are also subject to entry under the homestead law, which will make the cost of a good farm of 160 acres from $25 to $28, the title being perfectible after five years of residence and improvement. The Timber-

Culture and Desert Land Acts do not apply to public lands in Missouri.

2. There are yet large bodies of swamp lands in different parts of the State. These lands are the richest alluvial lands in the world, which are subject to occasional overflow, which make the best meadow and pasture lands.

3. Much of the land grant made by the general government to the Agricultural College remains unsold, and these lands are now in market.

4. Of the lands belonging to the various railroads, which were granted them by the general government, a considerable quantity are yet for sale. These grants embrace some of the best agricultural lands in the State; well located, accessible to market, with all the conveniences of an old settled country, of churches, schools and markets.

5. There is a large amount of land in the State owned by non-residents, speculators, widows and orphans, who are anxious to part with it.

6. There are many large farmers in the State who are anxious to divide their farms to enable them to reduce these farms to cultivation, and still others who through age, infirmity and other causes, desire to change their business, and will put their land into market at a low rate.

7. There are a great many persons whose property is mortgaged, and who are compelled to make sale of it, to save their equities that remain after the payment of the liens.

The entire aggregate of these lands amounts to several million acres, and they are scattered through every part of the State. The products of these lands embrace everything which may be grown in the temperate zone, from the apple to the orange and fig, from flax to cotton, from the Irish potato to the yam.

The advantages of these lands over those more remote from the great markets, from schools, churches and the social surroundings which make homes desirable, must be obvious; yet these lands have been taken up slowly, while those of Kansas, certainly no more intrinsically desirable, and many of them less so, have found ready purchasers. The reasons for this difference

in the past have been: The Missouri lands have been much less thoroughly advertised; the State has not kept itself before the public to so great an extent, and has, indeed, seemed wholly indifferent to accessions by immigration; the State debt was somewhat large, and with the county and city debts made taxation heavier; the lands, though fairly fertile, were badly cultivated, and gave to the new-comers an impression of their barrenness and worthlessness, which facts did not justify; the farming in many parts of the State was very slovenly and inefficient. On as good lands as those of Missouri, the average yield of wheat should never be as low as eleven bushels to the acre; of corn, twenty-six bushels to the acre, or of potatoes seventy-five bushels to the acre; yet these were the reported averages of 1878. The efforts of the State Agricultural Society have produced some improvements in these crops, but they are, even now, much below what they ought to be. The educational advantages in the country were much inferior to those of the neighboring States of Iowa and Kansas, whereas they ought to have been much better than in those States. There was, moreover, hanging about the State the old taint of slavery. The slaves had been emancipated ten, fifteen, sixteen years before; but the thriftless, indolent, reckless, and sometimes ruffianly spirit engendered by it, still remained in some degree, and this spirit repelled immigration. It is now more than half a generation since slavery was abolished, and most of these untoward obstacles have now disappeared. To-day Missouri is as good a State for the immigrant as any in the Great West, and better than some. Its climate, soil, markets and advantages are unsurpassed, and cordiality toward the stranger is no longer wanting, though perhaps not yet so warmly manifested as in some of the newer States; but this will come in time.

Educational Advantages.—The public schools of Missouri are in an anomalous condition. In the cities the schools are of a high order, and will compare favorably with those in any State or city in the Union. In St. Louis within the last decade, owing to an enormous estimate of more than 100,000 more inhabitants than the city contained, the school population was supposed to be

much larger than it really was, and the city superintendent and other officers were distressed because the scholars enrolled were but two-sevenths, and the actual attendance less than one-fifth of the supposed school population. They understand this better now.

The country schools were, to a large degree, without system or order, and were as much below those of the neighboring States in all good qualities as those of the cities were beyond the same class of schools elsewhere. There are not quite 300 schools of very high character in the State, most of them in the cities; the remainder, numbering nearly 8,200, are of very indifferent quality. In 1875, out of 7,224 school-houses in the State, 2,164 were built of logs; 4,636 were frame buildings, and only 424 brick or stone. The school fund is partly available, and partly at present unavailable. About $3,000,000 are available, and $7,300,000 unavailable now, but will eventually become so. The low condition of the country schools is due in part to the indifference of a considerable portion of the people to education; in part to the apathy of the legislature, and in part to the vagueness and incompleteness of the school law. The superintendent is deserving of great credit for his perseverance and efficiency under circumstances of great difficulty, but his efforts have not been so thoroughly sustained by the legislature as they should have been.

The following are the school statistics of the State for 1878, the last year whose report is published: School population, 688,248; school enrolment, 448,033; number of ungraded school districts, 8,142; number of graded school districts, 279; number of school-houses, 8,092; estimated value of school-houses, $8,321,-399; average school year in months in graded school districts, 9; in all the districts, 5 months; total number of teachers employed, 11,268; total wages of teachers, $2,320,430.20; average wages of teachers per month, males, $36.36; females, $28.09; average wages of teachers per month in graded schools, males, $87.81; females, $40.73.

Revenue.—From interest on State permanent fund, $174,-030.15; from one-fourth the State revenue collections, $363,-

276.32; from county and township permanent funds, $440,-191.37; from district taxes, $2,446,910.71; total, $3,424,408.55.

Permanent Funds.—State fund, $2,909,457.11; county fund, $2,388,368.29; township, or sixteenth section fund, $1,980,678.51; total, $7,278,046.80.

There are five normal schools in the State, besides normal departments in several of the colleges. There is one of these (Lincoln Institute) in Jefferson City for the instruction of colored teachers, which receives $5,000 a year from the State. The appropriations to the other normal schools are $7,500 each per annum. The State University at Columbia, with a School of Mines and Metallurgy at Rolla, has ten different departments or courses, in two groups, academic and professional. The University receives $19,500 annually from the State, and the School of Mines, $7,500. Washington University, at St. Louis, has departments of science, medicine and law, besides its academic course. There are also fifteen other colleges, four of them Roman Catholic, three Methodist, and the rest under the control of other denominations, four of medicine, one of dentistry, and one of pharmacy, beside those which are connected with the State University and Washington University. There are special institutions for deaf mutes, for the blind, for orphans, the aged, etc., etc. Most of these receive liberal appropriations from the State. The educational condition of the State, as a whole, is improving, and will in a few years attain to as high a standard as that of the adjacent States.

Religious Denominations and Churches.—About 315,000, or one-seventh of the population of Missouri, are members of churches, and two-thirds of the population, say 1,575,000, are adherents, more or less pronounced, of these churches. The Baptists have the largest number of churches and church edifices, but are followed very closely by the Methodists, who are, however, divided into Northern and Southern. The Methodist membership is a few hundred more than the Baptist, and their adherent population is about the same—not far from 375,000. The Roman Catholics count all their adherent population as members, and report about 275,000, but their church property,

including their costly cathedral and churches at St. Louis, is estimated at about $4,300,000, or double that of the Methodists or Baptists. The other denominations in their order of churches, membership and church property, are regular Presbyterians, Christians and Disciples, Cumberland Presbyterians, Lutherans, the Protestant Episcopal Church, Congregationalists, United Brethren in Christ and Evangelical Association (both minor Methodist churches), Free Will Baptists, Reformed German, Unitarians, Friends, Universalists, Jews, New Jerusalem Church, and Union. The total amount of church property in the State exceeds $15,000,000; the whole number of churches is about 5,000, and of church edifices nearly 4,000; of clergymen and preachers about 2,900.

Historical Dates.—First settlements in Missouri at or near St. Louis and Cape Girardeau, by the French, probably in 1720; at St. Genevieve about 1755. In 1775 St. Louis was a fur depot and trading station, with 800 inhabitants. In 1803 France ceded all this territory to the United States. In 1805 St. Louis was made the capital of the new Territory of Louisiana. In 1810 there were 1,500 inhabitants within the present limits of Missouri. In 1812 the name of the Territory was changed to Missouri Territory. In 1820 the people prepared and adopted a State Constitution. It was admitted into the Union as a State August 10, 1821, after a bitter and violent controversy in Congress as to its admission as a slave State, by an act known as the Missouri Compromise, which permitted slavery there, but prohibited it in all territory north of 36° 30′ north latitude. This act was virtually repealed in 1854. The people took part in the Kansas difficulties of 1854–59, and were very much divided in the civil war. Several severe battles were fought in the State. A new Constitution was adopted in 1865, and still another in 1875.

CHAPTER XIII.

MONTANA.

SITUATION—BOUNDARIES—EXTENT—MOUNTAINS—TIMBER—LAKES—RIVERS—GEOLOGY AND MINERALOGY—GOLD IN EXTENSIVE PLACERS AND LODES—SILVER—COPPER—LEAD—IRON—OTHER MINERALS—SOIL AND VEGETATION—ARABLE LANDS—GRAZING LANDS—TIMBER LANDS—MINING LANDS—DESERT LANDS—ZOÖLOGY—CLIMATE—BLIZZARDS—THE "CHINOOK" WIND—METEOROLOGY OF FORT KEOGH—FORT BENTON—HELENA—VIRGINIA CITY—MINING—ENORMOUS YIELD OF THE PLACERS—GOLD LODES—SILVER LODES—THE STEMPLE DISTRICT—LAST CHANCE GULCH, NOW HELENA—PHILLIPSBURG—WICKES—BUTTE—PECULIARITIES OF THE BUTTE MINES—OTHER MINES—TRAPPER DISTRICT—MINING THUS FAR ALMOST EXCLUSIVELY IN WESTERN MONTANA—PROBABILITIES OF MINES IN SOUTHERN AND SOUTHEASTERN MONTANA—AGRICULTURAL PRODUCTIONS—TESTIMONY OF Z. L. WHITE—OF ROBERT E. STRAHORN—OF THOMSON P. MCELRATH—ENORMOUS CROPS, OF EXCELLENT QUALITY—STOCK-RAISING—SHEEP-FARMING—BREEDING HORSES AND MULES—GOV. POTTS' EXPERIENCE—MANUFACTURES—OBJECTS OF INTEREST—THE MADISON RIVER—THE UPPER YELLOWSTONE VALLEY—THE STRUGGLE OF THE WATERS TO FORCE A PASSAGE THROUGH—OTHER WONDERS—RAILROADS—BEST ROUTES FOR IMMIGRANTS AT PRESENT—INDIAN RESERVATIONS AND THEIR POPULATION—POPULATION OF MONTANA COUNTIES AND ASSESSMENT—PRINCIPAL TOWNS OF MONTANA—PRICES OF ARTICLES OF GENERAL USE—AVERAGE WAGES—EDUCATION—RELIGIOUS DENOMINATIONS—CONCLUSION.

MONTANA TERRITORY is a central Territory of the northern belt of States of "Our Western Empire." About four-fifths of its area lies east of the Main Divide of the Rocky Mountains. Between this Main Divide and the Bitter Root Mountains, which are a second range of the Rocky Mountains, and form the boundary between Montana and Idaho, is a broad, elevated valley, through which flows Clarke's fork of the Columbia river. East of the Main Divide there are several isolated *mesas* or plateaus, such as the Snake's Head, Beque d'Otard, Bear's Paw, Little Rocky Mountains, the Snow Mountains and Bull Mountains farther south. In the southeast there are several short ranges extending northward from Wyoming, and part of them apparently connected with the Black Hills. These are, begin-

ning with the west, a short spur from the Big Horn range, the Wolf Mountains, Tongue River Mountains, and the Powder River range, which consists of four or five chains of hills of no great elevation, on both sides of the Powder river and its tributaries, and Cabin creek, all affluents of the Yellowstone. The valleys of the Missouri and its three constituent streams, the Madison, Jefferson and Gallatin, of the Yellowstone and its numerous tributaries, of Clarke's fork, the Milk river, Maria's river, Flathead, Musselshell and other rivers, affluents of the Missouri or the Yellowstone, are fertile and level or rolling lands, somewhat elevated, but not cold or bleak. The timber of Montana is peculiar, there being very little hard wood; if deciduous, the trees are almost wholly willow, poplar, linden and cottonwood; the only exception being on Tongue river, near the southern boundary, where there are large bodies of oak; if evergreens, pine, spruce, fir, cedar and balsam. The native grass is mainly the bunch grass, which grows to the height of four or five feet, and is the most nutritious of all the native grasses of this region for cattle, fattening them more thoroughly than corn or barley. Flowers are abundant in their season in all the valleys.

Montana is bounded on the north by British Columbia; on the east by Dakota; on the south by Wyoming and Idaho; on the west by Idaho, from which it is separated by the Bitter Root Mountains. It lies between the parallels of 44° 6′ (its southwestern corner only extending below 45°) and 49° north latitude; and between 104° and 116° west longitude from Greenwich. Its greatest length from east to west along the 48th parallel is over 700 miles; and its greatest breadth near the 113th meridian is about 340 miles. Its area is 143,776 square miles, or 92,016,640 acres.

Mountains, Lakes, Rivers, etc.— Montana is appropriately named, for mountain ranges, spurs, isolated peaks and hills constitute a large portion of its surface. Yet between, around and among these mountains are a great number of as lovely valleys as the sun ever shone upon. The mountains, unlike those of Idaho, are not, with a few exceptions, bare, with steep and inaccessible sides, but rounded summits, covered either with grass

or timber to the very top. They are admirably adapted to grazing, and of all the lands of "Our Western Empire," Montana is likely to be most completely the grazier's paradise. The summits are none of them so lofty as some of those in Idaho or Colorado, none of them reaching 11,000 feet. There are three peaks in the Yellowstone Park which are credited, not all of them correctly, to Montana. Of these Electric Peak is 10,992 feet; Mount Washburn, 10,388 feet, and Mount Doane, 10,118 feet. Aside from these there are but six peaks above 9,000 feet in height. These are: Emigrant Peak, 10,629; Ward's Peak, 10,371; Mount Delano, 10,200; Mount Blackmore, 10,134; Old Baldy, 9,711, and Badger's Peak, 9,000 feet. There are four passes over the Rocky Mountains within the limits of the Territory: Cadott's pass, between the 47th and 48th parallels, 6,044 feet high; Deer Lodge pass, between the same parallels, 6,200 feet; Lewis and Clarke's pass, 6,323 feet, and Flathead pass, in the north of the Territory, 5,459 feet. The general elevation of the Territory is from 2,500 to 3,000 feet.

Montana is not, like Minnesota, a land abounding in lakes. There are not more than ten or twelve in the Territory; of these Flathead lake is the largest, and Grizzly Bear lake, a triangular lake in the western part, nearly north of Helena, the most peculiar in form.

Montana is certainly well supplied with rivers, though portions of it may need irrigation. The Missouri, including its head waters, has a course of more than 1,200 miles in this Territory; the Yellowstone, its largest affluent, about 850; Maria's river, Milk river, Breast or Teton river, Rolling Branch and Park river are the principal tributaries of the Missouri on its north bank; on its south bank it receives Red Water, Elk Prairie and Big Dry creeks, and the large and important Musselshell river, the Judith river and many smaller streams, besides the three forks, Jefferson, Madison and Gallatin, which unite to form the Missouri. The Yellowstone, rising in Yellowstone lake in the National Park, has numerous affluents, especially on its south bank; among these are Clarke's fork, Pryor river, the Big Horn or Wind river, Rosebud creek, Tongue river, the Powder river with its numerous

branches, and Cabin creek. In the valley, between the Rocky and Bitter Root Mountains, the Clarke's fork of the Columbia river has a course of about 300 miles, and the Lewis fork or Snake river, another affluent of the Columbia, has its source in Yellowstone National Park, and perhaps within the bounds of Montana. The Kootenai, probably still another tributary of the Columbia, has its head waters in Northwestern Montana. Clarke's fork has two or three affluents of considerable size, the most important of which are the Missoula and the Flathead river; the latter passes through Flathead lake. Nearly all these rivers furnish abundant water-power.

Geology and Mineralogy.—The volcanic action in the past, and the repeated epochs of upheaval, have made the geology of Montana somewhat involved, but some simple explanations will give the reader a tolerable understanding of it. In the early geologic ages, the eastern half of Montana seems to have been a shallow sea, and its deposits were of chalk and the chalky limestones of the cretaceous period. These cretaceous deposits were succeeded farther west by the rocks of the Wealden and Jurassic periods—limestones, sandstones and shales, and during their deposition, as well as that of the cretaceous rocks farther east, there was a great abundance of the lower forms of animal life of gigantic size, mollusks and radiate animals, and some fish. The ammonites, conchifers, gasteropods, terebratulæ and other radiates and mollusks found in these rocks are among the largest of these fossils ever discovered. Fossil plants are also plentiful, and, in the Wealden, fossil insects, reptiles and fish abound; at the western limit of these beds there are narrow belts of Silurian rocks. Over all the Rocky Mountain region, in the Bitter Root range and the valley between, as well as in occasional patches east of the mountains, especially in the isolated mountains and buttes of Central Montana, we have evidence of repeated and violent convulsions of nature, and the ejection of vast quantities of lava and of molten azoic and metamorphic rocks through the superimposed strata. There were at one time numerous active volcanoes in this region. The repeated upheavals and their time of activity was probably mainly during the

tertiary period, though a later upheaval occurred in the post-tertiary or quaternary period, perhaps almost within historic times. As a result of this action, the whole of the Rocky Mountain summits and those of the Bitter Root Mountains, Bear Paw, Great and Little Belt, Crazy, Judith, Snowy and Highwood Mountains, are composed of eozoic rocks, granite, porphyry, trap, etc., and contain many veins and lodes of gold, silver, copper, lead and zinc, and possibly platinum and quicksilver. The course of these veins, as well as the regular position of the stratified rocks, is greatly disturbed and deranged by the frequent dikes of porphyry, trap and obsidian which have intruded upon the others when in a state of fusion.

Bordering these igneous rocks we find belts of Silurian rocks, and beyond these the Jurassic and Wealden beds, often overlaid by either tertiary or post-tertiary deposits, and these by alluvium. Farther south, in the Yellowstone Park, we find abundant evidence that volcanic action, though feebler now than formerly, has not yet ceased. After the volcanic action of which we have spoken, Montana must have presented the appearance of a series of large fresh water lakes whose shores were the summits of the present mountain ranges. From these mountain slopes came extensive glaciers, as the elevation was greater than now after many ages of denuding action and the intense cold of that time favored the formation of these glaciers, which carried down in the glacial deposits large quantities of gold and silver, and thus formed those immensely rich placers which have yielded such vast quantities of gold. While the glaciers, by their denudatory action, reduced the mountains and cut them into the most fantastic shapes, there must have been also a gradual subsidence of these elevated plains, and this subsidence rendered the climate milder, and thus the ice of the glaciers, melting the moraines or debris, were deposited along their course. The boulders scattered by these glaciers are found all over the western half of Montana, and to a considerable extent in the southeast also. Eastern and Northeastern Montana, having been originally the bed of a lake, have not undergone so many changes, and the superficial geology is later; the tertiary and post-tertiary deposits are

the surface rocks of this region, though there are occasional outcrops of the cretaceous rocks. It is a disputed point whether the lignite or brown coal of the region lying west of the Little Missouri river and extending almost to the Rocky Mountains, and from the Black Hills nearly to the British line, belongs to the tertiary or to the cretaceous epoch, but the opinion of the most eminent geologists is in favor of its being a tertiary deposit. It is a very good coal, and is coming into demand largely not only for the Northern Pacific Railway, which traverses it for hundreds of miles, but for domestic purposes, for which purpose it is far better than the cottonwood and linden firewood, and is less than half the price of wood.

The mineral wealth of Montana is very great. The whole region lying west of the Big Horn, Musselshell and Milk rivers, comprising fully three-fifths of the Territory, is full of gold and silver. The placers and gold lodes of this region lying west of the foot-hills of the Rocky Mountains, comprising not more than one-fourth of the Territory, have yielded in gold since 1863 about $140,000,000 in gold and $10,000,000 or more in silver. Eastern Montana, except perhaps in the southeast, is better adapted to agriculture and grazing, though this, as we have said, includes extensive beds of coal. Of other minerals, copper, lead and zinc are found extensively, the last two generally in connection with silver. There are immense beds of iron ores. Petroleum has been discovered at several points. The silver ores of Montana belong to the refractory class, and the principal obstacle in the way of a much greater annual yield from the rich silver mines of Montana has been due to this very refractoriness. The ores averaged perhaps sixty-five to seventy-five ounces of silver, and from twenty to forty-five per cent. of lead to the ton, but in the various processes necessary for their reduction—processes which could only be conducted at Omaha, Newark, N. J., or Freiberg, Germany, and the enormous expense of their transportation to a railroad, the nearest being about 300 miles distant, and the freight very heavy, while the reducing processes were also expensive—there was a necessary expenditure of from $108 to $114 per ton, and the returns did not come in under from four

to six months from the time of shipment of the ore. Under these circumstances the mining companies lost money on all ores which did not yield at least 140 ounces of silver to the ton, and even on 150 ounces they only made a mere pittance. Several attempts were made to establish reduction works at some point in the Territory, but owing to the immense cost of their transportation and bad management afterwards, they all proved failures. The last effort was made in 1879 at Wickes, and has proved successful, and as the Utah and Northern Railroad now traverses this part of the Territory, and the Northern Pacific will soon be there, the days of costly transportation and high cost reduction have come to an end.

Soil and Vegetation.—In the western, central and southern portions of the Territory, the land along the valleys adjacent to the streams is rich and well adapted to agriculture, large crops of grain, vegetables, etc., being produced with little or no irrigation. The soil of the table lands is generally good, only requiring irrigation, for which abundant water can be had, to produce largely; while the foot hills are covered with an abundant growth of nutritious grasses extending to the timber line. In the northern and eastern portions of the Territory are vast tracts of so-called Bad Lands; but these have a much worse name than they deserve, many portions of them being covered with grasses more or less abundant, and affording grazing to large herds of buffalo, antelope, etc., and where there are stock farms near, to cattle also. The Territory is well timbered throughout, though, as we have already said, the soft woods, whether evergreen or deciduous, predominate largely. There are some small groves of ash, and large bodies of oak have lately been discovered on the head waters of Tongue river, near the southern boundary. The forests in the immediate vicinity of the settlements have suffered somewhat from the wanton depredations of settlers, who often destroy half a dozen small trees in obtaining one of requisite size for their purposes; but even in those sections, where the hillsides have been stripped entirely bare, there is a sturdy and flourishing second growth. The loss from forest fires is far greater than from any other source, but as the country becomes

more settled, and the Indians, who are most careless with fire, are kept upon their reservations, these will become less frequent. Until the present year (1880), there being no railroad for the transportation of grain out of the Territory, and the steamboat navigation interrupted by falls and rapids, there was no export demand for Montana grain. This is all changed now; the Northern Pacific enters the Territory from the east, and is already near Powder river, while the Utah and Northern is already at Helena, and will probably go further, and the Pend d'Oreille Division of the North Pacific, which communicates directly with the Pacific through the Columbia river, will soon be stretching down the valley of Clarke's Fork. With these three outlets the agricultural lands of Montana will be rapidly taken up, and there is no better land for agricultural crops in the world. The yield per acre of grain, vegetables, etc., with irrigation where it is needed, and without it where it is not, is very large, and the quality is of the best. Montana wheat especially is unexcelled; careful analysis has demonstrated that it contains a larger amount of both the flesh and fat producing constituents than any other, and the weight is from sixty-four to sixty-nine pounds to the bushel (the standard being sixty), and the average yield from thirty to forty bushels. The Territory will not only be self-sustaining in respect to its cereals, but will have for many years to come a large supply for exportation.

Zoölogy.—The larger game animals are abundant in Montana. This is one of the few remaining haunts of the buffalo, which is now found in considerable numbers both north of the Missouri and south of the Yellowstone. The moose is seen, though not in large numbers, in the mountain gorges. The elk roam in large herds on the mountain slopes and in the valleys, as do the two species of deer. The Big Horn or Rocky Mountain sheep and the antelope are at home all over the Territory. Bears, badgers, gray wolves, panthers, beaver, otter, marten and mink, are found in the forests and streams in great numbers, and are largely captured for their pelts. In the mountain streams are an abundance of salmon trout, brook trout and grayling; and in their season the rivers and lakes are alive with wild geese,

brant, ducks of numerous species, and teal. The birds of prey are less numerous than farther south, though there are two species of eagle and many hawks and owls. Song birds are abundant.

Climate.—"In a general way," says Mr. Thomson P. McElrath, in his excellent little volume on the Yellowstone valley, just published, "the climate of Montana may be compared to that of the western sections of the Middle States. The summers are very warm, but, as a rule, the winters are far from being rigorous. The mean annual temperature of the valleys of Montana is 48°, which is higher than that of Massachusetts, Connecticut, Michigan, Wisconsin or Iowa, and only a little lower than that of Nebraska, Illinois and Ohio. Owing to the purity and dryness of the atmosphere, the heat, which is in the ascendency during five months of the year, is seldom oppressive. There is a reduced tendency to perspire, and out-door exercise with the mercury at 100° is not nearly so uncomfortable as it is in the East under considerably lower conditions of caloric. A brief rainy season sets in annually, in April or May, lasting with considerably more persistency than in corresponding latitudes on the Missouri river, until the middle of July, under the refreshing influence of which vegetation receives a wonderful impulse. The same amount of rain distributed through the whole year would be of little value to the agriculturist. During the rest of the year rain seldom falls in large quantities." *

The average mean temperature of Helena, Montana, which is 1,000 feet higher than many of the valleys, is 44.5 degrees; that of six stations in Minnesota for the same time 41.6 degrees; the amount of rain and melted snow at Helena, 22.36 inches; in Minnesota, 27.89 inches. The average temperature of the winter months at Helena is 23.7 degrees; of Minnesota, 21.3 degrees.

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* In the first part of this volume we animadverted with some severity upon some papers published in the *North American Review* and the *New York Tribune*, by Colonel (now Brigadier-General) Hazen, U. S. A., in relation to the climate, rainfall and fertility of Montana. These papers have brought upon General (Colonel) Hazen a large but just measure of opprobrium, because he wrote without any thorough acquaintance with the actual climate and character of the region he was denouncing, and because many of his statements in regard to it have been effectually disproved. His recent appointment as Chief Signal Service Officer may convince him of his errors.

The mean annual temperature of Maine and New Hampshire for six years (from 1866 to 1872) was 43.7 degrees; of Vermont, 43.2 degrees; that of the valleys of Montana, 48 degrees; yet half of Maine and nearly the whole of Vermont and New Hampshire are below the 45th parallel, which forms Montana's southern boundary. The mean annual temperature of Wisconsin for five years (1866 to 1871) was 44.8 degrees; of Michigan, 45.8 degrees; of Iowa, 46.4 degrees; Massachusetts and New York, 47.3 degrees; Connecticut, 47.6 degrees; Nebraska, 48.6 degrees; Illinois, 49.9 degrees; Ohio, 51.2 degrees.

The Missouri river at Helena is thoroughly open a month earlier each spring than at Omaha, 500 miles further south. The rainy season is in June, while the amount of rainfall is three-fourths that of Minnesota.

The winters are generally open, the long nights at that season being quite cold, but the days brilliant and far milder than would be expected in so high a latitude. The dryness of the atmosphere likewise prevents the cold from being as severely felt as it is in damp climates. The snow fall in the valleys is in most winters quite light, and after falling it is quickly melted or carried off by evaporation. The army officers stationed at Fort Keogh declare that until the past winter they have never enjoyed sleighing on the prairies for a week at a time, except occasionally in March, when the clear weather which had prevailed almost unbrokenly since the previous rainy season gave way to a short period of cold squalls accompanied by snow. These wind storms are liable to occur at any time during the year, resembling in the sudden lowering of temperature which accompanies them the chilling "northers" of the Gulf of Mexico, and occasionally equalling in their vehemence and abrupt subsidence the hurricanes which prevail on our South Atlantic coast yearly, from the middle of August to the middle of September.

Another phenomenon of a more agreeable character witnessed frequently in the winter season is the occurrence of the so-called "Chinook wind," a balmy zephyr, which, wafted from the Pacific Ocean and penetrating the gaps and passes of the Rocky Mountains, converts winter cold into summer warmth so suddenly that

sometimes a foot depth of snow will evaporate and disappear under its influence in the course of a single day. This is the realization of the "Japan current" theory, and while it prevails, it fully justifies that idea. One writer says: "I have known a foot of snow on the level to fall during the night and every patch of it to be melted before noon of the next day; and there are open spells in mid-winter, often lasting many days, when the trapper is comfortable without a coat over his woollen shirt." General Miles and others at Fort Keogh testify to similar facts. The winter of 1879–80 was exceptionally cold and protracted. From the end of November to the middle of March there was almost continuous sleighing in the lower Tongue river region, though the snow was not deep and the mercury, ranging in the vicinity of zero for several weeks, reached on one occasion, and probably only momentarily, on the night of December 24, 1879, as low a point as —57°. The Indians about Fort Keogh declared emphatically that they had never known the cold weather before to be so intense and so long continued. Notwithstanding the remarkably low temperature which prevailed for so long a period, no extraordinary discomfort was experienced beyond a few frozen fingers and toes on the part of travellers and soldiers unavoidably exposed on the bleak prairie roads, and not a single instance has been announced of cattle perishing from cold on their snow-covered pastures. The "Chinook wind" did not seem to manifest itself as efficiently as usual during that winter season. There was not much snow, however, in the valley twenty miles above Miles City; and eighty miles up the Tongue river the cold was not nearly so severe as that above recorded. Subjoined is a condensed summary never before published of the meteorological observations made at the United States signal station at Fort Keogh since the occupation of the valley by white residents. The observations were begun in the middle of January, 1879. The table shows the highest and lowest temperature recorded during each month, the average daily temperature, the range of temperature in each month, and the total rainfall.

Thermometric Observations at Fort Keogh, 1879–80.

MONTH.	TEMPERATURE. Highest.	TEMPERATURE. Lowest.	Mean temperature.	Range.	Total rainfall, Inches.
1879.	°	°	°	°	
January (from 13th)	36	11	32	25	.26
February	52	—15	23	67	.69
March	76	—25	40	101	.28
April	76	23	60	53	2.20
May	85	30	66	55	2.75
June	94	40	74	54	5.23
July	100	50	83	50	5.90
August	97	40	83	57	1.84
September	96	33	71	63	.44
October	90	12	58	78	2.47
November	94	— 5	42	99	.11
December	42	—46	2	88	.58
1880.					
January	50	—18	...	68	.32
February	54	—19	...	73	.17
March	72	—24	...	96	.51

Annual range, 146 degrees.
Total rainfall and melted snow in 1879, 22.75 inches.

The figures in the fifth column form a more effective refutation of the "barren land" theory than any argument that could be framed in words alone. But the collateral facts speak yet more emphatically than the figures!

In further illustration of the climate, we add the weather report from Fort Benton, Montana, which lies on or near the forty-eighth parallel:

Weather Report at Fort Benton from January 1, 1872, to July 1, 1879.

	1872.	1873.	1874.	1875.	1876.	1877.	1878.	First six months 1879.
No. of fair days	305	291	277	289	286	300	195	110
No. of cloudy days	60	74	88	76	79	65	169	70
Mean temperature of year	37.25	42°	42°.5	43°.5	30°.75	41°.00	48°.00	
Spring	11°	25°	13°	17°	14°	24°	37°	21°
Summer	48°	52°	56°	55°	54°	50°	55°	58°
Autumn	61°	63°	68°	66°	61°	58°	64°	
Winter	29°	28°	33°	36°	30°	32°	36°	
	In.	In.	In.	In.	In.	In.	In.	Inches.
Average annual fall of rain or melted snow	17.00	12.72	23.76	21.84	20.64	12.72	20.40	21.60

This shows an average of 275 fair days for each year.

We also give from the Surveyor-General's office in Helena the following record of temperature and weather in 1878–9:

Record of Temperature at Helena, Montana, from July, 1878, to June, 1879, inclusive, taken at the office of the Surveyor-General for Montana.

Month.	Highest.	Lowest.	Mean.	Clear days.	Cloudy days.	Snowy days.	Rainy days.
	°	°	°				
July, 1878	98	50	74	24	1	.....	6
August, 1878	94	51	70⅔	28	2	.....	1
September, 1878	85	30	54⅙	16	10	1	3
October, 1878	76	12	46⅔	14	12	1	4
November, 1878	62	22	41⅔	23	5	2	
December, 1878	52	0	27⅓	9	15	7	
January, 1879	52	—12	23⅛	23	5	3	
February, 1879	62	—11	26	19	4	5	
March, 1879	71	8	38⅓	24	4	3	
April, 1879	70	27	49	16	13	.....	1
May, 1879	77	30	53⅓	14	12	.....	5
June, 1879	80	43	59⅕	12	5	.....	13
For the year	98°	—11	44.6	222	88	22	33

We add also the—

Meteorology of Virginia City, Montana, 1878.

Year and Months.	Temperature.				Moisture.		Barometer.	Winds.
	Maximum Temperatures.	Minimum Temperatures.	Mean Temperatures.	Range of Temperature.	Annual and Monthly Rainfall.	Mean Humidity.	Annual and Monthly Mean Pressure.	Prevailing Winds in the Order of their Frequency.
	°	°	°	°	inches.	per cent.	inches.	Direction.
Year	92	—15	42.2	107	20.66	54.0	29.705	Calm, S. E., W., S.W., N.E.
January	43	—4	23.1	47	0.45	62 5	29,661	Calm, S. E., S. W., N. E.
February	49	10	27.9	39	0 62	63.2	29,536	Calm, S. W., S. E., W.
March	64	11	37.8	53	0.91	58.2	29,657	S. E., calm, S. W., W.
April	65	19	39.8	46	1.83	57.0	29,565	W., S. E., S. W., E., calm.
May	70	25	45.5	45	5.13	54.8	29,668	Calm, S. E., N. E., W., S.W.
June	85	35	58.6	50	3.78	48.0	29,766	Calm, S.E., W., N.W., N.E.
July	92	42	67.2	50	0.88	36.9	29.745	Calm, S. E., W., S., N. E.
August	90	50	69.2	40	2.16	45.4	29,808	Calm, S. E., N. E., E., W.
September	88	26	48 9	62	1.36	54.5	29,771	Calm, S. E., W., N. E.
October	64	9	38.9	55	0.98	59.7	29,734	Calm, W., N. W., S. W.
November	59	11	35.1	48	0.31	54.0	29,777	Calm, S. E., W.
December	46	—15	17.7	61	0.65	72.0	29,785	W., calm, S. W., N. W.

Mining.—It is matter of history that in 1852, a Scotch half-breed from the Red River country, returning from California,

found gold on Gold creek, in Deer Lodge county. This was, of course, a placer, though apparently not a very rich one. Others who had heard of this find, in 1856 prospected Benetsee creek, in the same vicinity, and found some gold, as did another party who came thither in 1858; but being without provisions or tools, and the Indians being hostile, they soon abandoned the country. In 1860, Henry Thomas, better known as "Gold Tom," sunk a shaft down to the bed rock on Benetsee creek, a depth of thirty feet; but owing to his poverty and disadvantages for work, having but little food and but few tools, he only made about $1.50 a day. From 1860 to 1863, the Stuart brothers, James, Granville and Thomas, a Mr. Anderson, M. Bozeman, S. T. Hauser, F. Louthan and others, were the principal pioneers in gold discoveries in what is now known as Southwestern Montana. The earlier discoveries were all of placers, some of them exceedingly rich. Alder gulch, on which Virginia City is situated, was probably the richest placer ever discovered in any part of the world. At first the product was from $100 to $200 a day for each man, and in the first five years after its discovery Alder gulch and its tributaries yielded on an average $8,000,000 a year. The total product from this single placer up to the end of 1876 was $70,000,000. Latterly it has fallen off to $600,000 or $800,000 a year. Silver Creek gulch, about twelve miles from Helena, and Last Chance gulch, upon which the town of Helena itself is situated, have also proved very rich placers, the two yielding about $16,000,000 since their discovery. Mining is still continued in these and other placers, and the advent of railroads into the region has caused machinery and timber to be brought there at so much less expense, and the gold product sent to market at so much cheaper rates, that hydraulic mining on a most extensive scale is to be resorted to in all the best placers. The total product of gold from placer mining in the Territory has been variously estimated at from $120,000,000 to $140,000,000. It is difficult to determine the exact amount, as the returns of the placers and the quartz veins or lodes have not in all cases been kept separate. It is probably not less than $125,000,000.

Quartz mining for gold began in Montana almost simultane-

ously with that of the placers. The first lode located was discovered near Bannock, in Beaverhead county, in 1862, and the mine was called the Dakota. Mr. Warner, in his "History and Directory of Montana," says that the decomposed quartz found near the surface of this vein was taken down the hill on which it was situated, to the creek, on pack animals, and the gold was there washed out. In the spring of 1863 a small water-mill for crushing this quartz was completed. The stamps were made of old wagon-wheel tires welded together and had wooden stems. Other mills were subsequently erected, and gold in small quantities has been taken from this and other mines in the vicinity almost ever since. Gold quartz ledges were discovered in the vicinity of many other placer mines, and the ores have been worked on a small scale in different parts of the Territory. A few of the lodes have produced large quantities of bullion. The chief obstacles to the development of the gold quartz mines of Montana have been lack of capital, bad management due to want of experienced superintendents, and the enormous cost of machinery. When freights from Chicago or St. Louis were never lower than five cents, and frequently as high as ten, twelve or fifteen cents a pound, it cost two or three times as much to bring machinery into Montana as was paid for it at the place where it was manufactured, and a man not only had to have a good mine but considerable ready capital in order to be able to develop it and bring it into a paying condition. Some of the most promising gold mining enterprises in this Territory have also failed on account of ignorance or extravagance in their management, and these failures have deterred capitalists, who at best were timid about investing their money in a country so difficult of access, from becoming interested even in the good properties.

The principal mines of gold in quartz lodes are almost as numerous as the placers. After the Dakota, which still yields a fair amount, are the Union lode and others in Lewis and Clarke county, which have yielded about $3,000,000; the Atlantic Cable lode, in Deer Lodge county, a very rich mine; while there are mines which have paid well for a number of years at Unionville and the Park, four miles from Helena, at Silver Star, Summit,

Alder, Meadow Creek, Iron Rod, Bannock, Radersburg, Pony, Boulder and Highland. But the richest quartz gold mines in Montana are those of the Stemple District, fifteen to twenty miles northwest of Helena. The famous Penobscot and other extensions of the Snow Drift lode are probably the most valuable gold quartz mines in the world. Mr. Nathan S. Vestel first developed the Penobscot mine, which is on the summit of the main range of the Rocky Mountains. His first efforts in 1877 did not meet with much encouragement, and late in the year he found himself $7,000 in debt and in doubt where he could obtain the means of payment. But the three shafts he had sunk on the Penobscot claim began to show good results, and the first clean-ups from a little five stamp mill, which had been brought there, gave him $20,000, with which he paid his debts and had $13,000 over. The yield now increased rapidly, some of the ore yielding $1,000 in gold to the ton, and the average being more than $100 to the ton aside from the waste, which was considerable, as it was in very fine particles. In the summer of 1878 he sold the mine to Mr. William B. Frue, of Detroit, on terms from which he realized $350,000. It has proved a very profitable investment, yielding about $23,000 a month. Mr. Vestel immediately commenced developing another mine, 900 feet below the Penobscot, which is yielding about $12,000 a month. It is called the Belmont. Other mines of this district and vicinity are the Blue Bird, Whip-poor-will, Black Hawk, Viola, Grey Eagle, Emma Miller, Mount Pleasant, Green Northern Light, Piegan, Humbug and Long Tom. These are all paying largely. The gold quartz mines have yielded since 1864 over $20,000,000; of the $162,000,000 of the precious metals sent to market to the end of 1879, about $145,000,000 are gold and the remainder silver.

The silver ores of Montana are mostly refractory, and have proved difficult of reduction, and in the past would only pay when they were very rich. Now the machinery, and concentrating, stamping, smelting, wasting, chlorodizing, amalgamating and leaching works are all in the Territory and easily accessible by railway, and the silver ores, which are, many of them, very rich, will yield great profits to the mine-owners and ore reducers.

The most important of these works are those of the Alta Montana Company, which owns several mines also, at Wickes, about twenty-five or thirty miles southwest of Helena, and about midway between the Utah and Northern Railroad and the Rocky Mountain Division of the Northern Pacific. When these works were first established they proved a failure, but they have now been taken up by an enterprising company from the East, with large capital, and are achieving a grand success. The Colorado and Boulder Districts have a large number of silver mines, with very rich lodes, many of which will contribute to the supply of ores to be reduced at Wickes. Another extensive silver lode, the earliest one discovered in Montana, is in the district of Phillipsburg, in Deer Lodge county, nearly 100 miles west-southwest of Helena, in the elevated valley between the main Rocky Mountain chain—the "Great Divide"—and the Bitter Root Mountains. This is on the surveyed route of the Rocky Mountain Division of the Northern Pacific. The Speckled Trout, the Algonquin and the Hope mine are the largest and most promising mines in this district. These have yielded somewhat largely of argentiferous galena, with considerable sulphur and other combinations. The yield is from seventy-five to ninety ounces of silver to the ton. Owing to heavy expenses, these mines have not proved very profitable till recently. But the most remarkable of all the mining districts is Butte and its vicinity, also in Deer Lodge county, but east of the Great Divide. The silver ores were first discovered in 1864 (or perhaps earlier), but the working of them could not be made profitable on account of their refractory nature and the great cost of transportation. They again attracted attention in 1874–5, and Butte City has a population of about 3,500, and in its immediate vicinity are twenty or more mines, all yielding well. The ores are of different kinds, and require different processes for their reduction. There is a silver-gold belt, with no copper, but some galena and oxide and carbonate of manganese. Above the water-line this is free milling, and can be reduced with a moderate amount of labor. Below the water-line it is baser, and requires chlorodization and roasting for its reduction. The silver predominates, but there is a small

amount of gold mixed with it. The yield ranges from twenty-five to one hundred and eighty ounces of silver to the ton. One mile east of this is a belt of copper ore of great richness, but containing some arsenic. The yield is about 400 pounds to the ton. In a contrary direction, a mile and a half west of the silver-gold belt, just beyond the Butte, is an extensive lode of chloride of silver, on which several mines have been opened, but though apparently very rich, it has not yet been largely developed. There are now extensive reverberatory furnaces for smelting these ores, and when reduced to a matte carrying from 600 to 900 ounces of silver to the ton, they are sent to Denver to be parted. Most of the mines are what are known as surface mines; that is, they do not penetrate below the water-line. Indeed, it was found that the ores rapidly depreciated in quality as they approached this line. The owners of the Alice mine, one of the best of the surface mines, had the courage, against the opinion of all the other miners, to go below the water-line, and, following the vein, to ascertain whether it would not improve as they reached deeper levels. They have expended $600,000 on this experiment, all of which, however, had been made out of the mine, and at 300 feet depth found the ore much better, and at 400 and 500 feet they were richer than at the surface. Encouraged by this they have proceeded to strike the vein at a depth of 800 feet. The silver deposits at Butte are believed to be more extensive than any yet discovered in Montana. The production of silver and gold at this camp to September, 1880, had been somewhat more than $4,000,000, and is likely to be largely increased.

Glendale and the Trapper district, situated in and around the Trapper Creek Cañon, in Beaverhead county, but on the eastern side of the "Great Divide," has come into notice within the last four years, and is regarded by Mr. Z. L. White as one of the two successful silver camps of the Territory, Butte being the other. The mines which have proved most profitable are on White Lion Mountain, about 9,000 feet above the sea. The ore is found in a wide belt of dolomite or soft white limestone, lying between two limestone strata of a much harder texture. The bulk of the ore in these mines is decomposed, earthy, and easily

mined with pick and spade. It consists of silver, copper, sulphur, lead, arsenic, antimony, aluminum and silica, with occasionally a little undecomposed galena. It yields on an average from eighty to one hundred and twenty ounces of silver to a ton.

There are several copper mines in the Territory, one large deposit of copper ores being at Copperopolis, on the head waters of the Musselshell river. There is also a beginning of iron mining in the Territory. Coal mining is becoming a profitable pursuit along the Missouri and Yellowstone Divisions of the Northern Pacific Railroad. The mining products of Montana in 1879 were about $10,000,000—an amount which will soon be doubled.

It is worthy of notice that all the vein and lode mining, whether of gold or silver, has been confined to the southwestern section of Montana, a region lying west of a line drawn southward from the junction of the Dearborn river and the Missouri, and striking the Yellowstone at or near Fort Ellis, thence along the Yellowstone to the Yellowstone National Park. It comprises both slopes of the "Great Divide," extends across the valleys beyond, and includes the eastern slope of the Bitter Root Mountains. That this is not the only part of the Territory which contains gold deposits appears from the fact that rich placers have been found in Missoula county, northwest 175 miles or more from Helena, and east and northeast of the Missouri river as far as the slopes of the Bear's Paw Mountains, northeast of Fort Benton; and where there are placers the gold and silver lodes are not far off. We may look confidently for further discoveries of both gold and silver in the detached and isolated mountains of the Territory, and very possibly extensive gold lodes in the Powder river range, in the southeast of the Territory, that range having strong geological affinities with the Black Hills. There have been some gold and silver lodes of rich promise recently discovered on Clarke's fork of the Yellowstone, about the middle of the Crow Indian reservation, and negotiations are now in progress with the Crows to cede this part of their reservation.

Agricultural Productions.—Writers on Montana have generally estimated its arable lands at 15,000,000, or at the utmost

16,000,000 acres; but the recent reports of the Surveyor-General of the Territory, and of the missionaries and travellers who have been up the valley of the Yellowstone and through Eastern Montana indicate that there are millions of acres which, with moderate irrigation, for which the facilities are abundant, will yield immense crops, and in fact a part are already yielding crops which astonish all beholders. Of the agricultural productions of the valleys and benches of Western Montana, the affluents of Clarke's fork of Columbia river, of the Jefferson, Madison and Gallatin, and of the Yellowstone and the upper Missouri, we will let Mr. Zimri L. White, the cautious and able correspondent of the *New York Tribune*, tell us:

"The agricultural lands of Montana are the valleys. The main range of the Rocky Mountains extends through the Territory generally in a northerly and southerly direction, and from this there are spurs and auxiliary ranges extending in all directions and covering nearly the whole face of the country except in the north and east, where there are extensive elevated plains. Between these ranges flow hundreds of beautiful clear-water streams, some large and some small, and bordering these rivers and creeks are fine rich valleys from one to ten or twenty miles in width. The soil in the valleys is an alluvial deposit, and the land generally has a gentle and regular slope from the bed of the stream to the foot of the bench which separates the valley from the foot-hills. So true is this slope that in almost every instance water taken out in a ditch parallel with the stream can be made to flow over every foot of land below it. The benches, of which there are sometimes several and sometimes only one, are simply continuations of the valley at a higher elevation. They frequently look like great terraces rising one above the other, and where the quantity of water in the stream and the fall are sufficient to make irrigation possible, the bench lands are found to be equally productive with the valleys proper. Behind the benches rise the foothills, with their rounded, grass-clad tops, now extended for miles and forming the divide between two streams, and again seeming to support a rocky, precipitous ridge that rises beyond them.

"Very few of these valleys are as yet settled. The Bitter Root Valley, in the west, where the farmers have become rich by the sale of their products to the government for use at the military post at Missoula, the Gallatin in the east, Prickly Pear, in which Helena is situated, Deer Lodge and Jefferson Valleys, have the oldest ranches, and until lately the largest breadth of land under cultivation.

"Within the last year or two the immigration to the Yellowstone Valley and its tributaries has been very great. This is about 650 miles long, and the average width of the valley which can be irrigated is about ten miles. It has only recently been safe for white people to go there, but the vigor with which the Northern Pacific Railroad has pushed westward during the past summer (this line will extend through the Yellowstone Valley for almost its entire length) has attracted many settlers, and I am told that there are already about 400 families there. I saw it reported early in the summer that General Sheridan told a Chicago reporter that he saw on one boat in his late trip up the Yellowstone twenty-seven threshing-machines bound for the very country in which General Custer lost his life in 1876, and which three years ago was one of the most remote and inaccessible sections of the country. So rapid has been the agricultural development of the Territory that Mr. R. H. Mason, the Surveyor-General of Montana, estimates that the acreage under cultivation this year is twice as great as it was in 1878, a part of the increase being due to the enlargement of the older farms, and a part to the opening of new farms.

"In all the older settled portions of the Territory the ranchmen are, almost without exception, remarkably prosperous. I have not visited the best agricultural sections of the country, nor shall I be able to do so. The area of the Territory of Montana is three times as great as that of the State of New York, and there is not as yet (in 1879) a single mile of railroad within its limits. Travel here is therefore very slow, and it would require more than one whole summer to see even the most important points. I did, however, ride through the Jefferson, Boulder and Deer Lodge Valleys, and spent an entire day in visiting a few repre-

sentative farms in the Prickly Pear Valley, so that I can speak from personal knowledge of what I saw in those.

"The average yield of wheat in Montana is at least twenty-five bushels to an acre. Other writers have placed it at from thirty to forty bushels, and fifty bushels is by no means an uncommon crop; but taking the whole country together, I doubt if the farmer can depend upon much more than twenty-five. This is ten bushels or sixty-six per cent. more than what is considered a good crop in the great grain States of the Mississippi Valley. The wheat of Montana is also of a very excellent quality. An analysis of samples of Montana wheat made at the Agricultural Department in Washington shows eighteen per cent. more nitrogenous or flesh-producing matter than Minnesota wheat, and that bulk for bulk it weighed about six per cent. more. I have before me a sample of spring wheat of the crop of 1878, raised by Mr. Reeves in the Prickly Pear Valley, that averages to weigh sixty-four pounds to a measured bushel. Some of the crops of wheat that have been raised in Montana have been almost fabulous. Forty, fifty, and even sixty bushels to an acre, are not uncommon crops. Several years ago the State Fair Association offered a premium for the best acre of wheat raised that season, and the award was made to Mr. Raymond, of the Prickly Pear Valley, who had 102 measured bushels on a single acre. The committee who made the award were prominent citizens of Montana, and one of them has told me that the same year a farmer in the Gallatin Valley raised an equally large average crop on a forty-acre lot, but as he could not show that he had more than 102 bushels on any single acre, the committee decided that he was not entitled to the premium.

"I have seen, in August this year, many fields of wheat, both standing and in the shock, in the country around Helena, and I have not seen one that appeared to have less than thirty bushels to an acre. In many fields the shocks of grain stood almost as thick as the sheaves in the fields of the Mississippi Valley."

Mr. Robert E. Strahorn, in his "To the Rockies and Beyond," gives the following statement in regard to crops in different valleys of Montana in 1878:

"As considerable has been said concerning large average yields of grain fields in Montana, the reader may be interested in noting a few names of farmers whose experiences for the past year or two have come under the observation of the writer. Following are the names of several prominent farmers of different valleys, with size of fields, amount of grain threshed, the average yield per acre for one season, and the selling price of the crop:

Name.	Location.	Field in acres.	Crop and Yield—bushels.		Av. per acre—bushels.	Value of crop.
A. G. England.....	Missoula Valley.....	160	Wheat,	7,000..	43¾	$8,400
"	" "	40	Oats,	2,000..	50	1,200
Robert Vaughn.....	Sun River Valley...	4	Oats,	410..	102½	246
M. Stone.....	Ruby Valley.....	100	Wheat	6,000..	60	7,200
Brockway's Ranch..	Yellowstone Valley..	8	Oats,	600..	75	360
Brigham Reed.....	Gallatin Valley.....	6	Oats,	620..	103⅓	362
Marion Leverich....	" "	23	Wheat,	1,150..	50	1,380
William Reed.....	Prickly Pear Valley..	50	Oats,	3,500..	70	2,100
Charles Rowe.....	Missouri Valley.....	23⅓	Wheat, Oats,	1,200..	45	1,250
Con. Kohrs	Deer Lodge Valley..	11	Oats,	1,200..	100	720
John Howe.....	Gallatin Valley.....	85	Oats,	4,982..	57	2,989
Robert Barnett.....	Reese Creek Valley..	48	Wheat,	2,200..	45⅝	2,640
S. Hall.....	Ruby Valley.....	400	Wheat,	10,000..	50	11,000

Mr. White continues:

"Oats and barley grow as well as wheat. The average yield of oats to the acre is considerably greater than that of wheat, and the weight per bushel is much above the standard. Mr. Reeves gave me a sample of oats from his farm which he said would average to weight forty-six pounds to a bushel. General Brisbin says that Mr. Burton raised a field of oats which averaged 101 bushels to an acre, and a field of barley on which there were 113 bushels to an acre.

"This is the bright side of the picture. On the other hand, it should not be forgotten that a considerable portion of the grain crop in certain portions of Montana is frequently destroyed by grasshoppers, and that there is reason to fear that for some years to come, and until the agricultural population of the Territory becomes much greater than now, these insect pests will make the business of grain-raising here somewhat hazardous. That the scourge of locusts has not been as serious as it might have been, nor as destructive as it would naturally have been expected to

be, is shown by the prosperous condition of all the farmers who have been established for a few years. Those in the neighborhood of the military posts, especially, have grown rich with wonderful rapidity. General Brisbin told me that the government has paid as much as $4,000 to one farmer in a single year for grain and hay raised by himself, and that the income of a farmer in the neighborhood of Fort Ellis from the portion of his crops sold to the United States is frequently as much as $3,000. Corn has not been very successfully cultivated in Montana, except in the warmer regions west of the main range of the Rocky Mountains. The hay cut in the Territory is wild, and costs the farmer who cuts it from $1.50 to $2.00 a ton.

"The soil of Montana seems to be especially fitted for the production of large crops of garden vegetables. The best market garden I ever saw, if abundant yield is a criterion, is that of Mr. Dorrington, in the Prickly Pear Valley. He sold $2,000 worth of strawberries, and his root crops, such as turnips, onions, beets, parsnips, etc., seemed literally to fill the ground. He expected to take ten tons of onions from a small patch of ground, and would receive five cents a pound for them in Helena. The following table, compiled by General Brisbin, shows what the product of the gardens cultivated by troops at Fort Ellis was in 1877:

Company and Regiment.	Number of acres.	Bushels Potatoes.	Bushels Onions.	Bushels Turnips.	Bushels Carrots.	Bushels Beets.	Bushels Parsnips.	Bushels Salsify.	Heads of Cabbage.
F 2d Cav.	7½	1,100	90	60	60	50	10	.....	3,600
G "	5	550	60	60	35	15	20	.....	2,500
H "	6	1,200	130	35	40	40	25	.....	3,300
L "	5	700	50	150	25	.....	.....	.....	2,300
G 7th Inf.	3	313	6	40	12	.....	20	3	800
Totals,	26½	3,865	336	345	172	105	75	3	12,500

"The value of the several articles, if bought at the fort, would have been: Potatoes, $3,865; onions, $2,352; turnips, $85; carrots, $206.40; beets, $315; parsnips, $225; salsify, $9.40; cab-

bage, $125. Total, $7,182.80. The garden crops at Fort Ellis in other years have been fully one-third greater for the same amount of ground."

The best farmers are turning their attention largely to fruit culture. This for many years to come will be the most profitable of crops, especially when it is not too far from a local market. Writing in 1879, Mr. White said: "Very little fruit has yet been raised (*i. e.*, has come to the bearing stage) in Montana.

"It has always been supposed that the part of the Territory east of the Divide was too cold in winter for even the hardier kinds of fruit, and very few varieties have been planted. In the west, in the Bitter Root Valley, orchards planted a few years ago are just beginning to bear, and the rapidity with which the trees have grown and the manner in which they have wintered have led to the belief that fruit-raising may yet become one of the important industries of that section. The fruit crop this year is not sufficiently large to affect the price, but the rapid extension of the Utah and Northern Railroad has had a very marked effect upon it. I bought nice grapes, peaches and pears in Helena for fifty cents a pound, which two years ago would have cost $1.

"As a rule the farms of Montana have to be irrigated, and in most of the valleys there is an abundance of water for this purpose. The cost of constructing good canals for the irrigation of 160 acres of land is, of course, considerable, but when once completed the expense of keeping them in order is very small, while the ability of the farmer to regulate absolutely the amount of moisture which his crop shall have, more than compensates for all the extra labor and expense which irrigation makes necessary.

"While some of the valleys near the mining centres of the Territory have been pretty well settled up, none of them can be said to be full, while in other parts of the Territory the land is almost untouched. Finely improved farms near markets are now worth $20 or $25 an acre; others a little more remote and not as well improved, sell for from $5 to $15 an acre, and there are hundreds of thousands of acres which can be obtained simply by settling upon

them under the Homestead law, or pre-empted and purchased for $1.25 an acre."

Mr. R. E. Strahorn gives the following statement of the productions of Montana in 1878. The crops of 1879 were of nearly double this amount, and those of 1880 larger yet. In 1878 he says:

"The different valleys of Montana, with their mere sprinkling of farmers, produced about 400,000 bushels of wheat, 600,000 of oats, 50,000 of barley, 12,000 of corn, 500,000 bushels of vegetables, and 65,000 tons of hay, the total value of agricultural products being not less than $3,000,000. A ready market has always been afforded by the non-producing population in the mines and cities, and by the numerous military posts. The constant increase in the magnitude of mining and other operations in all parts of the Territory justifies the belief that any considerable surplus of produce cannot be raised in Montana for years to come, and until that time prices must remain from fifty to one hundred per cent. higher than in the 'States.' The following were ruling prices paid farmers for produce in different Montana cities in January, 1879: flour, $4.75 per 100 pounds; oats, two cents per pound; wheat, two cents; hay, $12 to $14 per ton; potatoes, one and a half cents per pound; onions, six cents; butter, forty-five cents; eggs, sixty to seventy-five cents per dozen; squash, four cents per pound; cheese, sixteen to twenty cents; beets, four cents; cabbage, five cents; carrots, three and a half cents; parsnips, four cents; turkeys, $3 to $5 each; spring chickens, $6 to $7.50 per dozen."

Mr. Strahorn has contrasted in the following table the prices of farm and dairy products in Montana and in Ohio, and the yield in the East with the yield in Montana. The contrast is very instructive:

KIND OF PRODUCE.	Prices in the East.	Prices in Montana.	Yield in the East per acre.	Yield in Montana per acre.
Bacon, per pound.....	5c	15c		
Barley, "	1¼c	2c	19 bu	35 bu
Butter, "	16c	40c		
Beets, "	½c	4c		
Beans, "	2c	5c	24 bu	37 bu
Cabbage, "	¼c	3c		6,565 lbs
Carrots, "	1c	4c		
Cauliflower,"	1c	4c		
Corn, "	¾c	5c	34 bu	37 bu
Cheese, "	8c	17c		
Chickens, per dozen.....	$2 00	$6 00		
Eggs "	18c	50c		
Flour, per cwt.....	3 00	4 00		
Green corn, per dozen.....	5c	25c		
Hay, per ton.....	8 00	12 00	1¼ ton	1¼ ton
Hogs, per cwt.....	2 75	10 00		
Oats, per pound	¾c	2c	23 bu	45 bu
Onions, "	1c	6c	208 bu	385 bu
Parsnips, "	½c	4c		
Potatoes, "	1c	1½c	75 bu	200 bu
Peas, "	1¼c	2c	25 bu	40 bu
Rye, "	4c	2c	12 bu	35 bu
Squash, "	½c	4c		19,000lbs
Turkeys, live, per pound.....	7c	20c		
Turnips, per pound.....	¼c	1½c	150 bu	225 bu
Wheat, "	1½c	2c	11 bu	30 bu

"I firmly believe," he adds, "that no land under the sun offers such a favorable field for diversified rural industry as Montana. Take here, in connection with grain-raising, the production of poultry, eggs, butter, pork, vegetables, and similar items now almost unnoticed as 'not worth bothering about,' and the industrious and frugal farmer and housewife, managing as of necessity do those in the thickly settled States, should soon make themselves independent. It is often almost impossible in winter to secure fresh eggs at seventy-five cents per dozen in Montana cities, and during the winter of 1878–79, I have seen ninety cents freely offered in Helena. Butter ranges from forty to sixty cents

the entire winter, and it was frequently impossible to secure a good article. The Montanian who desires to celebrate Christmas in the time-honored way—turkey and all—will make a sad inroad in his bank account; as for spring chicken—at from fifty cents to $1 each—they might be of recent origin, but unfortunately that class is never numerous enough to go round."

Dairy-Farming and Stock-Raising.—Mr. R. E. Strahorn, after several years' residence in Montana, says, in regard to dairy farms: "Climate, pasturage, water and an unequalled market for dairy products, all combine to render dairying here one of the most lucrative and satisfactory pursuits. Cows cost nothing for their keep, and the product of butter or cheese is clear gain, as the increase in stock will pay all expenses. I am personally acquainted with several Montana dairymen who commenced four or five years ago with rented cows and not a dollar of capital. They are to-day the possessors of fine herds, good ranches, and worth from $5,000 to $10,000 each—all made by good honest labor in the corral and milk-house. Dairy cows cost about $30 per head, or they can be rented by giving the owner the increase and one-fourth of the butter or cheese manufactured. Of course, dairying is generally carried on only during the seven or eight months of spring, summer and early autumn, as few provide even so much as hay for cold weather, and when winter comes the cows have about enough to do to keep in good flesh. The number of cows milked in Montana in 1878 was placed at 10,000, and the product of butter and cheese in that year at 1,000,000 pounds. Butter sold at from thirty-five to fifty cents per pound, and cheese at from fourteen to twenty cents."

Mr. Thomson P. McElrath, a resident of the Yellowstone Valley, says that "in the winter of 1879–80 butter sold throughout the valley at from forty to fifty cents a pound, and home-made was not to be had even at those prices. Fresh milk brought ten cents a quart. The raising of poultry will also for a long time to come be a paying field for enterprise. Winter eggs are scarce at a dollar a dozen. Chickens for eating are correspondingly expensive, and the thanksgiving turkey, brought from Minnesota in a frozen state, is a very ineffective and costly reminder of that

home luxury by the time it is thawed out and ready for roasting."

For *stock-raising* Montana has unrivalled facilities. "It is," says Mr. Z. L. White, "the best grazing country in the world. I know that this is a bold assertion to make, but after seeing something, during the past summer, of the best cattle-ranges of Kansas, Nebraska, Colorado, Dakota, Wyoming and Utah, which States and Territories furnish so large a proportion of the beef consumed in this country, and talking with stockmen, army officers and others whose acquaintance with the West is far more extensive than my own, and whose experience gives to their opinion great weight, I am certain that it is not an exaggeration. There may be portions of South America where cattle, sheep and horses can be raised at less expense than in Montana, but there certainly is no part of the United States where the same grade of animals, ready for market, cost the ranchman less money, while the price which they command is many times greater than in any of the Spanish American Republics, and but very little below that obtained in the less remote States and Territories this side of the Missouri river."

In the classification of the area of 93,000,000 acres of Montana to the different purposes for which it could be utilized, after the assignment of 15,000,000 or 16,000,000 of acres to cultivation for farm purposes, an estimate, as we have already said, far below the fact, it has been customary to allot 38,000,000 acres to grazing lands, 14,000,000 acres to timber, and from 22,000,000 to 25,000,000 of acres to mountain, inaccessible, and desert or bad lands. Both the grazing and timber lands have been much underestimated. There are "bad lands," that is, lands of cretaceous rocks and soil, which, when eroded by the mountain torrents, have been cut into all sorts of fantastic shapes, and the clay strata exposed; but a large part of these "bad lands" furnish some of the sweetest and best pasturage to be found anywhere, and under the influence of irrigation, for which there are ample facilities, they will yield enormous crops. There are volcanic "bad lands" in the southwest, around the head waters of the Jefferson, Madison and Gallatin rivers, and the Firehole river and basin. Part

of these volcanic lands are unfit either for grazing or cultivation, but 10,000,000 acres is a very large estimate of all the worthless land in the Territory. Mr. Thomson P. McElrath, to whom we have already referred, and whose little work on the Yellowstone Valley, just published, is admirable for the valuable and interesting information it imparts, has discussed at considerable length in his book the fact and the causes of the superiority of Montana over other regions of the West in stock-raising. He says: "It is universally conceded that Montana is the best grazing country in the world. The beef raised there is superior, and more profitable than that raised in the best cattle ranges of Texas, Kansas, Colorado, Nebraska, Dakota, Wyoming or Utah, which States and Territories furnish a large proportion of the beef consumed in this country. This superiority is largely due to the fact that the Montana grasses are more nutritious than any of the cultivated grasses which grow elsewhere. The perennial bunch-grass (*Bouteloua oligostachya*), superior to all others, shoots from the root in the spring, before the frost disappears, and clothes the whole country, except the mountains, in a velvety vesture of emerald. It grows in small bunches, close and fine, which average from six inches to one foot in height. The stalk, unlike that of tame grass, is solid, and the head is well filled with small, firm seeds, full of nutriment. Exposed to the summer sun, and unaffected by frequent rains or early frosts, it begins to ripen about midsummer, and in the early fall is thoroughly cured, affording a standing hay for winter use, which needs no harvesting, and which unites with all the desirable qualities of good hay the fattening principles of oats and corn.* Professor R. W. Raymond, United States Commissioner of Mining Statistics, says: "To pasture a horse on bunch-grass is like giving him plenty of good hay, with regular and liberal feeds of grain." From August until the following spring the grass has a color somewhat similar to that of

* Mr. McElrath says, in describing the grazing lands of the Yellowstone Valley: "Back from the rich river valleys, and walling in their outer edges, rise the ranges of 'bad lands,' which are bare of vegetation and very forbidding in appearance, but which extend back only a few miles, usually terminating in rolling, grassy plains. These fantastic ranges form the escarpments of a vast expanse of table-land, covered with bunch grass, and far superior for stock-raising to any other public lands owned by the United States."

ripe wheat, though not quite so brilliantly yellow, and the country looks like one boundless field of grain nearly ready for the reaper. The Eastern visitor ascending the Yellowstone for the first time finds it difficult to realize that the vast yellow expanses which wave and glisten in the brilliant sunshine as the summer breezes play over their surfaces, are not cultivated fields, and as the steamboat approaches a bend in the stream the eye instinctively seeks for the farm-houses and granaries pertaining to these enormous stretches of agriculture. It is one of the earliest impressions experienced after entering the Yellowstone, far below the mouth of Glendive creek, and though the illusion is soon dispelled, the appearances which create it continue through the length of the valley, and in every part of Eastern Montana not actually given up to "bad lands." This bunch-grass, moreover, so prolific in growth, is, as already stated, wonderfully sweet and nutritious. Cattle fatten on it more rapidly and keep in better condition than those which feed on the blue grass in Kentucky and Southwestern Virginia, or the buffalo grass of Nebraska and Colorado. The beef is remarkably sweet, tender and juicy, the chief fault to be urged against it being that in summer it is sometimes too fat. The bunch-grass grows not only all over the valleys and the benches, but on the foot-hills, and even on many of the mountains. The supply of it is inexhaustible. Even in the older settled portions of the Territory, where improved farms are frequent, often adjoining each other in the valleys, the cattle, sheep and horses do not eat down the grass, and although the ranges in some sections on each side of the valleys may be nominally taken up, they are still capable of sustaining many times as many animals as now graze upon them. Of course no person intending to raise stock on a large scale, or to make that his chief business, would think of driving his bands of animals to locations near the settlements; but the farmers whose flocks and herds are now feeding upon them, and who want their cattle near home, may increase the size of their bands almost indefinitely before there will be any scarcity of pasturage.

"In this vast free pasturage," says a recent writer in an account of Western Montana, and the description applies likewise to the

Yellowstone Valley, "no one need really own an acre of land, and thus far few have cared to. But all stockmen have headquarters as near their range as is practicable. This is called the ranch, and usually consists of a plain log-cabin, and a large corral or pen in which stock can be held at branding time. What extent of the boundless grass lands surrounding are utilized by the owner depends entirely upon the size of his herd, and his inclination to let cattle roam and care for themselves. It is true that ranch sites are sometimes better improved, and herders employed; but to feed, water, shelter or salt the steer of the period would be a sad innovation upon the all-prevailing custom of letting said steer shift for himself. The improvements need not cost more than $250—not that, if the owner will rely largely on his own muscle. The additional expense will be the cost of living, if the owner does his own herding, and this will vary from $250 to $400 per year; if herders are employed, they are paid about $40 per month and board. One man can easily care for 1,000 cattle, except during the 'round-up' period, which here occurs twice per year, lasts about two weeks each time, and will require three or four extra men during that time. I have before me the statement of a stockman who commenced with $3,500, buying 100 head of cows, putting up a neat log-cabin, and reserving enough of the capital to pay his expenses for one year. At the end of the fourth year the increase from this little herd, at a low valuation, was worth $8,000. Another statement made by a well-known stockman of Helena, shows a net profit of $42,500 made in six years from an investment of $13,500. The average profit realized can without any doubt be placed at two per cent. per month on all capital invested in cattle in Montana. Men who put a few hundred dollars into cattle five or six years ago have become rich almost before they could realize how wonderfully the profits multiply in a region where food and shelter for their herds cost nothing.

"Very few Montana stock-farmers make any provision for feeding their cattle in the winter, and as yet there is no summer herding as in Nebraska, Colorado and Wyoming. In the winter season the animals speedily learn to 'rustle,' as it is called, with

their hoofs through the snow to the bunches of sweet hay beneath, and in ordinary seasons cattle come out in the spring in excellent condition. Old cattle-owners say that a herd which is fed occasionally, on the occurrence of a heavy storm, will not winter as well as one that is not fed. The cattle once receiving hay are likely to remain in the neighborhood of the ranch even after the feed there has become short, and if driven away will return thither. As it is impracticable to feed them all the time, they become lean, while if they remained out on the range where they could 'rustle' and graze steadily, they would keep in good condition. The grass is stiff on the stalk, and on the hillsides it is rarely entirely covered with snow. The loss from exposure is said to be not more than one or two per cent. It is nevertheless worth while to note that in Western Montana several of the most careful and most successful stockmen are beginning to put up hay as a precaution against severe cold and deep snows. They claim that the cost of the hay, cut with machines in the natural meadows along the river bottoms, is only from fifty cents to $1 a ton, and that in the long run, by being prepared to feed their cattle a little in the winter if it is found necessary, they can save more than enough animals that would otherwise perish, to pay for the trouble and expense. Judging from the unusually severe winter of 1879–80, which lasted from November to the middle of March, during which time much of the central Yellowstone country was covered with snow, while the mercury ranged from a few degrees above zero to fifty odd degrees below that point, it may be advisable to adopt a similar course in Eastern Montana. The expense would not be greater than that above estimated. It is true, that notwithstanding the protracted severity of the season referred to, no complaints have been heard on the part of the ranchmen in the valley in regard to losing cattle by reason of the cold and exposure. This, however, is partially attributable to the paucity of the herds in the valley. Had the stock been as numerous as it probably will be two or three years hence, the risk would have been very greatly enhanced. Sheep, of course, require more careful handling than cattle, and must be provided with constant means for shelter, as well as with feed in winter.

"The customary way of managing a band of cattle in Montana is simply to brand them and turn them out upon the prairie. Some stock-owners give no more attention to their cattle until the next spring, when they 'round them up' and brand the calves, select those they intend to sell, and turn the remainder out again. Under this careless management, which no prudent man would be likely to willingly imitate, they are certain to lose some steers, which stray away or are stolen. Others, more careful of their interests, employ herders, one man for every 1,500 or 2,000 head of cattle, whose duty it is to ride about the outskirts of the range, follow any trails leading away, and drive the cattle back, and seek through neighboring herds, if there are any, for cattle that may have mistaken their companionship. At the spring round up, a few extra men have to be employed for several weeks. In starting a new herd, cows, bulls and yearlings are bought. The older cattle of ordinary grade are all American, the long-horned Texan stock being excluded, and cost from $15 to $25 a head. Calves under one year old running with the herd are not counted. Yearlings may be obtained for from $5 to $7 each.

"The average cost of raising a steer, not counting interest or capital invested, is from sixty cents to $1 a year, so that a four year old steer raised from a calf and ready for market costs about $4. He is worth on the ranch about $20, and if driven to the Missouri river at Fort Benton, or the railroad in Wyoming, fully $25. A herd consisting of yearlings, cows and bulls, will have no steers ready for the market in less than two or three years. Taking into account the loss of interest on capital invested before returns are received, besides all expenses and ordinary losses, the average profit of stock-raising in Montana during the last few years has been at least thirty per cent. per annum. Some well-informed cattle-men estimate it at forty or forty-five per cent. Mr. Z. L. White, from whose correspondence several of the above-mentioned points respecting stock-raising in Western Montana have been taken, refers in the following passage to the profits of the business: 'No one can spend a week in any part of Montana without hearing some of the most marvellous

reports about the profits that have been realized during the last few years in the business of stock-raising in this Territory. These stories, many of which have reached the East recently in enthusiastic newspaper letters and pamphlets, are true, so far as I have been able to verify them; but while, as a rule, they relate only to the exceptionally successful ventures—just as the wonderful yield of a bonanza mine in a camp is heralded from one end of the country to the other, while the hundred prospect holes which have been failures are never heard of—the unvarnished truth about the average profits of the business will seem almost incredible to eastern people. It is only now and then that a band of cattle, sheep or horses yield a net income of from forty to sixty or even one hundred per cent. per annum; but I doubt if there is a single instance in which, taking a series of years together, the profits on stock-raising have not been from twenty to thirty per cent. on the original investment, and that, too, in cases where the animals have suffered severely from unusual cold weather and snow in the winter, or from disease.'

"A large and increasing percentage of the Montana cattle and sheep are not managed by the owners personally, the latter in many cases not being even residents of the Territory. Nearly all the leading merchants and bankers of the larger towns own interests in bands of stock; and lawyers, doctors and federal officers are following their example, and investing their own money or that of their eastern friends in cattle, sheep or horses.

"A man who desires to invest in stock, and who has not the time or inclination to attend to the business himself, takes as an associate some man of experience and known honesty, who lacks the means for going singly into the enterprise, and gives him entire charge of the herd. This man selects the range, cuts the hay, moves the animals when necessary—sheep requiring to be changed to a new range at least every two years—attends to the rounding up, and drives those that are sold to the place of delivery, paying all expenses, and being entirely responsible for the management of the business. In compensation for these services he receives one-half the increase of the herd, the capitalist taking the other half. The returns which the latter class obtain

on their money invested on this plan are never less than fifteen per cent., in a flock of sheep twenty per cent. and upward, and in a band of horses much greater than in either of those mentioned. A new plan for dividing the profits of this business between capitalists and managers has lately been suggested, and will probably be experimented upon this year. The manager is to take the herd purchased with the money his partner furnishes, the latter retaining the title to the animals, find a suitable range and defray all the expenses of the enterprise, until out of the profits he has paid back to the investor a sum of money equal to that which he at first put in. Then the manager is to become the owner of one-third of the business, and to receive thereafter one-third of the profits, the expenses being paid out of the receipts. It is proposed by responsible men in Montana to organize stock companies in the East for the purpose of conducting the cattle and sheep-raising business on this plan, and with adequate precaution in the selection of proper men to manage such enterprises there are few openings available for capital in which the security is better, or the certainty of large profits greater.

"The export of cattle from Montana began in 1874 with about 3,000, increasing during the following four years respectively to 5,000, 6,000, 10,000 and 22,000. In 1879 it is estimated to have been between 30,000 and 40,000. The principal route to market heretofore has been down the Yellowstone to Fort Custer; thence into Wyoming, via Forts McKinney, Reno and Fetterman, to Pine Bluff, a railroad station fifty miles east of Cheyenne. This route furnishes plenty of excellent grass and water, and the cattle reach the railroad in fine condition after a drive averaging about two months in duration. They are mostly shipped to Chicago. The completion of the Northern Pacific Railroad to the western extremity of the Yellowstone Valley will completely alter this feature of the cattle trade. Instead of the long drive through the Wyoming wilderness, stock from all parts of the Territory will be shipped by rail direct to its destination in, at the most, one-sixth of the time at present consumed in the journey, and by the shortest possible rail route that can ever traverse that Territory. For the Atlantic seaboard and for foreign export

the route by the great lakes, via Duluth, the eastern terminus of the Northern Pacific Railroad, will be availed of, the cattle traffic by that route having already assumed considerable dimensions, which are destined to a great expansion in the near future. The great market at Chicago will be no less benefited by the opening of this new and direct line.

"*Sheep-Raising.*—As already stated, the management of sheep is different in many essential respects from that of cattle. A band of sheep containing 1,000 head and upward, in good condition and free from disease, are procurable in Western Montana for from $3 to $3.25 per head. They must be herded summer and winter in separate bands of not more than 2,000 or 3,000 each, must be corralled every night and guarded against the depredations of dogs and wild animals. Hay must be provided to feed them while the ground is covered with snow, and sheds must be erected to protect them from severe storms. They must, moreover, be raised by themselves. Cattle and sheep cannot live together on the same range. The latter not only eat down the grass so closely that nothing is left for the cattle, but they also leave an odor which is very offensive to the others for at least two seasons afterward. But, notwithstanding that the cost of managing sheep is greater than that of handling cattle, the returns from sheep-raising are quicker and larger. While a herd of young cattle begin to yield an income only at the expiration of three years, sheep yield a crop of wool the first summer after they are driven upon a range, and the increase of the band is much greater than that of cattle, being from seventy-five to one hundred per cent. each year. The wool is of good quality, free from burrs, and brings a good price on the ranch, agents of Eastern houses being always on hand eager to buy it. Many thousand sheep were driven into Montana in 1879 from California, Oregon and Washington Territory, and every band that arrived was promptly purchased by men eager to increase their flocks or to start new ones. These data relate, of course, to the western portions of the Territory, only one experiment in sheep-raising having as yet been undertaken in the Yellowstone Valley. Its results show conclusively enough that at least equal success

in that field of enterprise is attainable in Eastern as in Western Montana.

"In the fall of 1876, while the valley was still occupied by the hostile Sioux under Sitting Bull, a man named Burgess drove a herd of 1,400 sheep, a cross of the Merino and Cotswold breeds, from California into Western Montana. He arrived at Miles City about the end of September, having consumed two seasons in the trip, and located on the east bank of the Tongue river, on the site of the present Miles City. In the following fall the flock was purchased by Mr. George M. Miles, the present owner, who moved it to a new range on the Tongue river about three miles farther up, with the intention of entering systematically into sheep-raising, the purpose of the original owner having been to take the flock to the Black Hills to be sold for mutton. After a second season Mr. Miles removed again to a new range on the Yellowstone river, about fourteen miles above the mouth of the Tongue, near which the flock yet remains. At the time of his purchase there were 1,001 sheep in the flock, Mr. Burgess having killed off a number for mutton. None died that season from disease, and very few were killed by Indians. During their first winter in the valley they had no hay fed to them. A little was fed to them during the heavy snows of 1877, and in the winter of 1878 they received almost none at all. During the first year there was little increase in the flock, and the second was not much better, the range being a poor one, and the lambs coming too late. Since then they have increased satisfactorily, the lambs being healthy and strong. The increase in number has proven sufficient to pay the whole cost of care, leaving the crop of wool as net profit. During the first year the clipping averaged from seven to eight pounds per head. The crop was sent to Philadelphia, where it realized good prices. In the second year the clip averaged seven pounds. The clipping of 1879 was shipped in July. It amounted to about one and a half tons in weight, and netted thirty-two cents per pound at the Eastern market. The herd's increase during the year was about eighty per cent. The wool is now consigned regularly to the Boston market, where it ranks with the best Territorial wool, and brings the highest

prices. The cost of shipment from the range above Miles City to Boston is $1.75 per one hundred pounds. It should be added that sheep can be readily purchased in California for from $1.50 to $2.50 per head. It costs little to drive them into the valley in two seasons, as the crop of wool almost defrays the expenses. The range on which they are placed in the Yellowstone Valley at present costs literally nothing, and the sheep are in steady demand in the local market at from $3 to $5 per head.

"The profits of sheep-raising are generally estimated at a higher figure than those of cattle-raising. The lowest calculation is based upon a net profit of from twenty-five to thirty-five per cent. on the whole investment. Occasionally larger returns reward the fortunate stockman, which are sometimes worthy of noting, although they must be regarded in the light of exceptional occurrences, the same as the wonderful yields of gold once in a while recorded respecting bonanza mines. Every miner, however, hopes constantly to stumble upon a bonanza, and in similar manner every stock-raiser is entitled to hope to achieve as brilliant success as others in his line, even though he will be contented with much less. In illustration of the possibilities connected with sheep-raising in Montana, Mr. White cites the experience of Judge Davenport, of the Sun River Valley. In July, 1875, he purchased 1,000 ewes, which cost him in the neighborhood of $3,000. 'These he put in charge of a young man, who was to take them on a range, care for them, pay all the expenses of the band, and to receive as his share one-half of the wool produced, and one-half of the increased flock. At the end of four years a settlement was to be made, and Judge Davenport was then to receive back 1,000 of the best ewes which the band contained. The settlement was made last July. In the meantime Judge Davenport had received for his share of the proceeds of the wool $6,500, and for his share of the increase $8,000. The profits of his investment of $3,000 for four years were, therefore, $14,500, or $3,625 or 121⅔ per cent. a year. During the same year other men made only fifty or sixty per cent. on their sheep, and some who, from inexperience or bad fortune, met with heavy losses, perhaps not more than twenty-five per cent.; but I have never heard of a single instance

in which there has been an absolute loss in a period of, say, three or four years. One man, driving a large band of sheep from the south a year or two ago, was caught by the winter in an unfavorable place, and lost one-half or two-thirds of his flock, but at the end of three years, when he came to balance his books, he found that the remnant of his flock had done so well that his profits had been about twenty-five per cent. a year on his original investment.'" *

On this subject of sheep-farming, Mr. Strahorn gives the following items of the eight months' experience of his Excellency, Hon. B. F. Potts, Governor of Montana: "Some time ago he purchased a ranch on the Dearborn river, fifty miles north of Helena. Last October he bought and placed upon it 4,000 sheep, at a cost averaging $3 per head. He subsequently sold 400. Of the remainder 2,700 were ewes. During the months of April and May these gave birth to 2,900 lambs. Two hundred were lost by exposure in the severe snow-storm that visited the Territory that spring, to compensate, it would seem, for a very mild winter, but the number of twins equalled the loss, and the net product, as appears from the above statement, was 100 per cent. of the ewes. It is estimated that when a lamb is dropped it is worth $2, and when three months old it is worth $3. The profit on the increase may, therefore, be put in round numbers at $5,000. The Governor has just completed his shearing. He sheared 3,600 sheep, and the average clip was six pounds per head. The wool is worth twenty-six cents in the Eastern market, and the cost of transportation will scarcely exceed four cents. The proceeds of this clip

* The increasing significance of the sheep raising industry is attested to by the following paragraph in the Philadelphia *Northwest* of February, 1880. The concluding sentence of the extract must be regarded as prophetic rather than strictly accurate:

"From as far west of the end of the ironed track of the Northern Pacific, in the Yellowstone Valley, as Bozeman, which is in the Rocky Mountains, and from the Musselshell Valley and the Judith Basin to the north, inquiries are already addressed to the General Manager of the road for through rates to New York on live sheep, dressed mutton, canned mutton and salted pelts. These rates are asked for on refrigerator cars, single and double deck cars, and for all rail to New York and part rail and part lake from Duluth. There is an element of romance in this sudden civilization of a region where, three years ago, Sitting Bull's young men would have ate up all the sheep and scalped all the shepherds that ventured on their hunting-grounds. But the change is made. The Yellowstone Valley is possessed by shepherds and herdsmen."

will therefore be about $4,750. A return of nearly $10,000 in less than one year, on an investment of $12,000, is certainly a most seductive showing."

The production of a better class of horses, and also of hogs, is beginning to receive some attention. Horses are even more hardy than cattle or sheep; they have the advantage of being able to paw away the deepest snows that may cover their pasturage, and they never fail to take good care of themselves in the worst storms. The correspondent just quoted offers these practical suggestions on this business: "What are wanted here are good draught horses, and the market for such would be limitless, at paying prices. Suppose a man, probably in connection with some other business, such as sheep-raising or raising grain, to buy fifty brood-mares (half-breed), which he can procure at $30 each, and one draught stallion, costing $1,000. He will thus have invested $2,500. He need be at no expense for feeding or stabling, except in the case of the stallion, and at very little expense for herding, if he gives the business his personal attention. The average of colts is eighty per cent. of the mares, so that at the end of the first year he would have forty colts, worth $20 each, making $800, a return of over thirty per cent. on his investment. Carry this computation forward, supposing him to sell off his geldings when they were four years old to pay expenses and to buy additional stallions, retaining the mare colts for breeders, and it will be seen that in five years he will have a band worth at least $10,000. Mr. Storey placed 200 mares on his ranch in the valley of the Yellowstone only a few years ago, and now has a herd of 1,200, worth an average of $75 each, besides having sold more than enough to pay all expenses." There are about 50,000 horses in Montana, a large proportion of which are the regular "broncho" or mustang stock. However, there are several large bands of thoroughbreds, and fine breeding animals are by no means rare.

In the absence of an abundance of corn, or a climate suitable for producing it extensively, a few farmers have been experimenting with peas as a substitute upon which to fatten hogs. Pork, by the way, is a rare commodity in all the northern country, and

commands very high prices. Mr. A. F. Nichols, of Gallatin county, sells from 12,000 to 20,000 pounds of pork annually, which has been produced on peas, and Bass Brothers, of Bitter Root Valley, market of bacon alone as high as 21,000 pounds per year. These gentlemen are of the opinion that peas make the best food for hogs, and they can produce more pork from an acre of peas than can be made from the same area in corn in Illinois. Pork in different forms sells at from twelve to twenty cents per pound in Montana towns, and hundreds of tons are still imported from distant States to supply the demand. Hogs for breeding purposes are very scarce at from $12 to $20 each.

Manufactures.—Montana is too new a Territory and has too small a population to have any very extensive manufacturing establishments. There are stamping, smelting and other reduction mills at Helena, Bozeman, Wickes, Butte City, Virginia City and other points in the Territory; saw-mills and flouring-mills at several of the larger towns, and the usual run of small manufactories in most of these places. Probably twelve or fifteen million dollars would cover the products of all the manufacturing establishments yet in existence.

Objects of Interest.—About one-tenth of the Yellowstone National Park is within the bounds of Montana; but as nearly seven-eighths of this great wonder of the world belongs to Wyoming, we reserve our description of it for that Territory. But it is not the Yellowstone Park alone which attracts the attention of the tourist. The whole valley of the Madison river, as well as that of the Upper Yellowstone, is full of wonders, and the valley of the Upper Missouri and the northern portion of the valley of Clarke's fork of the Columbia river. In the Madison and the Yellowstone, cañon succeeds cañon, and wild, rocky waterfalls are too lofty to be run by any boat, and within such narrow bounds that there is no passage there for any human being, and they can only be viewed from above. One of these cañons in the Madison is fifteen miles in length, and its walls are from 600 to 900 feet in height, while the water leaps over a succession of rapids and falls. No human being has ever passed through it. Not far off are beautiful crystal lakes, which attract great numbers in the

season. The geyser formation extends over all this region, and among the most remarkable examples of it are the Deer Lodge Mineral Springs, eighteen miles north of Deer Lodge, some of which are really geysers, while others have formed cones of their deposits thirty feet in height and fifty feet in diameter at the base, from the apex of which flows a large warm spring. This is surrounded by forty other springs, ranging in temperature from 115° to 150°. The cañons and falls on the Upper Missouri are very beautiful and grand. We can only name "The Gate of the Mountains" and the "Great Falls," eighteen miles north of Helena, "Atlantic Cañon," "The Bear's Tooth," "The Mysterious Thunder," supposed to be caused by hidden geysers in the mountains, "The Devil's Slide" and "The Devil's Watch-Tower;" and in the northwest, the Flathead Lake Region with its Twin Cascades.

Railroads.—Up to January, 1880, there were no railroads in operation in Montana, but since that time the Utah and Northern Railroad has been opened to Helena, with the intention of an extension westward or northwestward; and the Northern Pacific Railway has entered the Territory from the east, and will reach the junction of Powder river with the Yellowstone by January, 1881, and Miles City and Fort Keogh by the early spring. The western or Pend d'Oreille Division of the same road will probably also enter the Territory by next spring, and make some progress southward in the valley of Clarke's fork of the Columbia river. The surveyed route of the Northern Pacific will traverse Western, Southwestern and Southern Central Montana, throwing out a branch to the National Yellowstone Park, following the Clarke's fork of Columbia and the Yellowstone river from its source nearly to its junction with the Missouri river, leaving it at Glendive, opposite the mouth of Cabin creek. Both these roads are likely to do a large and profitable business from the beginning, and one which will be increased almost indefinitely. At present immigrants wishing to reach Virginia City, Helena, Butte City, or any of the places in the Clarke's Fork Valley, will find it for their advantage to take the Utah and Northern Railroad; and those who would procure or who have procured homes in the valley of the Yellowstone,

the Northern Pacific, which will soon be running to Miles City. The only other available route is that up the Missouri river by steamers, and for several hundred miles up the Yellowstone. This journey should be made after April and before August. Very soon there will be access to the Territory from the west by way of the Pend d'Oreille and Clarke's Fork Divisions of the Northern Pacific.

Indian Reservations and Population.—The Territory was regarded as the best place to which to banish the Blackfeet, Crows, Assiniboines, Gros Ventres and Yanktonnais, after the terror inspired among the settlers by the terrible massacres in Minnesota in 1862–3, had made their longer stay in a new and rapidly growing State intolerable and impossible, and so they were removed to immense reservations north of the Missouri river and south of the Yellowstone, in 1867 and 1868, in the expectation that there they would be able to remain without molestation. Little did the Indian Office then dream that within ten or twelve years this very region would be found to be the garden spot of American agriculture, and that mines of fabulous wealth would be discovered among the mountains which then seemed to be so forbidding. But so it was; and when, a year or two later, the Flatheads, Pend d'Oreilles and Kootenais were in need of a home, one was assigned to them also within the limits of Montana. The United States government was lavish in its gifts of land to these tribes —34,156,800 acres, or $\frac{37}{100}$ of the whole area of the Territory, was made over to them, including nearly all the land north of, and more than one-half of the region south of the Yellowstone, extending to the Wyoming border. The land north of the Missouri, though some of it unfit for cultivation, is for the most part good grazing land, and the mountain slopes and river bottoms contain gold lodes and extensive placers; but the region south of the Yellowstone is the garden of the Territory for productiveness, and contains also extensive lodes of silver and gold, especially on Clarke's fork of the Yellowstone, Rosebud creek, and the Upper Yellowstone itself. At and around the five agencies on these reservations, viz.: the Blackfeet Agency, Crow Agency, Flathead Agency, Fort Peck Agency, and Fort Belknap

Agency, there are congregated 21,670 Indians, of whom 3,470 are Crow Indians, occupying the reservation south of the Yellowstone; 16,842 Blackfeet, Assinaboines and other Sioux bands, and 1,338 Flatheads and other Pacific tribes. Of the whole number only 1,531, about seven per cent., can be called civilized, so far as the assumption of citizen's dress is concerned, and but 475 male Indians were engaged in civilized pursuits. The absurdity of giving such a vast tract to these vagrant and barbarous tribes will be appreciated if we notice that they are allowed over 1,700 acres to every Indian, man, woman or child. Now that the buffalo is so rapidly disappearing that it has already ceased in nearly all parts of the continent to be the dependence of the Indian tribes for game and for its peltries, it is well worth while to inquire whether some occupation cannot be devised for the Indian which shall enable him to do something towards earning his own livelihood without occupying, or, rather, withholding from occupation by others, a Territory as large as the State of Illinois. We would not have the Indian wronged, but the lands of the earth are too precious to be held by those who cannot and will not cultivate or use them for human subsistence, and will not allow others to do so.

Population of Montana.—In 1870 the population of the Territory was 39,895, of whom 18,306 were whites, 183 colored, 1,949 Chinese, and 19,457 Indians, of whom all but 157 were members of the different tribes. Estimates were made at various times between 1870 and 1880, and with a tolerably near approximation to truth; thus, in 1876, the white population was estimated at 23,000; in 1877, at 28,000; and in 1878, at 35,000, including the Chinese and the colored people. In 1880 the supervisor of the census reports the population (except Indians) as 39,157, and adding the number of Indians, according to the report of the Indian Office for 1880—21,670—we have a total of 60,827, the white population having more than doubled, and the Indians having increased 2,213. The corrected census returns for 1880 show that of the population not tribal Indians 28,180 were males, 10,977 females, 27,642 natives, 11,515 foreigners, 35,648 whites, 202 colored, 1,750 Indians and half-breeds, and 1,737 Chinese.

The following table shows the assessment of Montana Terri-

tory by counties for the years 1878–79, with their respective increase of taxable property:

Counties.	Population 1880.	1879.	1878.	Increase.
Beaverhead . .	2,712	$1,029,596 00	$977,990 00	$51,606 00
Choteau . . .	3,058	1,179,875 00	596,722 00	583,153 00
Custer . . .	2,510	350,000 00	329,231 02	20,768 98
Dawson . . .	180			
Deer Lodge . .	8,876	3,700,000 00	2,341,268 00	1,358,732 00
Jefferson . . .	2,464	843,683 95	795,663 15	48,020 80
Gallatin . . .	3,643	1,586,340 00	1,386,340 00	200,000 00
Lewis and Clarke	6,521	3,028,320 00	2,899,810 00	128,510 00
Madison . . .	3,916	1,874,543 00	1,790,462 00	84,081 00
Meagher . . .	2,744	1,187,408 00	867,999 00	319,409 00
Missoula . . .	2,533	735,507 00	647,189 00	88,318 00
Totals .	39,157	$15,515,272 95	$12,632,674 17	$2,882,598 78

The county of Dawson, organized we believe in 1880, is reported in the above table with Choteau county, of which it has been hitherto the eastern part; but the coming of the Northern Pacific into the Territory has called a considerable population into this region, and it will probably next year report an increased population and assessment.

The principal towns of Montana are: Helena, the capital of the Territory, and of Lewis and Clarke county also; a town which originated in a placer mine, and was at first known by the not very euphonious name of "Last Chance Gulch." The town is not beautiful. Its location forbids that, but it has some good buildings, several churches and a population of more than 5,000. Virginia City is in the southern part of the Territory, on the Yellowstone, a little north of the Yellowstone National Park. It is also near the famous Alder Gulch. It has a population of nearly 2,000. Butte City, forty or fifty miles south of Helena, is a pretty town, with some smelting works and a population of about 3,000. Bozeman is a flourishing town at the head of the Gallatin Valley, and is on the projected route of the Northern Pacific. It has about 1,500 inhabitants. Other towns, which are rapidly growing, are: Bannock, Phillipsburg, Deer Lodge, Radersburg, Vestel, Missoula, Benton, and on the Yellowstone, Miles City and Glendive. By way of enlightening our readers as to the cost of living in Montana, we give the following price current of articles of

general use, furnished by a merchant of Miles City in April, 1880. The Yellowstone Division of the Northern Pacific will probably reach Miles City in March or April, 1881, and a few articles may then be lower. The Yellowstone is, however, navigable for steamboats for several months of the year.

Flour, per cwt.	$4 25 to $5 50
Oats, per cwt.	5 00
Corn, per cwt.	5 00
Potatoes, per cwt.	3 00
Butter, choice, per lb.	50
Eggs, per doz.	75
Corn meal, per cwt.	4 00
Bacon, per cwt.	10 00
Breakfast Bacon, per cwt.	25 00
Ham, per cwt.	25 00
Lard, per lb.	20
Beef, per lb.	8
Mutton, per lb.	10
Onions, per lb.	8
Sugar, per lb.	13 to 16
Coffee, per lb.	25 to 35
Beans, per lb.	8
Salt, per lb.	8
Coal Oil, per gal.	60
Whiskey, per gal.	3 00 to 8 00
Beer, per case	7 00
Tobacco, per lb.	90 to 1 25
Lumber, per M.	45 00 to 100 00
Shingles, per M.	11 00
White Lead, per cwt.	5 50
Nails, per cwt.	12 50
Iron, per lb.	7 to 10

AVERAGE WAGES IN THE EAST AND IN MONTANA IN JANUARY, 1879.

Employment.	In the East.	In Montana.
Bakers, per month and board	$25 00	$65 00
Blacksmiths, per day	2 50	4 50
Bookkeepers, per month	70 00	125 00
Bricklayers, per day	3 50	6 50
Butchers, per month and board	24 00	50 00
Brickmakers, " "	20 00	50 00
Carpenters, per day	2 50	4 50

First Cook, per month and board	$60 00	$110 00
Second Cook, " "	30 00	55 00
Cooks in families, " "	11 00	35 00
Chambermaids, " "	10 00	30 00
Clerks, per month	50 00	90 00
Dressmakers, per month	25 00	70 00
Dairymen, per month and board	25 00	45 00
Engineers in mills, per day	2 00	3 50
Farm hands, per month and board	15 00	42 50
Harness-makers, per day	2 00	4 50
Hostlers, per month and board	15 00	45 00
Laundresses, " "	12 00	35 00
Laborers, " "	15 00	35 00
Lumbermen, " "	28 00	55 00
Machinists, per day	2 75	4 50
Miners, "	2 25	3 50
Millers, per month and board	25 00	65 00
Millwrights, per day	2 50	4 50
Painters, per day	2 25	4 00
Printers, per week	15 00	25 00
Plasterers, per day	2 50	5 50
School teachers, per month	30 00	80 00
Servants, per month and board	11 00	35 00
Shepherds, " "		40 00
Stone masons, per day	3 00	6 00
Teamsters, per month and board	18 00	45 00
Waiters " "	16 00	55 00

Education.—Our latest statistics of education are from Governor Potts' report to the Secretary of the Interior in October, 1878. There has been considerable progress since that time. Graded schools had been established at Helena, Virginia City, Bozeman, Butte and Deer Lodge, and large, well-ventilated brick school-houses had been erected for them. The other educational statistics were as follows:

Number of school-houses	80
Value of school-houses	$67,700
Whole school census (between ages 4 and 21 years)	4,705
Number of scholars enrolled in schools	2,927
Number of teachers employed	104
Salaries of teachers employed	$36,200
Salaries of superintendents	$4,500

Number of graded and high schools	6
Number of private schools	10
One collegiate institute in process of erection at Deer Lodge, estimated cost	$15,000
Amount of county tax collected	$47,323

Religious Denominations.

	Methodist.	Presbyterian.	Episcopal.	Methodist South.	Roman Catholic.	Other denominations.	Totals.
Number of church edifices	7	3	3	5	6	1	25
Probable value	$40,000	$17,000	$11,000	$10,000	$35,200	$300	$113,500
Other church property	$100	$800	$2,147	.....	$25,000	.....	$28,347
Membership	384	175	183	125	.....	50	917
Sunday-schools	12	5	3	5	5	5	35
Officers and teachers	78	40	23	.....	.....	30	171
Scholars of all ages	593	325	180	120	.....	150	1,373
Benevolent collections	297	300	.....	.....	.....	.....	597
For ministerial support (annually)	$6,100	$5,300	$4,400	.....	.....	.....	$15,800
Number of ministers	8	5	3	5	8	2	31

The above table also dates from 1878, and probably most of the items would be doubled in the autumn of 1880 by the influx of population and the efforts of home missionaries. We know that the Congregationalists, the Lutherans and the Baptists have now organizations, and we think church edifices, and probably some other denominations also. The state of morals is probably not worse than in other new territories, and perhaps better than some; but there is less regard for the Sabbath than there should be, and infidel clubs abound, while the usual concomitants of new settlements, gambling and drinking saloons and brothels, are very numerous. This is particularly the case in most of the new settlements, the mining camp at Wickes being, however, an honorable and conspicuous exception.

After a time these mining towns acquire a better and more creditable population, and the rougher class go on to newer settlements, where the same scenes are re-enacted. The only remedy for this state of things is that moral, and especially Christian people, who settle in these new towns and camps, should maintain their religious character, and put down, by vigorous and decided action, Sabbath-breaking, gambling and drinking, and though the struggle may be severe at first, they will find it not only pleasant but greatly advantageous to the permanent prosperity

of their settlements. Mr. Wickes has been successful in doing this at his large camp, and is now reaping the reward of his firmness for the right.

CHAPTER XIV.

NEBRASKA.

AREA AND EXTENT—BOUNDARIES—COMPARATIVE AREA—ITS RIVERINE BOUNDARIES—SURFACE OF THE COUNTRY—SENSE IN WHICH IT IS A PRAIRIE—ITS GRADUAL ELEVATION TO THE BASE OF THE ROCKY MOUNTAINS—THE NEBRASKA "BAD LANDS"—THE RIVERS OF NEBRASKA—THE MISSOURI AND NIOBRARA—THE NORTH AND SOUTH PLATTE AND THEIR AFFLUENTS—THE LOUP AND ITS FORKS—THE REPUBLICAN RIVER—GENERAL DIRECTION OF THESE RIVERS—GEOLOGY AND MINERALOGY—THE LOESS OR DRIFT—ALLUVIAL DEPOSITS—THE GREAT PRE-HISTORIC LAKE—TERTIARY FORMATION—CARBONIFEROUS STRATA—THE COAL MEASURES—LIGNITE IN THE TERTIARY—NOT MUCH ECONOMIC VALUE TO THE COALS OF NEBRASKA—THE PEAT BEDS OF THE STATE—SOIL AND VEGETATION—FERTILITY OF THE LOESS—TREES OF THE STATE—ZOÖLOGY—CLIMATE AND METEOROLOGY—TABLE—AGRICULTURAL PRODUCTIONS—CROPS OF 1877, 1878 AND 1879—WILD AND CULTIVATED FRUITS—MR. E. A. CURLEY ON THE WILD FRUITS—GRAZING—THE LIVE-STOCK OF THE STATE—MANUFACTURING INDUSTRY—RAILROADS—POPULATION—RAPID GROWTH OF THE STATE—INDIANS—FINANCIAL CONDITION—EDUCATION—LANDS FOR IMMIGRANTS—GOVERNMENT, SCHOOL, UNIVERSITY AND RAILROAD LANDS—ADVICE TO IMMIGRANTS—PRICES—COUNTIES, CITIES AND TOWNS—RELIGIOUS DENOMINATIONS—HISTORICAL DATA—NEBRASKA AS A HOME FOR IMMIGRANTS.

NEBRASKA, one of the States of the central belt of "Our Western Empire," lying between the parallels of 40° and 43° north latitude, and between 95° 20′ and 104° of west longitude from Greenwich. It is bounded on the north by Dakota; on the east by the Missouri river, which separates it from Iowa and Missouri; on the south by Kansas and Colorado, and on the west by Colorado and Wyoming. Its area, according to the United States Land Office, is 75,995 square miles, or 48,636,800 acres. Its greatest length from east to west is 412 miles, and its breadth

from north to south 208 miles. It is larger than all New England and New Jersey, and as large as Ohio and Indiana together. The Missouri river not only forms its entire eastern boundary, but in conjunction with the Niobrara, one of its larger tributaries, and the Keya Paha, an affluent of that stream, gives a riverine boundary to nearly one-half of its northern border.

Surface of the Country—Gradual Descent from West to East—Rivers, Bluffs, Hills, Valleys.—The State is called prairie. So it is, in the sense of the word which means meadow; but not in that secondary sense which implies a land of uniform flatness. In real truth, Nebraska is a part of the lowest eastern grass-clothed slope of the Rocky Mountains. The eye alone will make no observer aware of this fact. Nevertheless, from the eastern to the western boundary of Nebraska, there is a gradual and uninterrupted rise of the land of about seven feet to the mile in Eastern Nebraska, and from that to ten feet in the west; and thus it is that while the land on the eastern boundary is 910 feet above sea-level, on the western boundary it is about 5,000. The surface form of the State is, of course, made by the rivers. The eastern front of the country shows bold, wooded bluffs to the Missouri, their outlines being cut and scarped into fantastic and picturesque forms by the washing water. West of the Missouri bluffs, except on the table lands, there is no flat, but a land of many changing forms—now broad bottoms, bounded by low hills; now picturesque bluffs, and, especially in the grazing region, ravines sometimes as rugged as the gulches in the gold fields. In the northwestern part of the State, in the region lying between the sources of the Middle Loup fork and the Niobrara river, there are extensive sand hills, and those clay deposits, cut into the most fantastic forms by the erosion of the mountain streams. These are the "Nebraska Bad Lands," and are connected, both geologically and geographically, with the Dakota "Bad Lands," on and near the White Earth river, and between that river and the Big Cheyenne.

These "Bad Lands" are uninhabitable, but they are very interesting for their fossils, of which we shall have more to say under the Geology of Nebraska.

Now and again a river flows full to the bank, from which the bottom—from a mile to four or more miles wide—spreads out on either hand; but generally the streams run in deep beds, the high, steep banks and the narrow first bench being thickly clothed with timber. The general ascending lay of the land is broken from west to east by three main drainage channels. On the northern boundary of the State are the Niobrara and the Missouri rivers, of which latter the Niobrara is an affluent.

The Niobrara has many tributaries, some of them of considerable size; and several of them, as their names imply, have many rapids and waterfalls.* The Platte, a winding, shallow, spreading stream, has the sources of both of its main streams, the North and South forks of the Platte, far up the main range or Great Divide of the Rocky Mountains in Central Colorado; the North fork also traversing a great extent of territory in Wyoming; both forks cross Nebraska from west to east to their point of junction at North Platte. Before the division, the Platte river receives two large tributaries, the Loup Fork river, which, with its three branches, North, Middle and South, traverses a large territory, and the Elkhorn, which drains Northeastern Nebraska. On the south bank, neither the Platte nor the North Platte receive any considerable streams. The South Platte receives on its north bank Lodge Pole creek, in the valley of which the Union Pacific road is constructed for 150 miles. From fifty to eighty miles south of the Platte, the Republican river, the largest tributary of the Kaw or Kansas river, having its sources in Eastern Colorado, traverses the southern and southwestern counties of the State, receiving three large affluents, Medicine Lake creek, White Man's fork and Rock creek, on its northern bank, and an infinitude of small streams on both banks. Other smaller but considerable tributaries of the Kansas drain the southeast of the State. The general direction and flow of all these rivers is to the southeast. In their gradual descent from the lofty plateau at the west of the State, the rivers and streams, in seeking the lowest level,

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* *Eau qui Court*—"the water that leaps"—*Mini Chadusa*, or Rapid creek, Antelope creek, the Rapid river, are a few of the names of these affluents.

have cut their way through the soft and easily eroded deposits, and have worn away their banks to such a degree as to give the appearance of high bluffs along their banks, when in reality no such bluffs exist; but the stream has eroded for itself a channel at a lower level than that of the surrounding country. Such is the topography of Nebraska in barest outline; and, with the map before him, the reader can fill in the details. He can imagine the great plain ascending to higher altitudes as the mountains are approached; the rivers, west to east, making three great valleys, and two elevated divides separating the valleys; and, finally, the smaller streams exhibiting the land as broken into an almost infinite number of gently undulating hills and valleys—with great table lands on the summits—the trend of which is southeast.

Geology and Mineralogy.—The geological structure of the State is very simple. In the southeast a triangular tract, extending west as far as where the Little Blue river crosses the southern boundary of the State, and having the apex of the triangle at the point where the forty-second parallel of latitude intersects the Missouri river, is distinctly identified with the upper carboniferous formation. It is covered to a depth of from thirty to ninety feet by a yellowish marl (the loess or surface deposit described by Professor Hayden), but the rocks below belong to the coal measures. There are thin strata of coal of good quality, but ranging in thickness from five to twenty-two inches—not sufficiently thick to pay for expensive mining, while clays, limestones and sandstones belonging to the carboniferous era make up the remaining thickness of the coal measures, which aggregate 120 feet or more. The geologists believe this deposit to be the western rim or margin of the great coal basin of Missouri and Iowa, and think that on this border or rim the coal has been subjected to such pressure that it will be found too thin for profitable mining. West of these coal measures is a narrow belt of Permian rocks, and to this succeed the cretaceous deposits, having a breadth of seventy or eighty miles. West of this the whole surface rocks and soil of the State belong to the tertiary period. In the southwest the tertiary formation has large deposits of lignite of excellent quality, which will probably supply a large portion

of the demand of the State for coal. Of the loess or yellowish marl which forms the superficial deposit over the greater part of the State, we may remark, that this deposit, which is quaternary rather than tertiary, is supposed to be the sediment deposited by the great lakes, one of them in Nebraska and Iowa being estimated as 500 miles long, and from fifty to two hundred miles wide, which covered this whole region after the close of the last glacial period. Into and through the greatest of these lakes the Missouri, then, as now, the muddiest of rivers, poured its vast flood of yellow waters. As the land gradually rose, this immense lake drained off its surplus water through the Missouri river, became a vast marsh, and eventually, as the rivers cut deeper and deeper through this loess deposit, the land became dry and solid. Of this loess, Professor Aughey, the State Geologist, says:

"The loess deposit is in some respects one of the most remarkable in the world. Its value for agricultural purposes is not exceeded anywhere. It prevails over at least three-fourths of the surface of Nebraska. It ranges in thickness from five to one hundred and fifty feet. Some sections of it in Dakota county measure over 200 feet. At North Platte, 300 miles west of Omaha, and on the south side of the river, some of the sections that I measured ranged in thickness from 125 to 150 feet. From Crete, on the Burlington and Missouri River Railroad, west to Kearney, on the Union Pacific Railroad, its thickness for ninety miles ranges from forty to ninety feet. South of Kearney, and for a great distance west, along the Union Pacific Railroad, as far as to the Republican, there is a great expanse of territory, covered by a great thickness of this deposit. I measured many sections in wells over this region, and seldom found it less than forty, and often more than sixty feet in thickness. Along the Republican, I traced the formation almost to the western line of the State, its thickness ranging from thirty to seventy feet. One section north of Kearney, on Wood river, showed a thickness of fifty feet. The same variation in thickness is found in the counties bordering on the Missouri. One peculiarity of this deposit is that it is almost perfectly homogeneous throughout, and of almost uniform color,

however thick the deposit or far apart the specimens have been taken. I have compared many specimens taken 300 miles apart, and from the top and bottom of the deposits, and no difference could be detected by the eye or by chemical analysis.

"The physical properties of the loess deposits are also remarkable. In the interior, away from Missouri, hundreds of miles of these loess deposits are almost level or gently rolling. Not unfrequently a region will be reached where, for a few miles, the country is bluffy or hilly, and then as much almost entirely level, with intermediate forms. The bluffs that border the flood-plains of the Missouri, the Lower Platte and some other streams, are sometimes gently rounded off. They often assume fantastic forms, as if carved by some curious generations of the past. But now they retain their forms so unchanged from year to year, affected neither by rain nor frost, that they must have been molded into their present outlines under circumstances of climate and level very different from that which now prevails. For all purposes of architecture this soil, even for the most massive structures, is perfectly secure. On no other deposits, except the solid rocks, are there such excellent roads. From twelve to twenty-four hours after the heaviest rains, the roads are perfectly dry, and often appear, after being travelled a few days, like a vast floor formed from cement, and by the highest art of man. Yet the soil is very easily worked, yielding readily to the spade or the plow. Excavation is remarkably easy, and no pick or mattock is thought of for such purposes. It might be expected that such a soil would readily yield to atmospheric influences, but such is not the case. Wells in this deposit are frequently walled up only to a point above the water-line; and on the remainder the spade-marks will be visible for years. These peculiarities of the loess deposits are chiefly owing to the fact that the carbonate of lime has entered into slight chemical combination with the finely comminuted silica. There is always more or less carbonic acid in the atmosphere which is brought down by the rains, and this dissolves the carbonate of lime, which then readily unites with the silica, but only to a slight extent, and not enough to destroy its porosity. Though much of the silica is microscopically minute,

it has largely preserved its angular structure, and this of course aids the slight chemical union that takes place between it and the carbonate of lime. Had there been more lime and iron in this deposit, and had it been subjected to a greater and longer pressure from superincumbent waters, instead of a slightly chemically compacted soil, it would have resulted in a sandstone formation incapable of cultivation. There is not enough clayey matter present to prevent the water from percolating through it as perfectly as through sand, though a great deal more slowly. This same peculiarity causes ponds and stagnant water to be rare within the limits of this deposit."

In the northwestern part of the State, the region of the "Bad Lands," to which we have already referred, the loess is not a surface deposit. The hills, "Great Hills," as they are called on some of the maps, are either composed of loose-moving sand which is blown by the winds into round, conical hills with considerable regularity—hills sometimes covered scantily with tufts of grass, but oftener with the yuccas or Spanish needles or some of the cusci; or the fantastic forms of the clay and soft tertiary limestones, cut by the water-courses into the semblance of ruined cities, towers, temples and columns, and often covered with sparkling alkaline crystals. This region of "Bad Lands" occupies, according to Professor Hayden, an area of about 20,000 square miles on both sides of the Niobrara river. There are many little lakes or ponds in this region, some salt, some alkaline, and some very pure and fresh. This whole tract abounds in fossils of the most remarkable character. While these lands are geologically connected with the "Bad Lands" on the White Earth river in Dakota, it is a very interesting fact that the fossils of the Dakota lands belong to an earlier period than those of the Nebraska lands, and that the two seem to have had hardly any animals common to both. These regions have been the favorite hunting-ground for fossils of Professors Leidy and O. C. Marsh. Of the Nebraska fossils Professor F. V. Hayden says:

"If we pass for a moment southward into the valleys of the Niobrara and Loup fork, we shall find a fauna closely allied, yet entirely distinct from the one on White river, and plainly inter-

mediate between that of the latter and of the present period; one appears to have lived during the middle or miocene tertiary period, and the other at a later time in what is called the pliocene In the later fauna were the remains of a number of species of extinct camels, one of which was of the size of the Arabian camel, a second about two-thirds as large, also a smaller one. The only animals akin to the camels, at the present time in the western hemisphere, are the llama and its allies in South America. Not less interesting are the remains of a great variety of forms of the horse family, one of which was about as large as the ordinary domestic animal, and the smallest not more than two or two and a half feet in height, with every intermediate grade in size. There was still another animal allied to the horse, about the size of a Newfoundland dog, which was provided with three hoofs to each foot, though the lateral hoofs were rudimental. Although no horses were known to exist on this continent prior to its discovery by Europeans, yet Dr. Leidy has shown that before the age of man this was emphatically the country of horses. Dr. Leidy has reported twenty-seven species of the horse family which are known to have lived on this continent prior to the advent of man —about three times as many as are now found living throughout the world.

"Among the carnivoræ were several foxes and wolves, one of which was larger than any now living; three species of hyænodon—animals whose teeth indicate that they were of remarkably rapacious habits; also five animals of the cat tribe were found, one about the size of a small panther, and another as large as the largest wolf. Several of the skulls of the tiger-like animals exhibited the marks of terrible conflicts with the cotemporary hyænodons.

"Among the rodents were a porcupine, small beaver, rabbit, mouse, etc.

"The pachyderms, or thick-skinned animals, were quite numerous and of great interest, from the fact that none of them are living on this continent at the present time, and yet here we find the remains of several animals allied to the domestic hog, one about the size of this animal, another as large as the African

hippopotamus, and a third not much larger than the domestic cat.

"Five species of the rhinoceros roamed through these marshes, ranging from a small, hornless species, about the size of our black bear, to the largest, which was about the size of the existing unicorn of India. No animals of the kind now inhabit the western hemisphere.

"Among the thick-skinned animals were the remains of a mastodon and a large elephant, distinct from any others heretofore discovered in any part of the world. Dr. Leidy says that 'it is remarkable that among the remains of mammals and turtles there are none of crocodiles. Where were these creatures when the shores of the ancient Dakotan and Nebraskan waters teemed with such an abundant provision of savory ruminating hogs?' During the tertiary period Nebraska and Dakota were the homes of a race of animals more closely allied to those inhabiting Asia and Africa now, and from their character we may suppose that during that period the climate was considerably warmer than it is at present. The inference is also drawn that our world, which is usually called the new, is in reality the old world, older than the eastern hemisphere.

"Ever since the commencement of creation, constant changes of form have been going on in our earth. Oceans and mountains have disappeared, and others have taken their place. Entire groups of animal and vegetable life have passed away, and new forms have come into existence through a series of years which no finite mind can number. To enable the mind to realize the physical condition of our planet during all these past ages is the highest end to be attained by the study of geological facts. It has been well said by an eloquent historian that he who calls the past back again into being enjoys a bliss like that of creating.

"We may attempt to form some idea of the physical geography of this region at the time when these animals wandered over the country, and to speculate as to the manner in which their remains have been so beautifully preserved for our examination. We may suppose that here was a large fresh-water lake during the middle tertiary period; that it began near the southeastern side

of the Black Hills, not large at first nor deep, but as a marsh or mud-wallow for the gigantic pachyderms that lived at the time; that as time passed on it became deeper and expanded its limits until it covered the vast area which its sediments indicate. We cannot attempt to point out in detail all the changes through which we may suppose, from the facts given us, this lake has passed, during the thousands of years that elapsed from its beginning to its extinction, time long enough for two distinct faunæ to have commenced their existence and passed away in succession, not a single species passing from one into the other. Even that small fraction of geological time seems infinite to a finite mind. We believe that the great range of mountains that now lies to the west of this basin was not as lofty as now; that doubtless the treeless plains were covered with forests or grassy meadows, upon which the vast herds of gregarious ruminants cropped their food. Into this great lake on every side poured many little streams from broad valleys, fine ranging ground for the numerous varieties of creatures that existed at that time. Large numbers of fierce carnivorous beasts mingled with the multitudes of gregarious ruminants, constantly devouring them as food. As many of the bones, either through death by violence or natural causes, were left in the valleys, they would be swept down by the first high waters into the lake, and enveloped in the sediments at the bottom. As the gregarious ruminants came down to the little streams, or by the shores of the lake to quench their thirst, they would be pounced upon by the flesh-loving hyænodon, drepanodon or dinichthys. It was probably near this place also that these animals would meet in fierce conflicts, the evidences of which remain to the present time in the cavities which the skulls reveal; one of these, of a huge cat, shows on either side the holes through the bony covering which had partially healed before the animal perished; and the cavities seem to correspond in form and position with the teeth of the largest hyænodon.

"The remains of those animals which, from their very nature, could not have existed in great numbers, are not abundant in the fossil state, while those of the ruminants occur in the

greatest abundance, and are widely diffused in the sediments, not only geographically, but vertically. The chances for the remains of a species seem to depend upon the number of individuals that existed. The remains of ruminants already obtained comprise at least nine-tenths of the entire collection, while of one species portions of at least seven hundred individuals have been discovered. There is another interesting feature in regard to these remarkable fossils, and that is the beauty and perfection of their preservation; the bones are so clean and white and the teeth so perfect, that when exposed upon the surface they present the appearance of having bleached only for a season. They could not have been transported from a great distance, neither could the waters have been swift and turbulent, for the bones seldom show any signs of having been water-worn, and the nice, sharp points and angles are as perfect as in life."

Minerals.—The mineral wealth of the State consists largely of the two coal beds which we have described—the true coal in the southeast, which possesses but little economic value, and the lignite, which will probably be found profitable. Peat exists in immense beds in Central and Western Nebraska, and in the opinion of Mr. E. A. Curley, a competent judge in these matters,* in the best form and condition to be made available for fuel. At some time in the not distant future, these peat beds may prove more valuable than the thin seams of coal in the coal measures. Lime, sandstone, limestone, and marble for ornamental purposes, gypsum, and especially salt, are the other principal minerals. There are many salt basins in the central and western parts of the State. The most extensive is in Lancaster county, in a district of twelve by twenty-five miles, surrounding Lincoln, the capital of the State. The spring waters contain twenty-nine per cent. of salt, and the salt is manufactured by the solar evaporation process. The salt is said to be the purest in the world, having $98\frac{3}{10}$ per cent. of pure chloride of sodium. The sandstones, limestones, and marble or magnesian limestone, are all of excellent quality for building and ornamental purposes.

* "Nebraska and its Resources." London, 1875.

Soil and Vegetation.—The soil of the uplands is largely composed of loess, and that of the river valleys of alluvium. The two deposits are similar in chemical elements, and they form a very rich and durable soil, exceedingly valuable for agricultural purposes, ranging in thickness from five to one hundred and fifty and even two hundred feet. Careful analyses of the soil show that in the loess over eighty per cent. of the formation is finely comminuted silica: so fine that its true character can only be detected under a microscope. About ten per cent. of its substance is made up of carbonates and phosphates of lime. There are some small amounts of alkaline matter, iron and alumina; the result being a soil that can never be exhausted until every hill and valley which composes it is entirely worn away. Its finely comminuted silica gives it natural drainage in the highest degree. When torrents of rain come, the water soon percolates the soil, which, in its lowest depths, retains it like a huge sponge. When droughty periods intervene, the moisture rises from below by capillary attraction, supplying nearly all the needs of vegetation in the dryest seasons. The richer surface soil overlies the sub-soil, and is from eighteen inches to three and four, and even six feet thick. It is organically the same as the sub-soil, but enriched with organic matter, the growth and decay of innumerable centuries—a garden soil, easily cultivated, and making the arable farm as a garden.

The prairie, clothed only by natural processes, presents its own testimony to the riches of the State. Its whole expanse is covered with grasses, there being not fewer than 150 species, and the most abundant, making the best pasture, showing green at the end of April, and affording feed until November. The blue joint grows everywhere except on low bottoms. Under ordinary conditions its growth is two and a half to four feet; and on cultivated grounds it is found from seven to ten feet high. Wild oats grow on the uplands, mixed with blue-joint. This grass is relished by cattle and is abundant. The buffalo grass, low in habit, is now found in the western half of the State. It disappears before cultivation, but it is nature's provision of food for grain-eating animals during winter, on the prairie, inasmuch as it retains its

nutriment all the year round. Among other feed grasses are several varieties of bunch-grass; and in the low lands a native blue-grass and the spangle-top, which latter makes excellent hay.

The Nebraska prairie is not bare of trees—in fact, the native trees furnish a large list. The river bluffs are clothed with them, and the banks of the streams. There are two kinds of buckeye, two of maple, the box-elder, two of locust, four of ash, four of elm, four of hickory, eleven of oak, twelve of willow (eight species being shrubs), three of birch, three of poplar, hackberry, iron wood, one sycamore, black walnut, two spruce firs, yellow pine, white cedar and red cedar. The shrubs include common juniper, linden, pawpaw, prickly ash, five sumacs, shrub trefoil, two species of red root, spindle-tree, buckthorn, six species of plum, six currants and gooseberries, five dogwoods, butter bush, buffalo berry, red and white mulberry, hazelnut and beaked hazelnut. Cedars are found on the islands of the Platte, and along the Loups and the Niobrara there is a goodly quantity of pine. But the point is here: this list of trees is proof that trees flourish on the prairie; and that as much timber as is needed for all uses can be raised on the farm.

During the Indian period, when prairie fires annually swept over the country, the timber was confined to the banks of the streams; but since the era of civilization and cultivation has commenced, the prairie fires are checked, and groves and forests have become possible on the prairie.

Zoölogy.—Buffaloes are still found, though not plentiful, in the southwestern and northwestern parts of the State. The elk (*Cervus Canadensis*) is the noblest game animal of the plains; it sometimes weighs from 700 to 800 pounds, and its antlers are magnificent. Its range is in the west from the south to the north, feeding on the high prairies, and frequenting also the ravines. The antelope (*Antilocapra Americana*), in plentiful herds and fleet as the winds, is found everywhere west of Plum creek; and the white or long-tailed deer (*Cervus Leucurus*), and the black-tailed (*Cervus Macrotis*) are denizens of the same region—the white-tailed being found over the whole State. In the far west and among the ravines, the big-horn sheep (*Ovis Montana*) will now

and again fall to the rifle. The time for hunting is from the first of October to the end of December, the law protecting the animals during the remainder of the year. The jack rabbit or prairie hare (*Leporidæ Campestris*) is common. He is a strong and fleet animal, and is good game for coursing, and only to be run down by the strongest and fleetest greyhounds. The little gray rabbit is also common, and affords excellent shooting; and away in the west, the sage rabbit. In the timber, the black bear and two species of lynx are found—rarely in the settled parts of the State, and more commonly on the frontier; and also in the same localities, the large white and gray wolf. The coyote, or prairie wolf, is also worth hunting, the animal having all the cunning of the fox and more than the wit of the prairie foxes, of which there are three species, the red fox, the prairie fox and the kit fox. Some of the streams are still populous with beavers, minks and muskrats. The game birds of Nebraska are plentiful; and in the season afford sport in abundance. The wild turkey is the noblest of them all. Civilization drives it away; but in the wilder parts of the State, the bird is common enough, and where the woods are thickening in the river counties, its reappearance is beginning to be noted. The prairie chickens—the grouse of the prairie—are everywhere; and away out on the frontier, the large sage hen. Quail are plentiful and readily shot; and there are several plovers which are worth the powder and shot of the sportsman. In early spring and late fall, large flocks of wild geese cross the State, resting during the journey on the rivers, creeks and ponds. Mallards, teal, and many other species of wild duck, are plentiful during the same seasons. Of cranes there are four or five species—the sand-hill crane, the largest, being accounted an excellent table-bird. There are numerous hawks, and the bald-headed eagle is frequently seen in the sparsely settled districts. The streams are well stocked with the common kinds of fish, and in the northwest there is an abundance of trout in the streams.

Climate and Meteorology.—Nebraska has a very temperate and healthful climate. The gradually increasing elevation from east to west secures good drainage everywhere, and though the winds

which sweep across its prairies are strong, they are healthful. The climate is essentially a dry one, though the rainfall is sufficient and well distributed to secure the best results for the crops. The winters are not so rigorous as in the States and Territories farther north, though the temperature is occasionally low. The summers are long and warm, but the prairie breezes greatly modify and temper the extreme heat. The mean temperature during the winter months ranges from 22° to 30°; that of the spring from 48° to 50°; that of the summer from 71° to 74°, and that of the autumn from 48° to 51°. A record of thirteen years at Plattsmouth gives the mean annual rainfall as 38.35 inches, of which 28.82 inches fell between April 1st and October 1st, and only 9.53 inches between October 1st and April 1st. Farther west the rainfall is somewhat less, but with very rare exceptions it is sufficient. The table on page 1019 gives the meteorology of six different points for periods of from two to five years, though none of them indicate either the temperature or rainfall of the extreme west or northwest, which is as yet not inhabited, and some portions of it hardly habitable. In the "Bad Lands," the summer's sun beats down with terrible intensity, the heat reaching 112° Fahrenheit in the shade; and the winter's cold is, in its way, equally intense.

Agricultural Productions.—Although Nebraska is essentially an agricultural State, and has a large amount of good and fertile land, a larger proportion, perhaps, than most of the States adjacent to her, we have to complain that she has not made the most of her advantages, and in her accounts of her soil and productions has dealt altogether too much in glittering generalities, to the exclusion of those statistics of actual crops which alone can determine the actual capabilities of her soil and lands for new comers who desire to cultivate them.

We fear that there has been much slovenly farming on her rich and fertile lands; for, so far as the scanty statistics enable us to determine, the average yield of the cereals has been much lower than it should have been on lands as admirably adapted to cereal culture as those of the loess beds, and that that yield per acre is diminishing instead of increasing. The numbers and

METEOROLOGY OF NEBRASKA.

STATIONS.	Highest Temp. of Year.	Lowest.	Mean.	Range.	Highest Temp. of Spring.	Lowest.	Mean.	Range.	Highest Temp. of Summer.	Lowest.	Mean.	Range.	Highest Temp. of Autumn.	Lowest.	Mean.	Range.	Highest Temp. of Winter.	Lowest.	Mean.	Range.	Average Annual Rainfall.	Rainfall of Spring.	Rainfall of Summer.	Rainfall of Autumn	Rainfall of Winter.	Mean Annual Humidity.	Mean Annual Pressure of Barometer.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	in.	in.	in.	in.	in.	per ct.	in.
Omaha, Lat. 41° 16′ N. Long. 96° W. Elevation, 1046 feet.	98	—20	47 96	118	86	—3	47.1	89	98	51	75.7	47	91	19	48.1	72	57	—20	21	77	28.98	9.86	11.73	6.62	0 77	64.2	29.946
Omaha Agency, Lat. 42° 8′ N. Lon. 96° 23′ W. Elevation, 1053 ft.	98	—5	49.6	103	91	—5	49.6	96	98	48	75.	50	85	9	46.1	76	58	—5	27 9	63	32.85	5.20	13 06	10 43	4.14		
Dakota, Lat. 42° 24′ N. Lon. 96° 27′ W. Elevation, 1071 feet.	99	—19	45.5	118	89	—8	46.9	97	99	54	71.3	45	90	7	47.8	83	56	—19	18.2	75	30 46	4.32	13.16	10.33	2.65		
Nebraska City, Lat. 40°40′ N. Lon. 95°54′ W. Elevation, 993 ft.	99	—2	55.8	101	80	—2	55.	82	99	52	75.2	47	84	20	51.7	74	64	—2	29 3	66	46.24	8.60	22.98	8.63	6.03		
Ft. Kearney, Lat. 40° 37′ N. Long. 99° W. Elevation, 1247 feet.	100	—30	44.7	130	....	....	....	....	100	....	....	...	....	....	....	...	...	—30	....	....	24.10	3 67	12.13	5.12	3.18		
Nth. Platte, Lat 41° 8′ N. Lon. 100° 53′ W. Elevation, 2858.17 feet.	103	—19	48.7	122	93	11	51.5	82	103	38	72.1	65	96	11	49.	85	68	—19	20.8	87	17.15	4.28	8.41	1.50	2.96	61.3	29.646

The winds in Nebraska are strong, and in winter often intensely cold, and cyclones are not very infrequent; their direction in the order of frequency is N., N. W., S., S. E., S. W., and calm.

quality of the live-stock are increasing, and give evidence that the grazing lands which are now rapidly filling up, will prove profitable to the stock-raiser. With greater care in her cultivation, the average crop of wheat on her excellent wheat lands should be not less than twenty-five bushels to the acre instead of 13.1 bushels, as it was in 1878, or fifteen bushels, as it was in 1877. She has done better in corn, and as this crop is likely to be in demand for the fattening of her own live-stock, she will have strong inducements to do better yet. The quantity of land taxed or reported for taxation was, in 1879, a little more than 14,000,000 acres, or more than one-fourth of the entire area of the State, and it was valued for the purposes of assessment at only $3 per acre. This included, of course, a large amount of grazing land, and the assessment was high enough for this class of land. The land under cultivation in 1879 probably exceeds slightly 4,000,000 acres, or about one-twelfth of the area of the State. The large amount taken up for farms in the last two or three years has not yet become subject to taxation. The tables on page 1021 show the amount of the principal crops and their value in 1877, 1878 and 1879, so far as these can be ascertained, and also the numbers and value of the live-stock in the State for the same years.

There are, of course, other crops which are of considerable importance besides these, of which we regret that we have not full statistics; among these we may name sorghum, which is a crop of constantly increasing magnitude, and for which the soil and climate is peculiarly adapted; broom corn, which is largely cultivated in some sections; flax, cultivated mainly for the seed, though the lint, even without bleaching, makes an excellent paper stock. The cultivation of the flax is increasing in the newer sections, as it has been found the best crop to put in after the new breaking. Alfalfa, the millets and the rice corn, or dhourra, are coming into favor, while the castor bean and other oil-producing plants pay well.

Nebraska is probably destined to occupy a prominent place among the fruit-producing States. Its wild fruits are of exceptional excellence, especially its plums, strawberries, blackberries,

PRINCIPAL CROPS OF NEBRASKA.

	1877.					1878.					1879.		
Crops.	No. of bushels, pounds or tons in crop.	Yield per acre.	No. of acres in crop.	Price per bushel, pound, etc.	Total Value.	No. of bushels, pounds or tons in crop.	Yield per acre.	Acreage.	Price per bushel, pound, etc.	Total Value.	No. of bushels, pounds or tons in crop.	Acreage.	Value.
Wheat, bu	9,548,456	15	636,564	$ .83	$7,957,045	17,412,408	14.3	1,210,000	$ .60	$10,447,445	17,026,854	1,547,900	$14,302,557
Corn, bu	32,626,727	32.3	1,010,120	.18	6,172,811	45,147,355	37.0	1,220,198	.16	7,223,577	49,000,580	1,089,000	10,290,122
Rye, bu	888,676	19.4	45,808	.34	302,150	2,931,000	19.1	153,600	.35	1,025,850	2,684,000	167,750	1,100,440
Barley, bu	3,158,425	24	131,601	.30	1,347,528	5,254,650	25	131,366	.33	1,754,035	4,481,000	224,050	1,657,970
Oats, bu	5,829,162	40	145,729	.18	1,059,249	9,341,000	33 4	311,366	.27	2,522,070	8,472,000	264,900	1,948,560
Buckwheat, bu	27,533	17	1,619	.75	20,650	65,745	16	4,108	.55	36,160	60,700	2,428	41,276
Beans, bu	2,724	25	109	1.00	2,724	37,609	25	1,504	.90	33,848	39,900	1,600	63,840
Potatoes, bu	773,330	105	7,364	.40	309,332	2,839,360	125	22,715	.23	653,053	3,327,000	41,670	1,197,720
Hay, tons	475,000	1.45	327,586	3.65	1,733,750	620,400	1.88	330,000	3.29	2,041,116	1,067,000	582,000	3,446,410
Totals			2,306,500		$18,605,239			3,384,857		$25,737,154		3,821,298	$34,048,895

raspberries, buffalo berries, etc., and its wild grapes.* For a new State it has also made great progress in the cultivation of apples, pears, peaches, cherries, plums, quinces and the other fruits of a temperate climate. In cultivated grapes it has not yet made great progress. At the Centennial Exhibition the State had a collection of 163 varieties of apples, many of them of great excellence, and a considerable number of pears. Both fruits received the first premium.

But a large portion of Nebraska is and must continue to be, for many years to come, better adapted to grazing than to farming, and while it can hardly at the same cost maintain as large flocks and herds as Texas, Colorado, Wyoming or Montana, there is no question that stock-raising does and will prove very profitable, if rightly managed, in Nebraska. The amount of live-stock in these grazing States and Territories increases so rapidly every year that it is very difficult to keep pace with them, but although we cannot procure the statistics of the year 1880 as yet, a comparison of the live-stock of the State for 1877, 1878 and 1879 may give some idea of the rapidity of increase; for our statistics for 1877 and 1878 are compiled from the State Auditor's reports, and those of 1879 from the United States Agricultural report, the State report for that year not being yet published.

Animals.	1877.			1878.			1879.		
	Number of Animals.	Average Price.	Total Value.	Number of Animals.	Average Price.	Total Value.	Number of Animals.	Average Price.	Total Value.
Horses	112,715	67.68	$7,628,551	157,619	67 34	$10,614,063	180,537	68.10	$12,296,570
Mules and asses	10,632	92.73	983,123	16,482	87.45	1,441,361	17,150	91.00	1,560,650
Milch cows	93,700	26.96	2,526,122	127,600	24.27	3,096,852	145,280	26.00	3,777,280
Oxen and other cattle	238,200	21.30	5,073,660	376,058	19.45	7,314,328	458,147	25.10	11,499,490
Sheep	82,858	2.77	229,517	135,777	2.30	272,287	162,520	2.95	479,434
Swine	318,764	5.80	1,848,831	607,600	3.03	1,841,828	701,750	3.88	2,722,790
Totals of values	.....	.....	18,289,804	.....	.....	24,580,719	.....	.....	32,336,214

* Mr. E. A. Curley, the accomplished correspondent of the London "*Field*," published, in 1875, a valuable work, largely illustrated, entitled, "Nebraska, its Advantages, Resources and Drawbacks." In this work he has given engravings of many of these wild fruits, and particularly of the plums, strawberries, grapes and buffalo berries. In some of these fruits he thinks Nebraska surpasses any Western State.

As these are very low average prices, and the increase in the amount of stock in 1880 has been great beyond all former precedent, it is probable that a fair and just estimate of the value of the live-stock of the State at the end of 1880 would not be less than $50,000,000.

Manufacturing Industry.—Nebraska has not engaged in manufacturing so largely as her extraordinary facilities warrant her in doing. With abundant water-power, and coal sufficient to produce all the steam-power she needs, and abundant material for manufactures of all kinds, as well as the best possible facilities of transportation, she should become a large manufacturing State; but at present her almost sole dependence is upon her agriculture. Omaha, Lincoln, Nebraska City, Plattsmouth, and other towns have some manufacturing establishments of importance. Omaha in particular has extensive smelting and refining works, and receives and reduces large quantities of the refractory ores from Montana, Idaho, Utah, and some from Colorado. Flour and feed, iron ware, railroad cars, carriages and wagons, boots and shoes, furniture, ready-made clothing, hats, distilled and fermented liquors are the leading articles of manufacture. In 1875, the annual products of manufacture in the State were estimated at $15,500,000. They now probably exceed $30,000,000.

Railroads.—The railroad system of Nebraska traverses all parts of the State where there are inhabitants or products awaiting a market. South of the Platte river most of the roads are connected with the Burlington and Missouri Railroad in Nebraska. The main line of this railroad commences at Plattsmouth, on the Missouri river (where at this time a bridge is being constructed which will connect the Burlington and Missouri, in Nebraska, with the Chicago, Burlington and Quincy in Iowa), with a branch from Omaha which joins the main line at Oreapolis, four miles west of Plattsmouth. The line then follows the course of the Platte river to the mouth of Salt creek, whence it proceeds over Salt Creek Valley through Lancaster county to Lincoln, the State capital; and thence westward over the prairie through Lancaster, Saline, Fillmore, Clay, Adams and Kearney

counties to a junction with the Union Pacific road at Kearney, in Buffalo county. The Beatrice branch of the Burlington and Missouri road starts from Crete, in Saline county, and runs south along the valley of the Big Blue to Beatrice, in Gage county; and the same company, under the name of the Republican Valley Company, has built a line from Hastings, in Adams county, south over the prairie to the Republican Valley, and thence west along the valley to Naponee, on the west line of Franklin county, which road is now being pushed forward as rapidly as possible westward to Denver, in Colorado, and a contract for 100 miles west of Naponee has recently been made. It is also proposed to continue this line eastward from the point where it strikes the Republican Valley south of Hastings, to Beatrice, in Gage county. The Nebraska Railroad has at present its initial point in Nemaha City, in Nemaha county, and runs north on the west bank of the Missouri river through Brownville, in Nemaha county, to Nebraska City, in Otoe county; thence westward through Otoe and Lancaster counties to Lincoln; and thence through Seward, York, Hamilton and Merrick counties to Central City, where it connects with the Union Pacific, and the track is now surveyed north twenty miles to Fullerton, the centre and county-seat of Nance county. The Atchison and Nebraska Railroad starts at Atchison, in Kansas, and runs through Richardson, Pawnee, Johnson, Gage and Lancaster counties to Lincoln; and from the capital city this company is now building a road, under the name of the Lincoln and Northwestern Railroad, through Lancaster, Saline, and Butler counties to Columbus, in Platte county, where it connects with the Union Pacific. The Omaha and Republican Valley Railroad, a branch from the Union Pacific, runs through Douglas, Saunders, Butler, and Polk counties to Osceola, the county-seat of the last-named county, and a branch is now building from Valparaiso, in Saunders county, to Lincoln. The St. Joseph and Denver Railroad, which starts at St. Joseph in Missouri, runs westward through the north tier of counties in Kansas, and enters Nebraska in Jefferson county, passing through Thayer, Nuckolls, Adams and Hall counties to a junction with the Union Pacific at

Grand Island; and the company is now building a branch from Marysville, in Kansas, along the valley of the Big Blue river to Beatrice, in Gage county. North of the Platte river the Union Pacific is the main line of railroad; and, starting from Omaha, its track is along the Platte valley to the western line of the State, a distance of 475 miles; and this company is now building a branch road from Jackson, in Platte county, northward through Platte and Madison counties, to Norfolk, in the last-named county, with a branch running to Albion, in Boone county. The Union Pacific is further building a branch from Grand Island to St. Paul, the county-seat of Howard county. The Omaha and Northwestern Railroad runs northwest through Douglas, Washington and Burt counties, the present terminus being at Oakland, in Burt county. The Sioux City and Pacific Railroad runs from Missouri Valley in Iowa, westward across the Missouri river through Washington county to Frémont, in Dodge county, where it connects with the Union Pacific; and the Elkhorn Valley Railroad runs from Frémont up the valley of the Elkhorn river, through Dodge, Cuming, Stanton and Madison counties to Oakdale, in Antelope county, with a branch running from the main line to Norfolk, in Madison county, and Pierce, the county-seat of Pierce county. The Covington, Columbus and Black Hills Railroad runs from Covington, which is immediately opposite Sioux City, in Iowa, through Dakota county, to Ponca, the county-seat of Dixon county; and, the road having been sold in 1879 to the Sioux City and St. Paul Railroad, it is to be run farther west through the northern counties of Nebraska. At the beginning of 1880 there were about 1,650 miles of railroad in operation in Nebraska.

Population.—The growth of population in Nebraska has been very rapid, although such extraordinary efforts have not been made to attract population thither as in some of the new States adjacent. Having no mines or mineral wealth it has attracted for the most part the farming class, and its advantages have not been made as widely known as those of States having a large mining or manufacturing interest. The following table, prepared with great care, exhibits a steady and healthy growth which will compare

very favorably with that of any of the States or Territories belonging to "Our Western Empire:"

Year of Enumeration.	Aggregate Population.	Males.	Females.	White.	Colored.	Indians.	Natives.	Foreigners.	Density.	Ratio of Increase.	Of School Age, 5–20. Both Sexes.	Of Military Age, 18–45. Males.	Of Voting Age, 21. Males.	Citizens.
1855	4,494	3,061	1,433											
1860	28,841	16,760	12,081	28,696	82	63†	22,490	6,351	0.38	.....	8,671	9,023	9,907	
1870	129,322*	70,425	52,568	122,117	789	6,416	92,245	30,748	1.62	326.45	41,325	35,677	39,080	36,169
1874	234,357*	121,757	113,600	.....	.....	6,329	.....	.....	3.08	.....	72,991			
1876	257,747*	135,125	122,622	.....	.....	5,273	.....	.....	3.39	99.3	92,161			
1878	313,748*	165,327	148,421	.....	.....	4,710	.....	.....	4.13	.....	114,730			
1879	386,410*	201,355	185,055	.....	.....	4,350	.....	.....	5.08	.....	123,411			
1880	456,812*	249,275	203,157	449,805	2,394	4,642	355,042	97,390	6.01	77.26	.....	124,869	136,780	

Indians.—There are in the State four Indian Agencies, viz.: 1. The Great Nemaha Agency, of the Iowa and the Sac and Fox Indians of the Missouri, having 251 Indians of these tribes, with a reservation of 24,014 acres, most of it arable, and partly situated in Kansas. These Indians are about to be removed to the Indian Territory. 2. The Omaha and Winnebago Agency, including 1,429 Winnebagoes, 1,120 Omahas, and 36 Poncas—also liable to removal. Their reservation comprises 253,069 acres, of which 240,000 acres are arable lands. 3. The Otoe Agency, including 438 Otoes and Missouris,‡ and occupying a reservation of 44,093 acres, a part of it in Kansas, of which 40,000 acres are arable. 4. The Santee Agency, including 764 Santee Sioux and 103 Poncas in Nebraska, and 304 Santee Sioux in Flandreau, Dakota. The reservation, which is partly in Dakota, consists of 115,076 acres, of which 39,400 are arable lands. There are in all 4,350 tribal Indians, and their reserved lands amount to 436,252 acres, of which 341,400 acres are arable lands, and 11,645 acres, or one-thirtieth of the whole, are actually cultivated by somebody, though 580 acres are occupied by intruders. About 9,620 acres are cultivated by Indians.

The *financial* condition of Nebraska is good. The State has no debt except to its own school fund, on which the interest is

* Including Tribal Indians. † Tribal Indians not included. ‡ 216 of these now in Indian Territory.

paid promptly, and though taxation is low and the valuation (aside from many exemptions) is only about 33⅓ per cent. on the true value, yet the taxes bring in sufficient revenue to leave a considerable annual surplus. The assessed valuation on which taxes are paid (aside from exemptions) was, in 1878, the last auditor's report published, about $83,000,000. The true valuation, including property now exempt, is not less than $340,000,000.

Education.—Of the State school fund about $2,500,000 are now available. The total amount of this fund will eventually be about $19,000,000 or $20,000,000. The receipts of the temporary school fund for the two years ending November 30, 1878, amounted to $529,176. The following statistics from the State Superintendent of Public Schools give many particulars of interest in regard to the public schools for the year ending April 7, 1879:

Number of districts	2,856
Number of school-houses	2,489
Children between the ages of five and twenty-one	123,411
Average number of children in each district	30
Average number of days taught by each teacher	87
Average number of days of school in each district	107
Number of districts in which schools are graded	62
Number of teachers employed in all graded schools	284
Number of districts having six months or more school	1,242
Number of districts that had no school	173
Average square feet of blackboard surface	35
Number of houses with no blackboard	269
Number of houses furnished with patent desks and seats	1,574
Number of new school-houses built during year	191
Number of teachers' institutes held	63
Aggregate attendance upon institutes	2,344
Number of districts furnishing free text-books	137

STATISTICS OF PUPILS AND TEACHERS.

Children between the ages of five and twenty-one, males	64,179	
Children between the ages of five and twenty-one, females	59,232	
Total		123,411

Children enrolled in the schools		73,956
Number of qualified teachers employed, males		1,607
Number of qualified teachers employed, females		2,221
Aggregate number of days taught by males	125,332	
Aggregate number of days taught by females	173,669	
Total		299,001
Average wages per month, males		$33 25
Average wages per month, females		29 55

STATISTICS OF SCHOOL PROPERTY.

Value of school-houses	$1,622,355 18
Value of school sites	175,483 60
Value of books and apparatus	54,826 49
Total value of all school property	1,852,665 27
Average number of mills levied for school purposes	13
Amount apportioned by county superintendents	224,605 65
Money in hands of county treasurers April 7, 1879	160,201 24

Aside from these public schools, there are high schools of excellent character at Omaha and other large towns in the State; a normal school at Peru with nearly 300 pupils; a prosperous State university at Lincoln, the capital of the State, endowed with 130,000 acres of land, and to which the State makes an appropriation of about $25,000 annually; an institute for the deaf and dumb at Omaha, and for the blind at Nebraska City.

There are also colleges under denominational control; Doane College at Crete, Saline county; The Bishop Talbott or Nebraska College, at Nebraska City; Creighton College, at Omaha, and a Methodist Episcopal College recently opened at York, in York county.

Lands for Immigrants.—There are millions of acres of government lands yet unsold in Nebraska, which may be obtained either by purchase, pre-emption or under the Homestead, Timber-Culture or Desert Land Acts; but these are mostly in the more western portion of the State, and largely beyond the junction of the North and South forks of the Platte river. As we have shown, the rainfall is not so abundant as farther east, and the land must be thoroughly broken before it will yield good crops, but eventually, either with or without irrigation, these lands will be some of the most valuable in the State. It is best for the immigrant

who purposes to cultivate his lands, and not to devote them to grazing, not to go beyond the frontier line of progress in the purchase of these lands, as the expense of irrigation and of tree-planting for a single farm is very heavy; but where a town or colony engage in it together, the expense is much lighter. This frontier line is moving west at the rate of about ten or fifteen miles a year. There are very desirable lands, to the amount of about 2,500,000 acres, held by the State for school and university purposes. They are situated in every county of the State, and information in regard to them may be obtained by writing to F. M. Davis, State Commissioner of Public Lands and Buildings, at Lincoln, Nebraska. The minimum price at which these lands are sold is $7 per acre, on twenty years' time, at six per cent. interest; and leases are on appraised values. During the years 1877 and 1878 the lands sold were 26,819 acres, and leased 100,-918; and the sales and leases during 1879 and 1880 doubled upon these figures.

For detailed information about the Union Pacific Railroad Company's lands, written or personal application should be made to the Land Commissioner, U. P. R. R., Omaha, Nebraska. This company owns 3,000,000 acres of fertile lands in Central and Western Nebraska, which are sold for cash, or on a credit of ten years, at six per cent. interest, with gradual payments of principal and interest. The prices range from $2 to $10 per acre, on ten years' credit, "according to quality, location, timber and nearness to market;" and a deduction of ten per cent. from credit prices is made to cash purchasers.

For detailed information about the Burlington and Missouri River Railroad lands, address or apply to the Land Commissioner, B. & M. R. R., Lincoln, Nebraska. This company has remaining of its land grant of more than 2,000,000 acres, about 1,000,000 acres south of the Platte river, in the rich southeastern section, and in the northeastern section north of the Platte. The northeastern lands, of which there are about 650,000 acres, range from $1 to $6 per acre, on ten years' time, with discount from these prices on six years' and two years' credit, and for cash. The balance of the Burlington and Missouri lands in Southeastern

Nebraska are sold at from $3 to $10, on ten years' credit, with discounts off for cash or shorter time of credit.

The following instructions and advice to emigrants to Nebraska are of great importance, and should be carefully read and followed:

Persons with families should not come West entirely destitute of means to brave the hardships of pioneer life. Many have done so and have succeeded, and in a few years have been numbered among the most influential and well-to-do citizens of the State; but it more frequently leads to disappointment, homesickness and discontent. A capital of $200 or $300, after the land is secured, with which to commence operations, would be of very great advantage. An expenditure of $50 will complete a cabin in which a family can be comfortably sheltered. A neat one-story frame house, with from two to four rooms, can be built at a cost of from $200 to $600. Good stabling for stock can be constructed with but little expense, by the use of a few posts and poles covered with straw or hay.

Settlers coming West, and having a long distance to travel, should dispose of their farming implements and heavy or bulky furniture. Bedsteads, tables, chairs, mattresses, crockery, stoves, etc., etc., stock, teams, wagons, tools of all kinds, and farming implements, better adapted to this country than those left behind, can be purchased here at reasonable rates, frequently at less than would be the cost of transportation. Clothing, bedding, table linen, books, pictures, and other small articles, may be brought with advantage. It is also well to bring choice, graded stock, such as horses, cattle, sheep, swine, poultry, etc.

Prices at the West, as in the older States, are regulated by the supply and demand. As a general rule, groceries, dry goods and articles of domestic use that can be dispensed with, are dearer, and the common necessaries—meats, flour, grain, potatoes, etc.—are cheaper than in the Eastern States. The following may be taken as average prices, April 1, 1879, and there has been very little variation since:

Work cattle, per yoke	$75 00 to	$125 00
Horses and mules, per pair	100 00 to	220 60
Driving horses, each	75 00 to	200 00
Farm wagons	70 00 to	90 00
Spring wagons	70 00 to	125 00
Harness, double set	30 00 to	40 00

LIVE-STOCK.

Yearlings	$10 00 to	$15 00
Two-year-olds	20 00 to	30 00
Three-year-olds	25 00 to	40 00
Cows	20 00 to	50 00
Calves	5 00 to	10 00
Sheep	2 50 to	4 00
Hogs, per pound	03 to	03½
Beef cattle, per pound	03 to	04

AGRICULTURAL IMPLEMENTS.

Threshing machines	$500 00 to	$700 00
Harvesters	150 00 to	200 00
Mowers	75 00 to	90 00
Drills and seeders	40 00 to	80 00
Corn planters	35 00 to	55 00
Hand planters	1 00 to	2 50
Corn shellers	8 00 to	85 00
Corn stock cutters	40 00 to	60 00
Cultivators	20 00 to	25 00
Cane mills		55 00
Feed cutters	6 00 to	25 00
Sulky rakes	25 00 to	30 00
Revolving rakes	5 00 to	8 00
Harrows	8 00 to	10 00
Breaking plows	20 00 to	25 00
Stirring plows	10 00 to	20 00
Gang plows		75 00
Sulky plows	45 00 to	55 00
Headers	175 00 to	280 00
Wind Mills	90 00 to	150 00
Pump and brass cylinder		15 00
One-inch pipe, per foot	20 to	30

LUMBER AND BUILDING MATERIAL.

Flooring, dressed and matched, per M	$20 00 to	$30 00
Siding, per M	14 00 to	18 00
Ceiling, ½-in., beaded, per M	18 00 to	25 00
Common boards, per M	16 00 to	18 00
Joists, scantling, etc., 18 feet and under, per M		17 00
Fencing, per M	16 00 to	18 00
Shingles, A., sawed, per M	1 25 to	2 75
Shingles, No. 1, per M		2 00
Laths, per M		2 75
4-panel doors	1 25 to	2 00
Brick, per M	8 00 to	10 00
Lime, per barrel		1 25

HOUSEHOLD FURNITURE.

Bedsteads	$2 00 to	$4 00
Mattresses	2 00 to	4 00
Tables	1 75 to	7 00
Chairs, per dozen	4 75 to	10 00
Rocking chairs	75 to	4 00
Looking glasses	25 to	4 00
Kitchen safes	3 50 to	10 00
Bureaus, with glass	9 50 to	16 00

WAGES.

Carpenters, per day	$2 00 to	$3 00
Masons, per day	3 00 to	4 00
Painters, per day	2 50 to	3 00
Blacksmiths, per day	2 50 to	3 00
Carriage-makers, per day	2 50 to	3 00
Day-laborers, per day	1 50 to	2 00
Shoemakers, per week	15 00 to	20 00
Farm-hands, per month, including board	15 00 to	20 00
Clerks, per annum	500 00 to	1,500 00
Teachers, per annum	300 00 to	2,000 00

Counties and Towns.—There were in 1879 sixty-eight organized and four unorganized counties in the State. The extraordinary influx of population in 1879 and 1880 will undoubtedly lead to the organization of other counties by the legislature at its biennial session in 1881. Of the cities and towns, Omaha has 30,518 inhabitants, and is an important railroad centre. Lincoln, the capital, has 13,004 inhabitants. The other

important towns are: Nebraska City, with nearly 10,000 inhabitants, Plattsmouth, Brownville, Frémont and Peru, which range between 2,500 and 5,000 inhabitants. Kearney, Crete, Rulo, Beatrice, Tecumseh, Tekama, North Platte, West Point, Falls City and Grand Island are growing towns.

Religious Denominations.—In 1874 Nebraska had 514 organizations of the different religious denominations, 279 church edifices, 365 clergymen or preachers, 22,749 communicants, and an adherent population of about 125,000, or, possibly, 140,000. Its church property was estimated at $665,000. In the six years which have since passed, it has more than doubled its population, and its religious growth has kept pace with the advance in population. The Methodist Episcopal Church takes the lead in the number of churches, ministers and communicants, but is closely followed by the Baptists, the United Brethren in Christ, the Presbyterians, the Lutherans and the Congregationalists. After these, though in smaller numbers, come the Protestant Episcopal Church, the Roman Catholics, the Disciples, the Evangelical Association, and several smaller denominations.

Historical Data.—Nebraska was originally a part of the great Louisiana Territory, and subsequently of Missouri Territory. As early as 1844, Senator Douglas introduced a bill for the establishment of a Nebraska Territory, which was to include Kansas, Dakota, Wyoming, and so much of Colorado and Montana as then belonged to us, but the bill failed. Ten years later (in 1854), Nebraska was organized as a Territory, including Dakota, Montana, most of Wyoming and Northeastern Colorado. In 1861 it was stripped of most of these, and in 1867 was admitted as a State with a population considerably under 100,000. On the completion of the Union Pacific Railroad, which had its eastern terminus at Omaha, its population began to increase, but its most rapid growth has been during the last five years. From its location and its abundance of good and fertile lands, it seems destined to become a favorite resort for farming immigrants, and will undoubtedly attract a large body of intelligent agriculturists from both Europe and America. Some very successful experiments in the way of colonies of immigrants have been made here, and more are likely to follow in the near future.

CHAPTER XV.

NEVADA.

ITS BOUNDARIES, EXTENT AND AREA—ITS TOPOGRAPHY AND SURFACE—MOUNTAINS, LAKES AND RIVERS—ITS CLIMATE AND METEOROLOGY—GEOLOGY AND MINERALOGY—MINERALS—GOLD AND SILVER—OTHER METALS AND MINERALS—PERMANENCY OF ITS MINES—THEIR GREAT DEPTH—MINING INDUSTRY—THE COUNTIES CONTAINING MINES CONSIDERED IN DETAIL—THE PRODUCT OF THE PRECIOUS METALS IN NEVADA SINCE THEIR FIRST DISCOVERY THERE—THE SUTRO TUNNEL—ITS PURPOSE AND OBJECT—ITS FIRST SUCCESS LESS THAN WAS EXPECTED—ITS PROBABLE FUTURE TRIUMPH—ZOÖLOGY—AGRICULTURAL PRODUCTIONS—ADAPTATION OF CONSIDERABLE SECTIONS TO GRAZING—EXTENT OF ARABLE, GRAZING, TIMBERED AND MINERAL LANDS—TABLES OF AGRICULTURAL PRODUCTS AND LIVE-STOCK—MANUFACTURING INDUSTRY—RAILROADS—VALUATION—POPULATION—INDIAN RESERVATIONS—COUNTIES AND CITIES—RELIGIOUS DENOMINATIONS—HISTORICAL DATA—CONCLUSION.

NEVADA, sometimes called the Silver State, is the central State of the seven lying west of the Rocky Mountains, and may be said in a general way to be bounded by Oregon and Idaho, Utah and Arizona, and California. Its shape is irregular, and can perhaps be best defined by the official statement of its boundary, made in the act of Congress settling its present boundary. This statement is as follows: "Commencing at the northwest corner of Utah Territory, and the southern line of Idaho, at the 37th degree of longitude west from Washington (and 114 degrees west from Greenwich), and in latitude forty-two degrees north, and running west along the southern line of Idaho and Oregon to longitude forty-three degrees west from Washington (and 120 degrees west from Greenwich); thence south, along the eastern line of California, to latitude thirty-nine degrees north, which falls in the southeastern part of Lake Tahoe; thence southeasterly to the intersection of the Colorado river, in latitude thirty-five degrees north, and opposite Fort Mojave; thence north and easterly up the centre of the Colorado river to the intersection of the thirty-seventh degree of longitude west from Washington (and

the 114th degree west from Greenwich), and the prolongation of the western line of Utah Territory; thence north, along the western line of Arizona and Utah, to the place of beginning; containing 71,737,741 acres, or 112,090 square miles."

The boundaries of the State have been changed once or twice, but the actual area above given is that of the United States Land Office, and that laid down in the act of Congress enlarging its boundaries. The area as given in the almanacs varies from 81,539 square miles (30,551 square miles below the fact) to 104,125 (7,965 square miles too small); but the actual area is that given above. The greatest length of the State from north to south is about 490 miles; its greatest breadth about 300 miles.

Topography and Surface.—Nevada is almost wholly within the limits of the great interior American Basin, which includes also nearly three-fifths of Utah. This basin is bounded on the east by the Wahsatch range, a continuation of the Bitter Root and Wind River Mountains of Idaho and Wyoming, extending to and along the northwestern bank of the Colorado river, and on the west by the Sierra Nevada. The two chains meet in Southeastern California, and are connected at the north by spurs running from east to west. Within the basin all streams are either lost in "sinks" or discharge their waters into fresh or salt water lakes within the basin. A small tract in Northern Nevada is outside of the basin, and is drained by the Owyhee river, an affluent of the Lewis fork or Snake river, one of the constituent streams of the Columbia river. In the extreme south two or three small tributaries of the Colorado, as the Virgin river, Muddy river and Las Vegas creek, have cut their way through the mountain barriers of the basin, and discharge their waters into the Colorado. The Humboldt, the Little Humboldt, the Reese, the Carson, the Amargosa and many smaller streams, either sink through the alkaline sands and disappear from sight, or fall into deep depressions apparently made by the giving way of the roof of some cavern, or fall into some one of the marshes or the numerous lakes, salt and fresh, which are found all over the State.

The area of the Great Basin is traversed from north to south by numerous parallel ranges of mountains, having an altitude of

about 9,000 feet. These are separated by fertile valleys, which are watered by streams flowing from the mountains and having their supply from the melting snows. These streams afford facilities for irrigation, without which, in most cases, the cultivation of the soil is impossible. But a very large part of the State consists of a lofty table-land, with mountain summits rising to an altitude of about 9,000 or 9,500 feet, and broken mainly by the deep ravines or cañons, caused by the erosion of mountain torrents. The long valleys between have an elevation of from 4,000 to 6,000 feet.

Lakes and Rivers.—The principal lakes are Tahoe, Pyramid, Walker, Carson, Washoe and Humboldt. Tahoe has an elevation above the sea-level of about 6,000 feet. It is about 1,500 feet in depth. It is situated in the Sierra Nevada Mountains, fourteen miles from Carson City. The western line of the State divides it about the centre. The water is very clear and cool, and remarkable for its specific lightness. The bodies of persons drowned in Lake Tahoe never rise to the surface. It is twenty-two miles in length by fourteen in width.

Pyramid lake is thirty-five miles long, and from ten to fifteen in width. Its elevation above sea-level is about 4,000 feet. It is situated in the southwestern portion of Humboldt county. It is surrounded by mountains, which rise to the height of about 3,000 feet. It has been sounded, and found in places 3,600 feet deep. It gets its name from a rock which rises 600 feet above the surface of the water in the shape of a pyramid. There is an island near the eastern side which contains about 600 acres of land, upon which rattlesnakes and wild goats abound. It has no outlet, and is fed by the Truckee river and other mountain streams.

Washoe lake is situated in Washoe county. Its waters are shallow and alkaline. It covers about six square miles. It is surrounded by mountains; on the west are the Sierras, from which it is chiefly fed by numerous small streams which flow out into the valley sink, and then rise again in the lake.

Walker lake is about twenty-five miles long and ten miles in width. Its area has been considerably increased of late years, so that the old stage road, formerly about five miles from its shores,

is now under water. It is situated in Mason valley, Esmeralda county. Its elevation above sea-level is about 4,000 feet, and its waters are fresh and clear.

Humboldt lake, more commonly called the Sink of Humboldt, is twenty miles in length and ten miles in width. Its waters are brackish and strongly impregnated with salt and soda. It is situated near the line between Humboldt and Churchill counties, and has an altitude above sea-level of 4,100 feet. It is about the lowest point in the Great Basin. The waters from the east and west meet here.

The Carson lakes are situated near the centre of Churchill county. They are about twenty miles apart, and spread out over a vast area of low ground, so that their dimensions vary greatly in proportion to the dryness of the season, and the amount of the snow-fall on the Sierras. In wet seasons they are connected by a slough with Humboldt lake; and the waters, like that of the latter lake, are impure, and contain a large per cent. of alkali and salt.

With the exception of the Colorado, none of the rivers of Nevada are navigable. The Colorado forms part of the southern boundary of the State. Its average width is one-half mile. The average current at ordinary low stages, where no contraction or special obstruction exists, is about three and one-half miles per hour. When it passes over rapids and through narrow cañons, the current is more than twice as rapid, so that it is difficult for steamboats to stem it.

The Truckee river forms an outlet for Lake Tahoe to empty its waters into Pyramid lake. Two-thirds of its entire course is in Washoe county. It affords many excellent sites for mills, but its waters are chiefly used in irrigating the fertile lands of Washoe county. During the past few years many ditches have been constructed for irrigating purposes, and still there is a large supply of water left.

The Carson river heads in the Sierra Nevada Mountains and flows through Douglas, Ormsby and Lyon counties. Although not so large as the Walker, its waters have been made much more useful. Numerous large quartz mills have been erected

on its banks, which are run by water-power. It irrigates thousands of acres of fertile lands, and also furnishes the means for the transportation of thousands of cords of wood from the mountains to the markets.

The Walker river also has its source in the Sierras; it flows through Esmeralda county, and empties its waters into Walker lake. It is only used for irrigation, being situated too far away from the mines to be made available for milling purposes.

The Humboldt river flows from the east. It has its source in Utah, and, after winding through a succession of mountains for a distance of about 300 miles, it empties its waters into Humboldt lake.

The Owyhee river has its source in the mountains which surround Independence valley. It flows north into the Snake and Columbia rivers, and finally empties its waters into the Pacific. It is the only river which rises within the borders of the State that has an outlet to the ocean. Reese river heads in the mountains to the southeast of Ione. It flows north, and sinks before reaching the Humboldt.

In all of these lakes and streams are found several varieties of food fish, chiefly different species of trout. In all of the mountain streams and in the head waters of the rivers already described brook trout abound, while in the lakes and those streams which empty into them are found silver trout. In Lake Tahoe a very large variety of trout is found, some of which have been caught which weighed thirty pounds each. In the Owyhee river are found salmon and salmon trout. Through the efforts of the Fish Commissioner appointed at the last session of the Legislature, Carson, Walker and Humboldt lakes and the Truckee river have been stocked with Schuylkill catfish and Sacramento perch. A fish hatchery has been established in Carson, and 200,000 McCloud river salmon are ready for distribution in the different lakes and streams in the State.

In the eastern counties considerable game is found, as prairie chickens, grouse and quail. In the mountains and upland valleys are often seen mountain sheep and antelope. The otter and beaver are sometimes found. The grizzly bear, cougar, wild cat,

lynx, wolf, cinnamon and black bears, coyotes, and generally the beasts of prey found in California, are also inhabitants of Nevada, though not as abundant as in some other States.

Climate.—The climate of Nevada, owing to the diversities of surface, variations of altitude and other causes, irrespective of the differences of latitude, varies greatly in different localities. The changes of the season are very irregular, and pass into each other without notice. Generally the extremes of temperature are not great. Within the Great Basin, during the summer months, the thermometer seldom rises above 95° Fahrenheit; nor does it often fall below zero in winter, except upon the mountains and in the most elevated and exposed valleys. At Carson City, where the elevation above sea-level is 4,630 feet, the annual mean temperature is about 52°, the annual maximum 68°, and the annual minimum 34°. At this point heavy winds from the southwest prevail. During the year 1876 there were 316 windy days, 217 cloudy, and 49 rainy. The fall of rain and snow for the same year was 17.73 inches. The nights are always cool in summer in all parts of the State. This marked peculiarity of climate is due to the cooling effects of the many ranges of snow-covered mountains. The atmosphere is exceedingly dry. There are never any fogs. The moisture of the clouds is condensed on the mountain-tops, so that the fall of rain in the valleys is very limited. The carcasses of dead animals dry up with but little offensive putrefaction, leaving the bones and hides mummified. In the eastern portion of the State cloud-bursts are of frequent occurrence from about the first of July to the middle of September. The climate is healthful. No country in the world is more free from infectious diseases. Epidemics are never known. Earthquake shocks are sometimes felt, but rarely severe enough to do any damage.

The Signal Service Bureau has but two stations in Nevada, and those have been maintained less than three years. They are Pioche, in Lincoln county, in Southeastern Nevada, and Winnemucca, on the Central Pacific Railroad, in Humboldt county, Northwestern Nevada. We give the report of these for the year 1878, which, as supplementary to the above notes of the

climate of Carson City, give a tolerable idea of the climate of the State. (See page 1040.)

Geology and Mineralogy.—It has been demonstrated by the geological explorations on the fortieth parallel, that the Nevada ranges of mountains belong to the same system of upheavals which took place during the Jurassic period. These immense mountain masses are composed of sedimentary strata, granite and kindred formations and volcanic rocks. The stratified beds comprise the largest portion, and extend from the Azoic age up to the time of upheaval. The rock formations embrace nearly every species of sedimentary or eruptive products existing, from the earliest to the most recent period. In the mountains which skirt upon the Sierras, the eruptive rocks prevail; while farther east are found the metamorphic and sedimentary formations. Metalliferous deposits and veins exist in all the mountain ranges, the most productive of which still continues to be the Comstock lode.

The valleys, in general, correspond with the mountain ranges. They are sometimes short, being intersected by the low mountains, which in many places link together the parallel ranges, running north and south, but usually they are long and narrow. With but slight elevations, several openings are found, extending from the Humboldt river to the Colorado, the southern limit of the State. Many of the valleys are dry and unfit for cultivation; some are covered with alkali and sand, while others are scarcely less productive than the most fertile valleys of California. All have been mainly filled by the products of erosion.

Minerals.—Of the productions of Nevada, silver and gold are beyond comparison the most important. Scarcely twenty years have elapsed since this State was inhabited only by the red man, and a few Mormon settlers in Carson Valley; and yet during this time the enormous sum of $400,000,000 in silver and gold have been produced from the Nevada mines. More than two-thirds of this yield has been since the year 1871. The most productive year was 1877, the bullion shipments amounting to $51,368,917. The yield for 1878 was $35,181,949, a falling off from the year previous of $16,398,341. From these figures it may be seen that these two years have been a period of unexampled prosperity

PIOCHE, Lincoln county. Latitude, 37° 57′. Long., 114° 26′. Elevat'n, 5,779 ft.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Temperature.	Rainfall.	Mean Humidity.	Mean Barometer.	Direction of winds in the order of frequency.	WINNEMUCCA, Humboldt co. Latitude, 41° 00′. Long., 117° 41′. Elevat'n, 4,335 ft.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Temperature.	Rainfall.	Mean Humidity.	Mean Barometer, Monthly and Yearly.	Direction of winds in the order of frequency.
Months.	°	°	°	°	in.	per ct.	in.		Months.	°	°	°	°	in.	per ct.	inches.	
January	46	7	39	29.5	0.46	68.1	29.786	S., N. W., W., S. E.	January	57	—5	62	31.5	0.21	58.1	29.989	N. E., S. W., N.
February	53	16	37	32.7	1.67	67.0	29.689	S., N. W., N.	February	61	13	48	35.3	0.89	68.9	29.869	S.W., N. E., S., N., Calm.
March	66	16	50	41.8	0.73	53.3	29.751	S., N. W., N.	March	69	14	55	43.5	1.36	57.5	29.953	S.W., S., N., N. E., Calm
April	75	21	54	46.7	1.31	67.4	29.666	S., N. W., N.	April	74	24	50	48.4	0.25	44.8	29.870	S.W., S., N. E.
May	79	26	53	55.4	1.27	34.0	29.729	S., N., N.W., W., S.E.	May	83	28	55	55.4	1.32	34.8	29.932	S.W., N., W., S.
June	90	39	51	67.5	0.04	29.3	29.813	S., N. W., N., S. E.	June	94	36	58	69.0	0.55	31.0	29.969	N. E., S.W., N.
July	98	51	47	75.6	0.29	13.2	29.807	S., S. W., S. E.	July	97	37	60	74.4	0.50	19.1	30.051	S.W., N. E., W.
August	94	54	40	76.0	0.97	30.0	29.841	S., S. E.	August	100	44	56	74.8	0.50	25.3	30.040	S. W., N. E., S., N.
September	92	38	54	62.9	0.22	22.7	29.832	S., N. W., N.	September	94	29	65	58.1	0.94	31.4	29.998	S.W., N. E., N.
October	79	19	60	53.5	0.35	24.0	29.769	S., N. W., N., S. W.	October	77	10	67	46.5	0.07	39.7	29.966	S.W., N. E., W., N. E.
November	67	17	50	43.5	0.63	42.8	29.729	S., N., N. W.	November	66.5	9	57.5	38.9	0.16	53.7	29.967	S.W., N.E., N., S.
December	63	10	53	32.2	0.42	45.7	29.793	N., N. W., S.	December	65	—6	71	25.9	0.02	55.7	29.956	N. E., S.W., N.
Year	98	7	91	61.2	8.36	31.8	29.719	N. W., W., S. W., S.	Year	100	—6	106	49.7	6.77	42.4	29.970	S.W., N.E., W.

in the history of the State, and that the labor of the miner has met with merited reward. From the experience of the past, coupled with the condition and indications of the various mining districts at present, it may readily be inferred that Nevada's resources in silver and gold are practically without limit; and that the supply is still so great that a long time must elapse before it can be exhausted. So fruitful, indeed, has been the yield that the last decade forms a new era in the history of the precious metals in America; and the new discoveries being made in every direction promise excellent results in the near future.

Although silver and gold are the chief products of the State, there are other mineral resources which are of no mean importance. The lead product of Eastern Nevada has increased so rapidly during the past two years, that Eureka now stands at the head of the lead-producing districts in the United States. Tybo, too, is making rapid strides in the way of advancement. The product of these two districts falls but little short of that of Missouri, Iowa and Illinois combined.

The deposits of borax in Churchill and Esmeralda counties are sufficient to supply the demands of the world, but being situated so far away from the markets, the expense of transportation and the reduced price of the article have placed a limit upon its production. Fish lake, Columbus and Teal's Marsh have an almost inexhaustible supply, and their thousands of acres must some day be profitable to the owners.

The salt deposits are beyond computation. In Humboldt, Churchill, Esmeralda, Lander, White Pine and Lincoln counties there are beds of salt covering thousands of acres and of unknown depths. The waters of North Soda lake, in Churchill county, 270 feet in depth, and covering an area of 400 acres, contain about thirty-three per cent. of soda. Sulphur is found in immense deposits in Humboldt county, and in a comparatively pure state. Antimony in paying quantities is found in a dozen districts, and mines rich in copper are being worked in Lander and White Pine counties. Cinnabar, occurring in brilliant red crystals, and also in amorphous masses, is found in Washoe and Nye counties. Gypsum, plumbago, manganese, cobalt, arsenic,

magnesia, alum, nickel, nitre, iron of good quality, coal in small quantities, isinglass—such are some of the mineral products of Nevada, which will, in the future, produce some revenue to the people and State.

As was to be expected, the great falling off in the yield of the mines in the years 1879 and 1880 has raised the question whether they are approaching exhaustion, or whether there is to be a still more prosperous future for them. All past analogies in silver mining, both in Europe and America, forbid the idea of their exhaustion; the only real question is whether means can be devised to make the mining of low grade ores profitable when they are brought from a depth of 3,000 or 3,200 feet below the surface, where constant pumping of the very hot water from these great depths is required, and the temperature of the lower levels is 156° Fahrenheit, and the men can only work twenty minutes and rest twenty in four-hour shifts. If these lower levels yield silver ores assaying seventy-five to one hundred ounces to the ton, the working, even under these disadvantageous conditions, may be fairly profitable; but where the yield is only from fourteen to twenty-two ounces, as is too often the case, the margin is clearly too narrow to permit any considerable profit, and must in most cases result in an eventual loss.

On this question of the permanency of the mineral production from the mines now opened, the able and accomplished State Mineralogist, after a historical review of all the great silver mines of Europe and America, exhibiting their periods of decadence and revival, concludes his essay as follows:

"The history of all these European and American mines has been the same. They were discovered early; they have had their times of depression and times of extraordinary production; they have had their bonanzas and their barren levels; they have been abandoned at one time and energetically worked at another, but throughout all the ages they have continued to be productive to the present time, and without doubt will still continue to play an important part in the mining industries of the world in the future. One thousand years ago the Austrian miner descended the same shaft which the living descend to-day; for centuries to

come, the huge piles of waste rock will grow higher and more rugged on the Saxon plains. Empires have risen and fallen; rulers have passed from history since the mines of Mexico and South America began to be worked; twenty centuries have not exhausted the mineral wealth of Spain. Reasoning from these facts, it is safe to conclude that the mines of Nevada are far from being worked out. When the character of our mines is compared with those of other countries, the product is found to be small, and considering the extent of territory as yet undeveloped, the amount of prospecting done has not been great. But when a larger population shall have permanently settled here; when men shall be satisfied with smaller gains, and capital shall be more interested in the work, then grander and more remunerative results may be expected than any which have yet been obtained. The new level opened by the Sutro Tunnel insures the working of the Comstock lode for an indefinite period in the future, and although the results have not thus far equalled expectations, yet there is sufficient encouragement to continued perseverance in this greatest enterprise of modern mining, and that perseverance cannot long fail to reap an ample reward."

Mining Industry.—Twelve of the fourteen counties of Nevada have or have had mines of considerable importance. We will review them briefly in alphabetical order, showing the number of the mines and the product from them in 1877 and 1878, the latest detailed report we have been able to obtain:

Elko county had, in 1877, seven mines, and in addition an establishment where the tailings of the Leopard mine were worked over, yielding in that year $24,799. The entire yield of these mines in 1877 was $1,075,968.86. In 1878 but two mines of the seven were worked, but three new ones had been opened, and the yield for three-quarters of the year was $941,918.94, indicating for the entire year a considerably larger yield from the five mines than from the whole seven the previous year, although four of the five had only been worked for six months. The total yield of Elko county from 1871 to 1878, inclusive, was about $5,000,000.

Esmeralda county had, in 1877, twenty-four mines and mining

establishments, a part of which were merely from the sale or transfer of mines. These yielded that year $1,508,491.69, more than four-fifths being the production of a single mine—the Northern Belle. In 1878 the number of mines in operation had been reduced to sixteen. The Northern Belle was still the leading mine, but its production had fallen off largely, being only $236,373 for three quarters of the year against $1,250,757 the previous year. The total production of all the mines for three quarters of 1878 was $469,775. The total production of Esmeralda county from 1871 to October 1st, 1878, was about $5,400,000.

Eureka county is one of the most prominent mining counties of the State. It had in 1877 between seventy-five and eighty mines, some of them of great extent and productiveness, among them the Eureka Consolidated, the K. K. Consolidated, the Richmond and the Richmond Consolidated. These four mines yielded, in 1877, somewhat more than $3,500,000 out of a total of $3,898,878.65 for the whole county. Of this large amount the Eureka Consolidated produced about one-half. In 1878 the number of mines had been reduced to fifty-two, though including eleven or twelve new mines. The Richmond was merged in the Richmond Consolidated, and this and the Eureka Consolidated produced eight-ninths of the whole amount raised in the county. This amount for the three quarters to October 1, 1878, was $4,503,268, of which Eureka Consolidated produced $2,295,344 and Richmond Consolidated $1,722,689. The only other mine which reported a moderately large yield was the K. K. Consolidated, which produced $165,532. No mines reported from Eureka county till 1873, but between that year and October, 1878, the total product was, in round numbers, $18,700,000.

Humboldt county has never been extensively engaged in mining. In 1877 it reported but three mines, and in 1878 but two. The Rye Patch is the largest. The production of 1877 was $307,224, and for the three quarters of 1878, $176,403. The total production of this county from 1871 till October, 1878, was about $2,600,000.

Lander county had, in 1877, eighteen or twenty mines, only one of which—the Manhattan mine—produced largely. The total

production of the county was $595,829, of which the Manhattan mine yielded $411,066. In 1878 there were nineteen mines, of which nine or ten were new. The production for three quarters of the year was $500,782, of which $372,085 was from the Manhattan. The entire production of Lander county from 1871 to October, 1878, was $9,380,000, the product of the earlier years being much greater than of the later ones.

Lincoln county had, in 1877, twenty-six mines, yielding $556,095; the largest being the Raymond and Ely, which with its tailings produced $329,816, or nearly three-fifths of the whole; the Meadow Valley and the Alps, which together yielded $159,162. In 1878 there were but nineteen mines in operation, of which eight were new; these yielded in the three quarters of 1878 reported, $460,524, of which $120,605 were produced by the Raymond and Ely, and $79,000 by the Meadow Valley, while the Day, Techatticup and Alps showed much promise for the future. The total amount of bullion produced by Lincoln county from 1871 to October, 1878, was about $18,250,000, the earlier years having been much more productive than the later ones.

Lyon county had, in 1877, ten or a dozen mines and mills, none of them yielding a very large amount. The total for the year was $406,017. In 1878 there were nine mills and mines, most of them mills, much of the ore from the Comstock lodes being reduced in this county. The Sutro Tunnel has its entrance in this county. The production for the three quarters of 1878 was $471,643, of which $269,394 was reported by the Lyon Mill and Mining Company and the Woodworth Mill. The total production of Lyon county from 1871 to October, 1878, was about $4,255,000.

Nye county had, in 1877, twenty-two or twenty-three mines, yielding in all $842,584, of which two mines, the Q. G. and Bunker Hill and the Tybo Consolidated, yielded $642,504, or more than three-fourths. In 1878 there were but seven mines in operation, producing for the three quarters $770,088, of which the Tybo Consolidated yielded $447,780, and the Alexander Mining Company $114,100. The Illinois produced $80,345. The total product of the mines of Nye county from 1871 to October, 1878, was $5,527,000.

Ormsby county had no record as a mining county until 1878, and then rather for its mills, which reduced ores from other counties, than for any mines of its own. Its product in the three quarters of 1878 reported was $53,666, all gleaned from the tailings of one mill.

Storey county is the great mining county of Nevada, the mines of the Comstock lode being wholly within its bounds. Twelve of these were in operation in 1877, the largest being the California, Consolidated Virginia, Justice, Chollar-Potosi, Belcher and Ophir. The product of the twelve mines in 1877 was $37,062,252, of which the California yielded $18,913,843, a little more than one-half; the Consolidated Virginia, $13,725,751, or more than one-third, and the Justice, $2,339,057. The tailings from these mines yielded $770,716 in that year. In 1878 only nine of the mines were operated, and for the three quarters of that year the production had fallen off to $17,989,636, of which $7,590,658 was from the Consolidated Virginia, and $8,242,177 from the California, or $15,832,835 from the two—fifteen-seventeenths of the whole. The tailings amounted to $576,109. The total production for the year was $21,295,030, and that of 1879 only $8,830,562, a material falling off. The total production of Storey county in seven and three-quarter years, 1871 to October, 1878, was $186,853,849, and the total product since the discovery of the Comstock lode about $310,000,000.

Washoe county, once the seat of a large number of valuable silver mines, has reported no mining products since 1874, and only $148,464 in the three years, 1872, 1873 and 1874. There is, however, a prospect that its mines may again be put in operation, and that with new processes and prudent and successful management, it will again yield liberal returns.

White Pine county.—This was one of the counties which was regarded as containing some remarkable bonanzas, and in 1869 and 1870 was spoken of as likely to rival Storey county. Its yield of the precious metals at first was very fair, but for some years past has been steadily declining. From the first discovery of silver there, early in 1868, to 1880, the entire production has been, in round numbers, $9,700,000, but it was nearly double in

1868, 1869, 1870 and 1871 what it has been in any year since. In 1877, with seventeen mines in operation, it produced only $408,492. In 1878, in the first three quarters of the year, eleven mines produced $446,454, of which $375,699 came from two mines, the Star and the Paymaster. There were in Nevada at the close of 1878, 153 mines in operation, and probably more than twice that number on which work was suspended temporarily and possibly permanently. The production of gold and silver in the State for that year was $35,181,949. For the year 1879 it had fallen off to $21,997,714, and the indications are that in 1880 there has not been any material recovery. The production of gold and silver in the State since 1852 considerably exceeds $430,000,000—a vast result to be accomplished by so small a population.

The Sutro Tunnel, though its entrance is in Lyon county, was constructed to drain the mines on the Comstock lode. It is over four miles in length, and follows the ramifications of the principal mines, which it will drain to the depth of about 2,000 feet, and the deepest mines will only have to pump their surplus water from 1,000 to 1,200 feet to have it drawn off by this channel. The tunnel also contains railroad tracks to facilitate the removal of ores from the mines. Its cost was about $6,000,000. The Tunnel Company own some mines on this lode. While its success has not thus far been so great as was hoped, it must eventually greatly enhance the value of the mining property connected with the Comstock lode.

Zoölogy.—The wild animals of Nevada are those of California, except those which find their homes in the sea or along the shores of the Pacific. The grizzly bear is the monarch of the forest, and the black and the Mexican bear are sufficiently numerous; the cougar or panther, the wild cat, the gray wolf and the whole marten tribe, the lynx, skunk and raccoon are abundant. Of game animals, the elk, two species of deer, and possibly the moose, though that animal is very rare, Rocky Mountain sheep or big horn; rabbits, squirrels, the sewellel, the gopher and other rodents are so numerous as to give annoyance. Birds of prey, song birds and game birds are plentiful. Reptiles are of the

same genera and species as in California. Trout and salmon trout are found in the larger lakes, but the smaller lakes are too alkaline for fish. Southern Nevada has few animals.

Agricultural Productions.—While Nevada is essentially a mining State, and contains but a comparatively small proportion of arable land, she can, by the aid of irrigation, raise a sufficient quantity of cereals, root crops, etc., to supply her small population, and by turning attention to stock-raising soon export many thousand head of cattle.

The soil of the State is generally a loam, most fertile where the underlying rock is limestone, but nearly everywhere sufficiently so to reward the labors of the husbandman, where water can be obtained for the purposes of irrigation. The immense stretches of barren wastes so often seen are only so because of the want of moistening showers of rain, and streams sufficiently numerous to supply the demands for agriculture. As a large proportion of the land is much better adapted to grazing than to tillage, much attention has been given to the raising of live-stock, and the horses, cattle, sheep and goats bred here are of excellent quality. The winter feed, consisting of bunch-grass and white sage, furnishes the best of sustenance for stock, so that, with rare exceptions, is any provision made or stores of fodder laid up for winter use. During the summer months the pasturage in the vicinity of springs, brooks and creeks on mountain sides and in the cañons supplies the feed, but when winter comes, the herds and flocks feed miles away from water in the valleys. The northern and eastern sections of the State are the best adapted for grazing. Many of the loftiest mountains are covered with a species of bunch-grass peculiar to those localities. The table-lands and dry valleys in many places are covered with the white sage, which makes the best of winter feed for stock. When growing in the spring and summer, this sage is bitter and not eaten, but when the frosts of fall and winter come it is tender, sweet and nutritious, and better liked by stock than other kinds of feed. So extensive has the business of stock-raising become that now the supply far exceeds the wants of the population, and thousands of steers and beef cattle are yearly shipped by railroad to the markets

of California. The agricultural lands of the State are small in proportion to the area, though in all of the valleys where are found streams of water large tracts of land are brought under cultivation, and the crops produced are very superior in character. The best of these arable lands are found in Carson, Eagle, Mason, Washoe, Truckee, Humboldt, Reese River, Owyhee, Lamoille, Ruby, Steptoe, Spring, White River, Snake, Panaca, Pahranagat, Paradise, Muddy and Los Vegas Valleys. There are hundreds of other smaller valleys, and in many of them the soil is quite as productive, though less water is found; and there is no land in the State but what is benefited, for agriculture, by irrigation. In the northern and central valleys all the grains, vegetables, and fruits of a temperate climate are cultivated with success. In the southern valleys the proportion of fertile land is much less than in other sections of the State, except about springs and streams of water. The country is chiefly a desert. The scarcity of water is a noticeable feature, but where there is sufficient for irrigation, as in the Muddy and Las Vegas Valleys, the farmer is abundantly rewarded for his labor. Fruit trees, embracing nearly every variety known in both temperate and tropical climates, are cultivated. Growing here side by side are seen the olive and the plum, orange and apple, lemon and peach, fig and apricot, pomegranate and pear, and the walnut and pepper. Grapes also grow to perfection. The vineyards produce as perfectly ripened and delicious grapes as the most favored localities in California and France. Cotton and sorghum have been cultivated quite extensively; one acre of land yielding as much as a thousand pounds of the former. Melons, squashes and beans also grow abundantly, as well as corn and all the smaller grains. Some of the hardier vegetables, as potatoes, do not thrive so well. Two crops are raised yearly on the same land. It is first sown in small grains, as wheat, barley, rye and oats, which are harvested about the first of June. It is then planted in corn, beans, potatoes, beets, cabbage, onions, squashes, melons and all other varieties of garden vegetables. The mezquit bushes, which grow in some of these southern valleys, furnish a very nutritious bean, which all animals feed upon as soon as the grasses die in the fall.

Stock keep as fat upon this feed during the winter months as though fed upon hay and grain.

The tables on page 1051 give the latest reports yet published of the crops and live-stock of Nevada—the returns of 1877 and 1878. The Legislature has only biennial sessions, and the reports of the assessors and auditor are only made biennially. The amount of arable land enclosed or reported as in farms, was, in 1877, 152,810 acres, and in 1878, 158,097 acres; only one four-hundred-and-fifty-fourth part of the area of the State; and of this small territory—less than seven townships—only 75,743 acres in 1877, and 76,358, or not quite one-half, was under cultivation. It should be said, however, that there is no official record of the lands used for grazing purposes, and that a moderate portion of these is also under cultivation.*

Manufacturing Industry.—The fluctuations in the population and the mining industry of Nevada make it exceedingly difficult to determine the amount of manufacturing in the State at any given period. The annual product of its manufacturing establishments in 1870 was reported at $15,870,839. We doubt whether it is as much as that now, though at some periods during the decade the amount may have been twice as much.

There were in 1878 fifteen grist or flouring mills reported in the State, which were said to have produced 5,000 barrels of flour (all from Washoe county, though only one mill was reported from that county, the other fourteen being situated in other counties, and the same mill ground 1,500 bushels of corn, all

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* The State Surveyor-General in 1879 makes the following approximate estimate of the area of available lands in Nevada. It is, of course, only an approximation, and may eventually prove to be some millions of acres out of the way:

Approximate area of agricultural land	1,067,653 acres.
" " " grazing land	9,708,060 acres.
" " " timbered land	1,901,410 acres.
Mineral lands	1,261,600 acres.
Total of available lands now known	13,938,723 acres.

This is a little less than one-fifth of the entire area of the State; but it must not be hastily concluded that four-fifths of Nevada is a desert. There is undoubtedly a larger amount of unavailable land in the State than in any other State of "Our Western Empire;" but there will eventually be found to be thirty or forty million acres which can be made valuable.

AGRICULTURAL PRODUCTIONS.

Kind of crop.	1877. Acres.	1878. Acres.	1877. Bushels, tons or pounds.	1878. Bushels, tons or pounds.
Wheat, bushels	8,444	8,268	104,603	130,999
Barley, "	23,421	24,267	546,774	544,059
Oats, "	7,233	6,739	181,288	98,300*
Rye, "	109	166	3,035	3,060*
Corn, "	449	4,235	10,696	11,945
Buckwheat, "	11	13	157	165
Peas, "	24	18	505	445
Beans, "	46	43	1,052	1,035
Potatoes, "	4,602	3,575	345,900	382,397
Cabbage, tons	114	117	459	421.5
Hay, "	90,915	91,344	105,727	107,698
Hops, "	2½	2½	150	150
Beets, "	.....	.....	206	196
Turnips, "	.....	.....	212	206
Butter, pounds	.....	.....	326,015	337,925
Cheese, "	.....	.....	33,900	36,900
Wool, "	.....	.....	577,216	626,807
Grape vines, number	.....	.....	82,959	102,450
Wine, gallons	.....	.....	2,010	2,115
Honey, pounds	.....	.....	15,875	16,680

LIVE-STOCK.

Animals.	1877. Number.	1878. Number.	1877. Value.	1878. Value.
Horses	29,562	31,496	$1,478,000.00	$1,572,480.00
Mules	3,782	7,646	247,154.00	499,666.00
Asses	173	175	12,110.00	12,250.00
Milch cows	46,879	50,951	1,078,217.00	1,171,873.00
Oxen and other cattle	98,849	173,840	1,878,131.00	3,476,800.00
Bulls	1,068	1,032	64,080.00	61,920.00
Sheep and lambs	198,911	211,173	397,822.00	443,463.00
Angora and Cashmere goats	4,246	6,698	42,460.00	73,678.00
Hogs	5,537	6,080	16,611.00	19,760.00
Chickens	54,170	56,820	21,668.00	28,410.00
Turkeys	5,127	5,040	7,690.00	7,560.00
Geese	1,522	1,510	1,369.80	1,359.00
Ducks	3,997	4,483	2,998.00	3,362.25
Hives of bees	1,053	1,190	10,530.00	11,900.00
Total values	.....	.....	$5,307,970.80	$7,394,491.25

* Assessor's report, evidently incomplete.

that was reported, and 50,000 bushels of barley); 55,000 bushels of barley were ground in other counties. This was a falling off from the production of the previous year, but this may be due to the fact that the assessors in most of the counties neglected to report. There were twenty-seven saw mills reported; a part of these sawed 27,490,000 feet of lumber, and made 100,000 shingles. There were eight planing and framing mills. There were 119 quartz stamp mills in operation, six less than the previous year, and they crushed 659,534 tons of quartz, almost 300,000 tons less than the year before; there were thirty-four smelting furnaces, which smelted 154,651 tons of ore, about 70,000 tons more than the previous year. Seven pan mills worked over 83,563 tons of tailings. Six borax mills were operated, but how much they produced is not told. The other manufactures are not reported, and we have no key to the value of the production of these. There were seventeen mining ditches in operation, having a total length of fifty-seven miles, and eight of them used 484 miner's inches of water daily. There were 407 irrigating ditches, having a total length of 1,491 miles, and irrigating 128,004 acres of land. There were also six wood flumes, fifty-three miles in length, and 75,000 cords of wood were flumed through them.

Railroads.—The entire number of railroads in the State was fifteen in 1878. The total length at the close of 1879 was about 685 miles.

Valuation.—The assessed valuation of real and personal estate in 1878 in the State, with one county (Elko) missing, were $26,018,392, about $1,400,000 less than that of the previous year. These amounts were absurdly below the real valuation. Either one of the four or five bonanza kings of the State could probably show an inventory exceeding this amount, and the property of the Central Pacific Railroad in the State alone is probably worth considerably more than the entire assessed valuation of all real property in the State.

Population.—Nevada is not a State of large population, and since 1870, the number of its inhabitants has fluctuated remarkably. When admitted into the Union as a State, its population

was far below the usual requirement, and indeed has never yet attained to it. The almost exclusive devotion of the inhabitants to mining enterprises, and the fact that many of these were managed by foreign companies, and the employés were very few of them citizens, has aided in keeping the population at a low figure. The following table gives the particulars of the population so far as they are attainable:

Census Year.	Aggregate Population.	Males.	Females.	Whites.	Colored and Chinese.	Indians.	Natives.	Foreigners.	Density.	Ratio of Increase.	Of School Age, 5-20. Both Sexes.	Of Military Age, 18-45. Males.	Of Voting Age, 21 and upwards. Males.
1860	6,857	6,137	720	6,812	45	.....	4,793	2,064	0.06	.....	500	5,149	5,699
1870	58,734*	32,359†	10,112†	38,959	3,509‡	16,243	23,690	18,801	0.41	519.67	6,930	24,762	26,920
1875	60,543*	37,541†	14,999†	48,127	4,413§	8,000	.....	.....	0.66	17.11	8,785	.....	29,780
1877	64,164*	.....	.....	.....	.....	7,000	.....	.....	0.51	10.03	9,465	.....	30,813¶
1878	64,334*	.....	.....	.....	.....	6,750	.....	.....	0.52	00.06	9,521	.....	31,494¶
1880	69,065*	42,013	20,252	53,574	5,988	6,800	36,623	25,642	0.44	7.35	8,274	.....	

Indian Reservations.—The Indian reservations amount to 897,815 acres, but only a very small part of this consists of arable lands.

Counties and Cities.—There are fourteen organized counties in Nevada, viz.: Churchill, Douglas, Elko, Esmeralda, Eureka, Humboldt, Lander, Lincoln, Lyon, Nye, Ormsby, Storey, Washoe and White Pine; of these Storey county, in which is situated the Comstock lode, is much the largest; of the others only Eureka and Ormsby exceed 5,000 inhabitants. The principal cities and towns are Virginia City, which has 13,705 inhabitants; Gold Hill and Hamilton, mining towns, with 4,000 or 5,000 each; Carson City, the capital, with about 4,000; Treasure City, Elko, Reno and Pioche, with from 1,500 to 2,000 each.

Education.—The State has a moderate school fund from the sale of school lands, and the provision for public school education is very good. Her fund will increase with the growth of the

* Including tribal Indians. † Excluding tribal Indians. ‡ Includes 3,152 Chinese. § Includes 3,919 Chinese. ¶ The number of registered voters in 1877 was 17,761, and in 1878 17,166, showing that a large number of those of voting age were aliens.

State. In the cities and towns, the schools are well maintained. Among the scattered population of the newer mining districts and the grazing lands there is more difficulty. The only institution for higher education is the State University, which has not yet organized anything beyond its preparatory department.

Religious Denominations.—In 1874 there were in Nevada, as reported, forty-four church organizations of all denominations, thirty-two church edifices, thirty-seven clergymen, priests or ministers, 1,132 communicants, 10,300 adherent population, and $301,450 of church property. Of these the Roman Catholics claimed thirteen church organizations, though but seven church edifices and six priests. They numbered all the adherents of their church as Catholic population, and reported them as 5,000. Their church edifices were the best buildings of the kind in the State, and were valued at $134,000, probably considerably less than their actual worth. The Methodists came next with eleven church organizations, ten church edifices, twelve ministers, 496 communicants, 2,500 adherent population, and church property reported at $76,250. There were nine Protestant Episcopal Churches, six church edifices, nine clergymen, and 269 communicants, with $48,000 of church property. Next in order came Presbyterians, with five churches, three church edifices, three ministers, 169 members, and $21,200 of church property. The only other denominations reported were the Baptists, with three churches, three church edifices, three ministers, and $16,000 of church property ; and the Congregationalists, with one church, one church edifice, and one minister, with twelve members, and $6,000 of church property. Nevada could hardly be called a very religious commonwealth, when less than one-fifth of its population were even adherents to any form of religion, and only one-fiftieth were actual communicants. The condition of things is not much better now. At that date the Mormons had begun to plant their communities, and teach their doctrines in the mining districts, and now, six years later, they claim to have the control there, and we fear their claim is just. This faith, which is also an authority or empire, is the sum of all abominations, and we cannot look at its spread without

horror and disgust. The prevalence of polygamy, blasphemy, lust and murder in a State like Nevada, would portend its ruin were its mines a thousand-fold richer than they are.

Historical Data.—Nevada is a part of the region acquired from Mexico by the treaty of Guadalupe-Hidalgo in February, 1848. It was at first a part of California Territory, and on the admission of that State into the Union, was made a part of Utah Territory. It was set off as the Territory of Nevada, in March, 1861, but had not then so large an area as it has now. A part of its present boundaries on the east were fixed in 1862; it was admitted into the Union as a State in 1864, and received some further accessions of territory in 1866. It furnished its quota of soldiers to the civil war, and sent material aid to the Sanitary Commission to the extent of $51,000.

Conclusion.—Nevada does not offer a very promising field for immigration. Its great mining operations are in the hands of wealthy capitalists, and are not at the present time very promising; there are probably new lodes and new placers which may prove very rich; but only capitalists will be able to hold or work them. Grazing, especially with herds of cattle, might prove better, but it requires a large capital, and Wyoming, Montana, Oregon, Washington Territory, and perhaps California, are so much better adapted to grazing as to leave but small inducements to the stock-grower to start here. Farming in some of the fertile valleys, or market gardening, would be more feasible, for, with irrigation, crops can be raised, which will find a good and ready market at home. But the lack of any patriotic State feeling, and the prevalence of Mormonism throughout the State, make it a State to which immigration is not desirable.

CHAPTER XVI.

NEW MEXICO.

TOPOGRAPHY—BOUNDARIES (ENLARGED BY THE GADSDEN TREATY)—EXTENT AND AREA—MOUNTAINS—RIVERS AND LAKES—CLIMATE—VARIETY IN TEMPERATURE—MR. Z. L. WHITE ON THE SUMMER CLIMATE OF THE TERRITORY—NEW MEXICO AS A HEALTH RESORT—METEOROLOGY AND RAINFALL OF VARIOUS POINTS IN THE TERRITORY—GEOLOGY AND MINERALOGY—MINERAL WEALTH OF THE TERRITORY—GOLD AND SILVER—OTHER METALS AND MINERALS—TURQUOISE—HOT SPRINGS—COAL—BITUMINOUS, LIGNITE AND TRUE ANTHRACITE—COAL FOUND IN NEW MEXICO OF THE BEST QUALITY AND IN INEXHAUSTIBLE QUANTITIES—ARABLE LANDS—THEIR QUANTITY AND QUALITY—NATIVE AGRICULTURE—GRAZING LANDS—NEW MEXICO BEST ADAPTED TO SHEEP-FARMING—NUMBER OF SHEEP—CROPS OF 1879—MINING INDUSTRY—GOVERNOR WALLACE ON THE MINING DISTRICTS—THE GOLD AND SILVER PRODUCTION—OBJECTS OF INTEREST—THE CAÑONS AND TERRIBLE DARK VALLEYS AND CAVES OF THE TERRITORY—THE SEVEN CITIES OF CIBOLA—EVIDENCES OF VOLCANIC ACTION—BURIED CITIES—ABO AND ITS RUINS—THE INDIAN SKELETON OVERWHELMED BY VOLCANIC ASHES—THE VAST CRATER—ROCK CITIES—THE PUEBLO POTTERY—HOW IT WAS AND IS MADE—THE ZUNI BLANKETS—MANUFACTURES—RAILROADS—GREAT DEVELOPMENT OF RAILWAYS—POPULATION—TABLE—CHIEF-JUSTICE PRINCE ON THE THREE CIVILIZATIONS FOUND THERE—THE INDIAN TRIBES—THE PUEBLOS—THE APACHES—THE NAVAJOES—COUNTIES AND PRINCIPAL TOWNS—EDUCATION—RELIGION AND MORALS—HISTORICAL DATA—CONCLUSION.

NEW MEXICO is a central Territory of the southern tier of States and Territories of "Our Western Empire." It is a portion of the territory ceded by Mexico by the treaty of Guadalupe-Hidalgo, in February, 1848, and, previous to the cession, had been a State of that republic. It was created a Territory by Act of Congress, September 9th, 1850, but the Territorial government was not organized till March 1, 1851.

The Territory extends from 103° to 109° of west longitude from Greenwich, and from 31° 20′ to 37° north latitude. It is bounded by Colorado on the north, by Texas and the Indian Territory on the east, Texas and Old Mexico on the south, and Arizona on the west. It is almost a perfect square, a small tract projecting into Mexico, which was acquired by the Gadsden

treaty, in the southwest, being the only departure from completeness in its proportions. This tract contains some noted mineral springs, but otherwise is not at present known to be of much value. The greatest length of the Territory from north to south is 390 miles, and its greatest breadth from east to west 341 miles. Its area is 121,201 square miles, or 77,568,640 acres.

Mountain Chains.—The mountains enter the Territory from Colorado in two ranges, the eastern, lying wholly east of the Rio Grande, being a continuation of the Sangre de Cristo, or Park range, of Colorado, and continuing below the 37th parallel under the name of the Raton Mountains. The whole range is high, and numerous elevated summits and lofty peaks, as well as continuous ridges of great height, are found in its course; but these terminate abruptly a short distance below Santa Fé, and only an elevated and somewhat broken plateau remains of this range from that point to the Texan boundary. The other range, which seems to be a continuation of the San Juan and Uncompahgre Mountains of Colorado, consists of many detached mountains of lower altitude, with passes between them of only 5,000 or 6,000 feet in height. They are known in New Mexico as the Sierra Madre, and form the connecting link between the lofty and rugged mountains of Western Colorado and the equally lofty Sierra Madre of the Republic of Mexico. The various groups of these detached mountains with the valleys between them fill up almost the entire region west of the Rio Grande. Though the eastern mountains are much the highest, yet here, as in Southern Colorado, the western and lower mountains form the water-shed between the waters flowing to the Atlantic and Pacific Oceans. There are a chain of hills of moderate elevation along the eastern bank of the Rio Pecos, which form the boundary on the west side of the vast Llano Estacado, or Staked Plain.

Topography.—The face of the country is diversified by mountains, valleys, plains, and high level plateaux or mesas; similarity of climate, character and resources, pertaining to a large portion of the country, excepting in the highest ranges and lowest valleys. In portions of the Territory the surface is much broken and disrupted by chains of mountains, preserving a general direction of

north and south. Intervening, there are large areas of table lands, bisected by many large and small valleys of unsurpassed fertility, and susceptible of the highest state of cultivation. The valleys have a mean altitude above the sea of 4,500 feet, and the mountains on either side of the Rio Grande del Norte and Rio Pecos of 6,000 to 8,000 feet. In the more northerly portions of the Territory they rise to 10,000 and 12,000 feet.

Rivers and Lakes.—The rivers of New Mexico contribute to both the Atlantic and Pacific slopes. The eastern is watered and drained by the Canadian and its tributaries into the Mississippi, and the Rio Grande del Norte and its tributaries into the Gulf of Mexico. The western slope is watered and drained by the Colorado of the West and Rio Gila, and their tributaries, into the Gulf of California. The Rio Grande del Norte takes its rise in the high mountains, north of the boundary line of New Mexico, where it is fed by numerous springs and the meltings of the annual snows, and augmented by tributaries, watering and draining a vast area of some of the finest farming and grazing lands on the continent. It flows south through the western division of the Territory, a broad, beautiful river, enriching with its turbid water a valley more than 400 miles long and many miles in breadth—one of the most wonderful for fertility and beauty in the world. The Rio Pecos, on the eastern slope of the principal mountains, has its source in the mountains near Santa Fé, watering and draining, through its numerous tributaries, an immense district of country, and flowing through its eastern division into Texas, through a valley only second in importance to that of the Rio Grande del Norte, with which it forms a junction below the southern boundary. The Canadian river flows to the east, and through its affluents waters and drains the entire northeastern part of the country. The Rio San Juan, formed by the Rio Piedra, Rio Los Pinos, Rio Florida, Rio de Los Animas, Rio Navajo, Rio de La Plata and other smaller streams, constitutes one of the most beautiful rivers in the West, watering and draining all the southwestern slope of the San Juan Mountains. In the southwest the Rio Mimbres, Agate creek, Bear creek, and the San Francisco river, together with the head waters of the Rio Gila, water and drain the region.

East of these, and flowing from either side of a system of detached mountains, occupying nearly the longitudinal centre of the Territory, and extending through its entire length from north to south, terminating in the Guadalupe Mountains on the borders of Texas, are a large number of small rivers and creeks, supplying a large area of table lands and valleys, as well as a portion of the Terraces of the Rio Grande and Rio Pecos with pure living water. Besides these, almost every mountain and hill is supplied with numerous springs of sparkling cold water; also, there are many good springs found in the low depressions and valleys many miles distant from the mountains. Thus, it will be seen that the water supply is far more ample than the casual observer or stranger would infer from an examination of maps drafted years ago, or a supposition derived from vague reports of the arid climate and light rainfalls.

Climate.—There is great diversity of climate, owing to differences in latitude and altitude between different portions of the country. Almost any degree of temperature may be attained by change of locality, there being a wide range of extremes in temperature. In the lower plateaux, the summer days are warm, but not debilitating, because the atmosphere is so dry that perspiration is rapidly absorbed. The nights are always cool and bracing. The climate throughout the Territory is so mild and equable, combining dryness and purity, particularly so on the plateaux of mean elevation, that many persons afflicted with pulmonary and other diseases of a like character, have tested its salubrity with marked benefit, and in many cases permanent cure. Those who have lived in this delightful climate for a few years believe it to be the healthiest location in the United States.

Mr. Zimri L. White, the able correspondent of the *New York Tribune*, writing from the Territory in September, 1880, says:

"The summer climate of the northern part of the Territory is delightful. At Santa Fé, which has an altitude of about 7,000 feet, the nights are always so cool that heavy blankets upon the beds are comfortable, and the heat at midday, although sometimes great, is never oppressive. Americans here dress in heavy woollen fabrics, both for outside and underwear, at all seasons

of the year. I am told that the winters are mild and sunny, with comparatively little snow. The low altitudes in the central and southern portions of the Territory are very hot and dry, but on account of the absence of moisture in the atmosphere and the exceedingly rapid evaporation, the apparent intensity of the heat is much reduced. The temperature in the mountains is always and everywhere delightful.

New Mexico as a Health Resort.—New Mexico has a deservedly high reputation as a sanitary resort in pulmonary diseases, and that its real character and the diseases which are benefited by a residence there may be better understood, we present the following testimony from eminent physicians and others long resident in the Territory.

Lewis Kennan, M. D., an eminent physician of Silver City, New Mexico, twenty-seven years resident in the Territory, says: "It is certain that even when the lungs were irreparably diseased, very much benefit has resulted. Invalids have come here with the system falling into tubercular ruin, and their lives have been astonishingly prolonged by the dry, bracing atmosphere. The most amazing results, however, are produced in warding off the approaches of phthisis, and I am sure there are but few cases which, if sent here before the malady is well advanced, would fail to be arrested. Where hardening has occurred or even considerable cavities have been detected in the lungs, relief altogether surprising has taken place. The lowest death rate from tubercular disease in America is found in New Mexico, notwithstanding the large number of cases of that disease who resort thither for healing. The census of 1870 gives twenty-five per cent. as the death rate from this disease in New England, fourteen in Minnesota, from five to six in the different Southern States, and three per cent. in New Mexico. I have never known a case of bronchitis or asthma in the Territory that was not greatly improved or altogether cured. For rheumatism and diseases of the heart with or without a rheumatic origin, I would not recommend this climate. Valvular difficulty in that organ is invariably made worse."

"The most wonderful effect of this climate," says an eminent

physician, "is seen in those cases of general debility of all the functions of body and mind, the used-up condition. People come here in a state of languor, having little hope of life and often little desire to live, and the relief is so speedy as to seem miraculous. For weak and broken-down children there is nothing like it on the face of the earth; with them the law of the survival of the strongest seems not to prevail here. I have no doubt that when the means of access to this country are more easy, and it is in consequence better known, it will rival or supersede Florida, Madeira, Nice, or the much vaunted paradise of Mentone as a sanitarium. The country is far distant from either ocean; it is absolutely free from all causes of disease." Distinguished travellers who have visited the health resorts of all other countries say: "The climate of New Mexico is very salubrious and bracing; in fact it is unsurpassed by that of any other Territory or State."

The following tables prepared from the Signal Service Reports, give the particulars of the rainfall and temperature at different towns in the Territory, and also at El Paso, Texas, which is on the Rio Grande, just at the southeastern point of the Gadsden Purchase.

Rainfall in New Mexico in 1878 *and* 1879.

Year and Months.	ALBUQUERQUE. Latitude 35° 2'. Longitude 106° 40'. Altitude 5,026 feet.	FORT CRAIG. Latitude 33° 42'. Longitude 107° 8'. Altitude about 5,000 feet.	LA MESILLA. Latitude 32° 17'. Longitude 106° 48'. Altitude about 3,800 feet.	SANTA FÉ. Latitude 35° 41'. Longitude 106° 10'. Altitude 6,851 feet.	SILVER CITY. Latitude 32° 48'. Longitude 108° 15'. Altitude 6,896 feet.	EL PASO, TEXAS. Latitude 31° 46'. Longitude 106° 32'. Altitude about 3,500 feet.
	inches.	inches.	inches.	inches.	inches.	inches.
The Year		2.96	6.52	15.79	20.77	8.99
1879.						
January	0.47	0.65	1.20	0.77	2.78	1.57
February	0.26	0.30	0.62	0.23	1.12	0.83
March	0.02	0.00	0.31	0.15	0.32	0.18
April	0.02	0.12	0.03	0.48	0.01	0.07
May	0.03	0.00	0.00	0.37	0.00	0.00
June	.....	0.08	0.03	0.51	0.08	0.08
1878.						
July	.....	0.01	2.06	3.20	3.92	1.25
August	.....	1.41	0.61	5.12	7.70	2.55
September	.....	0.08	0.21	1.03	0.27	0.66
October	0.00	0.00	0.09	0.00	0.00	1.02
November	1.83	0.18	1.29	3.15	3.80	0.67
December	0.07	0.13	0.07	0.78	0.77	0.11

SANTA FÉ. Latitude 35° 41′. Longitude 106° 10′. Altitude 6,851 feet.							FORT CRAIG. Latitude 33° 42′. Longitude 107° 8′. Alt. ab. 5,000 feet.				SILVER CITY. Latitude 32° 48′. Longitude 108° 15′. Altitude 6,896 feet.				EL PASO, TEXAS. Latitude 31° 46′. Longitude 106° 32′. Altitude ab. 3,500 feet.			
Year and Months.	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Humidity.	Mean Barometer.	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.
	°	°	°	°	per ct.	in.	°	°	°	°	°	°	°	°	°	°	°	°
Year	50.2	97	—3	100	39.3	29.836	55.5	105	—2	107	53.5	96	11	85	60	104	34	70
1878.																		
July	70.4	95.5	50	45.5	40.4	29.911	80	100	60	40	72.2	96	56	40	82	98	70	28
August	68.7	97	52	45	48.5	29.928	81.5	105	58	47	70.8	94	58	36	80	97	69	28
September	58.4	88	38	50	37.2	29.896	66	91	41	50	63.8	90	43	47	75.5	90	61	29
October	50.4	85	18	67	23.2	29.881	56	90	22	68	60	90	30	60	69.5	89	50	39
November	38.9	77	12	65	52.6	29.823	44.5	75	14	61	.....	.....	... ...	.....	57	74	40	34
December	25.9	65	0	65	49.4	29.770	31	56	6	50	47	82	12	70	50	63	37	26
1879.																		
January	29.3	76	—2	78	55.4	29.782	33	68	—2	70	45.5	80	11	69	55.5	72	39	33
February	36.5	75	—3	78	49.6	29.772	48	82	14	68	49	80	18	62	56	82	30	52
March	48.3	82	25	57	34.7	29.810	58	89	27	62	57.5	83	32	51	62	88	43	45
April	48.9	84	23	61	35.3	29.770	64	97	31	66	.....	.....	.....	.....	64.5	98	31	67
May	60.9	84	34	50	24.3	29.837	69.5	96	43	53	64	87	41	46	74	101	47	54
June	66.4	91	38	53	20.5	29.847	73.5	100	47	53	66.5	92	41	51	83	104	69	35

Geology and Mineralogy.—The surface rocks of the great plateau, which comprises so large a portion of the Territory, belong to the cretaceous period, except those in the southwest and west, which are a part of the plateau of the Sierra Madre, and are entirely of the eozoic period. The summits of the Rocky Mountain system, as well as those of the Sierra Madre, are also eozoic, but the peaks are capped with metamorphic rocks, chiefly porphyry, trap and basalt. Besides these exceptions, there are three considerable tracts which are volcanic, and covered with lava, which is, apparently, only a few centuries old; the first of these tracts is in the Zuni Mountains, between the Rio Puerco and the Rio San José, including Mount Taylor; the second is east of and parallel to the Rio Grande; it is nearly 140 miles in length; the third is near the northern boundary of the Territory, along the west bank of the Rio Grande and extending to the Rio Chama. The tract east of the Rio Grande is called *Mal Pais* ("bad country"), and besides the lava, has a broad expanse of volcanic sand, alternating with salt marshes.

The valleys of the Rio Pecos and of the Canadian river and its branches are triassic or jurassic, and at some points are underlaid with coal at such depths as to be accessible. The valley of the Rio Grande above the thirty-fifth parallel is tertiary: below that parallel it partakes of the general character of the plateau, and is cretaceous. The foot-hills of the eastern slope of the Guadalupe Mountains are triassic. There are two considerable tracts of tertiary in the northeastern portion of the Territory, the larger of the two lying between the head-waters of the Cimmaron and the north fork of the Canadian rivers, and the smaller between two of the affluents of the Canadian.

Mineral Wealth.—The geological formations of New Mexico form an extremely interesting study, as well on account of their peculiarities as of the vast quantities of minerals, especially the precious metals, which are contained in some of them. The syenitic rocks of the mountains which traverse the central plateau between the Pecos and the Rio Grande, and the carboniferous limestones found on the flanks and sometimes on the ridges of these mountains, are both traversed by mineral-bearing lodes.

In the sandstone formation beds of lignite and bituminous coal from three to five feet in thickness are found, alternating with layers of iron ore of good quality and fire-clay. In the Old Placer Mountains and elsewhere, mines of anthracite of a superior quality have been opened. Marls, gypsum, and other valuable earths are abundant and easy of access, but little has been done to develop the deposits. Zinc, manganese, quicksilver and some minor minerals occur. In the Placer mountains, and at several other points, especially near Pinos Altos and Embudo, iron is worked. Lead is found in the Pinos Altos mines, in the Organ mountains, and at other points. Copper is even more abundant, and some of the mines yield large results. The chief deposits worked are those of the Manzano, Magollon, and Magdalena mountains.

Turquoise of rare beauty has been found in the Cerillos Mountains, about twenty miles southwest of Santa Fé, and mines of it were worked with great profit before the Indian revolt in 1680. The finest turquoise in Europe, one of the jewels of the Spanish crown, was obtained in these mountains more than two centuries ago.

Hot springs and other mineral springs of great medicinal virtue, abound in New Mexico. Governor Wallace says that excellent hot springs have been discovered at Fernandez, in Taos county; at Las Vegas, San Miguel county; at Ojo Caliente, in Rio Arriba county; near Jemez, in Bernalillo county; near Fort McRae, Socorro county; Fort Selden, Doña Ana county; and at Mimbres, in Grant county. Those at Jemez are probably unexcelled in the world. At Las Vegas elaborate preparations are in progress for the care and entertainment of guests and invalids. Any and all these springs are equal in curative qualities, if not superior, to those in Arkansas. They have certainly the attraction of an unsurpassed climate.

In this connection mention may be made of the soda springs, of which there are several. One, east of Isleta eighteen or twenty miles, is particularly worthy of notice as yielding seltzer quite equal to the best imported article.

But the chief mineral wealth of this rich Territory is contained

in its gold and silver mines, some of which have been worked since remote times. The earliest Spanish discoverers found such convincing proofs of the richness of the gold and silver deposits that they gave to the country its present name from the resemblance to the mineral regions of old Mexico. Throughout the periods of the Spanish and Mexican occupancy the precious metals were worked, and even with the rude appliances and desultory methods of those peoples, wonderful results were obtained. Capital, abundant water power and railroad communication, are the three desiderata for the successful development of the rich mines of this country, which are believed to rival the most productive deposits known. The chief gold fields now operated are those of Colfax, Grant, Santa Fé and Bernalillo counties, and of the Carrizo, Sierra Blanca, Patos, Jicarilla and Magdalena Mountains, but these are only a few of the many regions in which gold is known to exist. So far little more than the placers have been touched, while the great resources of the quartz lodes still await the advent of machinery, capital, and, above all, well-directed labor. The silver mines of Pinos Altos, the Cerillos, Sandia and Magdalena Mountains, formerly so productive, have been worked in a perfunctory way, but without any organized system of procedure, and the production is now small. A few words should be said in regard to the coal deposits of New Mexico. The greater part of the coal deposits throughout "Our Western Empire" are bituminous, and even where they are called anthracites, they are generally only a little harder or denser veins of the bituminous coal, and at most can be regarded as only semi-anthracites. Some geologists have boldly declared that there was *no* anthracite west of the Mississippi river, and have predicted that nothing of the kind would ever be discovered there; but they are certainly in error. Whether the so-called anthracites of Southwestern Colorado, of Texas, of Arizona and of Utah, will prove to be true anthracites, may be a question until we have more and more careful and thorough analyses of them; but that there is anthracite coal in Northwest Washington Territory, and that it is abundant in New Mexico, seems to be proved beyond the possibility of a doubt. The only locality where it has thus far been found is

among the foot-hills of the Placer Mountains, about thirty miles south-southwest of Santa Fé. The formation is tertiary, but it has been subjected at various times to volcanic action, as the lava and metamorphic rocks plainly indicate. Mr. Z. L. White examined these coal deposits very carefully in August, 1880, and though previously faithless in regard to the existence of anthracite anywhere in this region, became fully satisfied that it was anthracite, and of the very best quality. The mines already opened are on the "Ortiz Grant," and the coals in this, of which there are twenty-seven veins, ranging from a few inches to more than six feet in thickness, are easily accessible. The coal was probably originally a lignite of excellent quality of the tertiary, but by volcanic action was changed into anthracite. Mr. White fortifies his opinion by the definition of true anthracite given in the best treatises on coal, and by three analyses made by the geologists of Lieutenant Wheeler's expedition in 1875, by R. D. Owen and E. T. Cox in 1865, and by Professor J. L. Leconte in 1868, and in a fourth column gives the analysis of the Pennsylvania anthracites from "Dana's Mineralogy." The economic importance of this anthracite coal to the whole West, it being very near the Atchison, Topeka and Santa Fé Railroad, must be our apology for devoting so much space to it.

	ANALYSES.			
Constituents.	W.	O. & C.	Lec.	Penna. Coal.
Water	2.10	3.50	2.90	
Gas	6.63	4.50	3.18	3.84
Fixed Carbon	86,22	87.00	88.91	87.45
Ash	5.05	5.00	5.21	7.37
Totals . . .	100.00	100.00	100.00	98.66

"True anthracite has a specific gravity of 1.4 to 1.7; its hardness is 2 to 2.5; and it contains 85 to 93 per cent. of fixed carbon; and volatile matter, after drying, 3 to 6 per cent. It is amorphous, of conchoidal fracture, brittle, has a sub-metallic lustre, iron black to grayish and brownish black color, and when pulverized forms a black powder. It ignites with difficulty and at a high temperature, but when ignited produces an intense heat. This is an exact description of the coal in the Ortiz mines."

Agricultural Productions.—There are in New Mexico from 18,000,000 to 20,000,000 acres of arable lands, or at least that much can be brought under successful cultivation, when a judicious system of irrigating canals and reservoirs shall have been constructed. More than three-fourths of all the waters of the Territory run to waste at present. The country is admirably supplied with hundreds of natural basins on the elevated plateaux, where the water of all or nearly all the streams could be stored by means of canals and ditches. The water supplies would commence accumulating during the early fall, and continue through the winter, spring and early summer rises or freshets, from the melting snow in the high mountains. In this way immense reservoirs could be accumulated, ample for all purposes.

The soil of the valleys throughout the Territory is a rich sandy loam, composed of the disintegrated matter of the older rocks and volcanic ashes. It is light and porous and of surprising fertility. Corn, wheat, oats and barley grow well in all parts of the Territory; corn is a staple product. The cereals do best in the northern districts and elevated plateaux; corn, vegetables and all kinds of fruit do best in the valleys; corn, in the rich bottoms, along the principal streams, if well cultivated, may be made to yield over eighty bushels per acre; wheat on the uplands often yields over fifty bushels per acre, and in portions of the Rio Grande Valley averages twenty-five bushels under the rudest and most imperfect culture.* Farm lands in the Taos Valley and

* Mr. White says of the native agriculture:

"The Mexican and Indian methods of harvesting their grain are very primitive, similar, indeed, to those of Eastern countries in Bible times. The wheat is cut by hand with a sickle, and taken, unbound, in carts to the threshing-floor. This consists of a round plat of level ground in an elevated place, fifty, one hundred, or two hundred feet in diameter, as the farm is a large or small one, the surface of which is pounded or trodden as hard as a cement floor. Around the edges of this, tall poles are set in the ground five or six feet apart, forming a circle. The unthreshed grain is piled up loosely in the centre, and, when everything is ready, a thin layer is raked down between the central pile of grain and the circle of poles, and then a flock of goats or sheep, or sometimes of burros, or ponies, is driven around over the grain until it has all been beaten out of the heads by their feet. The straw is then thrown outside of the circle of poles, and the wheat pushed up toward the centre. Another lot of the unthreshed grain is then raked down, and the operation repeated until the whole is threshed. I was forcibly reminded of the Scriptural injunction which forbade the Hebrews to muzzle the ox that trod out the grain. The winnowing is also done in the Biblical way. After the wheat has been separated from the straw, it is gathered up into a heap, and when a brisk breeze arises it is thrown into the air in

in the vicinity of Santa Fé have been under cultivation over 200 years, and in all that time not one ounce of fertilizing material has been used to enrich them; yet there is no perceptible diminution in crops. The valley of the Rio Grande del Norte, for 400 miles in length, averaging five miles in breadth, can all be irrigated with the turbid water of the stream from which its name is derived. This stream, like the Nile, is the sole reliance of the farmer; the water is turbid with sediment, one-fifth of its weight at high water. At such times, each irrigation is equal, if not superior, to a coat of the richest fertilizer. El-Paso Valley has been cultivated in this way over 265 years.

The valley of the Rio Grande del Norte is admirably adapted to grape culture: there is probably no part of the *world* where all the conditions of soil, humidity and temperature are united to produce this delicious fruit in greater perfection. The frosts of winter are just severe enough to destroy insects without injuring the vines, and the rains seldom fall at the season when the plant is flowering, or when the fruit is coming into maturity, and liable to rot from exposure to moisture; as a result, the fruit, when ripe, has a thin skin, scarcely any pulp, and is devoid of the musky taste usual with American grapes. Grapes do well also on the lower valley of the Pecos, and in many other parts of the Territory.

Mr. White says of the grape culture: "Grapes constitute one of the principal crops of the Rio Grande Valley. The commonest variety is the Muscat, from which a very good wine is made. The vineyards look like plantations of currant bushes, the vines

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the teeth of the wind, which blows away the chaff while the wheat falls by itself on the clean floor. At a distance the flying chaff looks like steam escaping by successive puffs from the exhaust pipe of an engine.

"The Mexicans and some of the Indians are beginning to adopt modern farming implements, and in a few years iron ploughs will probably have replaced the wooden ones that have been in use here for centuries, and which are exactly like those with which the Egyptians cultivated the valley of the Nile in the time of Moses. I saw one of these ploughs, but as this is not the season when the ground is broken up, I have had no opportunity to observe its use. It consisted simply of a crooked stick, upon the point of which an iron point was fastened by means of raw-hide thongs. The Pueblo Indian carts are also curiosities. Not a scrap of iron is used in their manufacture. The wheels are discs made of boards, with a clumsy wooden hub on the outside. The tire is of raw-hide, and the body of the cart is constructed of poles rudely framed together."

being planted in rectangular order, and trained in the form of shrubs. The fruit is delicious, like that of California, and I have no doubt that the wine crop of the valley will, before many years, become one of the largest and most profitable in the Territory. Archbishop Lamy, who is a native of France, and who, during the almost third of a century of his residence here, has travelled thousands of miles every year among the Mexican and Indian population of New Mexico, told me that no part of California is better adapted for the culture of grapes and the manufacture of wine than the Rio Grande Valley. The natives tread out the juice of the grapes with their feet, as did the slaves in the great vineyards of classic times.

"The orchards of the valley are remarkably thrifty and prolific, and the fruit is large and fair. I never saw apple trees that were apparently so free from disease. The bark was as bright as though the trunks of the trees had been washed in lye. The peach and plum trees are large and full of fruit. The orchards do not appear to have been planted with much regularity, but the trees seem to have been stuck down by the side of the acequias, wherever they were certain to have plenty of water."

Cabbages grow finely, often weighing from thirty to sixty pounds each. Onions also grow very large, weighing from one to two pounds each; those raised in the Raton Mountains are said to possess the finest flavor. Irish potatoes are grown in the northern districts, where they yield enormously. Sweet potatoes are raised in the Mesilla Valley, and at Fort Stanton, on the Rio Bonito and Ruidoso, in Lincoln county.

Beets, radishes, turnips, parsnips and carrots grow well everywhere. Beans, peas and tobacco are also grown successfully; beans to the native population are what the potato is to the Irish. Apples do well in almost all parts of the country. Peaches, pears and apricots do well from Bernalillo down; also on the Pecos from Anton Chico down; melons of all kinds grow to large proportions, and of the most delicious flavor.

Not more than one-tenth of the valleys of the Rio Grande or Pecos are occupied or cultivated. The same may be said of an hundred other valleys and terraces along the large streams, and

especially so of the higher plateaux. The most extensive settlements are confined to the valleys of the principal streams. Those of the Rio Grande, Pecos, and Mora contain the majority, the balance being located in the small valleys and isolated districts, in and near the mountains, where their pursuits are divided between agriculture and stock-raising.

The only forage crop of the grasses that has been attempted here is "Alfalfa," the Chilian or California clover; when cultivated it yields an enormous crop. It grows well throughout the Territory, and in the southern districts often yields three crops per annum. In a country where there is such a profusion of nutritious grasses, as are indigenous to the mesas and mountain slopes, it is not necessary to cultivate forage crops, except for the sustenance of farm animals, and those in use in the towns. Thousands of tons of grama grass are cut annually to supply the demands of military posts and stage stations.

As a sample of what can be done in the valley of the Rio Grande, it is only necessary to refer to the beautiful Mesilla Valley; it is seventy miles long, and embraces 280 square miles, or 179,200 acres, or 560 farms of 320 acres each. It is one of the richest and most delightful valleys in the world. There are farmers who settled in this valley only fifteen years ago, without one dollar to start with, who to-day are worth from $50,000 to $60,000, and every dollar of it made from the products of the soil. It is the rival of any portion of California in the raising of all kinds of fruit, and as to grapes it is not surpassed by any district in the world. In the coldest season the thermometer never falls lower than 15° above zero. Snow is scarcely ever seen. It is a district that needs only to be seen to be appreciated.

The most valuable timber in New Mexico is the pine,—its growth principally confined to the mountain districts and high rolling lands. Pitch, yellow and spruce varieties grow to a large size, and make excellent lumber. Cottonwood, walnut, locust, box-alder and sugar tree fringe the streams and cañons of the mountains. Also live oak of small size, and a peculiar species

of cedar, called here "juniper." It grows on the upland, and to large size, throughout the southern half of the Territory. The nut-pine, or piñon, is abundant, and makes good charcoal and fire-wood. The timber supply is ample for all purposes.

Stock-Raising.—Though not as arid as Arizona, good water, even in the mountains, is very scarce. On the plains and mesas and in the valleys, running water is seldom seen, and when it is found, it is so strongly charged with alkali as not to be drinkable. It is not an uncommon thing to travel thirty or forty miles without seeing a spring or a drop of water in the river courses Cattle, horses and sheep on the ranges often habitually go two or three days without water. About twice a week they get around to some spot where the bed-rock of a stream rises to the surface bringing the water with it, remain in the vicinity over night, and then wander off perhaps twenty-five miles, returning again about the third day.

Cattle and sheep-raising is carried on very successfully over large areas in New Mexico, and although the grama grass is so thin that it will not support as many animals to a thousand acres as the bunch grass of the more northern Territories, it furnishes a wonderfully nutritious food, and the country is by no means fully stocked. There is great room for improvement in the grade of all kinds of stock, but even now the business of grazing is a remarkably profitable one. The markets of Kansas and Colorado are easily accessible to New Mexican stock-men, and this has given a great impetus to the business.

While there are considerable tracts in which cattle will do well, and the raising of beeves for the market may yet become a very profitable industry in New Mexico, yet for the present and probably for many years to come it will be pre-eminently the country for sheep-farming. The number of sheep in the Territory is probably not less than two millions, of which half a million or more are owned by the Navajoes, an Indian tribe occupying its western and northwestern portions.

The Hon. J. Francisco Chaves, late a delegate in Congress from New Mexico, in a letter to General Brisbin, the author of "The Beef Bonanza," written the past summer, says of sheep-farming in New Mexico:

"Without having the data before me, and only judging from what I know of the Territory and of the large sheep-owners in it, I am satisfied that I do not overestimate the number in stating them at 1,500,000 head of ewes. The climate is exceedingly temperate and salubrious; no diseases, much less those affecting the skin or hoofs, being known. Sheep in our Territory are herded and grazed from one portion of the Territory to another during the same year, thus adopting what may be termed the migratory plan. The climate is dry and the soil is gravelly, producing the most nutritious grasses and shrubs. Of the former the grama and bunch grass, of which there are two or three different varieties, and the latter the various kinds of sage, which make the best and most nutritious of browsing, and a large amount of underbrush and seed grass in the mountains. Were it not for the insecurity of life and property caused by the wild, marauding tribes of Indians, especially the Navajoes, but a few years would elapse before New Mexico's hills and plains would be literally covered with fleecy flocks. It is but a few years back, and actually within my own personal recollection, when nearly 1,000,000 sheep were actually driven to market to southern Mexico from our Territory. At that time sheep were worth but twenty-five cents per head, and all those engaged in the business made money. That prosperity in the history of New Mexico was superinduced by twelve years of unintermitted peace with the Navajoes. A sheep-raiser in New Mexico can safely calculate on an increase of eighty per cent. at least. A sheep-raiser in New Mexico, notwithstanding the coarse quality of wool of the present flock, can herd his sheep and make a profit from the product of his wool, and have all the increase of his stock in addition thereto. I have no hesitation in saying that New Mexico can fairly compete with Australia, South Africa and South America, in the production of cheap wool. These statements may appear to you somewhat exaggerated, but I assure you, on the contrary, that they are within the limits of reasonable bounds. I was born and raised in New Mexico, my friends and relations have always owned sheep, and I myself have to a large extent been an owner of that kind of property, and therefore speak from personal experience."

Sheep, and especially ewes, are largely sold from New Mexico to other States and Territories to form the basis of flocks there. They are sold at a low price, from $1.50 to $2 each. They are small, and yield only from one and a half to three pounds of a coarse wool, which will bring usually only from eighteen to twenty-two cents a pound. By breeding them with pure Merino, Cotswold, Leicester or Lincoln bucks, the size is soon increased, and the quality of the wool is greatly improved. As yet but little attention is paid in New Mexico to improving the breeds, and hence the wool crop there is not nearly as valuable as it might easily be made. The immigrants who are coming into the country in such numbers are giving more attention to improving their stock. There is reason to believe that sheep-farming will soon become a profitable and extensive industry in the Territory; but, like everything else which is to be made profitable, the sheep-farmer must give it his close personal attention. Beginning with a capital of about $5,000, and giving strict attention to his business, improving his flocks as rapidly as possible, the wool-grower may in ten years find himself worth from $60,000 to $75,000, and with constantly increasing profits from that time forward. Hon. Henry M. Atkinson, Surveyor-General of New Mexico, in his report dated August 27, 1879, gives the following summary of the agricultural and pastoral condition of the Territory. We think his estimate of the number of sheep must be exaggerated, or it is possibly a misprint; but we give it as stated. The number is undoubtedly larger than has been supposed, but this estimate makes New Mexico exceed both California and Texas in the number of its flocks:

"The crops of last year were good throughout the Territory, and a largely increased acreage was sown over that of any previous year in its history; and with the rapid influx of population, new and previously unexplored and uninhabited sections are being settled and subjected to cultivation.

"The native wine product in the valley of the Rio Grande, in this Territory alone, is reliably estimated at 240,000 gallons the past year, and in a few years that stream will be properly designated as the Rhine of America. Large crops of corn, wheat,

apples, peaches, apricots, pears and other fruits were raised during the year.

"The business of stock-raising is most successfully and profitably engaged in, as no feeding is required during the winter season, the stock subsisting entirely upon the rich and nutritious grasses so abundant in the Territory. It is estimated that there are 500,000 head of cattle and 10,000,000 sheep in New Mexico."

Mining Industry.—We have given under the head of *mineral wealth* full particulars, so far as known, concerning the presence of the precious and other metals in the Territory; but we add, on the authority of Governor Wallace and Z. L. White, Esq., a few particulars in regard to the mining districts and mines in actual operation. Governor Wallace says of the silver mining districts: "The best known districts at this time are the Bremen mines, near Silver City; the Shakspeare mines, in Grant county; the Sandia district, in Bernalillo county; the Socorro district, in Socorro county; the Cerillos, twenty-two miles southwest of Santa Fé. The San Juan country, in the north part of the Territory, and the Nogal, Capitan, Sierras Blancas, and Iccarilla Mountains, in Lincoln county, are all attracting a great deal of attention."

The gold districts are: The Moreno mines, on Ute creek, Colfax county. One mine proprietor carries water to his claims near Elizabethtown, by ditch and flumes forty-two miles. At Pinos Altos extensive work (quartz mining) is going on with good returns. In this district, gold, silver, copper, zinc, lead and plumbago are all obtainable.

The old placers (Spanish *placeres*) are situated twenty-six miles southwest, or, rather, south-southwest, from Santa Fé. In these placers there are also quartz lodes which are believed to be very valuable. The Ortiz mine grant, described by Mr. Z. L. White, occupies a portion of this district, and is now preparing to work some of these placers, and bringing water from the Galisteo river by extensive hydraulic structures, to work them successfully.

The new placers are ten miles south of the old placers. The San Pedro mine and the Cañon del Agua property, with which

General Grant's name has been connected, and in which we believe one of his sons is a director, is in this region, and covers 40,000 acres, including 2,600 acres of the new placers, and numerous veins of gold, silver, copper, lead and zinc in sufficient quantities to warrant extensive mining operations. For these mines and placers there are now building extensive dams and reservoirs, guaranteed to deliver at least 6,336,000 gallons of water daily. Both these districts are easily accessible by way of the Atchison, Topeka and Santa Fé Railway, and their products can be sent to market at small cost.

Silver City, in the Mesilla Valley, in Grant county, is one of the best mining districts in New Mexico. The Sierra Diablo range at the northeast, and the Burro Mountains, southwest of the town, have many leads of gold, silver and copper. These mines produce largely every year. The Animas Peak district, in Doña Ana county, is one recently discovered and of great promise. Hillsborough, on the line of Doña Ana and Grant counties, is another new discovery. The Jicarilla gulches, between the mountains of the same name, in Lincoln county, are very rich, and need only an abundance of water to take rank with the best producing placers of California and Montana. The same may be said of the gold gulches in the Nogal Mountains, and of the placers near Fort Stanton, in the same county. The new placers, already mentioned, are in Bernalillo county; but aside from these rich veins of gold and silver have been discovered in the Sandia and Manzana Mountains (the latter partly in Valencia county), and in or near Albuquerque, all in Bernalillo county; in the Zuni Mountains, in the western part of Valencia county; in the Madalena Mountains, in Socorro county, where some rich silver lodes have been traced; in the western part of Rio Arriba county, in the valleys and gulches of the Chusca Mountains; in Taos county, both around the head waters of the affluents of the San Juan in the west, and in the vicinity of Taos, on the main Rocky Mountain range; and in Colfax county, in the Moreno district, and elsewhere. There can be little doubt that gold or silver, or both, will be found in Mora and San Miguel counties, on the eastern slopes of the Rocky Mountains, if not elsewhere. If these dis-

coveries are made, every county of New Mexico will have its mining districts of the precious metals. The gold and silver production of the Territory is much less than it should be, and far below what it will be, now that capital, railroads and water contribute to its rapid development. From $3,000,000 to $5,000,000 has been the maximum yield for the past twenty or twenty-five years.

Objects of Interest in the Territory.—These are of various kinds, archæological, ethnological, fossil, volcanic, and the results of glacial and erosive action of water. All that portion of New Mexico lying west of the Rocky Mountains belongs to the great valley between the Rocky Mountains and the Sierra Nevada, which extends from Idaho and the eastern part of Oregon and Washington Territory through Utah and Nevada, Western Colorado, Western New Mexico and Arizona into Mexico, and terminates along the eastern shore of the Gulf of California. It is a land of lofty *mesas*, deep and rugged cañons, precipitous mountains, and hot, dry plateaux; a land of frequent drought, and of terrible volcanic action in the past, and perhaps the not distant past. There are deep valleys, where no water capable of sustaining life is to be had, but where alkaline and sulphurous vapors rise continually, and lofty, perpendicular walls of porphyry and trachyte forbid escape, yet to remain there for any considerable time is certain death. Of such as these are the Death Valley, in Southeastern California, the *Jornada del Muerto* of New Mexico, and the *Mal Pais* of the same Territory; while evidences of the destruction of former inhabitants by sudden volcanic eruptions, more fatal and extensive than that of Herculaneum and Pompeii, is not wanting. One of the most remarkable of these overwhelmed cities is that of Abo, in the Manzana Mountains, about a hundred miles south of Santa Fé, in Valencia county, eighteen miles east of the Atchison, Topeka and Santa Fé Railway, and perhaps twenty miles from the Rio Grande. It was discovered by Messrs. H. J. Patterson and J. H. Mackley during the summer of 1880. Messrs. Patterson and Mackley are citizens of St. Louis, who have been exploring New Mexico for mining properties for some months past. The following are the principal points in their narrative:

Manzana Mountains mean Apple Mountains. There is a noble spring of water called the Abo spring, which is shaded by two immense cottonwood trees on each side. There are no inhabitants in the vicinity, but everywhere there are evidences of the former existence of a dense population. There are seen the ruins of a large church or temple, covering one acre of ground. Mr. Patterson paced it off, and found it to be seventy paces square. The walls that remain are sixty feet high. The roof has long since caved in, and the interior of the enclosure is filled with *debris*. The thickness of the wall at the base is about ten feet. Mr. Patterson brought away a piece of one of the timbers that protruded from the walls. It is of what is called in that country the piñon tree, a species of pine, and is as sound as when taken from the tree. There are on one side of the piece of timber some rude figures, one of the All-Seeing eye, representing probably the sun. Other figures are deeply indented in the wood, as if made by anything but a sharp-edged tool. Mr. Patterson says that he found stone hammers, but nothing in the shape of sharp-edged or steel tools. There are small furrows seen in the wood, as if plowed out with a stone gouge. The building evidently belonged to a style of architecture anterior to the adobe and dried brick period. Mr. Patterson inclines to the opinion that the locality was the site of one of the seven cities of Cibola, mentioned by the Spanish chroniclers, the author of which traversed the country after the conquest of Mexico, among which were the cities of Camelone, Grand Cavra, Santa Cruz, Puerto de Abo, the Abo and the old Pecos, and another situated a few miles west of Abo in the lava beds. Mr. Patterson asserts that the old city in question was never until quite recently explored by white men.

Another specimen brought by these gentlemen is a human skull, evidently that of a young female, as shown by the teeth, which was exhumed about half a mile from the church. Skulls are quite plentiful among the old ruins in the vicinity. About five miles from the Abo Springs they have discovered some ancient silver diggings. They were brought to light in this wise: some three months ago a gentleman named Livingston, who was engaged in mining operations at the White Oaks, lost

some stock and went in search of it in the neighborhood of the Manzana Mountains. While here a Mexican handed him a piece of ore for examination, which he stated he had found in the hills of the vicinity, but the exact locality he declined to indicate. Mr. Livingston, on his return to White Oaks, showed the specimen to some friends in camp, among whom were Messrs. Patterson and Davidson. They left White Oaks with a complete outfit to explore the Manzana range, and were amply rewarded in the discoveries made. Right below the old mines they found twenty-two old smelters, and there were acres covered with the slag, some specimens of which Mr. Patterson brings with him. The smelters were built of adobe, or sun-dried bricks, and were elevated some twenty or thirty feet above the surface of the ground.

In digging down they found the remains of charcoal, which was used for fuel by the old smelters. There were also seen the remains of an aqueduct, in which water was conveyed from a spring three-fourths of a mile distant to a dam which diverted the water into the smelting works.

About five acres were found covered with slag, which Mr. Patterson has taken up for a mill site. From the old furnaces a trail was found, after considerable exploration, leading directly from the smelting works to the mine in the mountains, which here rise in peaks to a height of 10,000 feet. The ancient trail pursues a zigzag course, having a length of some five miles, while, in an air line, the distance is not much exceeding one mile. Everything was transported in those old mining days on men's shoulders to and from the mountains. There are now trees of the "pinon" growing on the trail larger than a man's body, showing the antiquity of the path. Mr. Patterson said he was two weeks in discovering the mines after finding the smelting works. The trail was five feet wide and protected by rocks on one side near precipitous places. Limbs were seen some thirty feet high on trees that had been cut when the trees were small and the limbs near the ground. The cutting was haggled, and evidently not made with sharp tools.

The mines were found filled with old timber. The explorers

could not imagine for what purpose the timber was used, because the walls of the mine are quartzite, and, therefore, it was unnecessary to protect the sides from tumbling in by timber supports. They, therefore, made up their minds that the mine was covered up with timber to conceal it. The timber had rotted and fallen in from the top, choking up the passage. Thirteen of the party worked nearly two weeks in clearing out the mine, removing the timber, stagnant water and old leaves. They found the mine seventy feet deep, with several horizontal drifts from the main shaft. The rock is found to be very rich, as appears from the specimens brought here.

An old miner named Baxter found, in digging down, a chamber about ten feet square, having on one side a fireplace, across which hung a crane having a clay hook, and at the end of the hook was a bone. On the opposite side of the fireplace was found the skeleton of a man in a sitting position, who was evidently watching the bone roasting for his meal, when he and his habitation were overwhelmed in ruin by a sudden discharge of lava from the mountain. There are lava beds near there extending about fifty miles, and Mr. Patterson is of the belief that the entire population in some former period must have been suddenly extirpated by a great volcanic eruption. He thinks at one time the crater of these mountains was sixty miles long and from fifteen to twenty miles across, an eruption from which would destroy every living thing within a hundred miles. The only idea we can form of its destructive influence is by the ruins seen on every hand. In that dry atmosphere, where it rains only between the months of June and July, wood and animal remains are long preserved, and that so little is preserved of this ancient people gives us a good idea of the ruin that ensued.

All over Western New Mexico are ruins of former cities, inhabited once perhaps by the same races who reared similar cities in Arizona and Southwest Colorado, and closely resembling them in structure and plan. Some of these are massive stone fortresses of great extent, and would now be impregnable against everything except modern artillery. Among these, two are

especially worthy of notice as being well known to travellers. One is the extensive stone fortifications at the eastern base of the Sierra Pajarito, on the southern border of Lincoln county; the other the large and massive ruins in Socorro county, east of the Mesa Jumanes, known as "*La Gran Quivira.*" These ruins are large enough for a large city, and Mr. S. W. Cozzens, who visited them in 1859, says that the city must have had not less than 60,000 inhabitants. The ruins extended for miles, and showed that while it had undoubtedly been a large city before the advent of the Spaniards in 1540, it had been captured by them, as the ruins of two large stone churches, over which the arms of Spain were carved, fully demonstrated. There were also extensive ruins of an ancient temple like the *Casas Grandes* on the Gila, which we have noticed under Arizona. The *Acequia* or aqueduct, which had brought water for this city, was traced fourteen miles into the mountains to a very large spring. It was built of stone and laid in cement, and was an admirable piece of engineering work. There were traces also of silver mines which had been worked for a long time, but with very imperfect tools. The city was undoubtedly one of the "seven great cities of Cibola." About eighty or ninety miles south of *La Gran Quivira*, on the plain east of the Organ Mountains, in Doña Ana county, is one of those rock cities, carved by the winds and waters into the semblance of a city with its massive wall, its churches, cathedrals, castles and towers, its broad streets and its numerous dwellings, all carved out of a soft white sandstone, and so perfect an imitation as to deceive any one at a little distance. Near this are salt lakes, the salt of which is very pure, and extensive fields of gypsum, some of it in the crystallized form of selenite, which was used instead of glass for lighting the best dwellings of these ancient cities. In the "*Mal Pais*" or Bad country, in Socorro county, east of the Rio Grande, are vast deposits of fossils as remarkable as those of Colorado, Nebraska or Montana.

In 1879 the Smithsonian Institution sent a small party of ethnologists into New Mexico for the purpose of exploring the ancient Pueblo ruins of the valleys of the Rio San Juan and the Rio Grande del Norte, and of making extensive collections of

antiquities and objects of aboriginal interest for the National Museum at Washington. The party, while in the vicinity, visited the ancient town of Zuñi, where they have succeeded in gathering together upward of two thousand specimens of modern pottery, stone implements, images, costumes, etc. Scattered through the valley of the Rio Grande del Norte are nineteen Pueblo villages, which were in existence long before the discovery of America; and the inhabitants to this day preserve their old traditions and arts comparatively uninfluenced by the innovations of civilization.

The pottery manufactured in the town of Zuñi is exceedingly interesting, and is almost identical with the very ancient ware which is found among the stone ruins which abound throughout that section. Attention has been called to this ware by Lieutenant A. W. Whipple, in the third volume of the Pacific Railroad Reports, and more recently by Professor F. V. Hayden, in his last annual report of the United States Geological Survey of the Territories (1876). In the latter are figured several fine water vessels in the forms of owls, hawks, ducks and domesticated fowls. The collection made by the Smithsonian party includes many animal forms and hundreds of specimens of almost every conceivable shape, scarcely any two of them being similar. It is, without exception, the finest and most complete collection of modern Pueblo ware in existence. The methods of manufacturing this pottery are exceedingly interesting, and a study of them throws much light on the ancient Pueblo art, which produced the most superior aboriginal ware yet discovered within the limits of the United States. The clay is procured from the neighboring mesas, and the vessels are moulded entirely by hand. When an unusually fine piece is being made, the clay is wet and smoothed by the lips of the potter, who then sets the vessel aside to dry. The paint is put on by a brush, and then burned in an oven surrounded with dry manure.

In the Pueblo of Laguna pottery is made in a similar manner. A private collection, just received in Philadelphia from there, contains a number of vessels in imitation of ducks, setting hens, etc. Such objects, while ornamental, are designed for use also,

and are employed in carrying water on journeys. A common ornament on this ware is a painted representation of the elk or deer, in which a passage invariably extends from the mouth to the heart, which latter is of triangular form. The tenahas, or earthen basins, are used as receptacles for meal, corn, water, or other substances which constitute the food of the natives. One very old vessel is covered with representations of snakes, a rare figure in the ornamentation of Pueblo ware, since the priests or medicine men no longer permit the people to employ the sun or serpent symbols, but monopolize them in their incantations and stately ceremonies. Tenahas are made of all sizes, from an inch in diameter to those that will hold from twenty to thirty gallons. Each large vessel has a concave bottom, like a champagne-bottle, for steadying it on the head in carrying water from the well.

The clay used in the manufacture of the Laguna pottery is of a dark slate color and exceedingly compact, oftentimes approaching soft rock in texture. This is taken from seams or veins in the mesa walls. The Indians soak this clay in water for two or three days, when it becomes perfectly plastic. It is then kneaded with the feet of the workmen on a large flat stone, and all the hard lumps are taken out carefully. After the vessels are moulded into form they are left to dry, and then covered with a ground work of white paint. Over this are painted fanciful devices in red, orange and black. The lustre of the ware is imparted by polishing the paint, before baking, with an exceedingly smooth stone like an ordinary seashore pebble. The brown or black pigment is made from a black stone somewhat resembling hematite. This is ground fine, mixed with water, and violently agitated for some time. It is then poured from one vessel to another to remove all grit, and is applied to the surface of the vessel to be ornamented, as common paint, with a stick. This paint alone would rub off, but to prevent this it is mixed with the residue of two plants or weeds boiled together for a long time until it becomes of the required consistency, after which it is allowed to cool; it then becomes perfectly hard. The clay employed for the red color is of a yellowish tint, but on being

baked changes to a brilliant red. The process of burning or baking consists in first placing the vessels on stones, around which is packed a quantity of dry barnyard manure, which is considered the best fuel. The vessel is covered completely with this substance, so as to exclude the air, and a very hot fire of two or three hours' duration is produced. During the process of burning the vessels are closely watched, and no portion of them is permitted to become exposed to the atmosphere.

The pottery of Laguna, and in fact of most of the other Pueblo villages, is almost entirely made by the women, who expend much of their leisure time in moulding and decorating the ware. The particular interest which attaches to the Pueblo pottery is in the fact that these people of New Mexico and the Moquis of Arizona are the only aboriginal tribes in the United States that still practise their old arts, unchanged by the influences of civilization.

Manufactures.—Very little is done in the way of manufactures, though the Pueblo Indians and the Mexicans are both ingenious; and with very imperfect and rude tools will produce remarkable results. The jewelry produced from native gold and silver is of remarkably artistic designs, as is the native pottery. The *serapes* and blankets made from the coarse wool of the Mexican sheep or the hair of the goat are of excellent quality, and so dense that water cannot percolate through them. The saddles, stirrups and horse fixtures generally are of excellent quality, and the better sorts have a good deal of bullion, and a rude, barbaric splendor about them. Beyond these articles there is very little which can be called manufactures. The rude *bateas*, or wooden bowls, which were their substitute for the pan and the rocker of the placer miner, and the arastras, great boulders, bound to the arms of the central capstan, with which they ground their quartz rock to powder, constituted their sole mining apparatus; they had even forgotten how to construct the rude adobe smelters, which the Indians used three centuries ago. But with railroads and railroad towns all over the Territory, there will come in manufactures, and builders, architects, machinists and engineers will be found in great numbers through the Territory.

Railroads.—The Territory, so long completely isolated, and which one year ago had not a mile of railroad within its borders, is now in a fair way to have its full share of railroad communication, not through the enterprise of its citizens, but because it is on the highway to Mexico and Southern California. The Atchison, Topeka and Santa Fé Railway, which entered the Territory from Colorado by way of the Raton Pass about the beginning of 1880, ran its lines southwest to Las Vegas, and thence nearly due west to the Rio Grande, throwing out a branch to Santa Fé, and extending its line down the Rio Grande, expected to reach Mesilla by January, 1881, and El Paso, Texas, by the spring of that year. The Southern Pacific, controlled by the Central Pacific Railway, which had crossed Southern California and bridged the Rio Colorado of the West at Yuma in 1879, traversed Arizona, reaching Tucson in the spring of 1880, and crossing Western New Mexico in the summer, will unite with the Atchison road at Fort Thorne, on the Rio Grande, by January, 1881, and thence proceeding down the Rio Grande to El Paso will probably make its terminus at Galveston a year later. Meanwhile the Atchison, Topeka and Santa Fé, having purchased the charter of the Atlantic and Pacific, and controlling the St. Louis and San Francisco Railway, have commenced and are actively pushing a railway west from Albuquerque through the Zuni country, across Arizona, on or near the thirty-fifth parallel, and crossing the Rio Colorado at "the Needles" by a bridge 400 feet above the river, will reach the Pacific at San Diego and Santa Barbara by the end of 1881. Another branch, following substantially the line of the Southern Pacific to Tucson, Arizona, will turn southward at that point, and reach Guaymas, Mexico, on the California gulf, probably before 1882.

Still another line is projected, and from its connection with the Mexican lines recently authorized, may very soon be built, viz.: the line of the Denver and Rio Grande, which, starting either from Alamosa or Animas City, Colorado, will proceed nearly due south to the Mexican line, to connect there with a road from the City of Mexico. There may eventually be a railway down the valley of the Pecos, connecting with some of the Texas railroads;

but at present there are no railways projected through Eastern or Southeastern New Mexico. Those already completed or in course of construction give ready access to the great mining and stock-raising districts, and ensure the rapid development of the Territory.

Population.—The Territory has a larger native population than any other of the Territories of "Our Western Empire." This native population at the time the United States government acquired the country consisted of about three-fourths Mexicans, or Hispano-Americans, and one-fourth Pueblo and other Indians, with a very few Germans, French and Americans. Its population has doubled in thirty years, and to this original element have been added a considerable number of Irish, Germans, Belgians, French, Spanish and Americans. The following table shows the population, so far as it has been ascertained, and such other particulars as are attainable by the census enumerators:

Census Year.	Total Population.	Male.	Female.	White or of European Descent.	Colored.	Indians.	Natives.
1850.....	85,547	31,742†	29,805†	61,525	22	24,000	59,261
1860.....	107,516	49,091†	44,425†	82,924	85	24,507	86,793§
1870.....	111,303	47,138†	44,739†	90,393	172	20,738	86,254
1879¶.....	148,750	53,155	48,595	124,920	330	23,500	94,370
1880*.....	141,882	.....	.....	118,430	417	23,452‡	

Census Year.	Foreigners.	Density of Population.	Ratio of Increase.	Illiteracy.	Of School Age, 5–20. Both Sexes.	Of Military Age, 18–45. Males.	Of Voting Age, 21 years and upwards. Males.	Citizens. Males.
1850.....	2,286	0.30	.....	25,089	22,774	12,698	13,920	10,871‖
1860.....	6,723§	0.36	51.94	32,785§	32,796	21,371	25,483	23,781
1870.....	5,620	0.76	19.02	52,220	29,312	20,070	23,332	22,442
1879¶.....	30,550	1.23	33.63	67,233	31,270			
1880*.....	.....	1.35	27.47	69,487	39,117			

* Including tribal Indians. † Sex of Indians not given. ‡ Indian office report. § Exclusive of tribal Indians. ‖ Pueblo Indians, not allowed to vote, though reckoned as citizens. ¶ Governor Wallace's estimate, evidently excessive.

It should be said, however, that the previous enumerations have been very imperfect, because the canvassers were supposed to be unfriendly conspirators against the inhabitants, Indian and Mexican, and were purposely avoided or misinformed. We have included in these enumerations the Indian population, both Pueblos and tribal Indians, so far as it could be ascertained, though in 1850 and 1860 the number of the latter could only be conjectured.

Chief-Justice Prince, in an address delivered in Brooklyn in the winter of 1880, said of this population:

"There is great interest as to this population, there being three entirely distinct civilizations and three distinct epochs of history represented. In New Mexico are found the only remains of the aborigines of the people of America. They are living in the same kind of houses, and to all intents and purposes existing as they did 300 years ago. Such are the Pueblo Indians. Side by side with these are the Spaniards and American civilization in its broader type especially. The aborigines or Pueblo Indians numbered in 1879 9,013 souls, all told, and occupied nineteen villages. There are evidences of large Indian cities, not a single inhabitant of which remains, and villages have been deserted in the life of the present generation. These aborigines call themselves the children of Montezuma, who has gone from them, but promised to return, and left the sacred fire, which is still kept burning until he returns. Their religion is indistinct, but seems to be mainly a worship of the powers of nature, the sun, the clouds, the wind and the rain. Their sacrifices are of fruits and flowers, and resinous gums only. They have been throughout New Mexico nominally converted to Catholicism, but maintain their old worship in secret. The men and women of this singular people are orderly, peaceable and industrious, and they make good citizens of the Territory. They are the best cultivators of the soil on the Rio Grande. The women grind the corn or wheat, and make pottery, very astonishing in its symmetrical proportions. The customs of these people have never changed, and they are extremely neat and cleanly. The Spanish-speaking people are generous and hospitable and most agreeable in their manners. They are a contented people, perhaps too contented.

They have no ambition to rise, and their wants are so few that they even don't want money. You cannot buy land from a Mexican, even if he is not using it himself, because it belonged to his father. Instead of being murderous or dangerous in their tendencies, they have a positive dislike for murder and bloodshed, except in the case of those who are located on the border. It is a remarkable fact that they have five distinct languages. In their methods of courtship and marriage the Spanish differ very much from them. The third type in Mexico is the American. The typical American life is found in the Texas frontier or the frontier of the Indian Territory. Among these are many wild and lawless men, away from the restraints of civilized life, some of them being practically outlaws. The railroads have just penetrated New Mexico, and emigrants of a better class are flocking there from all parts of the country."

To the Chief-Justice's list of civilizations should be added two more—the tribal Indians, of whom there are two distinct races—the Apaches, of three or four distinct bands, the Jicarillas, Mescaleros and Hot Spring Apaches, who occupy Southern and Southeastern New Mexico, and are, without exception, the meanest, filthiest, most treacherous, murderous and degraded of all the Indian tribes; and the Navajoes, in the northwest of the Territory, a tribe of much higher character, largely engaged in pastoral pursuits, owning nearly or quite a million sheep and large herds of cattle. This tribe, whose reservation is partly in New Mexico and partly in Arizona, are possibly of kindred race with the Pueblo Indians; they have been badly treated by the whites, but are greatly superior to any of the other nomadic tribes of the West, and give good ground to hope that they may yet be civilized. There were, in 1879, 11,850 Navajoes, and 1,977 Apaches in the Territory.

Counties and Principal Towns.—There are twelve counties in the Territory, viz.: Taos, having in 1879 13,025 inhabitants; Colfax, 4,290; Mora, 11,475; Rio Arriba, 12,000; Bernalillo, 19,595; Santa Fé, 13,355; San Miguel, 16,175; Valencia, 10,035; Lincoln, 4,450; Socorro, 6,220; Grant, 7,200; Doña Ana, 7,430. The population in all these cases is exclusive of Indians. Of

these counties Bernalillo, Valencia, Santa Fé and San Miguel are of the most irregular and peculiar shape, Bernalillo and Valencia having portions entirely detached and separated by other counties from their larger sections. The other counties are of comparatively regular form.

Of the towns Santa Fé, the capital and oldest city, has about 6,500 inhabitants; Albuquerque, about 5,000; Las Vegas, Mesilla and Silver City, from 3,000 to 4,000 each; Cimarron, Las Cruces, Mora, Placita, Fernando de Taos, Ocate, Tome and San Marcial, growing towns, each of 1,000 or more inhabitants.

Education is at a low ebb in New Mexico. The Territory being under the control of the Roman Catholic hierarchy, which largely outnumbers all other denominations in its adherent population, the public school education has been wholly usurped by them, and the public funds for school purposes are entirely expended by them upon their own schools. Governor Lew Wallace, in his report to the Secretary of the Interior, September, 1879, gives the following as the latest report concerning education in the Territory:

"The lands set apart for public schools in New Mexico are in very liberal quantity; nothing, however, has been done to make them available.

"In 1871 the legislature passed an act establishing a common school system, for the support of which there were set apart not only the poll-tax and a quarter of all other taxes, but a certain surplus in the various county treasuries. Four years afterwards eight of the twelve counties reported:

Schools	138
Pupils in attendance	5,151
Teachers (male and female)	47

Wages of teachers per month, $16 to $40.

"The amount of school moneys raised by tax in 1874 was $28,523.34.

"Education is chiefly in the Spanish language. In Grant and Colfax counties the English is the prevailing tongue.

"In addition to the above there are twenty-six private and

parochial schools, in the greater portion of which the common and higher branches are taught. In some instances German and French, and the classics and music, have place in the course of instruction."

Religion and Morals.—As we have already said, Roman Catholicism is supreme in New Mexico. In 1874 there were 198 church organizations and 170 church edifices, belonging to the Roman Catholics, many of the latter being costly buildings, against ten organizations and nine church edifices of all other denominations, and the proportion is about the same to-day. The Territory, while a Mexican State, was, of course, under exclusively Roman Catholic jurisdiction, and so far as the great mass of the people are concerned, especially the Mexicans and Pueblo Indians, it is so to-day. Unfortunately the Catholicism of the Territory is the Catholicism of the middle ages, and not that of the nineteenth century, aggressive, imperious, arrogant and exclusive, while it is also illiterate and with few exceptions grossly immoral. Its priests are to a lamentable extent literally the fathers of their flocks; and illegitimacy is as common and as little regarded as it was on the continent of Europe three hundred or four hundred years ago. This scandal became so gross a few years since that the archbishop banished all the priests (who were of Spanish or Hispano-American birth) from the Territory, and supplied their places with priests from France and Belgium; but it is said that the time has come for another expatriation. There is some reason to hope that a portion of the large immigration now flowing into the Territory may be of a better class, and that purer morals and better educational facilities may soon prevail.

Historical Data.—New Mexico was first heard of in Europe in 1530 as the Kingdom of Cibola, from whence the Mexican rulers obtained their gold and precious gems. It was reached in 1540 by Coronado, but did not come fully under Spanish domination until near the close of the sixteenth century. The foreigners were well received at first, but they soon became obnoxious to the people. The religious and civil authorities were alike greedy for gold, and the gold mines were made to

yield immense sums to the church and the rulers, by the enslaving of the natives, and the practice of the most atrocious cruelties upon them. The cathedral of Santa Fé alone received from one mine $10,000,000. At last, exasperated beyond endurance, the long-suffering natives rose in rebellion in 1680 and expelled the Spaniards, but only succeeded in keeping them out for thirteen years. During this time every mine in the country was filled up. Peace was made on condition that there should be no more slavery and no more mining. From that time until 1846, when the American army took possession of the Territory, the history of New Mexico is almost a blank; things went on the same from generation to generation. The governors of New Mexico were practically independent by their isolation; and the revolution which threw off the Spanish yoke from Mexico made very little difference with this remote State. In 1846 General Kearney captured Santa Fé, and overran the entire Territory, which was ceded to the United States two years later under the treaty of Guadalupe-Hidalgo. The land south of the Gila was obtained in 1853 by purchase from Mexico, and in 1854 New Mexico contained, besides the region within its present limits, the whole of Arizona and portions of Nevada and Colorado. So much of the country east of the Rocky Mountains as lies between the thirty-seventh and thirty-eighth parallels was annexed to Colorado in February, 1861, and, two years later, Arizona was set off. Several attempts have been made to secure the admission of New Mexico to the Federal Union, but so far without success. A bill for that purpose was presented to the Forty-third Congress in March, 1875, but failed to become a law. Until it can come in as a State having a republican form of government and not under the control of a religious hierarchy and an established church, it is to be hoped that all future applications will prove equally unsuccessful. But the vast tide of immigration now flowing into the Territory, and which is likely to be still larger, will soon effect such changes that its reception into the Union will be both proper and desirable.

Conclusion.—There is no use in counselling immigrants to avoid a region so rich in mineral wealth, or so well adapted to pastoral

pursuits, as New Mexico; but there is a sufficiency of these advantages to last for several years to come; and the immigrant who delays until the Indian troubles are fully settled, and the country, and its railways and highways, its government, schools and religious advantages are more fully developed, will be wiser than those who, in their haste to be rich, rush in now, and find, as they will, that wealth is only to be purchased by great trials, privations and sacrifices.

CHAPTER XVII.

OREGON.

BOUNDARIES, AREA AND EXTENT—FACE OF THE COUNTRY—MOUNTAINS, RIVERS, LAKES—THE VALLEYS OF OREGON—THE WILLAMETTE VALLEY—UMPQUA VALLEY—ROGUE RIVER VALLEY—THE NUMEROUS VALLEYS OF EASTERN OREGON—THE ELEVATED PLAINS OF MIDDLE AND CENTRAL OREGON—MR. TOLMAN'S DESCRIPTION OF EASTERN OREGON—SOIL AND VEGETATION—FERTILITY OF THE SOIL—THE GREAT WHEAT VALLEYS OF EASTERN OREGON—FOREST GROWTHS—GREAT SIZE OF FOREST TREES—WATER SUPPLY—CLIMATE AND RAINFALL OF DIFFERENT SECTIONS—METEOROLOGICAL TABLE OF PORTLAND, ROSEBURG, UMATILLA, ASTORIA, AND CORVALLIS—GEOLOGY AND MINERAL WEALTH—FOSSILS—GOLD AND SILVER—LEAD AND COPPER—IRON AND COAL—EXCELLENCE OF THE COAL—ZOÖLOGY—OREGON FISHES—AGRICULTURAL AND PASTORAL PRODUCTS—TABLE OF CROPS AND LIVE-STOCK—FISHERIES—THE SALMON TRADE—TIMBER AND LUMBER PRODUCTION AND EXPORTS—WHEAT AND FLOUR EXPORTS—WOOL—TOTAL EXPORTS—MANUFACTURES—LABOR—WAGES—PRICE OF LAND AND FACILITIES FOR OBTAINING IT—RAILROADS AND RIVER NAVIGATION—FINANCES—EDUCATIONAL FACILITIES—HIGHER AND SPECIAL EDUCATION—POPULATION—TABLE—CHARACTERISTICS OF THE POPULATION—INDIAN RESERVATIONS AND TRIBAL INDIANS—COUNTIES AND PRINCIPAL CITIES AND TOWNS—RELIGIOUS DENOMINATIONS—HISTORICAL DATA—THE TITLE OF THE UNITED STATES TO OREGON.

OREGON is one of the States of "Our Western Empire," situated on the Pacific slope, and, except Washington Territory, is the most northwesterly of the States and Territories comprised within the limits assigned to that "Empire." It is between the parallels of 42° and 46° 18′ north latitude, and between the meridians of

116° 33′ and 124° 25′ west longitude from Greenwich. It is bounded on the north by Washington Territory, the Columbia river forming the boundary to the point where that river crosses the parallel of 46° and the boundary running thence eastward, along that parallel, to the Snake river; on the east it is bounded by Idaho Territory, the Snake river forming the boundary to the mouth of the Owyhee, and thence a line drawn due south along the meridian of 116° 50′ west longitude to the Nevada line; on the south it is bounded by Nevada and California, the parallel of 42° forming the boundary line; on the west its shores are washed by the Pacific Ocean. Its greatest width from east to west is 360 miles, and from north to south 275 miles; while its coast line is about 300 miles. Its area is 95,274 square miles, or 60,975,360 acres. It is a little larger than the two States of New York and Pennsylvania.

Face of the Country.—The principal mountains of Oregon, those having the highest summits, are the Cascade Mountains, a continuation of the Sierra Nevada of California, which stretch across the State from north to south, at an average distance of about 110 miles from the coast of the Pacific. Numerous barren snow-capped peaks of volcanic origin rise from them to great heights within the limits of Oregon, of which the most elevated are Mount Hood (11,025 feet), Mounts Jefferson, Thielsen, Scott, Pitt and the Three Sisters. The Cascade Range divides Oregon into two distinct sections, known as Eastern and Western Oregon. Of these the former contains by far the most territory, but the latter is far more advanced in settlement; and within its natural boundaries, that is, between the Cascade Mountains and the Pacific coast, more than seven-tenths of the present population of the State are living.

Another chain of mountains, the so-called Coast Range, extends also north and south, over Western Oregon, at a distance varying from forty to seventy miles from the Cascade Mountains, and proportionately nearer to the Pacific coast. Its elevation is, however, much lower than that of the latter, its highest points being only a few thousand feet above the level of the sea. Eastern Oregon is subdivided, so to speak, into Middle Oregon

and Eastern Oregon proper, by the Blue Mountains; a range with a general northeast and southwest direction, at a distance of about 150 miles east of the Cascade Mountains. A chain known as the "Western Spur" of the Blue Mountains extends at right angles with the main chain of the Blue Mountains, in a direction from northwest to southeast, from the mouth of Trout creek, on the Des Chutes river, to the Malheur river, and a parallel but shorter chain extends from Camp Curry to Crooked lake.

The Cascade Mountains, in conjunction with the Coast Range and the numerous chains of hills flanking and skirting and running out from them, divide the surface of Western Oregon into numerous valleys of varying extent, traversed by more or less important water-courses.

The largest rivers of Western Oregon are the Columbia, which separates it on the north from Washington Territory; the Willamette, the largest tributary of the Columbia; Young, and Lewis and Clarke rivers, also flowing into the Columbia; the Umpqua and Rogue, Tillamook, Yaquina, Alseya, Siuslaw and Coquille, emptying into the Pacific; and the Tualatin, Clackamas, Yamhill, Santiam, Luckiamute, Mary and Long Tom rivers, all tributaries of the Willamette, which itself is formed by three separate streams, known as McKenzie's, Middle and Coast forks.

The principal water-courses of Middle Oregon are the Des Chutes, John Day's and Umatilla rivers, and their numerous tributaries, the waters of which unite with the Columbia.

The principal river of Eastern Oregon proper is the Snake river, which separates Oregon from Idaho, and its main tributaries, the Grande Ronde, Powder, Burnt, Malheur and Owyhee rivers.

There are numerous lakes in Southeastern Oregon, the principal of which are the Klamath, Goose, Malheur and Warner's lakes, Lake Harney, Silver, Summer, Albert, Christmas and Guano lakes.

Among the distinctive features of Oregon are the numerous valleys formed, as already stated, by the several mountain chains and the minor ranges issuing from them.

The principal valleys of Western Oregon are those of the Willamette, Umpqua and Rogue rivers, each of which deserves particular mention.

The Willamette valley is by far the largest, and in every respect the most attractive. It has been appropriately named "the garden of the Northwest." None of the famous valleys of the Old or New World, not even that of the Nile, or the Sacramento, San Joaquin or Santa Clara valleys of California, surpass it in fertility or salubrity. In beauty of scenery its equal is not to be found anywhere. The Hon. Schuyler Colfax, late Vice-President of the United States, who visited it some years since, enthusiastically pronounced it "as charming a landscape as ever painter's hand placed upon canvas." It is about 150 miles in length, from thirty to sixty miles in width, and contains within its natural boundaries—viz.: the Columbia river on the north, the Cascade Mountains on the east, the Coast Range on the west, and the Callapoia Mountains on the south—about 5,000,000 acres of unusual productiveness, of which only a part is as yet under cultivation. It is well watered throughout by the Willamette river and its tributaries. This valley was the first portion of Oregon to be settled, and will always be the Eden of the Pacific. A few years ago it contained two-thirds of the population of Oregon, but within the past decade other portions of the State have been rapidly settling up, and its population, though large and permanent, does not bear as large a proportion to the whole as formerly.

The Umpqua valley lies to the south of the Callapoia Mountains, and is watered by the Umpqua river and its tributaries. Its eastern boundary is formed by the Cascade Mountains, its western by the Coast Range, and its southern by the Grave Creek Range. It contains about 2,500,000 acres.

To the south of the chain of mountains last named lies the Valley of Rogue River, which has the same boundaries to the east and west as the two other valleys described, and is bounded on the south by the Siskiyou Mountain, which separates it from California. Its area is about 2,400,000 acres. There are several other smaller but fertile valleys, the bottom lands of the numerous small streams which fall into the Pacific.

Middle Oregon has no great agricultural valleys, the region between the Cascade Range and the western spur of the Blue Mountains being almost wholly composed of high rolling plateaux, and the Des Chutes river, as its name implies, flows through deep and narrow cañons, with numerous rapids and cataracts. At the sources of the Des Chutes there is an extensive sage desert, but the sage after being touched with the frost is very much liked by cattle, and forms an excellent forage for them, so that the "Sage Desert" proves to be excellent grazing ground. This whole region of the plains has been found to be admirably adapted to grazing, and portions of it are among the most productive wheat farms in the State.

Eastern Oregon abounds in fertile valleys, which yield immense crops. The *Commercial Reporter* gives a list of twenty-two (not one-half of those which are known there), which have an area of 5,891,200 acres, every foot of which is very fertile. These valleys will soon have good access to markets over narrow-gauge roads, now in course of construction by the Oregon Railway and Navigation Company to La Grande, Baker City and Sparta, which will connect them with Portland, Oregon, by rail or steamer, and very soon also by the way of the Northern Pacific with the East.

The Surveyor-General of Oregon, Hon. James C. Tolman, speaks as follows of those sections of the State which have hitherto been least known, in his report to the Land Office, August 15, 1879:

"A small portion of Southwestern Oregon is quite mountainous, and is mostly adapted to mining and grazing. The area of this class, however, is comparatively small, and generally contains sufficient arable tracts to furnish supplies of garden products for local use.

"That portion of the district east of the Cascade Range and north of the Blue Mountains, generally known as Northeastern Oregon, consists principally of high, rolling table-lands, with occasional river and creek bottoms, and, with the exception of the eastern and northern slopes of the mountain ranges mentioned, is scarce of timber. It comprises an area of generally arable land,

of about forty by eighty miles in extent, is rapidly settling up in the more eligible locations, and is certain, in the near future, to become a vast wheat-growing region. Where, but a few years ago, only the Indian or the trapper found inducement to remain, is now the scene of busy activity and great attraction. It is in this region that timber is now in most demand, and dependence is upon the adjacent mountains. There they can cut and saw timber for rails and lumber and draw or raft it to the farms below, and it is here that timber depredations have been most frequent. The land has mostly remained unsurveyed where the timber grows, and the citizens could not purchase it, or procure the use of it, even by the payment of 'stumpage;' but they felt that they must have timber. . . . . The central portion of Eastern Oregon is mainly mountainous, with occasional valleys and water-courses adapted to settlement and utility. This tract is bounded on the north by the Blue Mountains, on the west by the Cascade Range (the latter extending entirely through the State from north to south), on the east by Snake river, and on the south by the spurs and buttes of the Cascade and other ranges of mountains, embracing a tract of country near 150 miles square. Although mainly devoted to mining at this time there are yet large tracts of this district that are good arable land, and which will, in the course of time, be surveyed and taken up by settlers. At this time it is so far removed from market that it affords little attraction to other than stock-raisers and miners, excepting a narrow strip along the one overland thoroughfare.

"Southeastern Oregon comprises about one-fourth the entire area of the State, and is mainly adapted for grazing. It is here that are annually reared and fattened the beeves which furnish the markets of California, Utah, Nevada and most of Southern Oregon. There are numerous small valleys, however, which are of most excellent agricultural quality, and will be more than sufficient for all time to furnish the local demand for produce. This portion of the country is composed principally of vast grassy plains, interspersed with low wooded hills, and thickly set with beautiful lakes. Scattered over it are some marshes and swamps,

many of which are susceptible of easy reclamation, and when once redeemed will add that much to the already abundant meadow land. There are no extensive belts of arid land in Oregon, only at long intervals small tracts of desert, and these generally reclaimable. Such tracts as could be thought worthy of the name exist only in the imagination of those really unacquainted with the country."

Soil and Vegetation.—In Western Oregon, both mountain and valley have good and productive soils, the valleys being very rich, the mountain slopes hardly less so; while the mountains are rich enough to be covered with gigantic growths of timber to their summits, or where this has been burned, with a dense undergrowth, indicating its productiveness. The general character of the soil in the valleys is a dark loam and vegetable mould with a clay subsoil. The soil of the bottom lands, contiguous to the water-courses, is generally composed of rich alluvial deposits of decomposed earth and vegetable mould. The so-called beaver-dam lands have deep accumulations of *humus* or earthy deposits, decayed vegetable matter and decomposed trees, the work of beavers during centuries, and are of extraordinary fertility, but are of limited extent. Most of the lands in the larger valleys have a rich, very deep soil. This is especially true of the level and rolling prairies between the river bottoms and foot-hills. Besides the large valleys of the Willamette, Umpqua and Rogue rivers, and their tributaries, those of the Young, Lewis and Clarke, Nehalem and Coquille rivers, and of Skippanon creek, the basins of Tillamook and Yaquina bay, and the so-called Clatsop plain, offer fine fields for agricultural pursuits in Western Oregon. The action of the clay subsoil in retaining moisture accounts for the exceeding productiveness of the soil. The land, too, retains its productive capacity for unusually long periods of time, and seems, indeed, all but inexhaustible. Even after having produced crops of wheat, oats and barley, for from fifteen to thirty years, without any manure, and with indifferent ploughing, it remains as fertile as ever.

The soil of the foot-hills and tillable mountain surfaces consists of red, brown, or black loam; the black predominating near

the mountain ranges. The elevated lands not only afford the best natural pasturage, but produce good crops of hay, cereals, vegetables and fruit.

In Middle Oregon soil for agricultural purposes is not so generally good on the elevated plateaux as west of the Cascade Mountains; the best openings are in the valleys along watercourses. In some parts of these districts, artificial irrigation has to be employed to make the soil productive, and with this stimulus, they yield enormous crops.

In Eastern Oregon, the river valleys are rich, and most of the land, even in the uplands, is a strong alluvium, producing from thirty to sixty bushels of wheat, a like proportion of other grains, and immense root crops. These lands are new, and their productiveness has not been known until within the past five years. The Cascade Mountains, the Coast Range, and the Callapoia Mountains, as well as a large part of the valleys of Western Oregon, are covered with mighty forests, affording an inexhaustible supply of hard and soft timber. In the valleys different kinds of ash, oak, maple, balm and alder, as well as fir, cedar, spruce, pine and yew, grow in great abundance. In the foothills scattering oaks and firs, with a thick second growth in many places, are found. The mountains are mostly covered with thick growths of tall fir, pine, spruce, hemlock, cedar, larch and laurel, without much undergrowth. Two kinds of cedar, two of fir, and three of pine, are indigenous to Oregon. Trees attain an unusually fine development, both as regards height and symmetrical form. In the northern part of the State the red fir abounds, and often measures two hundred to two hundred and fifty feet in height, with trunks nine feet in diameter, clear of branches up for one hundred to one hundred and fifty feet. Out of such trees eighteen rail-cuts have been made, and five thousand to ten thousand feet of lumber. Elder stalks from eighteen to thirty inches in circumference, hazel bushes from one to five inches in diameter, are of common occurrence. Lumber is cut from elder saw-logs measuring twenty to thirty inches in diameter. In the forests south of the Umpqua the yellow pine is found, as also an abundance of sugar pine, the wood of which is in great demand.

For commercial and industrial purposes, the red cedar, red fir, hemlock, sugar pine, maple and ash, are the most valuable. The natural grasses of Western Oregon are of fine quality and retain their nutritious and fattening character till late in the autumn. The rains which fall regularly in May and June keep the pasture in a succulent condition through the later summer and autumn. One acre of this natural pasture will feed a sheep through the year, and two acres an ox. But the best grazing lands are found in Middle and Eastern and especially Southeastern Oregon. There are a great variety of native grasses of the most nutritious character in this vast pasture-ground, which comprises about thirty-three million acres. The cattle and sheep pastured on these grasses thrive better than those fed on grain in the east. The only difficulty is that they become too fat. These lands, where they are moderately accessible to a market, are being taken up extensively for dairy farms, and the golden Oregon butter has already a high reputation on the Pacific coast.

Water Supply.—Western Oregon, with its immense annual rainfall, its streams fed from the snow on the Cascade Mountains, and the moist breezes swept in from the Pacific, is in no want of water. Lakes, ponds, and fine springs abound. In Middle Oregon, on the elevated plains, there is sometimes a scarcity, and occasionally irrigation is necessary, but the facilities for this are so ample, the cost of irrigation is so moderate, and the results produced by it so vast and profitable, that irrigation is not a drawback to the cultivation of these lands. In Eastern Oregon the rainfall, though less copious than in the western portion of the State, is sufficiently so for all practical purposes, and the beautiful valleys there do not suffer from drought.

Climate.—The climate of Western Oregon is mild and equable, differing in this from that of the Eastern States, that it is neither too hot in summer nor too cold in winter. Owing to the proximity of the Pacific and the Gulf stream of that ocean, snow or frost never prevails to any considerable degree. The average temperature explains this fact. The average for spring is 52°; for summer, 67°; for autumn, 53°; and for winter, 39° Fahrenheit, showing a mean deviation of only 28° during the year. The

average yearly rainfall is forty-four inches, about the same as at Davenport (Ia.), Memphis and Philadelphia. Thunder-storms are almost unknown in Western Oregon, and the disastrous hurricanes and whirlwinds of the Atlantic States entirely so.

Eastern Oregon has a dryer climate, a considerably smaller rainfall, a somewhat greater heat in summer and a lower temperature in winter, assimilating very closely in these respects to the Red River valley of Minnesota and Dakota, though in general with less depth of snow in winter. But this climate is eminently healthful, and the smaller rainfall does not interfere with the production of the largest and finest crops of wheat grown anywhere.

Middle Oregon has a more equable climate and a moderate rainfall, but on its elevated plateaux both the cold and the heat are felt all the more keenly, that there is no kindly forest to shelter and protect the traveller from the hot rays of the sun, or the biting cold of the winter winds.

Rheumatic and pulmonary diseases are excessively rare in all parts of Oregon. There are in some of the lowlands near rivers and lakes in Southern Oregon occasional sporadic cases of a mild intermittent fever, but they are never severe enough to be serious, and they yield rapidly to treatment. Some of the small towns on the Pacific, like Astoria, Port Orford and Umpqua City, have a much greater rainfall than the towns of the Willamette valley. In these towns, in the past, the annual rainfall has reached sixty-four, sixty-six, or sixty-seven inches, but the Coast Range robs the weeping clouds of the skies of the coast of a part of their superabundant moisture.

According to the census of 1870, the death-rate in Oregon is lower than in any other State or Territory in the Union, excepting Idaho, being only .69 per cent. of the population: while in California it is 1.16; in Vermont, 1.07; Massachusetts, 1.77; Indiana, 1.05; Illinois, 1.33; Kansas, 1.25; and Missouri, 1.63.

The equable temperature, the absence of high, cold winds and sudden atmospheric changes, render people less subject to bronchial, rheumatic and inflammatory complaints than in other parts of the country, where the extremes of heat and cold are

greater, and the changes of temperature more sudden and violent.

We give on page 1102 the meteorology of Portland, Oregon, representing the northwest region of the State; of Roseburg, representing the southwest, and of Umatilla, on the Columbia, in the northeast. We have no reports from the southeast, but only know from the correspondence of those who have lived there, that the climate has very much the same characteristics as that of Eastern Oregon generally. We give also the average temperature and rainfall of Astoria and Corvallis, representing the extreme northwest, at the mouth of the Columbia, and Western Central Oregon in the Willamette valley.

Portland, average temperature of five years: Spring, 51° 9′; summer, 65° 3′; autumn, 52° 8′; winter, 40° 1′. Annual rainfall for five years: 43.41; 53.12; 43.69; 41.45; 47.70.

Astoria, latitude, 46° 17′; longitude, 123° 50′. Mean temperature for ten years: Spring, 51° 16′; summer, 61° 36′; autumn, 53° 55′; winter, 42° 43′; year, 52° 13′. Annual rainfall, 60 to 67 inches.

Corvallis, latitude, 44° 35′; longitude, 123° 08′. Mean temperature for ten years: Spring, 52° 17′; summer, 67° 13′; autumn, 53° 41′; winter, 39° 27′; year, 53°. Annual rainfall, 38.47 to 42.08 inches.

Geology and Mineralogy.—Much of the area of Oregon has been subjected to volcanic action on a grand scale, and in Eastern Oregon this has been comparatively recent (though probably not within the historic period), and on the most stupendous scale. The Coast Range and the Blue Mountains and their spurs are both eozoic; the intermediate Cascade Range is volcanic in its surface rocks, with indications that these metamorphic rocks were originally limestones and sandstones. The volcanic action in Eastern Oregon was so violent as to leave deep fissures or cañons where the rocks were rent. Some of these cañons are 1,500 feet deep, and on their perpendicular walls there is a record of the order of the geologic strata rarely accessible elsewhere. Near the bottom of the fissure are the cretaceous beds, abounding in marine shells, preserved in perfect form, but often filled

Year and Months.	PORTLAND, OREGON. Latitude 45° 30'. Longitude west from Greenwich 122° 27' 30". Elevation of barometer above sea-level 66.50 feet.							ROSEBURG. Latitude 43° 10'. Longitude west from Greenwich 123° 16'. Elevation above sea 537 feet.							UMATILLA. Latitude 45° 55'. Longitude west from Greenwich 119° 21'. Elevation above sea-level 461 feet.							
	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Mean Humidity.	Mean Barometer.	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Mean Humidity.	Mean Barometer.	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Mean Humidity.	Mean. Barometer.	Direction of Winds in the order of frequency.
	°	°	°	°	in.	per ct.	in.	°	°	°	°	in.	per ct.	in.	°	°	°	°	in.	per ct.	in.	
Year	53.8	97	23	74	59.66	72.5	30.111	52.8	96.5	17	79.5	38.17	76.2	30.106	55.1	103	8	95	11.04	60.8	30.173	W., S. W., E., calm.
1878.																						
July	65 9	85	49	36	1.10	62.5	30.043	64.5	84.5	48	36.5	1.18	68.2	30.007	74.3	103	48	55	0.32	39.6	29.986	W., calm, S. W.
August	67.3	87	47	40	0.50	62.5	30.043	66.5	83	44.5	38.5	0.46	63.7	30.002	76.1	100	47	53	0.15	37.0	29 993	Calm, W., S. W., S. E.
September...	59.1	86	43	43	3.54	70.5	30.067	58.1	88.5	37.5	51	1.29	64.9	30.047	62.3	93	37	56	1.14	43.9	30.098	W., calm, S. E.
October. ...	50.7	70	33	37	3.22	78.0	30.185	49.1	73.5	26.5	47	2.55	78.7	30.172	51.5	73	25	48	0.56	61.2	30.237	W., S. E., S. W., calm, S.
November...	46 9	62	32	30	5.61	82.8	30.161	45.4	66	27	38.5	3.55	87.5	30.119	43.3	73	23.5	49.5	0.72	79.6	30.290	S. E., W., E., calm.
December...	39.8	59	23	36	4.52	75.7	30.300	37.4	62.5	17	45.5	2.73	90.4	30.259	32.4	56.5	8	48.5	0.36	83.4	30.535	S. E., E., calm, W.
1879.																						
January	37.8	52	20	32	5.28	76.1	30.173	36.9	56.5	18	38.5	4.74	85.3	30.186	27.6	46	—2.5	48.5	0.95	82.3	30.335	S. E., E., calm.
February....	44.0	60	25	35	13.22	79 3	30.090	43.8	66	21 5	44.5	4.21	81.6	30.127	35.5	65.5	11	54.5	1.81	78.4	30.249	W., S. W., S. E., E., N.
March	48.8	73.5	33	40.5	11.70	78 8	29.971	49.5	75	32.5	42.5	8.60	79.7	30.005	49.8	77.5	28	49.5	1.30	62.1	30.088	W., S. W., N. E., E., S. E.
April.....	52.3	77	35.5	41.5	2.19	65.8	30 109	51.3	75	32.5	42.5	3.67	73.1	30.101	54.7	81	33	48	1.49	57.5	30.142	W., S. W., E.
May	54.6	81.7	41	40.7	6.60	73.5	30.080	52.9	82.5	34	48.5	4.63	76.6	30.097	58.2	81.5	37	44.5	1.96	58.4	30.115	W., S. W., N. E.
June.....	60.5	81.7	43.5	38.2	2.18	66.5	30.106	60.7	84	41	43	0.56	64.3	30.105	65.3	91	46	45	0.28	47.7	30.030	W., S. W., N. E.
July.....	66.1	85	49	36	1.75	62.5	30.079	66.5	95.5	47.5	48	0.15	68.3	30.083	73.3	100.3	46	57	0.21	40.1	30.005	W., S. W., calm.

with chalcedony or calcareous spar; next above, the lower tertiary strata, with leaf impressions of great trees—of palms, yews and giant ferns, as well as of the oak leaf and acorn; with these are associated fossils of two species of rhinoceros, four of the *oredon*, a connecting link between the camel and tapir, and several genera of the tapir and peccary families; and with them the *orohippus*. Upon these lower tertiary strata supervenes the period of volcanic action, with a vast overflow of lava, mud and ashes. The region thus rent is heaved elsewhere into isolated cone-like hills, or ridged with secondary rocks, thrown up dike-fashion, their strata contorted into sharp angles or broken into chasms filled with earth or lava. Here are mountains of amygdaloid, heaps of volcanic conglomerate, and cliffs of columnar basalt walling in the water-courses. In the region of the upper Des Chutes and John Day rivers, the volcanic action is less marked, and here the cretaceous formation approaches the surface. The whole of the Cascade Range in the State gives evidence of volcanic action, and this extends westward into the Willamette valley. The bed of the Willamette river near its mouth is partially basaltic, with perpendicular walls; south of Oregon City it traverses a district of volcanic *débris*, and black trap is frequently exposed on its banks. Southward of this occur thin strata of limestone, with fossil bivalvular shells, granite *in situ*, and again basalt. The prevalent rock of the Willamette valley is trap, while at the head of the valley a light-colored clayey sandstone, possibly tertiary, is found. The fossil teeth and tusks of elephants have been found at great depths in the same valley. At the Dalles, on the hillsides, are boulders of gray and of a red granite.

Minerals.—The mineral wealth of Oregon is very great, but as yet very imperfectly developed, mainly owing to the want of capital. Gold was first discovered in 1851, in the counties of Jackson and Josephine, in the extreme south of the State; and mines have been worked in them ever since. Their total product up to the present time is estimated at $27,000,000; but of late years the yield has declined in consequence of the want of water. Baker and Grant counties, in Eastern Oregon, have also yielded

many millions of the precious metal. In Baker county, especially in the vicinity of Baker City, gold mining is carried on very actively at this time, and with good results. On the ocean beach, near Coos bay, placer mines are worked to a considerable extent. Rich gold quartz lodes have been discovered and partially worked in the southern part of the Cascade Mountains; but their distance from railroads, and the want of machinery for working them, has, until now, prevented their development on a scale commensurate with their richness. Were the same amount of capital, enterprise and trained skill brought to bear upon the gold mines of Oregon, that is now again increasing the gold product of California at a rapid rate, after years of decline, the former State would not be far behind the latter in the production of precious metals. The yearly gold product of Oregon represents now a value of nearly $1,500,000.

Lead and copper have been found in large quantities in Jackson, Josephine and Douglas counties, on Cow creek, a tributary of the Umpqua, and also on the Santiam river. The mines on the latter river are successfully worked.

Large deposits of rich iron ore exist in nearly every part of the State. The most important of these is situated near Oswego, on the Willamette, about six miles south of Portland. The ore from it yields about fifty-four per cent. of pure iron. Other extensive deposits exist in the counties of Columbia, Tillamook, Marion, Clackamas, Jackson and Coos. A large bed of ore has been found at St. Helen's, on the Columbia.

That essential element in the development of mineral resources, coal, abounds in Oregon no less than iron. Beds of great thickness exist on Coos bay, in Coos county, on the northern Umpqua, and in Douglas county. Beds, as yet but partially explored, have been found on Yaquina bay, at Port Orford, near St. Helen's, on Pass creek, and on the line of the Oregon and California Railroad, and at different other points in Clackamas, Clatsop and Tillamook counties. But only a few of these coal mines are regularly worked. The Coos bay mines keep a fleet of schooners busy carrying coal to San Francisco, where it is highly esteemed, and brings about $11 a ton. With the exception of that obtained

from the Queen Charlotte Islands, it is the best coal produced on the Pacific coast.

What, with the abundance of coal and the immense beds of iron ore, the day cannot be far distant when Oregon will have a well-developed iron industry.

There are also quarries of limestone, brown stone and marble in the State.

Of the present outlook for gold and silver mining in the State, the Surveyor-General, Hon. James C. Tolman, says in his report of August, 1879:

"The mining interests of Oregon are assuming an importance and permanent assurance of profit not heretofore exhibited. Gravel mining is being extensively prosecuted in some districts with the aid of the most approved and extensive machinery, although the past year only has been witness to their general introduction. A new era has undoubtedly dawned upon that industry in this State. The existence in Southern and Middle Eastern Oregon of immense deposits of auriferous gravel has long been known; but prospectors and men seeking only shallow surface diggings in connection with water do not generally have the capital and enterprise necessary to prosecute hydraulic mining of the modern kinds. Within the past two or three years capital has been attracted to these deposits, wherein in two counties of Southern Oregon alone I am credibly informed that many hundreds of thousands of dollars have been expended in opening up claims—in the constructing of ditches and arrangement of machinery principally. Much labor and time, as well as money, is required to develop and put in paying order any of these claims, and although numbers of them are now in working order, few or none of them have yet been sufficiently tested to develop their real worth. A full 'clean up' is the only fair test of value, even after months of labor and many thousands of dollars of expenditure.

"This must be ranked mainly as an agricultural State, though mining is, and will indefinitely continue to be, a large factor in the sum of our productions, both in gravel and quartz mining. Our people have never been subjected to the emotional risks

occasioned by stock boards and wild cat speculations which have swept other mining regions, and are thus more disposed to weigh the chances of profit in any enterprise offering inducements. Hence our mining interests have lagged, only to be placed upon a profitable basis when undertaken at all.

"The quartz mining of this district has also attracted a renewed share of attention. Heretofore, with but few exceptions, this class of mining has been lightly employed, and has yielded but small returns, for precisely the reasons which have been offered in regard to the small effort expended in placers. Some wonderfully rich deposits were discovered many years ago, and were worked with immense profit. Notable among them were the Gold Hill and Steamboat or Fowler lands, in Jackson and Josephine counties respectively. From these, by the ordinary processes then in use, several hundred thousands of dollars were taken from the surface rock alone in the space of a few months. In one instance, from the Gold Hill ledge, one gentleman secured a trifle over 1,600 pounds of surface rock, from which he took $30,000. When these surface deposits were exhausted (nearly twenty years ago) by crushing in 'arastras' and other almost equally primitive methods, and the serious and expensive work of sinking shafts, driving tunnels, etc., began, those mines were abandoned and have lain idle till this day, with the exception of an effort now being made to resume work on the Steamboat.

"In Eastern Oregon quartz mining has been steadily followed, in a small way, by gentlemen of limited means, for a number of years, yielding fair returns where effort merited reward. Several small mills are now in operation there, and prospecting is pushed with considerable vigor. I have no data as to average yield, but am assured that it has been uniformly satisfactory. The general outlook, however, is better now in regard to mining than it has been before for many years. In the course of time I believe this State, to the extent of its mining area, will rank with the most favored mining localities of the coast. Given the mines, and we certainly possess facilities unsurpassed by any region—cheap fuel and labor, abundance of water and plenty of all kinds of provisions, all easily obtained."

Zoölogy.—The beasts of prey are identical with those of California; the grizzly bear, black and cinnamon bears, the cougar, or panther, and several of the smaller *felidæ*, the catamount, lynx and ocelot, the fisher, otter, marten, mink and beaver, several species of fox, the gray wolf, possibly the raccoon; and of game animals, elk, deer of two species, antelope, bighorn, or Rocky Mountain sheep, rabbits and hares, including the jackass rabbit, and two or three hares found only on the Pacific coast; all the rodents of the coast; and of game birds, wild swans, wild geese and ducks of many species, pheasants, sage hens and other grouse, quail and snipe of extraordinary size, and a great variety of song birds and birds of prey. The waters of Oregon abound in fish of great delicacy and economic value. There are six or seven species of salmon native to the coast; and the Eastern salmon and lake salmon have been introduced. The salmon forms an important item in the products of the State. Trout of great size and excellence are found in the streams; sturgeon, tom cod, flounders and other edible fish are abundant. The shad and black and sea bass have been introduced. Most of the edible shell fish are found in great abundance on the coast.

The following table shows the estimated number and value of live-stock in January, 1879, and January, 1880:

1879. Animals.	Number.	Av. Price.	Value.	1880. Animals.	Number.	Av. Price.	Value.
Horses	109,700	50.05	$5,491,485	Horses	117,400	$61.43	$7,211,882
Mules and asses	3,500	50.91	178,185	Mules and asses	3,600	51.30	184,680
Milch cows	112,400	18.26	2,086,144	Milch cows	121,392	19.10	2,318,587
Oxen and other cattle	183,300	12.15	2,287,345	Oxen and other cattle	201,500*	14.60	2,941,900
Sheep	1,160,600	1.57	1,822,142	Sheep	1,265,054	1.65	2,087,339
Swine	221,900	3.19	707,761	Swine	225,257	3.45	778,521
Totals			$12,572,662	Totals			$15,531,342

The real increase in the grain crops and in cattle and sheep is considerably greater than our tables would indicate.

Fisheries.—The canning and pickling of salmon mainly at the mouth of the Columbia river is becoming an immense industry. It had not attained any great proportions until 1872, in which year

* Probably much below the actual number.

AGRICULTURAL AND PASTORAL PRODUCTS:

The principal crops of Oregon were as follows in 1878, 1879 *and* 1880, *according to the estimates of the Agricultural Department, as corrected in Oregon:*

	1878.					1879.					1880.				
KIND OF CROP.	Quantity Produced.	Average yield per acre.	No. of acres in each crop.	Price per bushel, pound, or ton.	Total Value of each crop.	Quantity Produced.	Average yield per acre.	No. of acres in each crop.	Price per bushel, pound, or ton.	Total Value of each crop.	Quantity Produced.	Average yield per acre.	No. of acres in each crop.	Price per bushel, pound, or ton.	Total Value of each crop.
	Bushels.	Bu.	Acres.	cts		Bushels, etc.		Acres.			Bushels.				
Indian corn	166,500	33.3	5,000	.92	$153,180	142,400	32	4,450	.93	$132,432	118,000	29.5	4,000	.96	$113,280
Wheat	7,665,000	21	365,000	.92	7,051,800	9,855,000	18	547,500	.98	9,657,900	17,191,500	20	859,575	$1.05	18,051,075
Rye	13,230	14.7	900	.72	9,525	24,750	22	1,125	$1.00	24,750	24,053	22.5	1,069	1.00	24,053
Oats	2,790,000	31	90,000	.50	1,395,000	3,303,300	36.3	91,000	.44	1,453,452	3,696,320	38	94,640	.45	2,663,444
Barley	370,300	23	16,100	.62	229,586	521,640	30	17,388	.64	333,850	501,005	29.4	17,041	.65	325,653
Potatoes	598,500	95	6,300	.60	359,100	885,600	123	7,200	.42	371,952	834,295	121	6,895	.49	412,976
	Tons.	*Tons.*	107,000			*Tons.*	*Tons.*				*Tons.*	*Tons.*			
Hay	160,500	1.50		$12.00	1,926,000	186,200	2.10	88,667	10.80	2,010,960	177,335	1.33	133,001	11.20	1,986,152
Totals	.....	.....	590,300	.....	$11,124,191	.....	.....	757,330	.....	$13,985,296	.....	.....	1,116,221	.....	$23,576,633

170,000 salmon, weighing 2,700,000 pounds, and when canned valued at $432,000, were canned and exported, and 162,500 pickled fish valued at $117,000. In 1873 the export value of the canned salmon was $949,000; in 1874, $1,500,000; in 1875 it was nearly $2,000,000; in 1876, $2,215,000; in 1877, $2,300,000; in 1878, $2,920,000; in 1879 over $3,200,000; and it is believed that it will reach $4,000,000 in 1880. But for the large salmon trade in Puget sound, and in Alaska, it would have attained even larger proportions.

The Timber and Lumber Trade.—The magnificent forests of Oregon supply an immense amount of timber and lumber for San Francisco and other California ports, and also for the Mexican and South American markets. For ship-building, mine-timbering and house-building, as well as for the choicest furniture, the Oregon woods are the best in the world. Over 100,000,000 feet of lumber and timber were exported in 1875, and the amount has greatly increased since that time. In 1877 the value of the exported lumber was set down as $510,000. It has greatly increased since, and the home demand, with the rapid increase of immigration, is larger than of the foreign.

Wheat and Flour.—The exports of wheat in 1880 will probably exceed $9,000,000, the larger part being from the Upper Columbia and the rich valleys of Eastern Oregon. In 1877–78, seventy-six large vessels were loaded with wheat from Portland, of which seventy-four sailed direct for Great Britain. Oregon flour has a very high reputation, and was exported in 1877 to the amount of $2,500,000.

Wool is also largely exported, and about 1,500,000 pounds manufactured in the State. The wool clip of 1878 was over 6,000,000 pounds, and that of 1879 nearly 7,500,000 pounds.

The total exports of the State in 1877 were $16,086,897, and were increasing at the rate of four or five million dollars a year.

Manufactures.—The leading manufactures of the State are lumber, flour, of which we have already spoken; woollen goods, especially fancy cassimeres and blankets, which bear the highest reputation, and bring the best prices of any in the market; dressed

flax-linen goods, and linseed oil, leather, and especially harness leather of excellent quality, iron furnaces and foundries, and manufactories of iron and tinned goods, wooden ware, agricultural implements, butter, dried and canned fruit, and fruit juices of remarkable excellence, furniture and paper. In 1870 the manufactured products of the year were valued at $6,877,387. In 1880 they will exceed $20,000,000.

Labor, Wages.—Common laborers earn $2; mechanics, $3 to $5; farm-hands, from $25 to $30 a month, and found. Farm-laborers, and especially female servants, are in good demand. The latter earn as high wages as in California. Persons with some means and a knowledge of farming or a mechanical trade can easily establish themselves, and, with frugality and industry, acquire a competency in a few years.

Ruling Prices.—For the past three years wheat in bulk in Portland has ranged from 80 cents to $1.25 per bushel; oats, 50 cents; potatoes, 50 cents to 75 cents; apples, 50 cents; corn, $1; flax, $2; onions, $1.50; good average farm-horses, $100 each; oxen, $125 per yoke; good average milch-cows, $25; sheep, $3 per head; wool, common-graded, 35 cents per pound; beef on foot, 5 to 6 cents; fresh pork, 7 cents.

Price of Land.—In the valley of the Willamette good brush and timber lands can be purchased for $2.50 per acre and upwards, according to soil and locality. All the prairie lands are, however, taken up, but can be bought at from $8 to $50 an acre. Along the foot-hills, and near them, small tracts or farms can be purchased, with ample outside pasturage for extensive stock-farms. The Oregon and California Railroad Company, and the Northern Pacific Railway, have large grants of land from the United States Government, which they sell on very liberal conditions at the low prices of $1.25 to $7 per acre. The purchaser can pay cash, in which case he will be allowed a discount of ten per cent. on the purchase price, or can have ten years' time in which to make up the same by small annual payments, with interest at seven per cent. per annum. In this case the purchaser pays down one-tenth of the price. One year from the sale he pays seven per cent. interest on the remaining nine-

tenths of the principal. At the end of the second year he pays one-tenth of the principal and one year's interest on the remainder; and the same at the end of each successive year until all has been paid at the end of ten years. There is an abundance of government land surveyed and in the market, subject to the Homestead and Pre-emption laws.

In Eastern and Middle Oregon the government lands are the best, though partially improved farms may sometimes be had. Government lands may be bought there under the Pre-emption, Homestead, or Timber-Culture laws, and in Middle Oregon under the Desert Land Act, for grazing purposes. The immigrant requires a little more capital to land him in Oregon, than would be necessary for some of the States and Territories farther east; but once there, and a small capital will go as far and can be as readily supplemented by labor for others, as anywhere else in the country.

Railroads and River Navigation.—The Columbia river, which forms the northern boundary of Oregon as far as nearly to the mouth of the Snake river, is navigable from its mouth to this point, and above, except at two points: the Cascades, where there is a portage railroad of five or six miles, and the Dalles, near the mouth of the Des Chutes, where there is another portage railway fourteen miles long. These obstructions, requiring two railway and three steamer transshipments, have greatly enhanced the cost of transportation by it, but are now in a fair way to be removed. The Northern Pacific Railway, whose Pend d'Oreille division starts from Ainsworth, at the mouth of the Snake river, has built a branch to Wallula, on the south bank of the Columbia, connecting there with the Oregon Railway and Navigation line to Walla-Walla, thirty miles east; and the Oregon Railway and Navigation Company have undertaken the construction of a railway along the south side of the Columbia river to Portland, where the steamships of this company to San Francisco can receive the freight. This road is now completed to the Dalles, and will reach Portland next season. The United States government are constructing canals and locks around the Cascades and Dalles, but so leisurely that it will require twelve or fifteen years to complete

them; so that the railway is the only hope for cheap transportation from the Upper Columbia. The Northern Pacific will eventually construct a railway down the north bank of the Columbia, and extend it to Portland, which is not on the Columbia, but on the Willamette, one of its largest tributaries. The. Willamette is navigable partly by slackwater navigation for 138 miles from its mouth. But the Willamette valley is already traversed by two railroads, and is likely ere long to be gridironed by one and possibly two more. The Oregon and California Railroad, starting from East Portland, extends southward through the Willamette and Umpqua valleys to Roseburg, a distance of 200 miles. Its eventual terminus is to be Redding, in California, where it will connect with the Northern California Railway. The Oregon Central, starting from Portland, extends in a horseshoe curve to Hillsboro, and thence south to Junction City, whence one branch goes to Ellendale, across the Coast Range, and another to Luckiamute, with a probable future terminus at Harrisburg, on the Oregon and California road. The Oregonian Railway Company (limited), a Scottish company, has undertaken to construct two narrow gauge railways, close to the mountains on either side of the Willamette valley, one to cross the Coast Range and reach Yaquima Bay, and the other crossing the Cascade Range to connect with a road from the Central Pacific in Nevada. They also propose to build from Portland to Astoria, at the mouth of the Columbia. The Oregon Railway and Navigation Company have also commenced several narrow-gauge railroads from Wallula and Milton southward and southeastward in Eastern Oregon, to points where the great live-stock and wheat crop can be most easily conducted to their main line on the Columbia river. Some of these will eventually extend into Idaho.

The Northern Pacific, though having an extensive land grant in Northern Oregon, from Walla-Walla to the Willamette, has not, and does not intend to have, any portion of its line in Oregon, except, perhaps, a branch of some twelve miles, extending across the Columbia to Portland. Its present terminus on the Columbia is at Kalama, in Washington Territory, forty-five miles north of Portland. We have already spoken of the short

railway portages (six and fourteen miles) at the Cascades and the Dalles. With the completion of the railways now under contract or in course of construction, Oregon will have nearly 1,000 miles of railroad in operation.

Finances.—The government of the State has been economically administered and taxes are light. The entire indebtedness of the State, January 1, 1881, will not probably exceed $308,000, and there is sufficient money accruing from the sale of swamp lands, etc., to meet it when it becomes due.

Educational Facilities.—The school fund of the State (derived from the sale of school lands) amounted in 1878 to $609,000; it has since materially increased. In 1878 the number of youth of school age (four to twenty) was 53,462, of whom 26,992 were enrolled in the public schools, and the average daily attendance was 21,464. There were 904 organized districts, of which 865 reported; there were 768 public schools of ordinary grade, and twenty-two of advanced grade. The average time school was maintained was four and a half months. The value of public school property was $483,058. The total number of teachers was 1,068, of whom 569 were males, and 499 females. The average monthly pay of the men was $45.25; of the women, $34.33. The total receipts for public schools were $258,786; the total expenditures, $275,107. There were 105 private and collegiate schools. The schools of Portland and Salem are of very high character. There is a normal school at Monmouth, and a normal department of the State University at Eugene City. There are Teachers' Institutes held annually in each judicial district. In the way of higher instruction there are four (so-called) universities, which are really only colleges, viz.: the University of Oregon, at Eugene City, with a normal department attached; this had a land grant of 66,080 acres, and has received $100,000 from it, 20,000 acres being yet unsold; the Blue Mountain University, at La Grande, Eastern Oregon, with a very thorough course; the Willamette University, at Salem, a Methodist college with a medical school attached; and Pacific University and Tualatin Academy, at Forest Grove, a non-sectarian institution. There are also four colleges, viz.: Corvallis College, at

Corvallis, under the control of the Methodist Episcopal Church South, of which the State Agricultural College, endowed with the Congressional land-grant of 90,000 acres, is a department; McMinnville College, a Baptist institution at McMinnville; Philomath College, at Philomath, under the control of the United Brethren in Christ (German Methodists); and Christian College, at Monmouth, under the control of the Christian connection. These institutions had 1,025 students in 1878, 675 of them in the preparatory departments. All of them admit women to their classes, and there is also at Portland a college for women, St. Helen's Hall, under the care of the Protestant Episcopal Church.

There are also institutions at Salem for the education of deaf mutes and of the blind.

Population.—In 1843 there were not more than 400 white inhabitants in Oregon Territory, which then included Washington Territory also. The following table shows the growth since that time:

Population of Oregon.

Census Year.	Total Population.	Males.	Females.	White.	Colored.	Indian.	Chinese.	Natives.	Foreigners.	Ratio of Increase.	Illiteracy.	Of School Age, four to twenty, both sexes.	Of Military Age eighteen to forty-five, males.	Of Voting Age, twenty-one and upwards, males.
1850	13,294	8,266	5,036	13,087	207	.....	.....	12,081	1,213	.....	162	4,522	4 9'3	5,617
1860	52,465	31,-27	20,817	52,179	128	177	.....	47,342	5,123	294.6	1.511	16,988	1 ,7 7	18 8.6
187-	101,883*	49,777	37,498	86,929	346	11,278†	3,330	79,323	11,600	73.3	4,427	29,400	23 955	28,616
187-	122,962*	.....	.....	108,324	.....	10,962†	3,410	.....	.....	26.6	.. ..	44 661		
188-	180,922*	103,388	71,379	163,087	493‡	6,934†	9,508	144,327	30,440	78.0‡	....	61,122		

Oregon has been called the "New England of the Pacific Coast," and has probably a larger proportion of New England people in its population than any other of the Western States. Its people are thrifty, intelligent and moral. They have reared the church and the school-house in their villages, even while their own dwellings were of logs or sods, and have shown their New England origin by their early attention to higher institutions of learning. No one of the States of the far West has, in proportion to its population, so many colleges and collegiate schools

*Tribal Indians added. †A part of these Indians are in Washington Territory. ‡For decade.

of high character, or imparts to the students so thorough training.

Eastern Oregon, which is now receiving a vast number of emigrants in its rich and fertile valleys, will have a larger proportion of people of foreign birth, as well as a greater number from the Mississippi valley and the Middle States; but the State is a desirable one for the better class of emigrants, not only from its advantages of soil and climate, and its mining and pastoral facilities, but for its educational and religious advantages, and the high character of its inhabitants.

Indian Reservations and Tribal Indians.—The 5,818 tribal Indians credited by the Indian Commissioner to Oregon, though some of them more properly belong to Washington Territory, are of twenty different bands. Those belonging to the Grande Ronde, Klamath, Malheur and Siletz Agencies, and most of those connected with the Warm Springs Agency, about three-fourths of the whole, have adopted citizens' dress, and are becoming quite civilized. They till about 8,000 acres of land of their reservations, and a few have had lands allotted to them in severalty. Their reservations include 3,853,800 acres, but less than 200,000 acres of this is tillable.

Counties and Principal Cities and Towns.—There are twenty-three counties in the State, whose population in 1880, and assessed valuation in 1879, was as follows:

COUNTIES.	Population, 1880.	Ass'd Valuation, 1879.
Baker	4,615	$874,516 00
Benton	6,403	1,722,115 00
Clackamas	9,260	1,908,580 00
Clatsop	7,222	1,159,361 00
Columbia	2,042	287,837 00
Coos	4,834	894,113 00
Curry	1,208	243,733 00
Douglas	9,596	2.133,118 00
Grant	4,303	1,102,327 00
Jackson	8,154	1,466,992 00
Josephine	2,485	278.290 00
Lake	2,804	830,591 00
Lane	9,411	3,301,368 00

Counties.	Population, 1880.	Ass'd Valuation, 1879.
Linn	12,675	$4,490,854 00
Marion	14,516	3,922,258 00
Multnomah	25,204	10,633,190 00
Polk	6,601	1,599,423 00
Tillamook	970	83,902 00
Umatilla	9,607	1,523,988 00
Union	6,650	1,117,099 00
Wasco	11,120	2,262,570 00
Washington	7,082	2,069,190 00
Yam Hill	7,945	2,465,258 00
Total	174,767	$46,370,673 00
For 1878	.....	46,240,324 00

This valuation was about fifty cents on the dollar of the true valuation. In 1880 the true valuation, including property not taxed, is not less than $100,000,000.

The largest city in the State is Portland, on the Willamette, 112 miles by river from the Pacific Ocean. It is a place of considerable and increasing business and of great wealth. Its population in 1880 was 20,549. Salem, the capital, is also on the Willamette, and on the Oregon and California Railroad. It is a pretty town of about 5,000 inhabitants. Oregon City, Albany, Harrisburg and Eugene City, all on the Willamette, have over 3,000 inhabitants each. Astoria, at the mouth of the Columbia; Roseburg, the present terminus of the Oregon and California Railroad; Jacksonville, in the southwestern part of the State; Corvallis, Junction City, both in the Willamette valley; Dallas, at the second rapids of the Columbia; East Portland, Port Orford and Empire City, on the coast; and St. Helen's, in the northwest, on the Columbia river, are towns of 2,000 or more inhabitants. These are all in Western Oregon. In Eastern Oregon, La Grande, Baker City, Umatilla, Sparta, Pendleton and Milton are the principal towns.

Religious Denominations.—In 1875 there were in Oregon 351 church organizations and 242 church edifices of all denominations; 320 clergymen, priests or ministers; 14,324 members or communicants; 71,630 adherent population, and church property valued at $652,950. This with a population estimated at 112,000,

exclusive of Indians, is certainly a very creditable showing. The Methodists were considerably the most numerous denomination, the Methodist Episcopal Church having 121 church organizations, 63 church edifices, 140 ministers, 5,871 members, 20,170 adherent population, and $139,500 of church property, while the minor Methodist denominations (Evangelical Association and United Brethren in Christ) had 42 churches, 23 church edifices, 19 ministers, 1,028 members, 4,200 adherent population, and $22,000 of church property. The Baptists came next, the regular Baptists having 59 churches, 54 church edifices, 47 ministers, 2,052 members, 8,000 adherent population, and $51,300 of church property, and the Christian Connection, Baptists in their practice, had 43 churches, 29 church edifices, 36 ministers, 1,867 members, 7,900 adherent population, and $42,500 of church property; the Presbyterians had 28 churches, 26 church edifices, 25 ministers, 1,599 members, 7,000 adherent population, and $64,150 of church property. Next in order came the Catholics with 17 churches, 15 church edifices, 18 priests, 15,000 adherent population, and $124,500 of church property. Then followed the Protestant Episcopal Church with 16 parishes, 14 church edifices, 15 priests, 607 communicants, 2,800 adherents, and $74,300 of church property, while the Congregationalists were nearly equal to them in numbers. There were five minor sects represented, of whom only the Lutherans have increased very much within the past five years. Of the leading denominations there has been a very decided increase, most marked among the Baptists, Presbyterians, Episcopalians and Congregationalists.

Historical Data.—Spain seems to have had the first title—that of maritime discovery—to Oregon and Washington Territory, having visited and mapped the coast nearly to the fifty-fifth degree of north latitude, in 1592 by the Greek pilot, De Fuca, in 1640 by Admiral Fonte, and subsequently by other explorers. This title, with whatever validity it possessed, was expressly conveyed to the United States by Spain by the treaty of Florida, concluded in 1819. The title of the United States to Oregon and Washington Territory by no means, however, rested on this alone. Other valid claims were the following: the discovery and explo-

ration of Columbia river by Captain Robert Gray, commanding the ship "Columbia," in 1792, who gave the name of his ship to the river; his previous exploration of the coast in connection with Captain Kendrick, in the "Washington" and the "Columbia," and his discovery and naming of Gray's Harbor, and exploration of the Straits of San Juan de Fuca and Puget Sound, more fully detailed in the chapter on Washington Territory; the purchase of Louisiana and all that belonged to it from the French in 1803, this including the Spanish title so far as they had received it from the French in 1762;* the exploration of Columbia river from its sources to its mouth by Captains Lewis and Clarke, by order of our government in 1804, 1805, and its continued occupation by American citizens from 1810, as a result of the knowledge of its resources gained from the report of Lewis and Clarke.

In 1810 the first house was built in Oregon by Captain Winship, a New Englander, but the house was carried away by a flood the following year. In 1811, John Jacob Astor, of New York, established a trading-post at the mouth of the Columbia river, which was named "Astoria" in his honor. The venture proved disastrous, mainly in consequence of the war between the United States and Great Britain in 1812. The British took possession of the post in 1813 and called it Fort George. Subsequently it became the property of the Hudson Bay Company, and remained in its possession until 1848. The Northwest Fur Company disputed for a time the rule of the latter company on the Pacific coast, but had to succumb in a few years, and was absorbed by its rival in 1824, from which time, till 1848, the latter ruled supreme in the valleys of the Columbia and Willamette.

In 1824 the first fruit trees were planted in Oregon, and in

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* This claim to Oregon in consequence of the Louisiana purchase was a very weak one, and has been abandoned by Greenhow and some other American authorities. The great name of Thomas Jefferson, who was President when the Louisiana treaty was negotiated, has also been cited against it; but the other claims were sufficient, and their justness and completeness cannot be denied. See on this subject two very able and conclusive papers by John J. Anderson, Ph. D., author of several works on the history of the United States, entitled "Did the Louisiana Purchase extend to the Pacific Ocean?" and "Our Title to Oregon"—San Francisco and New York, 1880.

1831 the first regular attempts at farming were made by some of the retired servants of the Hudson Bay Company. In 1832 the first school was opened. Between 1834 and 1837 missionaries of various denominations arrived, bringing the first cattle with them. In 1838 the first printing press arrived in Oregon. In 1841 Commodore Wilkes visited the Columbia on an exploring expedition at the instance of the United States government.

From 1816 till 1846 the American and British governments had held Oregon "by joint occupancy" under a formal treaty, but neither nation had organized any form of civil government there. In 1843 the inhabitants organized a provisional government, which continued in force till 1848. In 1846, after a long discussion, a treaty was made with Great Britain by which the whole territory south of 49° was ceded to the United States.

In 1848 Oregon Territory was organized, and in 1849 received its first territorial governor.

In 1859 it was received into the Union as a State. Since that time it has had some Indian troubles, but these are now all quieted, by the banishment of the Indian offenders, and the location of the Indians on reservations where they are cared for and educated.

CHAPTER XVIII.

TEXAS.

SITUATION AND BOUNDARIES OF TEXAS—ITS AREA AND EXTENT—VASTNESS OF ITS AREA—COMPARISONS WITH OTHER STATES AND COUNTRIES—FACE OF THE COUNTRY—MOUNTAINS IN THE NORTHWEST—ISOLATED SUMMITS AND RIDGES ELSEWHERE—ELEVATIONS OF VARIOUS POINTS—RIVERS, BAYS AND ESTUARIES IN THEIR ORDER FROM EAST TO WEST—TEXAS RIVERS NOT NAVIGABLE—GEOGRAPHICAL DIVISIONS OF THE STATE AND THEIR CHARACTERISTICS—GEOLOGY AND MINERALOGY—MINERALS—FORESTS AND VEGETATION—ZOÖLOGY—CLIMATE—METEOROLOGICAL TABLE GIVING THE TEMPERATURE, RAINFALL, ETC., AT EIGHT POINTS IN THE STATE—MINING AND MANUFACTURING INDUSTRIES—AGRICULTURAL PRODUCTIONS—TABLES OF AGRICULTURAL PRODUCTS AND LIVE-STOCK—NOT ALL THE ARABLE LANDS OF TEXAS OF THE FIRST QUALITY—THE LIVE-STOCK OF THE STATE COMMANDS LOWER PRICES THAN THAT OF STATES AND TERRITORIES FARTHER NORTH—WHY?—RAILROADS AND NAVIGABLE WATERS—POPULATION—TABLE OF POPULATION—STATISTICS—NATIVITIES OF THE POPULATION—FROM WHENCE THE EMIGRATION—COUNTIES AND THEIR FINANCES AND VALUATION—PRINCIPAL CITIES AND TOWNS—EDUCATION—PUBLIC SCHOOLS—CONTRADICTORY STATISTICS—LACK OF INTEREST IN THEM—UNIVERSITIES, COLLEGES AND PROFESSIONAL SCHOOLS—INSTITUTIONS FOR BLIND AND DEAF MUTES—LANDS FOR IMMIGRANTS—RELIGIOUS DENOMINATIONS—HISTORICAL DATA—EARLY SETTLEMENTS IN TEXAS—ITS REVOLT AND INDEPENDENCE OF MEXICO—THE REPUBLIC—ANNEXATION TO UNITED STATES—PROGRESS—SECESSION—RECONSTRUCTION—PRESENT CONSTITUTION—CONCLUSION.

TEXAS is the southernmost State of "Our Western Empire," and joins on its western border the Republic of Mexico, of which it was once an integral part. It is a vast domain, extending from the parallel of 25° 51′ to that of 36° 30′ north latitude, and from the meridian of 93° 27′ to that of 106° 43′ west longitude from Greenwich. It is of very irregular shape, a part of its boundaries being of mathematico-geographical lines of latitude and longitude, and a much greater portion following the natural lines of gulf coast, bay and river. Its northern boundaries are New Mexico from the Rio Grande eastward, to the 103d meridian, the Indian Territory (the narrow strip in the northwest of that Territory) from the 103d to the 100th meridian, and the Red river from the


PUBLIC LANDS
INDIAN TERRITORY
NEW MEXICO
TEXAS
OKLAHOMA
MISSOURI
ARKANSAS
LOUISIANA
GULF OF MEXICO
OSAGES
CHEROKEE COUNTRY
CREEK COUNTRY
CHEYENNES & ARRAPAHOES
SAC AND FOX
SHAWNEES
QUAPAWS
KANSAS
NEZ PERCES
PONCAS
WICHITAS
KIOWAS
COMANCHES & WICHITA & APACHES AGENCY
CHICKASAW NATION
CHOCTAW NATION
DALLAM
SHERMAN
HANSFORD
OCHILTREE
LIPSCOMB
HARTLEY
MOORE
HUTCHINSON
ROBERTS
HEMPHILL
OLDHAM
POTTER
CARSON
GRAY
WHITLER
DEAFSMITH
RANDALL
ARMSTRONG
DONLEY
COLLINGS WORTH
PALMER
CASTRO
SWISHER
BRISCOE
HALL
CHILDRESS
BAYLEY
LAMB
HALE
FLOYD
MOTLEY
COTTLE
HARDEMAN
COCHRAN
HOCKLEY
LUBBOCK
CROSBY
DICKENS
KING
KNOX
BAYLOR
ARCHER
CLAY
YOAKUM
TERRY
LYNN
GARZA
KENT
STONE
HASKELL
THROCKMORTON
YOUNG
JACK
WISE
DENTON
COOKE
GRAYSON
LAMAR
RED RIVER
BOWIE
GAINES
DAWSON
BORDEN
SCURRY
FISHER
JONES
SHACKELFORD
STEPHENS
PALO PINTO
PARKER
TARRANT
DALLAS
RAINS
WOOD
UPSHUR
MARION
HARRISON
ANDREWS
MARTIN
HOWARD
MITCHELL
NOLAN
CALLAHAN
EASTLAND
ERATH
HOOD
JOHNSON
ELLIS
NAVARRO
HENDERSON
PANOLA
SHELBY
RUNNELS
COLEMAN
BROWN
COMANCHE
HAMILTON
BOSQUE
HILL
FREESTONE
ANDERSON
CHEROKEE
TOM GREEN
CONCHO
MENARD
MASON
LLANO
SAN SABA
LAMPASAS
MILAM
WILLIAMSON
ROBERTSON
LEON
HOUSTON
ANGELINA
TRINITY
MADISON
TYLER
POLK
WALKER
CROCKETT
KIMBLE
GILLESPIE
BLANCO
BURNET
LEE
WASHINGTON
MONTGOMERY
HARDIN
EDWARDS
KERR
KENDALL
HAYS
CALDWELL
BASTROP
AUSTIN
JEFFERSON
BANDERA
COMAL
GUADALUPE
COLORADO
FORT BEND
CHAMBERS
BEXAR
MEDINA
UVALDE
LAVACA
WHARTON
BRAZORIA
GALVESTON
ZAVALA
FRIO
ATASCOSA
WILSON
KARNES
GONZALES
DEWITT
JACKSON
MATAGORDA
VICTORIA
DIMMIT
LASALLE
MCMULLEN
LIVE OAK
BEE
REFUGIO
ARANSAS
SAN PATRICIO
ENCINAL
DUVAL
NUECES
WEBB
ZAPATA
STARR
HIDALGO
CAMERON
WILLACY
EL PASO
PRESIDIO
JEFF DAVIS
BREWSTER
PECOS
COUNTY MAP
OF
TEXAS
AND
INDIAN TERRITORY
Scale of Miles
WESTERN PART
OF
TEXAS
Same Scale as Main Map.
West of Washington
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100th meridian to the 94th, where it crosses the Arkansas boundary. This river separates it from the Indian Territory. Its eastern limits are the meridian of 94° 10′, as far south as the thirty-second parallel, Arkansas and Louisiana being its actual bounds, and from the thirty-second parallel the Sabine river and lake or estuary to the Gulf of Mexico, and the gulf itself thence to the mouth of the Rio Grande del Norte. The Rio Grande del Norte forms its southwestern border, separating it from the Republic of Mexico, as far as to El Paso, where it passes into New Mexico. The 103d meridian, passing through the Llano Estacado, forms its western boundary. Its extreme length from southeast to northwest is somewhat more than 800 miles, and its extreme breadth about 750 miles. Its area is 274,365 square miles, or 175,587,840 acres. This area is equal to that of the German Empire, with Holland, Belgium, Switzerland and Denmark added to it. It is one-third larger than the Republic of France. It is four times larger than all New England, and nearly equal to the combined area of New York, Pennsylvania, Ohio, Michigan, Indiana and Illinois.

Face of the Country.—It is a vast inclined plane, with a gradual descent from the northern and northwestern boundary to the Gulf of Mexico. The coast counties are nearly level for sixty or eighty miles inland; the surface then becomes undulating, with alternate gradual elevations and depressions, and this feature increases as we proceed toward the northwest, until it becomes hilly and finally mountainous in some of the far western counties; the Sierra Charrotte are the most eastern of these mountain ranges, and between these and the Rio Grande, in Pecos, El Paso and Presidio counties, are the Guadalupe, the Pah-cut, the Apache, the Sierra Hueco, the Sierra del Diablo, the Sierra del Muerio, the Chanatte Mountains, the Sierra Merino, the Sierra Cariso, Eagle Mountain, the Sierra Blanca, and stretching along the Rio Grande for many miles the Sierra Blancha. Most of these mountains carry leads of silver, lead and copper. The highest of them do not attain an elevation of more than 5,000 feet. In other portions of Texas there are hills, and occasionally a summit towering above the plain, but no mountains in the strict sense of the word. The gradual character of the ascending slope of the country is

indicated by the following elevations ascertained by the coast survey and railway surveys: Goliad, 50 feet; Houston, 65; Gonzales, 150; Jefferson, 226; Silver Lake, 350; Marshall, 377; Webberville, 394; Brenham, 435; Dallas, 481; San Antonio, 575; Fort Worth, 629; Austin, 650; Sherman, 734; Fort Inge, Uralde county, 845; Weatherford, 1,000; Sisterdale, in Kendall county, 1,000; Fort Clark, Kenney county, 1,000; Fredericksburg, 1,614; Mason, 1,800; Fort Concho, 1,750; Fort McKavitt, 2,050; Fort Bliss, El Paso county, 3,830; Fort Davis, Presidio county, 4,700 feet.

Rivers, Bays, Estuaries and Lakes.—The State, except in the region of the *Llano Estacado*, or Staked Plain, in the northwest, is well watered. The Canadian river, the largest tributary of the Arkansas, and the Red river, which forms a part of its northern boundary, both have their head-waters in Northwestern Texas and New Mexico, but neither of them receive any very large affluents in Texas, though the North, Salt, Middle and South forks of the Red river are considerable streams. Beginning now at the east, the Sabine river, which for nearly 200 miles forms the eastern boundary of the State, is a large and for much of its route a sluggish stream, with several considerable affluents; and the Neches, or Naches, a river of about the same size, runs nearly parallel with it, both discharging their waters into the Sabine lake. The affluents of these streams and of those to be mentioned interlock with each other, and though not of large size water the country well. All the rivers of Texas except the Canadian and Red river have a general direction toward the southeast; at first perhaps rather to the south-southeast, but each successive river makes a larger angle with the meridian. After the Naches come successively the Trinity, the Brazos, with several large affluents, the Colorado, the largest river of Central Texas, having its sources on the borders of the Staked Plain, and fed by a hundred or more tributaries, the Guadalupe and its large affluent the San Antonio, Mission river, Aransas river, the Nueces, with its tributary, the Rio Frio, the Aqua Dulce, and a dozen smaller streams; and on its southwest border the Rio Grande del Norte and its great tributary, the Rio Pecos.

None of the Texas rivers are navigable for any considerable distance except at high water, but by dredging and the construction of a short canal, Galveston bay and Buffalo bayou have been rendered navigable as far as Houston, fifty miles from Galveston.

Most of the so-called lakes in Texas are really estuaries and bays, and when somewhat narrower and without much current, they are called bayous. Of these bays and estuaries the principal are Sabine lake, at the mouth of the Sabine river, Galveston bay and its two arms, East and West bay, Matagorda bay and Lavaca bay, connected with it, Espiritu Santo and San Antonio bays, one opening into the other, with several small bays connected with them, Aransas and Copano bays, Corpus Christi and Nueces bays, and the Long Lagoon, or sound, *Laguna de la Madre*. The only considerable lakes not estuaries are Caddo lake, in the east, Forked lake, in Zavala county, Espantosa, in Dimmitt county, and three large salt lakes in Presidio county, in the northwest.

Divisions of the State.—The State is divided for civil and descriptive purposes into—1. The coast counties; 2. Eastern Texas; 3. Central Texas; 4. Northern Texas; 5. Western and Southwestern Texas; 6. Northwestern Texas.

In the coast counties the soil and climate are especially adapted to the culture of the sugar-cane, sea island cotton, rice and many semi-tropical fruits and vegetables.

The eastern portion of the State, including some eighteen counties, is heavily timbered, and from here are drawn nearly all the immense supplies of pine lumber required in the prairie portions of the State. The natural resources of this section are varied. In it are vast deposits of iron ore of excellent quality and extensive beds of lignite. Large crops of cotton, corn and other grains are grown in its valleys, and its uplands are noted for the production of fruits and vegetables. It is generally well watered by streams and springs.

Central and Northern Texas, though generally a rich prairie country, is by no means devoid of a sufficiency of timber for ordinary purposes, its numerous streams being fringed with a large

growth of forest trees. It is also traversed by what is known as the upper and lower Cross Timbers—a belt of oak, elm and other timber, from one to six miles wide.

Western and Southwestern Texas are the great pastoral regions of the State. The surface is generally a high, rolling tableland, watered by creeks and ponds, but with little timber, except along the streams and on some of the hills and mountain regions of the western part, where forests of cedar, mountain juniper, oak, etc., exist.

The luxuriant growth of rich, native grasses found in this section renders it pre-eminently a stock-raising country, and as such it is unexcelled by any other portion of the continent. The precious metals and other mineral deposits are known to exist in this section of the State, and it is believed their development will be rapid when railroads shall have been built across it.

Northwestern Texas includes not only the mountainous region comprised in Pecos, Presidio and El Paso counties, but the unorganized region known as the Territory of Bexar, and Tom Green county, and sixty-three counties north of and east of these, extending up to the parallel of 36° 30′, and eastward to the meridian of 99° 30′. This region, a part of which is known as the "Pan-handle of Texas," has an area of more than 90,000 square miles, and perhaps one-third of it belongs to the *Llano Estacado*, or Staked Plain. It is not well watered, and portions of it are not watered at all except by wells. Its rainfall is very small, and the pasturage, though scanty, is nutritious where any water can be obtained. The mountainous portion is rich in minerals. Silver, lead, copper and iron are found there, and gold probably will be. If, as is proposed, the great Staked Plain is rendered habitable by water supplied from artesian wells, this will be an excellent country for pasturage. Flocks and herds sufficient to supply the world could be raised there.

Geology and Mineralogy.—Texas has never had a State geological survey; it has been once or twice attempted, but has soon failed for the want of means for its prosecution. It is said that the new constitution of the State prohibits anything of the kind—a most unwise provision, if true, as no State in the Union would

be as much benefited by such a survey as Texas. From some rapid and superficial geological reconnoissances of the State, we glean the following general view of the geology and mineralogy of the State.

Mr. N. A. Taylor, a Texan geologist, has gathered together the sum of what is known in regard to it, though acknowledging that extensive districts, like that from Bandera west to the Rio Grande, and that from San Antonio southwest to the Rio Grande, have not been explored even superficially, and that even the formations which approach the surface are entirely unknown, though they are conjectured to be Tertiary:

"The coast-belt, like that of the other gulf and southern Atlantic States, is alluvial, though somewhat less fertile than the deposits of the Mississippi delta; it is, however, well adapted to corn, cotton, sugar-cane and the tropical fruits.

"From the best data and my own observations, the Tertiary formations occupy all Eastern Texas as high as Red river, and all the lower portion of the State from the gulf 100 to 150 miles, and farther, into the interior. If there is any exception to this, it is in the remote southwest, which I have not visited. Of this great Territory, the Pliocene, or newer Tertiary, occupies the tide-water region, and a considerable portion of Eastern Texas above tide-water. All this region is low and level, and wonderfully productive when well drained and well treated. The Miocene, or middle Tertiary, appears here and there in scattered patches above the Pliocene, and is quite largely developed about Huntsville. These lands are largely sandy, and usually hilly or broken. From the melting nature of the soil they are also cut up by considerable gullies and ravines. Usually productive, but cannot resist drought. Above these comes the Eocene, or oldest Tertiary, which occupies a larger space. These lands are rolling, and contain much very graceful and beautiful scenery. The waves and swells rise higher and higher as you go north and west. This formation has a very small percentage of poor land.

"There are, no doubt, here and there, many intrusions on a small scale of older strata through these formations, but I know of

only one of any importance. That is at the place called Damon's Mound, in Brazoria, where several acres of valuable limestone rise many feet above the Pliocene which surrounds it. This limestone cannot be later than Eocene, and may be older. It is the only stone I have seen in the Pliocene territory of Texas, and some day it will be very valuable for quicklime.

"Above the Eocene, the Cretaceous formation rises like a rampart and extends north and west a great distance—how far it is not certainly known. Many say that it goes on northward, with occasional interruptions, until it reaches the plateau of the Rocky Mountains, including the Staked Plains. This is the idea of Professor Buckley. With all deference, I believe it is not so. I believe there is very little Cretaceous after reaching the great outburst of Plutonic and Metamorphic rocks which extend through Burnet, Llano, Mason and Menard counties, and farther west to an unknown distance. After passing this primitive region, the country assumes outlines totally unlike the Cretaceous as elsewhere seen. I have no doubt, indeed I know, that it appears here and there even to El Paso, on the Rio Grande, but the general formation I believe to be Jurassic, including the Staked Plains, and have little doubt that investigation will prove it to be so.

"Just north of the primitive region of Llano, etc., there is a large development of Carboniferous, extending northeast toward the Indian Territory, and embracing, as is calculated, 30,000 square miles of coal-bearing strata. It is no doubt a continuation of the Arkansas or Ozark system. The Permian formation here and there crosses this coal territory, and probably flanks it all round. The Permian is also undoubtedly developed largely farther north and west. Not far from Fort Concho it terminates, and here, closely connected with it, there is a narrow streak of coal strata, in which an excellent coal has been found. As in England, so in Texas, this formation, wherever found, seems to indicate unerringly the near presence of coal. I believe the Permian may be found almost anywhere near the foot of the Staked Plains.

"Beyond the Pecos, in that almost unknown region below the

El Paso stage route, it is difficult to say what is the ruling geological formation. All the formations, except the Tertiary, seem to have been thrown together in one vast pile of ruin, penetrated by valleys of exquisite beauty and fertility. Here we find all manner of Plutonic eruptions, frequently capped and flanked by Jurassic and Cretaceous rocks. Perhaps basaltic rocks predominate. They certainly assume some very immense forms, sometimes rising into perpendicular cliffs many miles long and a thousand or more feet high. The Permian also appears here, filled with selenite and other forms of gypsum. This is the most interesting region in the world to the geologist.

"*Minerals.*—If we are filled with doubt in regard to the geological formations of Texas, we are much more so in regard to the minerals that lie hidden in her strata. As regards the Tertiaries, they contain many valuable deposits of iron ore in Eastern Texas, some of which have been a little worked and found to yield from forty to sixty per cent. of metallic iron. These ores are the brown oxides or limonite. The forests are dense in this region, and charcoal is obtainable at a nominal price. Limestones are usually within easy distance, sufficient to supply fluxes. These ores are also abundant in Robertson, Limestone and other counties of Central Texas, but have received no attention. The Eocene also contains very large deposits of lignite, some of which, particularly that found in Limestone county, is a superior variety of that sort of coal. It would prove excellent for gas-making, but will not coke. It burns furiously in a grate, but emits an unpleasant odor in combustion, which goes through the whole house and may even be smelled at a distance outside. Some of these layers of lignite are said to be at least twelve feet thick. They are associated with brown and blue shales, and rather soft brown sand-stone. There is some gypsum in the Eocene—notably about the falls of the Brazos, in Falls county, where it is in considerable quantity. It is pure enough for manufacturing into plaster of Paris, and there is none better for fertilizing. West of Corpus Christi large deposits of salt are formed annually in the lagoons near the gulf. In the winter these basins are filled with water from the gulf, which evaporates in

summer, leaving the clean white salt. Enough of it is thus formed here every year to salt all Texas. During the war these deposits supplied a large portion of Texas with salt.

"The Cretaceous contains a good deal of gypsum, and limestone for building or quicklime, without end. About two miles from Round Rock, on the International railroad, there is a great quantity of gypsum, quite pure. There is also a good deal of it about Mount Bonnel, near Austin. Both of these points are so convenient to transportation that it is singular that some one has not engaged in making plaster of Paris. Nearly all that article used in Texas comes from Newfoundland, and this when we have it just as good and in great abundance right at our own doors. No chalk has ever been found in the Cretaceous system of Texas, so far as I know.

"The granitic and metamorphic region, running through Burnet, Llano, Mason, Menard, etc., abounds in mineral wealth. There are probably no larger and certainly no better deposits of iron ore in the world than those of Llano county; none easier to get at. These ores are magnetic and specular, and often appear in immense masses resembling solid iron. They have been wrought to a very small extent and found to yield from seventy to eighty per cent. of iron, equal to the best in the world. With such immense masses of iron as this, Texas ought to furnish not only her own railroad iron, but also ship it to other lands. This will be done in time. At present Austin is the nearest point to a railroad, about a hundred miles off. The region is generally timbered, furnishing plenty of material for charcoal; some coal has also been discovered in this region, and it is known to exist abundantly in Coleman and other counties not far off. There is also abundance of limestone. Soapstone, valuable for furnaces, also abounds. Some copper, silver, and even gold, have been found in this region, but not yet, I believe, in paying quantities. Its great mineral wealth is doubtless its iron. Marble of excellent quality is found in places throughout this region. Perhaps the largest deposit of it is at the Marble Falls of the Colorado, where the river for a considerable distance cuts its way through walls and mountains of solid marble. It is not uncommon in this

region to find the people living in huts or cabins surrounded with fences built of the finest marble. The marble is of various shades—some pure white, some variegated with red and blue markings, and some black. This place is about sixty miles above Austin, and the marble might be brought down the river in flat-boats, but it is not.

"In the same region there are numerous salines, issuing, it is said, from Silurian rocks, and some salt of a very fine quality is manufactured—enough to supply the wants of the people around there. This whole region is very picturesque, and has some of the loveliest scenery on the American continent.

"Below this primitive region, lying out in the post-oaks to the southeast, are numerous strange boulders, which have been borne many miles from their native beds by some remarkable occurrence which took place about the close of the Cretaceous era. Some of these lost rocks are many tons in weight. The Jurassic and Permian beds are known to contain great deposits of copper, gypsum and salt. Indeed, the largest deposit of gypsum known in the world is found in Northwest Texas along Red river, and extending a great distance into the State. The gypsum belt is a hundred or more miles in width, and of unknown thickness. The gypsum is of all sorts, from the purest alabaster and selenite to the common massive forms. There is enough of it to supply the demands of the universe for centuries. All the streams that wander through this great bed are impregnated with this mineral and salt—some to such a degree that even the animals will not drink them. The Pecos is a strange compound, and one of the arms of the Brazos is far more briny than the ocean. Yet in all this region there are springs and deep circular pits of pure water. The Permian, in Archer and several other counties, is heavily stored with copper.

"In regard to the region west of the Pecos, I have this prophecy to place on record—that the day will come when it will develop great mineral wealth. We have every reason to think so. No intelligent man has ever penetrated that region without being filled with this conviction, and the more intelligent and observing he is the stronger is this conviction upon him. There is hardly

a doubt that the geological formation there is but a continuation of the rich mineral-bearing system of Colorado, Nevada and Chihuahua. The rocks appear the same; they contain silver, copper and lead. These rich metalliferous rocks run in great systems, and not in isolated protrusions. Thus we find gold in the great Appalachian system of mountains, reaching out thousands of miles; and thus we find gold and silver in the great Rocky and Andes Range, traversing the length of two continents. For this reason I have ever entertained a lively hope that much silver and gold will be found in the far isolated group of Llano, etc. The mountains beyond the Pecos fill every condition for the expectation of great mineral wealth. Here the systems of Colorado and the Sierra Rica, of Mexico, meet and blend. Being so rich elsewhere, why should they not be even richer where they meet and blend? I have no question that they will eventually prove so, and that those now utterly lonely mountains will be filled with great works and the busy camps of the miners. Silver will be the principal metal, though copper and lead will abound."

Forests and Vegetation.—Eastern Texas, east of the Trinity river, is a region of abundant timber, and although the most densely populated portion of the State, full one-half of its surface is still covered with forests. There are two species of pine, here known as the "long straw" and "short straw" pine, both of large size and producing excellent lumber, while the long straw yields a superior quality of turpentine. There are also in Eastern Texas several species of oak, including the live-oak, so called, an evergreen oak which differs somewhat from the live-oak of Florida, and which is found all over the State; the post-oak and blackjack; the ash, elm, black walnut, butternut, pecan, box-elder and pride of China; and toward the coast, the magnolia (here a stately tree), the cypress, palmetto, etc. In Northern Texas there are two immense belts of woodland, extending from the Red river southward, called the "Lower" and "Upper Cross Timbers." They are each about forty or forty-five miles wide, and extend southward from 150 to 200 miles; the first commences in Cooke and Grayson counties, along the Red river, and extends to McLennan county; the second, which is smaller,

occupies parts of Wise, Jack, Palo Piuto, Hood and Erath counties. Most of the trees in these forests are post-oak and black-jack oak, and they stand so wide apart that a wagon can be driven between them in any direction.

Central Texas is mainly rolling prairie; but with plenty of timber, generally of good quality, though sometimes cottonwood, buckeye, black gum or sweet gum, in the river and creek bottoms. There are also islands of forest trees, live-oak, cypress (which grows on the hills here), post-oak and mesquite scattered through the prairies. The coast belt has no forest trees, but frequent chapparals, composed mainly of the different species of cactus. This region has also in spring and early summer rich and nutritious grasses, and a profusion of brilliant flowering plants. Western and Northwestern Texas are scantily wooded, though even there the cypress, the live-oak (more rarely), and that wonderful tree, the mesquite, are found. The Osage orange (bois d'arc) and the pecan tree are among the other valuable forest trees of Texas. The bois d'arc grows in almost all soils; its wood is very hard and durable, and its thorns and rapid growth make it excellent for hedges.

The other shrubs and plants most common in Northwestern Texas and in the Llano Estacado are the yucca and four or five genera of the cactus, among which are the prickly pear, the melocactus, the mammelaria and several species of cereus. The sage brush is not so abundant, even on the Llano, as in New Mexico and Colorado. The mesquite grass, a very great favorite with cattle, is the best of the pasturage grasses of this region.

Zoölogy.—There are still some herds of buffalo and antelope in the northwestern part of the State, though the number is diminishing every year. In Western Texas the mustang or wild horse of Mexico still feeds in large troops on the prairies; the gray wolf, more ferocious and stronger than his northern congener, the black bear, the puma or cougar, the jaguar or American tiger, the wild cat and the lynx, are found in the wooded and thinly inhabited districts; while deer, peccaries, raccoons, opossums, foxes, hares and squirrels abound in the woods.

Among the feathered tribes are found: of game birds, the wild

turkey, pheasant, quail, snipe, curlew, many species of wild ducks, brant and teal, wild geese, swans, and a great variety of birds remarkable for sweetness of song or beauty of plumage; and among the birds of prey, the king vulture, or king of the buzzards, the common turkey buzzard, and other vultures, eagles, hawks, kites, pelicans, herons, king-fishers, flamingoes, cranes, etc. The streams abound in fish, of which the black bass and the war-mouth perch are the best edible fresh-water varieties, while the waters of the bays and gulf yield immense numbers of the salt-water fish common to all the Atlantic and gulf coasts. The oysters of Galveston bay and its vicinity are considered good by epicures. Alligators, turtles, etc., are abundant in the lower portion of the rivers and bayous, and on the coast are seen, though less frequently, the great sea-turtles, the manatee, octopus and the porpoise. In the mountains and wooded districts, rattlesnakes, moccasin snakes, copperheads, the red-mouthed adder and the milk adder are sufficiently numerous, and several species of the black snake (our American boa) and great numbers of harmless snakes are found almost everywhere. The gecko and other lizards, among them the chameleon, horned toads, horned frogs, salamanders, etc., abound, and the insect tribes are both numerous and formidable. The centipede, and on the lower coast a small sand scorpion, the large jumping spider, horse flies, buffalo gnats, chigoes and mosquitoes are all more or less troublesome; but they are not found in the same localities nor at the same season of the year. The insects injurious to vegetation are less numerous and destructive than in any other States.

Climate.—The climate of Texas is varied from semi-tropical to moderately temperate. Snow and ice are seldom seen in the central portion, and rarely, if ever, in the extreme south. In the northern part one or two snow-falls during the winter, of from one to three inches in depth, are usually expected. Occasionally a much heavier fall is had, and ice from one to two inches in thickness is sometimes made.

In the northeastern and eastern sections of the State the mercury in summer rarely rises above 100, and as rarely descends to zero. The summers are long and the heat continuous, but

not as intense as in many localities farther north. The winters are generally mild and for the most part pleasant. On the coast, even at Brownsville, near the mouth of the Rio Grande, the mercury rarely or never reaches 100°, and as rarely falls below 32° in winter. The entire range of the year is not over 66°.

Along the whole course of the Rio Grande, and, indeed, generally in Western and Northwestern Texas, the climate is entirely different, bearing a greater resemblance to that of Arizona and New Mexico. The summer temperature rises to 110°, 112° or 116°, and what is remarkable attains its greatest intensity in May, when it remains above 100° for fifteen or twenty days together. In winter it falls to about 20° or 25°, the annual range being from 91° to 96°. The rainfall varies as much as the temperature. In Galveston it averages more than 50 inches; in Austin, 34.55; in Denison, about 31 inches; while west of the 100th meridian it gradually diminishes from 21.21 at Brackettsville to 8.99 at El Paso. From the reports of twenty-five stations of the Signal Service Office in Texas, and reports from two or three others from private sources, we have selected eight points, of which we give temperature, rainfall, and, in two of them, the barometer. These eight points represent as fairly as possible the meteorology of all parts of the State. (See pages 1134, 1135.)

Mining and Manufacturing Industries.—There can be no question that Texas possesses a vast amount of mineral wealth, and that at some not distant day the mountain districts of Western and Northwestern Texas will be thoroughly prospected, and hundreds of mines of gold, silver and copper opened and profitably worked. The mines of coal, of rock salt and of lead, which are now just developing, will be wrought on an extensive scale, and the soapstone, marble, slate and gypsum will be largely exported. The whole State west of the meridian of San Antonio is full of mineral wealth. But at present there is a lack of the enterprise which is necessary for the development of these treasures. The coal mines are worked to a considerable extent, because the railroads need and will have the coal, and the salt mines are worked, and the water of the saline springs evaporated, because there is an importunate and constant demand for salt for

Year and Months.	AUSTIN, situated on the Colorado river. Latitude 30° 16′ 25″. Longitude 97° 43′ 58″. Elevation 650 feet above sea-level. Averages of 22 years.					DENISON, Grayson Co., near the Red river. Latitude 33° 52′. Longitude 96′ 40′. Elevation 767.40 feet.						GALVESTON, Galveston Co., on the coast. Latitude 29° 18′. Longitude 94° 50′. Elevation 39.08 feet.						BROWNSVILLE, Cameron Co., at mouth of Rio Grande. Latitude 26° 00′. Longitude 97° 30′. Elevation 43.40 feet.				
	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Mean Pressure of Barometer.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Mean Pressure of Barometer.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Monthly and Annual Rainfall.
	°	°	°	°	in.	°	°	°	°	in.	in.	°	°	°	°	in.	in.	°	°	°	°	in.
Year	107	6	68.03	101	35.12	102	1	63.7	101	30.79	29.962	95	23	69.4	72	51.03	29.995	98	27	71.1	71	29.51
July	107	62	85.32	45	5.98	102	65	82.5	37	9.95	29.951	95	73	84.7	22	7.70	30.006	97	73	85.0	24	6.58
August						102	65	82.5	37	2.61	29.951	94	73	83.8	21	7.58	29.985	98	72	85.0	26	7.20
September						97	49	73.5	48	1.70	29.957	89	61	78.5	28	5.08	29.942	96	61	78.5	35	5.21
October	98	20	65.95	78	7.64	88	35	64.4	53	0.56	29.979	87	50	73.6	37	3.72	29.990	93	53	73.0	40	0.86
November						81	27	56.1	54	0.62	30.122	75	37	62.2	38	7.31	30.114	86	40	63.0	46	1.76
December						71	11	38.5	60	2.24	30.150	71	29	51.5	42	7.07	30.156	80	32	56.0	48	1.34
January	88	6	52.44	82	5.50	78	1	41.0	77	2.79	30.070	71	23	51.2	48	1.88	30.102	79	27	53.0	52	1.03
February						78	19	45.6	59	0.45	29.926	71	39	55.6	32	1.36	29.968	81	37	59.0	44	1.03
March						92	26	61.4	66	0.31	29.959	85	45	66.8	40	0.91	29.563	92	44	68.0	48	0.33
April	103	21	68.73	82	16.00	85	40	64.0	45	4.33	29.764	82	56	70.6	26	2.55	29.828	97	50	73.5	47	1.57
May						96	55	74.4	41	1.52	29.888	89	64	77.4	25	1.91	29.952	94	64	79.0	30	0.05
June						101	51	80.0	50	3.71	29.881	94	64	81.4	30	1.96	29.939	95	65	80.0	30	2.55

Year and Months.	EAGLE PASS, Maverick Co., on the Rio Grande. Latitude 28° 40′. Longitude 100° 15′. Elevation 710 feet.					EL PASO, El Paso Co., on the Rio Grande river. Latitude 31° 46′. Longitude 106′ 32′. Elevation 3,920 feet.					SAN ANTONIO, Bexar Co., on San Antonio river. Latitude 29° 28′. Longitude 98° 22′. Elevation 564 feet.					FORT GRIFFIN, Shackelford Co., on Clear fork of Brazos river. Latitude 32° 53′. Longitude 99° 21′. Elevation 1,270 feet.				
	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Monthly and Annual Rainfall.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Monthly and Annual Rainfall.
	°	°	°	°	in.	°	°	°	°	in.	°	°	°	°	in.	°	°	°	°	in.
Year	116	23	69.9	93	24.20	104	30	68.1	74	8.99	104	18	69.1	86	32.12	104	6	64.6	98	28.79
July	101	65	83.0	36	3.17	98	70	84.0	28	1.25	99	58	78.5	41	6.09	101	64	82.5	37	7.84
August	99	64	81.5	35	4.30	97	69	83.0	28	2.55	99	67	83.0	32	3.93	100	59	79.5	41	1.27
September	95	47	71.0	48	4.18	90	61	75.5	29	0.66	95	53	74	42	3.98	96	45	70.5	51	2.37
October	95	43	69	52	0.41	89	50	69.5	39	1.02	94	41	67.5	53	0.56	96	35	65.5	61	0.56
November	85	32	58.5	53	0.47	74	40	57.0	34	0.67	83	31	77.0	52	4.68	81	25	53.0	56	2.89
December	77	25	50.5	53	0.35	63	37	50.0	26	0.11	78	25	51.5	53	1.91	76	14	45 0	62	1.24
January	85	23	54.5	63	0.10	72	39	51.5	33	1.57	79	18	48.5	61	0.98	82	6	44	76	1.96
February	90	30	60.0	60	0.95	82	30	56.0	52	0.83	88	32	60.0	56	1.07	88	16	52.0	72	0.52
March	93	42	67.5	51	2.05	88	43	63.5	45	0.18	92	38	65.0	54	0.28	98	26	62.0	72	0.12
April	100	46	73	54	2.47	98	31	64.5	67	0.07	90	44	72	46	5.71	98	34	66.0	64	2.96
May	116	63	89.5	53	0.63	101	47	74.0	54	0.00	104	61	83 9	43	0.61	104	53	78.5	51	0.08
June	104	58	81.0	46	5.12	104	69	86.5	35	0.08	98	55	83	43	2.32	103	48	75.5	55	6.98

daily consumption. The manufacture of flour, of lumber, of machinery, furniture, carriages and wagons, of cotton goods, of packed meats, leather and leather goods, might easily be ten-fold what it now is but for a lack of enterprise and push in these matters. The annual product of mines and manufactories in the State in 1870, according to the ninth census, was $11,517,302. It is safe to say that at the present time, including the large development of coal mining, copper mining, salt works, cotton gins and mills, saw mills, etc., etc., it is not less than $50,000,000. Yet there is much truth in the words of the editor of the *Galveston Daily News*, in December, 1879:

"The great want of Texas is manufacturing industry. With the exception of her flouring mills, cotton-seed mills, the New Braunfels woollen mills, and three or four foundries and workshops—all successful testimonials, however, as to what can be accomplished in this way—the State is altogether deficient in manufactures. Yet there is plenty of opportunity and facility in the State for the establishment and successful operation of such in a variety of lines. State demand is ample, and the means are native here, awaiting the touch of enterprise and capital. Texas, as yet, is dependent upon the outer world for everything, from ax-helves to farm-wagons, from the hoe to the steam-engine; yet the State abounds in mineral wealth, and the timber of the country is profuse in the best of varieties and boundless in extent. With the full achievement of the manufacturing era will come the industrial glory of Texas."

Agricultural Productions.—In other parts of this work we have devoted much attention to the agricultural productions of Texas, as well as to its flocks and herds, and have endeavored to show that its present products, large as they may be, are very much less than they might be, even with the land at present under culture, and the present population, if there were greater enterprise and more skilful farming. We have shown, also, that she has the land and the capacity to grow all the cotton necessary for the world's consumption, and a sufficiency of grain to feed the whole human family, as well as flocks and herds in sufficient number to furnish meat for every person on the globe; yet she is strangely

apathetic to her grand opportunities, and prefers to boast of her wealth and productions, and discourse of them in glittering generalities, rather than to work out her destiny by energetic and skilfully directed labor. Meanwhile other States, with not one-fourth of her area or natural advantages, are rapidly surpassing her in population, wealth, and manufacturing and mining development. The climate, pleasant as it is, may have something to do with this indisposition to vigorous and continued exertion; and the former prevalence of slavery there may have had its influence; but until this apathetic indolence is overcome, the State will make far less rapid progress than she dreams of making.

The latest complete statistics of agricultural products of the State are for 1878 and 1879, those of 1880 being simply conjectural. There has been undoubtedly a considerable increase in many of the crops in the last year, but nothing except the special investigation made by the census office will account for it. The following table gives the statistics of products for 1878 and 1879:

Agricultural Productions of Texas in 1878 *and* 1879.

PRODUCTS, 1878.	Quantity produced in 1878.	Av. yield per acre.	Number of acres in each crop.	Value per bushel, pound or ton.	Total valuation.
Indian corn, bu	58,396,000	26	2,246,000	44	$25,694,240
Wheat, bu	7,200,000	16	450,000	86	6,192,000
Rye, bu	54,000	18	3,000	72	38,880
Oats, bu	5,531,500	37	149,500	42	2,323,230
Potatoes, bu	604,800	84	7,200	99	598.752
Hay, tons	127,200	1.59	80,000	9.75	1,240,200
Cotton, pounds	497,310,000	275	1,808,400	8.2	40,779,420
Totals	.....	.....	4,744,100	.....	$76,866,722
PRODUCTS, 1879.					
Indian corn, bu	29,198,000	13	2,246,000	1.03	$30,073,940
Wheat, bu	3,454,200	7.6	454,500	1.15	3,972,330
Rye, bu	32,400	12	2,700	1.00	32,400
Oats, bu	3,962,500	25	158,500	.62	2,456,750
Potatoes, bu	310,200	47	6,600	1.29	400,158
Hay, tons	131,000	1.08	121.296	11.64	1,524,840
Cotton, pounds	338,625,000	175	1,935,000	.10	33.862,500
Totals	.....	.....	4,924,596	.....	$72,322,918

Of the following articles the entire production is unknown, but as there are no large tanneries and but few woollen mills, the exports of both raw-hides and wool must cover nearly the production. This is partly true also of cotton seed-cake and oil:

Wool exported, 14,568,920 pounds, valued at . .	$2,913,784
Hides exported, 28,104,065 " " . .	2,810,406
Cotton-seed cake and oil, ...	506,063
Of the next three, probably the export is less than one-half the production; lumber and shingles .	1,349,691
Sugar and molasses, ...	433,960
Miscellaneous products, ...	672,364
	$8,686,268

Adding to these the live-stock of the State, January, 1879, and January, 1880, we have the following as an approximate estimate of the entire agricultural and grazing product of the State:

JANUARY, 1879.				JANUARY, 1880.			
ANIMALS.	Number.	Price.	Value.	ANIMALS.	Number.	Price.	Value.
Horses	918,000	$22.40	$20,563,200	Horses	963,900	$24 60	$23,811,940
Mules, etc.	180,200	40.23	7,249,446	Mules and asses	101,012	45.90	8,767,451
Milch cows	544,500	14 53	7,911,285	Milch cows	566,280	13 85	7,832,973
Oxen and other cattle	4,800,000	9.15	43,920,000	Oxen and other cattle	4,464,000	10.51	46,916,640
Sheep	4,560,000	1.83	8,208,000	Sheep	5,128,400	2.13	11,072,592
Swine	1,957,000	2.91	5,694,870	Swine	1,917,860	3.00	5 753,580
Agricultural products	.....	.....	76,866,722	Agricultural products	.....	.....	72,322,918
Special exports	.....	.....	8,686,258	Special exports	.....	.....	8,686,258
Total agricultural and grazing products			$179,100,81	Total agricultural and grazing products			$185,164,357

There is, in the vast area of Texas, much arable land, and some of it, especially in Eastern and Central Texas, is of the first quality; that of the coast counties is inclined to be sandy, but produces excellent crops of tropical and semi-tropical fruits, and sugar and rice. But a very large portion of the arable lands are of the second or third quality, and are not thoroughly cultivated. The average yield of cotton, Indian corn and wheat per acre is conclusive evidence either that the land is poor or the farming very slovenly. There are farms in the State, and those not on the land which is considered of the highest quality, where the cotton crop in average years is two bales (960 pounds) to the acre, in fields of many hundred acres; and others where the corn

crop is forty to forty-five bushels, and the wheat crop twenty-five to thirty bushels. These are not extravagant or fancy crops; but they prove the truth of the old Georgia adage, that "it is as much in the man as in the land."

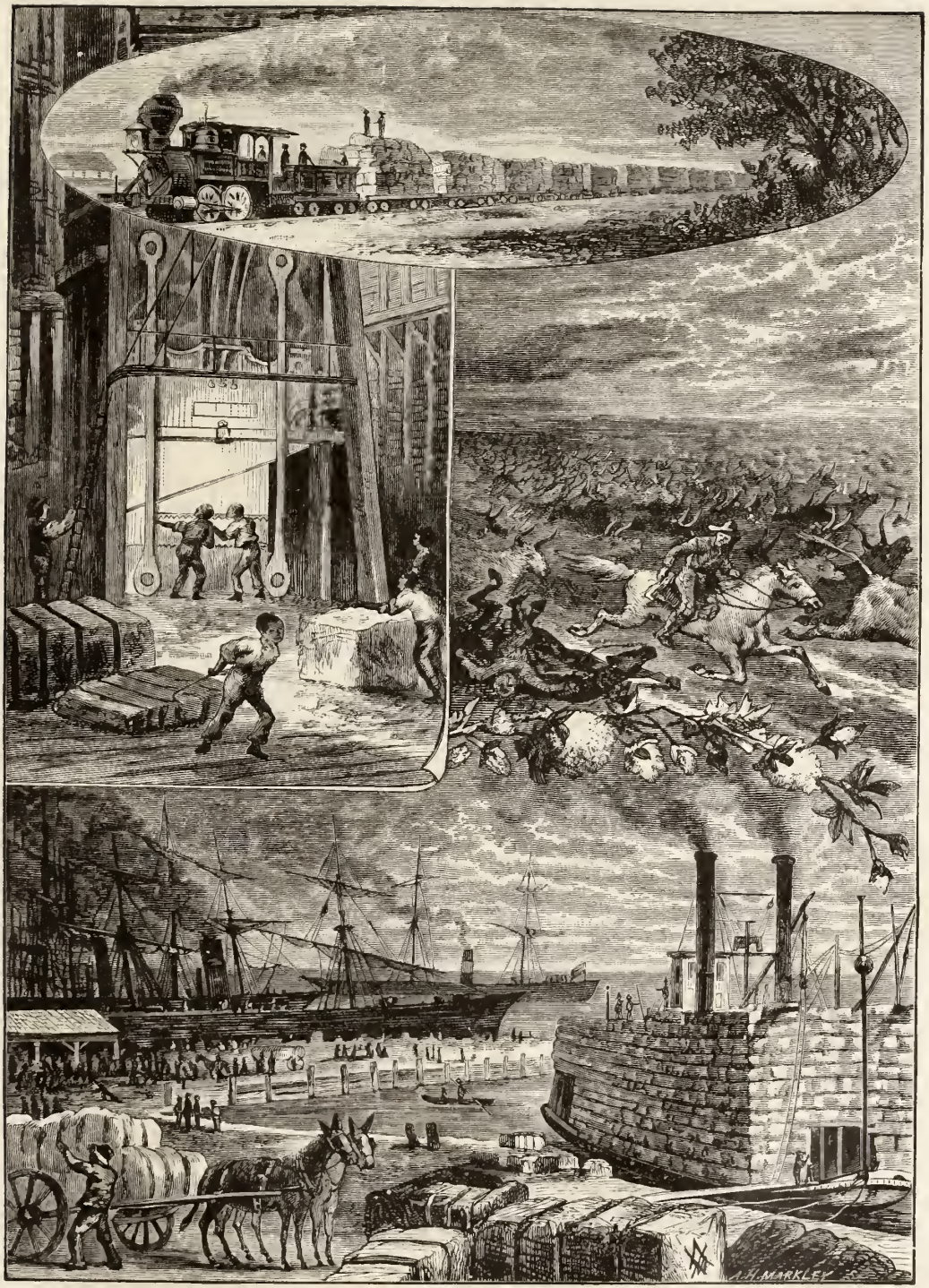
The State is well adapted to grazing, and even the northwestern region, with its small rainfall and its few streams, often dry, is a fair grazing country, if water enough can be found for the cattle and sheep. Texas has the largest amount of live-stock to be found in any one State or Territory in the Union; but even in this pursuit the carelessness and shiftlessness of her stock-growers prevent her from making as good a showing as her situation warrants. The cattle of Texas are very largely of a comparatively poor breed; long-horned, not very large, and somewhat unshapely, not inclined to take on flesh rapidly, and yet wanting in the qualities for good milkers. They bring in the market from $5 to $10 per head less than steers of the same age in Colorado, Kansas, Wyoming or Montana, and the larger stock-raisers, with few exceptions, take no pains to improve the breed. The horses, which now number more than a million, are to a very large extent mustangs and most of them wild. The mustang is, for its size, the most vicious horse in the world. There are some bronchos, a cross between some of the better breeds and the Indian pony; these are better than the mustangs, but are not very valuable. There are, of course, better horses than either in the State, and a few of the more wealthy stock-raisers are making efforts to introduce horses of better quality, but with indifferent success.

The sheep are also of poor quality—Mexican sheep which will yield only from one and a half to two and a half pounds of wool at a shearing. The average weight of the fleeces on "King" Carlin's sheep ranche is three and a half pounds, but these are nearly all of improved breeds, and the wool clip is regarded as something astonishing in Texas; while in Colorado, Wyoming, Montana, Oregon and Washington, the average weight is from five and a half to seven pounds, and the wool is of much better quality and higher price. The same indifference appears in the rearing of swine. The average Texas hog has long legs, a

humped back, a sharp snout, can run like a hound, and clear any fence without difficulty; but he is not given to taking on fat, and though his hams may have a gamy flavor, he excels most in all those points which neither breeder, butcher nor pork-packer regard as desirable in a hog. Of course such swine as these are not very profitable, especially when the adjacent, but much newer, State of Kansas has attained so nearly to perfection in raising swine. Of course there are farmers, and large farmers, who are not liable to these criticisms; men who endeavor to raise only the best animals; but these are the somewhat rare exceptions to the general rule; and with a most admirable country and climate for rearing stock, it has come to pass, that the average Texas horse, the average Texas steer, the average Texas sheep, and the average Texas hog, are about the poorest specimens of those animals respectively, to be found in all "Our Western Empire," and command the lowest prices.

There is no good reason for this either in the soil, the climate or the location. The large ranche-owner may say, indeed, that it is not worth his while to take any more pains, or put himself to any more trouble to raise better animals, for he is becoming rich as fast as he cares to, and he wouldn't know what to do with more money if he had it; but this is a very poor argument for shiftlessness and indolence. No man lives, or should live, for himself alone. It is every man's duty to do the best he can with the property which comes into his hands, and he who gives the best culture possible to his lands, who rears the best animals, or develops most fully the resources of his estates, is not only enriching himself thereby, but is benefiting his neighbor by his enterprise and example, and brings prosperity and wealth to his State, by thus showing its capacity for future growth and expansion. He is the State's best citizen who does the most for its material and intellectual advancement.

Railroads and Navigable Waters.—Texas has over 400 miles of coast line on the gulf, though its harbors are not of the first class. Still Galveston, Indianola, Corpus Christi and Brazos de Santiago are somewhat important ports, and have a foreign commerce of about $23,000,000 annually, and a much larger coasting



COTTON TRAIN. COTTON PRESS. CATTLE STAMPEDE. VIEW OF GALVESTON HARBOR.

trade. With the exception of the canal and bayou, by means of which Houston has water communication with Galveston and has become a port of entry, none of the rivers of Texas are navigable for any considerable distance. The editor of the *Galveston Daily News*, in the issue of December 29th, 1879, described the progress of the State in railroad construction since 1865 as follows:

"At the close of the war in 1865 there were but six railroads in Texas that had track laid in running order, viz.: the Buffalo Bayou, Brazos and Colorado Railroad, from Harrisburg to Alleyton, eighty miles; the Houston and Texas Central Railroad, from Houston to Millican, eighty miles; the Washington County Railroad (now the Austin division of the Central), from Hempstead to Brenham, thirty miles; the Galveston, Houston and Henderson Railroad, from Galveston to Houston, fifty miles; the Texas and New Orleans Railroad, from Houston to Liberty, forty miles; and the Columbia and Brazos River Railroad, from Houston to Columbia, fifty miles—making a total of 330 miles of railroad in actual operation fifteen years ago. The Southern Pacific Railroad (now the Texas and Pacific) was under operation from Shreveport, La., to the Texas line, but at that period had not penetrated the State. Now there are twenty-six different lines of railroad in actual operation within the State, with a total mileage in running order of 2,556 miles, showing that since the year 1865 no less than 2,226 miles of railroad have been constructed and placed in running order. Twenty of these roads are standard gauge and six are narrow gauge railroads. There are few States in the Union with a better record than this. It speaks volumes for the future of the commonwealth in every direction toward progress and prosperity, and to all appearances the next few years will witness still further advances in the important work of railroad construction."

During the year 1880 considerable progress has been made in railroad construction, and still more in railroad consolidation in the State. None of the Texas railroads are completed west of the ninety-ninth meridian, though the Texas Pacific is, we believe, under contract to El Paso; while the Southern Pacific

of California is already at or near El Paso, and is heading directly for Galveston by as nearly as possible an air-line as far as Austin, where it will probably join the Houston and Texas Central. The Atchison, Topeka and Santa Fé is also at or near El Paso, and is supposed to have a terminus on the Gulf of Mexico in view, but whether over the Southern Pacific line or not is as yet uncertain. The Missouri, Kansas and Texas Railway and the St. Louis, Iron Mountain and Southern are now virtually under one control, and will probably form some connection with Western Texas. Several short roads and connections have been constructed in Eastern Texas, and the first of January, 1881, will probably find about 3,000 miles of railroad in operation in the State, with another thousand in prospect by January, 1882.

Population of Texas.

Year of Enumeration.	Total Population.	Males.	Females.	Whites.	Free Colored.	Slaves.	Indians, Mexicans and Chinese.
1806	7,000						
1834	21,000						
1836	52,670	33,500	19,170	30,000	5,000	.....	17,670
1845	150,000	91,000	59,000				
1850	212,592	113,780	98,812	154,034	397	58,161	
1860	604,215	320,167	284,048	420,891	355	182,566	403
1870	818,579	423,557	395,022	564,700	253,475	.....	724
1880	1,510,000						

Year of Enumeration.	Natives.	Foreigners.	Density.	Ratio of Increase.	Illiteracy.	Of School Age, 5–20. Both Sexes.	Of Military Age, 18–45. Males.	Of Voting Age, 21 years and upwards. Males.
1806	.....	.....	0.02					
1834	.....	.....	0.07	300				
1836	.....	.....	0.19	150				
1845	.....	.....	0 54	185				
1850	194,433	17,681	0.77	41.70	10,583	83,206	43.909	52,666
1860	560,793	43,422	2.20	184.22	18,476	233,417	119,362	143,151
1870	756,168	62,411	3.02	36.46	221,703	319,233	158,765	184,094
1880	.....	.....	5.50	82.21				

Population.—The growth of Texas has been more rapid than that of most of the Southern States, though less so than that of some of the Northern States. The preceding table gives the population of the State at different periods, and other particulars.

Of this population, the number of foreign birth has never been very large. The Germans have some colonies in New Braunfels and its vicinity, and there are a considerable number of Irish, English, French and Spanish, a few Italians and many Mexicans and half-breeds of the lower classes, and some Indians. The last two classes find employment as cow-boys, shepherds, teamsters, etc. But there has been for the past thirty years and more a steady stream of emigration into Texas from the Southern, Gulf and Atlantic States, and, since the war, from the States of the Mississippi valley—Illinois furnishing, perhaps, the largest number. The people are brave, free-hearted and hospitable, and immigrants are made welcome there; but there is need of a larger infusion of Northern thrift, enterprise and thoroughness. The habits, and perhaps some of the vices engendered by slavery, have not been entirely eradicated, but progress is made every year, and eventually this vast domain will be developed on a grand scale by the efforts of the generation now coming upon the stage.

Counties and Principal Cities and Towns.—There are 220 counties in Texas, of which, however, only 154 are as yet fully organized, while some of the unorganized counties are vast tracts as yet unpeopled, and some of them are designated as territories rather than counties. The assessment valuation of the year 1877–1878, the last published, seems to be made on a basis of fifty per cent. of the true valuation, and perhaps on sixty per cent. of the numbers of live-stock. It is as follows:

Acres of land	76,480,450
Miles of railroad	1,781
Number of steamboats and other vessels	575
Number of carriages and buggies	131,920
Number of horses and mules	985,561
Number of cattle	3,312,356
Number of asses	5,371
Number of sheep	2,883,372
Number of goats	229,618
Number of hogs	1,292,909

The total value of all property assessed was $318,985,765. A true valuation would be not less than $450,000,000.

Of the towns and cities, Galveston, the commercial capital and chief port of entry, is the largest. It has a very poor harbor, the entrance to the bay being obstructed by a bar nearly four miles across. Its population according to the census of 1880 is 22,253. It is said not to be growing, though it has a good back country, all of Central and Eastern Texas, to furnish it with trade. Houston, which has already become a great railroad centre, had in June, 1880, 18,646; and San Antonio, which is called the capital of Western Texas, has a large trade from Northwestern Texas, as well as from other sections of the State, and is rich in historic interest, had at the same date 20,561. Austin, the capital of the State, had in June, 1880, 10,960. Waco and Dallas are of about the same size as Austin, the latter having 10,358 and the former a little less than 10,000. Fort Worth has not quite 10,000; Sherman, about 8,000 or 9,000; Denison, Marshall, Paris, Jefferson, Corpus Christi, Brownsville, Laredo, Brenham, Indianola, and perhaps one or two other towns, have 5,000 or more inhabitants, and there may be a dozen, New Braunfels, the chief town of the German colonists, among them, which range between 3,000 and 5,000.

Education.—Public school education in Texas has not been well managed. There is, indeed, nominally, provision for a school fund, which may eventually become large, but the school lands are held at a price considerably higher than other lands of equal value, and the State and railroads have so much land to sell that the school lands are neglected.

During the late civil war, the school fund and its income were diverted to other purposes, and though an effort has been made to increase the amount of the fund since the war, it has not proved very successful, and the schools have been much hampered by bad legislation. The permanent school fund on September 1, 1879, was stated at $3,300,581, but the income from it, which constituted the available school fund, was only $132,883. Three and a half months later, viz.: December 15, 1879, the State Treasurer reports the permanent school fund of the State as only

$1,154,400, and the available school fund as $102,409. We cannot explain the discrepancy. Some money is raised for schools by taxation, but the taxes are not promptly paid. The whole actual expenditure for public schools does not probably exceed $550,000 per annum. The number of children of school age reported in 1879 (eight organized and all the unorganized counties not reporting) was 224,720. The various reports in regard to public school education are so conflicting as to impair confidence in their accuracy. That of the United States Commissioner of Education for the year 1878, from Secretary Hollingsworth, of the State Board of Education, gives the following figures, which do not agree with any others: Counties reporting, 137 (there are 154 organized counties in the State); youth of school age (eight to fourteen), 194,353 (other reports for the same year give 168,294 and 164,294); whole enrolment in public schools, 146,946; non-attendants, 23,963 (these figures again do not agree); whole number of illiterates of school age, 61,123. Whole number of organized schools, 4,633, of which 905 are for colored pupils; average time of schools in days, 88 days; 243 school-houses built within the year, at a cost of $54,267. Whole number of teachers reported, 4,330—303 less than the number of schools. Of these 2,895 were white males; 760 white females; 562 colored males, and 113 colored females. The average pay of all male teachers was $42 per month, and of all females, $33 per month. The whole income of public schools was stated to be $859,484, and the whole expenditure, $747,534. *Per contra*, it is stated recently that the wages of the teachers are sadly in arrears. The amount of the permanent school fund in 1878 is stated to have been $3,385,571, while a year later it was only one-third of that sum. There is certainly room for improvement. Some of the cities, as Houston, Dallas and San Antonio, have good schools. The only normal schools are those sustained by private enterprise or by religious associations.

There are five so-called universities, viz.: Baylor, Southwestern, Trinity, Waco and St. Mary's; and four colleges: Austin, Mansfield, Marvin and Salado. Five of them admit young women on equal terms with young men as students. None of these insti-

tutions have more than a local reputation. These and the Texas Military Institute and the State Agricultural and Mechanical College, at College Station, in Brazos county, had together 1,984 students in the preparatory and collegiate departments.

There were also one theological, one law and one medical school, and institutions for the deaf and dumb, and for the blind, in the State.

Lands for Immigrants.—Texas is the only State or Territory of "Our Western Empire" in which the United States government holds no land, the State being annexed to the Union as an independent republic, and retaining its unoccupied lands in its own possession. We have given in Part II. of this work a full account of the modes of procuring lands from the State, and it is not necessary that we should repeat them here. (See page 257.)

Religious Denominations.—The census returns of these for 1880 are not yet available, and would not give any information in regard to the three important items of number of clergymen, ministers or priests, the number of communicants, and the adherent population, if they were. Our latest information on these points is that of 1875, as exhibited in the following table:

Denominations.	No. of church organizations, 1875.	No. of church edifices, 1875.	No. of clergymen, ministers or priests.	No. of church members, or communicants, 1875.	Adherent population, 1875.	No. of sittings, 1875.	Value of church property, 1875.
All Denominations	2,050	1,764	1,307	167,850	330,150	220,510	$1,979,600
Baptists	1,047	853	590	59 6 7	8 000	89 30	447,500
Christian Connection and Disciples	36	29	21	2,816	14,080	5,100	27,400
Congregationalists	8	7	7	359	1,600	75	20,000
Protestant Episcopal Church	45	38	41	2,612	12,000	11,4 x	168,400
Jews	5	5	5	1,80	2,300	1,50	21,000
Lutherans	45	39	22	4,127	18,000	7,650	75,250
Methodist Church South	421*	386	298	43,000	215,000	89,200	305,100
Methodist Episcopal Church	163	124	98	16,200	81,000	12,40	87,600
Methodist, African, Zion, etc	106	83	57	17,000	62,000	8,30	41,500
Methodist, Protestant	35	25	17	2,500	8,000	61	12,500
Presbyterian, Regular	138	126	88	6,951	30,250	27,0 x	239,000
Presbyterian, Cumberland	79	67	41	8,450	42,250	9,15	93,000
Roman Catholics	99	86	97	.....	13,000	26,20	401,000
Union, and minor sects	6	6	6	1,200	6,000	650	4,800

Historical Data.—The following memoranda of dates and events in Texan history are from a "Chronological Compend

of Texas History," prepared for "Burke's Texas Almanac for 1880," by D. W. C. Baker. They have been carefully verified by us:

"Texas is supposed to have its name from an Indian village called Texas on the Neches river. Its meaning in the Indian language is *friend.*

"In 1685 a French cavalier named Robert de La Salle, with a small colony, landed at Matagorda bay and built a fortress, which he called in honor of the King of France, St. Louis. This colony was soon exterminated by disease and the hostility of the Indians; and La Salle was killed by one of his own mutinous followers.

"Spain next attempted the occupation of Texas, and in 1689 a colony was landed and a mission was built near the spot where four years previously La Salle had landed. This colony was soon broken up by the same causes as the former one.

"Between the years 1690 and 1720 the Spanish Roman Catholics established many missions and fortresses within the borders of Texas. Three missions were built and occupied by monks and friars, and by soldiers who were sent to defend them.

"After many vicissitudes the Spanish missions were within a century from their establishment one after another abandoned, leaving throughout the State crumbling ruins of massive buildings, which to this day sufficiently attest the self-sacrificing devotion and labors of those Christian ambassadors from the Old World.

"The fate of the inmates of the mission of San Saba was one of the most deplorable recorded in history. This mission was established in 1734, and for a while the Indians proved friendly. In 1752 a silver mine was discovered there, which drew to the place a number of adventurers. Trouble soon arose between these and the savages, who in their rage made an onslaught on the fortress, and slew all who were there, not one escaping.

"Thus the efforts of France and Spain to effect a permanent occupation of Texas failed.

"France formally abandoned her claims in 1763, and in 1821 Mexico threw off the Spanish yoke, and Spain thereafter ceased

to press her claims for it. Texas thus became a province of Mexico in 1821. At that time, despite the blood and treasure which had been expended by the governments of the old world to hold Texas, nothing had been accomplished. It was practically as much a wilderness in 1821 as when La Salle set foot upon its shores in 1685, the white population being only 3,000 in the whole Territory.

"But the time had now come when the Anglo-American turned his steps hither, and history has yet to record where he has ever failed of his undertaking. The permanent colonization of Texas by citizens of the United States began in 1821.

"In 1821–22 Stephen F. Austin, to whom justly belongs the title, Father of Texas, introduced a large number of colonists, and furnished them homes. After devoting the best years of his life to the accomplishment of his darling enterprise of establishing permanent and prosperous colonies in Texas; after undergoing hardships and braving dangers such as few men have ever experienced, he was stricken down with disease at Columbia, Brazoria county, and there died, December 25th, 1836, in the forty-fifth year of his age. From the advent of Austin until 1830 the American population of Texas continued rapidly to increase, and at that time numbered about 20,000.

"Then the government of Mexico became alarmed at the rapidly increasing strength and influence of the young colony, and took steps to prevent its further growth. The Dictator of Mexico, Bustamente, issued a decree suspending all existing colony contracts, and forbidding under severe penalty any citizen of the United States from settling in Texas. This measure did not have the desired effect, and the tide of immigration continued to pour into the country.

"In 1833 the citizens of Texas, in the proper exercise of their rights as freemen, called a council at San Felipe. Of this council W. H. Wharton was president. A memorial and petition was prepared, setting forth in calm and forcible language the wants and grievances of the colonists, and praying the central power at Mexico for a separate State organization. This memorial was sent to Mexico by the hands of Stephen F. Austin. No definite

response was given to this petition, and Austin was thrown into prison, where he remained many months. Thus matters remained until 1835, when the colonists becoming fully satisfied that prompt action could alone protect their interests, held primary meetings and took steps to secure a separate government. Santa Anna, the Dictator, at once sent large bodies of soldiers to quell the revolutionary spirit which now showed itself.

"On the 2d of October the opening battle of the Texas revolution was fought at Gonzales.

"On the 8th day of October, 1835, a force of Texans under Captain Collingsworth, attacked and captured the fort at Goliad. On the morning of the 28th of October a detachment of Texans under Captains Fannin and Bowie, who were encamped on the bank of the San Antonio river near the Mission of Conception, was surrounded and attacked by a large body of Mexicans. A short but decisive action followed, in which the Mexicans were completely routed, and fled, leaving one hundred dead upon the field.

"On the 3d day of November, 1835, a general consultation, consisting of delegates of the colonists, assembled at San Felipe for the purpose of establishing a provisional government. This consultation elected Henry Smith Provisional Governor of Texas, and adopted a declaration setting forth that Texas no longer owed allegiance to the nominal Mexican Republic.

"On the 26th day of November, 1835, a skirmish took place near San Antonio, called the *grass fight*, in which the Mexicans were driven to their entrenchments with a loss of fifty men.

"On the 5th day of December, 1835, the forces of the colonists in two divisions, under command of Col. J. W. Johnson and Col. Benj. R. Milam, made a series of determined assaults upon the city of San Antonio, which was occupied by a large force of the enemy. After a number of sanguinary battles, in which great valor was displayed on both sides, the Texan forces obtained complete possession of the city on the 10th of December, and General Cos, with eleven hundred soldiers surrendered. In this affair the heroic Milam was slain. This decisive conquest had the effect of exciting much enthusiasm among the colonists.

"Santa Anna now determined to crush out the rebellion in Texas by one decisive campaign, and in January, 1836, he equipped an army of 7,500 picked men, and placing himself at their head he marched into Texas.

"The fortress of the Alamo was then garrisoned by a force of 170 men, commanded by Col. W. B. Travis. They were soon surrounded by the whole Mexican army and summoned to surrender. This being refused, a furious bombardment was commenced, which was continued from the 25th of February until the 6th day of March, 1836. On the morning of the last named day the besiegers made a desperate assault upon the garrison. The particulars of that struggle can never be known. Enough to say the heroic band, exhausted by incessant toil, watchfulness and privation, were at length destroyed. Of the whole number within the walls of the fort only two escaped, a woman and a child. This victory cost Santa Anna 1,500 of his best soldiers. Close upon the heels of the dreadful massacre at the Alamo came another equally appalling.

"Col. J. W. Fannin, who was stationed at Goliad with a garrison of 500 men, was, on the 19th day of March, 1836, surrounded by a vastly superior force of the enemy. Notwithstanding the Texans were almost entirely destitute of supplies and ammunition, a desperate battle was fought, in which after inflicting a loss of 300 men upon the enemy, Col. Fannin was compelled to surrender, on promise of honorable treatment. The forces thus capitulated were, in violation of the terms of surrender, marched out and inhumanly shot on the 27th day of March, 1836.

"General Sam Houston, who had been appointed Commander-in-Chief of the Texan army, now fell back before the invader, in order to draw him as far as possible from his base of supplies, as well as to recruit his little army. He continued his retreat until, on the 20th day of April, he formed his troops in line of battle on the banks of the San Jacinto river.

"The Mexican commander eagerly followed, and on the 21st day of April, 1836, was fought the memorable battle of San Jacinto. This decisive encounter resulted in the total rout of the Mexican army and the capture of Santa Anna, and secured the independence of Texas.

"On the 2d day of March, 1836, a convention of the people of Texas at Washington, on the Brazos, adopted a declaration of independence and established a government *ad interim*, by electing David G. Burnet President.

"The population of Texas now increased rapidly.

"The first newspaper in Texas was established in San Felipe in October, 1835, by Joseph Baker and Gail and Thomas H. Borden.

"September, 1836. General Sam Houston and M. B. Lamar elected first constitutional President and Vice-President of the Republic.

"October, 1836. First Congress met at Columbia. By this body wise laws were enacted, an able judiciary established, the army organized, and the people put in possession of their civil and political rights.

"March, 1839. The Congress of the United States acknowledged the independence of Texas.

"October, 1839. Seat of government established at the new city of Austin. It had previously been first at San Felipe, next at Washington, next at Harrisburg, next at Galveston, next at Velasco, next at Columbia, next at Houston. In 1842 a Mexican invasion into Western Texas induced General Houston to order the removal of the government offices to Houston, where they remained until November of that year, when the seat of government was removed to Washington. In 1850, and again in 1870, elections were held by which the capital of Texas was permanently fixed at Austin, where it now is.

"In September, 1838, M. B. Lamar and David G. Burnet were elected President and Vice-President. In 1837, the independence of Texas was acknowledged by France, and in 1840 by England, Holland and Belgium. September, 1841, General Houston and Edward Burleson were elected President and Vice-President. September, 1844, Anson Jones was elected President, and K. L. Anderson, Vice-President.

"In February, 1845, Texas was annexed to the United States.

"July, 1845, first State Convention met at Austin.

"November, 1845, Constitution adopted.

"From 1853 to 1856, public buildings were erected at Austin, the debt of the Republic cancelled, the Asylum founded, criminal code adopted, permanent school fund set apart, and aid given to railroads.

"In 1859, General Sam Houston and Edward Clark were elected Governor and Lieutenant-Governor.

"February, 1861, the ordinance of secession was passed by Texas Convention.

"March 18th, 1861, General Houston retired from office to his home in Huntsville, where he died, July, 1863.

"August, 1861, F. R. Lubbock and John M. Crockett were elected Governor and Lieutenant-Governor.

"October, 1862, Galveston captured by Federal troops.

"January, 1863, Galveston retaken by Confederate forces.

"August, 1863, Pendleton Murrah and F. S. Stockdale were elected Governor and Lieutenant-Governor.

"In 1865, A. J. Hamilton was appointed by the President, provisional Governor of Texas.

"June 19th, 1865, General Granger issued a general order proclaiming freedom of slaves in Texas.

"February 10th, 1866, first reconstruction convention assembled at Austin, and framed constitution.

"July, 1866, J. W. Throckmorton and G. W. Jones were elected Governor and Lieutenant-Governor.

"March, 1867, Texas again under military rule.

"August, 1867, E. M. Pease appointed provisional Governor.

"June, 1868, second reconstruction convention met at Austin and framed constitution.

"November, 1869, E. J. Davis and J. W. Flannagan were elected Governor and Lieutenant-Governor.

"In 1870, Senators and Representatives from Texas again admitted into Congress.

"December, 1873, Richard Coke and R. B. Hubbard were elected Governor and Lieutenant-Governor of Texas, and they were re-elected to these positions in February, 1876.

"The present State Constitution was framed by a Convention which assembled at Austin, September 6th, 1875. Governor Coke,

having been elected United States Senator, resigned the office of Governor, and R. B. Hubbard became Governor of Texas, December 1st, 1876.

"November, 1878, O. M. Roberts and J. D. Sayers were elected Governor and Lieutenant-Governor, which positions they now hold.

"At the first election for President of Texas in 1836 the whole vote cast was only 5,704; in 1838 the vote was 7,247; in 1840 it was 11,531; in 1844 it was 12,752; in 1845 the vote for Governor was only 9,578, because many neglected to attend the polls; in 1847 it was 14,476; in 1849 it was 21,715; in 1851 it was 28,309; in 1853 it was 36,152; in 1855 it was 45,339; in 1857 it was 56,180; in 1859 it was 64,627; in 1861 it dropped to 57,443 on account of the neglect of people to vote, while in 1863, when most of the voters were in the Confederate army, it was only 31,037. In 1866 it rose to 60,682; in 1869 it was 79,373; in 1873 it was 128,361; in 1876 it was 198,137; in 1878 it was 236,917; in 1880 the vote for President was 237,337."

Conclusion.—Land is so cheap in Texas, and some of it so good, the facilities for stock-raising, as well as for farming, are so desirable, the climate so mild and healthful, and the greater part of the State is now, or soon will be, so accessible by steamers and railroads, that it presents great advantages to immigrants. There should be better farming, more care in improving live-stock of all kinds; more enterprise in engaging in manufacturing and mining, and generally less brag and bluster and more industry, thrift and hard work. The public schools should be elevated and improved, and the laws somewhat more rigidly enforced. We think immigrants from our Southern States, and from Central and Southern Europe, will be more welcome and be better pleased with the country than those from more northern climates; but in many respects Texas is a very good State for immigrants.

CHAPTER XIX.

UTAH TERRITORY.

UTAH A PECULIAR TERRITORY—ITS LOCATION, BOUNDARIES, AREA AND EXTENT—FORESTS AND VEGETATION—ALTITUDE OF ITS MOUNTAINS AND VALLEYS—ZOÖLOGY—GEOLOGY—MINERALOGY—TOPOGRAPHY AND GENERAL FEATURES—THE GREAT SALT LAKE BASIN—CACHE, SAN PETE AND SEVIER VALLEYS—THE COLORADO BASIN, EAST OF THE WAHSATCH MOUNTAINS—CLIMATE—METEOROLOGY OF SALT LAKE CITY AND CAMP DOUGLAS—NOTES ON THE TEMPERATURE, RAINFALL, ETC., OF OTHER PARTS OF THE TERRITORY—ADVANTAGES OF UTAH AS A SANITARY RESORT—DISEASES FOR WHICH ITS CLIMATE IS BENEFICIAL—OPINION OF EMINENT ARMY SURGEONS ON THE SUBJECT—SOIL AND AGRICULTURE—IRRIGATION VERY GENERALLY REQUIRED—IMMENSE CROPS WHERE IT IS PRACTISED—NON-IRRIGABLE LANDS SOMETIMES PRODUCTIVE WITH DEEP PLOWING—TIMBER—YIELD OF CEREAL AND OTHER PRODUCTS—FRUIT-CULTURE—STOCK-FARMING—SHEEP-FARMING—EVILS OF MIGRATORY HERDS—GOV. EMERY'S COMPLAINTS OF CALIFORNIA FLOCKS—MINES AND MINING PRODUCTS—WIDE DISTRIBUTION OF GOLD, SILVER, LEAD, COPPER, IRON, COAL, SULPHUR, SODA, SALT, AND BORAX—THE MINES OF THE PRECIOUS METALS IN THE SALT LAKE BASIN VERY RICH AND EASILY ACCESSIBLE—RAILROADS—OBJECTS OF INTEREST—THE "TEMPLE OF MUSIC" ON THE COLORADO—TEMPLES ON THE RIO VIRGEN—THE AMERICAN FORK CANON—IT IS CALLED THE "YOSEMITE" OF UTAH—THE GREAT SALT LAKE MINERAL AND HOT SPRINGS—FINANCES—POPULATION-TABLE—THE POPULATION OF UTAH PECULIAR—ITS EARLY SETTLEMENT BY THE MORMONS—MOTIVES WHICH LED TO THEIR MIGRATION—MORMONISM A RELIGIOUS OLIGARCHY—ITS DESPOTIC RULE—ITS CRIMES—POLYGAMY ITS CORNER-STONE—ITS DEFIANCE OF THE GOVERNMENT—ITS PROPAGANDISM—RELIGIOUS DENOMINATIONS—EDUCATION—MORAL AND SOCIAL CONDITION—COUNTIES AND PRINCIPAL TOWNS—HISTORICAL DATA.

UTAH is a peculiar Territory; peculiar in its situation, half in the Great Salt Lake basin, and half in the equally wild and deeply grooved basin of the Colorado river; singular in its geology, its minerals, its salt and fresh water lakes and rivers, with no outlet beyond its walls of rock; peculiar in its deposits of the precious metals and coal; peculiar in its deserts, and still more peculiar in the character, religious, political, and social, of the majority of its inhabitants.

It is one of the central Territories of the middle belt of States

and Territories of "Our Western Empire." It is bounded wholly by mathematico-geographical lines, lying between the parallels of 37° and 42° north latitude, and 109° and 114° west longitude from Greenwich. Its northern boundaries are Idaho and Wyoming; its eastern, Wyoming and Colorado; its southern, Arizona, and its western, Nevada. It is not quite a square, a tract which extends from the 41st to the 42d parallel and from the 111th to the 114th meridian being added to it on the north to include Great Salt lake, Bear lake, etc., and to make a part of its northern boundary coterminous with that of Idaho and Nevada. It has a maximum length of 325 miles by a breadth of 300; area 84,476 square miles, or 54,064,640 acres.

Forests and Vegetation.—On the mountains and along the water-courses are found the following trees, shrubs and vines, to wit: cottonwood, dwarf birch, willow, quaking aspen, mountain maple, box-elder, scrub cedar, scrub oak, mountain oak, white, red, yellow and piñon pine, white spruce, balsam-fir, mountain mahogany, common elder, dwarf hawthorn, sumac, wild hop, wild rose, dwarf sunflower, and of edible berries, service berry, bull-berry, wild cherry, wild currant, etc. Most of the plants belong to the *compositeæ*, *cruciferæ*, *leguminosæ*, *boraginaceæ*, or *rosaceæ*.

Altitude of Mountains and Valleys.—It is intersected from north to south by the Wahsatch mountains, dividing it nearly equally between the Great Basin and the basin of the Rio Colorado. The altitude of the surface on both sides of this mountain range is about the same, the valleys 4,000 to 6,000 feet above sea-level; the mountains, 6,000 to 13,000. West of the Wahsatch, the drainage is into lakes and sinks which have no outlet, the largest of which is Great Salt lake, with an elevation of 4,260 feet, a shore line of 350 miles, and an area of 3,000 to 4,000 square miles. It receives the Bear and Weber, and many smaller streams, and, also, the discharge from Utah lake through the River Jordan. The latter is fresh water, about ten by thirty miles in extent, the receptacle of American, Provo, and Spanish rivers. There are numerous valleys, the lowest of them higher than the average summit of the Alleghanies. Following

are the ascertained altitudes of representative lakes, rivers, springs, valleys, and towns, namely:

Great Salt Lake		4,260	Skull Valley,	Tooele County	4,850
Utah Lake		4,500	Deep Creek,	Tooele County	5,230
Sevier Lake		4,600	Nephi,	Juab County	4,927
Little Salt Lake,	Paragoonah	6,220	Fillmore,	Millard County	6,024
Bear Lake,	Laketown	6,000	Antelope Springs,	Millard County	5,850
Bear River,	Randolph	6,440	Beaver,	Beaver County	6,050
Bear River,	Hampton's Bridge	4,540	Fort Cameron,	Beaver County	6,100
Weber River,	Kamas	6,300	Wah Wah Springs,	Beaver County	5,450
Weber River,	Ogden	4,300	Buckhorn Springs,	Iron County	5,690
Provo River,	Heber	5,574	Desert Springs,	Iron County	5,880
Provo River,	Provo	4,520	Iron City,	Iron County	6,100
San Pitch River,	Mt. Pleasant	6,090	Cedar City,	Iron County	5,726
San Pitch River,	Gunnison	5,144	St. George,	Washington County.	2,900
Sevier River,	Pangnitch	6,270	Diamond,	Tintic Mines	6,370
Sevier River,	Bridge	4,765	Strawberry Valley,	Wahsatch County	7,716
Cache Valley,	Logan	4,550	Rabbit Valley,	Sevier County	6,820
Salt Lake City,	Signal Office	4,350	Kanab,	Kane County	4,900
Fort Douglas,	Near Salt Lake City.	4,800	Paria,	Kane County	4,562
Bush Valley,	Tooele County	5,200	Kanarra,	Rim of Basin	5,420

Zoölogy.—Among the animals are the coyote, gray wolf, wolverine, mountain sheep, buffalo (now extinct in Utah), antelope, elk, moose; black-tailed, white-tailed, and mule deer; grizzly, black, and cinnamon bear; civet cat, striped squirrel, gopher, prairie-dog, beaver, porcupine, badger, skunk, wild cat, lynx, sage and jack-rabbit and cottontail. Birds: golden and bald eagle and osprey; horned, screech and burrowing owl; duck; pigeon; sparrow, sharp shinned and gos-hawk: woodpecker, raven, yellow-billed magpie, jay, blackbird, ground robin, song sparrow; purple, grass and Gambell's finch; fly-catcher, wren, water ouzel, sky lark, English snipe, winter yellow-legs, spotted sand piper, great blue heron, bittern, stork, swan, pelican, Peale's egret, ground dove, red shafted flicker, mallard and green-winged teal, goose, ptarmigan, humming bird, mountain quail, sage cock and pine hen. Reptiles: Rattle-snake, water-snake, harlequin-snake, and lizards. The tarantula and scorpion are found, but are not common.

Geology.—The greater part of the rock of the interior mountain area is a series of conformable stratified beds,* reaching

* Clarence King's Explanations 40th parallel.

from the early Azoic to the late Jurassic. In the latter these beds were raised, and the Sierras, the Wahsatch, and the parallel ranges of the Great Basin were the consequence. In this upheaval important masses of granite broke through, accompanied by quartz, porphyries, felsite rocks, and notably sienitic granite, with some granulite and gretsen occasionally. Then, the Pacific Ocean on the west, and the ocean that filled the Mississippi Basin on the east, laid down a system of Cretaceous and Tertiary strata. These outlying shore beds, subsequently to the Miocene, were themselves raised and folded, forming the Pacific Coast Range and the chains east of the Wahsatch; volcanic rocks accompanying this upheaval as granite did the former one. Still later a final series of disturbances occurred, but these last had but small connection with the region under consideration.

There is a general parallelism of the mountain chains, and all the structural features of local geology, the ranges, strike of great areas of upturned strata, larger outbursts of gigantic rocks, etc., are nearly parallel with the meridian. So the precious metals arrange themselves in parallel longitudinal zones. There is a zone of quicksilver, tin, and chromic iron on the coast ranges; one of copper along the foot-hills of the Sierras; one of gold farther up the Sierras, the gold veins and resultant placers extending far into Alaska; one of silver, with comparatively little base metal, along the east base of the Sierras, stretching into Mexico; silver mines with complicated associations through Middle Mexico, Arizona, Middle Nevada, and Central Idaho; argentiferous galena through New Mexico, Utah, and Western Montana; and, still farther east, a continuous chain of gold deposits in New Mexico, Colorado, Wyoming and Montana. The Jurassic disturbances in all probability are the dating point of a large class of lodes: *a*, those wholly enclosed in the granites, and *b*, those in metamorphic beds of the series extending from the Azoic to the Jurassic. To this period may be referred the gold veins of California, those of the Humboldt mines, and those of White Pine, all of class *b;* and the Reese river veins, partly *a*, and partly *b*. The Colorado lodes are somewhat unique, and in general belong to the ancient type. To the Tertiary period

may be definitely assigned the mineral veins traversing the early volcanic rock; as the Comstock Lode and veins of the Owyhee District, Idaho. By far the greater number of metalliferous lodes occur in the stratified metamorphic rocks or the ancient eruptive rocks of the Jurassic upheaval; yet very important, and, perhaps, more wonderfully productive, have been those silver lodes which lie wholly in the recent volcanic formations.

Mineralogy.—Utah is probably the richest Territory in "Our Western Empire" in its deposits of gold and silver, though Arizona, Colorado, Montana, Nevada and California might be inclined to dispute the justice of her claim. The region south of Great Salt Lake, between the Jordan river and the Oquirrh Mountains, and the whole of the Oquirrh range on both sides, is full of gold and silver veins. Next south of these comes the Tintic Silver district, and as we proceed south, still in the Great Salt Lake Basin, the whole region from Sevier lake to the Arizona line abounds in lodes of silver, gold and copper, with occasional beds of coal, iron and alum. On the western slope of the Wahsatch Mountains, which forms the eastern wall of the basin, there are numerous silver mines, and they extend also east of the Wahsatch, especially along the line of the Uintah Mountains. But those counties in the Colorado Basin are especially rich in coal, much of it adapted to smelting purposes. There are twelve counties in which extensive coal lands have been found. The iron deposits of all varieties are of enormous extent in every part of the Territory. Utah could produce all the iron and steel needed in the United States more cheaply than any other section. Sulphur exists in immense beds. Salt abounds everywhere. Other minerals are copper, lead, manganese, antimony, chrome, red and white ochre, jet, asphalt, mineral wax and mineral waters. The mines of antimony in Southern Utah are said by Professor Newberry to be richer and more easily worked than any other in America.

Topography, General Features.—The settled part of Utah lies along the western base of the Wahsatch Mountains, which run through the heart of the Territory from north to south, reaching their greatest altitude near Salt Lake City (where they abut on

the Uintah Range coming from the east, forming the cross-bar of a T), and almost losing themselves in the sandstone plateau of the Rio Colorado in the south. Abreast of Salt Lake City the Wahsatch Range is 10,000 to 12,000 feet in altitude. Here, within a small area, rise the Bear and Weber rivers, which empty into Salt lake; the Provo, which empties into Utah lake; and some of the main affluents of the Green river, which, with the Grand, become the Rio Colorado, lower down. It is in the vicinity of the heads of these rivers that the Emma, the Flagstaff, the Vallejo, the Ontario, McHenry and various other well-known mines are situated. Nearly one-half of the Territory lies south of the Uintah Range, and east of the Wahsatch Range proper, and is drained by the Green and Colorado rivers and their tributaries. Its general altitude along these streams is between 4,000 and 5,000 feet; it is much broken by mountains, and is but partially explored and not settled at all. It contains many thousand square miles of fine grazing country, above the Grand cañon, with more or less arable land, and no one yet knows what mineral treasures. It is believed that the Denver and Rio Grande Railroad, after being drawn to the head of the Arkansas river by the mineral attractions of Leadville, will find an easy way through this region, entering the Great Basin via some of the feasible railroad passes of the Wahsatch. A wide strip of the western part of the Territory is lake, sink, mountain or desert. The inhabited part is chiefly a narrow belt, watered by the streams of the western slope of the Wahsatch Range, which lose themselves in inland lakes or basins. The largest and best known of these is the Great Salt Lake Basin.

Great Salt Lake Basin.—Including the valley of Bear river up to the Gates on the north, the Utah Basin, on the south, whose waters are discharged into Great Salt lake, through Jordan river, it is 200 miles in length by forty or fifty in width. The principal streams which are lost in Great Salt lake are the Malad and Bear, the latter 300 miles long, on the north; Box Elder and Willow creeks, Ogden and Weber rivers on the east; and City, Mill and the Cottonwood creeks and the river Jordan on the south. Into Utah lake flow the American, Provo and Spanish

forks, though they are not forks but independent mountain streams, and Salt creek. All of them but the Malad have their sources in the Wahsatch Range, which collects the snows in winter that give them life and being. Where they emerge from their cañons, settlements have been made on them, and their waters appropriated, so far as it can be cheaply done, for the purposes of irrigation, and in some cases, of furnishing power for mills. Of these settlements, the largest is Salt Lake City, located about centrally as regards the length of the entire basin, at the base of the Wahsatch Range, ten or twelve miles from the southeast shore of Salt lake, containing a population, June, 1880, of 20,768. The city is supplied with water by City creek. It is laid out with broad streets and sidewalks, and is built up more or less for two miles square, shade and fruit trees largely hiding the buildings in the summer season. It has ample hotel accommodations, gas, water and street cars; is peaceful and orderly; is connected with the outside world and adjacent points of interest or business by rail. Enjoying the most healthy and agreeable climate of perhaps any large town in the United States, with street cars running to the famous Warm Springs, and the bathing shores of Salt lake but a half-hour's ride on the rail distant; with the peaks of the Wahsatch, the Oquirrh, and other ranges ruffling the clouds at every point of the horizon; with picturesque mountain cañons threaded by trout streams accessible by rail, it is one of the most attractive places of summer resort for tourists seeking health or pleasure in all the world. The eastern edge of Salt Lake Basin is dotted with settlements, and is highly cultivated wherever water can be got on the ground. There are the North String, Bear River City, Corinne, Brigham City, Willard, North Ogden, Ogden, Kaysville, Farmington, Centerville, Bountiful, Salt Lake City, the Cottonwoods, Sandy, West Jordan, Deweyville, Lehi, American Fork, Pleasant Grove, Provo, Springville, Spanish Fork, Salem, Payson, Santaquin, Mona, Nephi and Levan. Ogden, at the intersection of the east and west and north and south railroads, is the town next in importance to Salt Lake City, the capital. It is in the forks of Ogden and Weber rivers, is within a short drive of fine fishing and mountain scenery, and is

rapidly improving. The Salt Lake Basin at large has an altitude of about 4,500 feet above the sea, and is the paradise of the farmer, the horticulturist, and the grower of fruit. Cut off from it by a low range, now surmounted by the Utah and Northern Railway, toward the northeast, is Cache Valley.

Cache, San Pete and Sevier Valleys.—Cache Valley is oval in shape, and perhaps ten by fifty miles in extent, watered by Logan and Blacksmith forks of Bear river, and by the latter itself, and sustaining a settlement wherever a stream breaks out of the enclosing mountains. Logan is the principal town of Cache Valley, and thence one drives eastward through Logan Cañon forty or fifty miles to Bear Lake Valley, Bear river here flowing toward the north. Farther on it bends to the west and southward, and down through Cache Valley, finds its way to Salt Lake. Cache and Bear Lake Valleys have a score of towns and 15,000 inhabitants. To the southeast of Salt Lake Basin, and to be connected with it by rail through Salt Creek or Nephi Cañon, this season, lies San Pete Valley, called the granary of Utah, surrounded by mountains, except on the south, where the San Pitch river breaks through into the Sevier, and sustaining eight thriving towns, all still in their infancy, though founded several years ago. San Pete and Cache Valleys are fine grain-growing sections, but having colder winters are not so well adapted to fruit-raising as the Salt Lake Basin. Next southward is the Sevier river, which has its source in Fish (Indian, Panguitch) lake, near the southern boundary of the Territory, and runs, like Bear river, a long way north before it finds a way out of the mountains, and turning to the southwest is finally lost in Sevier lake. Most of the streams in the southwest lose themselves in small lakes or sinks, that is, such as rise to the northward of the divide between the Great Basin and the Rio Colorado country. The Sevier River Valley is occupied, like all the other Utah valleys (and there are many in the recesses of the Wahsatch, and some outlying and disconnected with that range, although of minor importance, which have not been particularly noticed), where a stream breaks out of the adjoining mountains, by a settlement; but, like the other streams, the full capacity of the Sevier river for irrigation has not been called into requisition.

The western third of the Territory from end to end is an alternation of mountain, desert, sink and lake, with a few oases of arable or grazing lands. Great Salt lake covers an area of 3,000 to 4,000 square miles, and the desert west of it a still larger area. The Sevier, Preuss and Little Salt lakes, all together, are small, in comparison. Formerly a mighty river flowed northward from the vicinity of Sevier lake to the westward of Great Salt lake, the dry bed of which, nearly a mile in width, must be crossed in going west from Salt Lake City to Deep Creek. Since it dried up, hills and spurs of mountains have been upheaved in its course, but the old channel continues on its way up hill and down, and over them all. Divided off from Great Salt lake by a sort of causeway 800 feet high is Rush Valley, containing a lake covering twenty to thirty square miles, where twenty years ago there was hay land and a military reservation. This, as well as the accompanying filling up of Great Salt lake, shows a decided aqueous increase in Salt Lake Basin within that time. Rush Valley has mining and agricultural settlements, but much more pastoral than arable land; and so has Skull Valley, to the westward. But from these south to the rim of the Basin, there are only occasional habitable spots, and they are due to springs. The mountains are the source of the wealth of Utah, present and prospective, which consists in water and metals. They gather the snows in winter which feed the streams in summer. In the northern part of the Territory the Wahsatch Range attains generally a high altitude, with a mass in proportion. There is a large accumulation of snow in winter, and the streams are correspondingly large and numerous. In the southern part of the Territory the main range is lower and less massive; the average temperature is higher, of course; there is less snow, smaller and fewer streams, and more desert in proportion. This part of the Territory is not rich in agricultural resources. The isolated ranges in the Great Basin seldom give rise to streams of much magnitude, and the intervening valleys partake more of the desert character. But all the mountains, so far as known, are full of minerals, and there is generally water enough for the purposes of mining and reducing them.

The region east of the Wahsatch Mountains and south of the Uintah Range, is wholly in the Colorado Basin. It is not as yet settled to any considerable extent, but the deep cañons of the Grand, Green, San Juan and Rio Colorado, which traverse it, are full of wonders and terrors. There is every reason to believe that the mineral wealth of this region is fully equal to that of the Great Salt Lake Basin, and unless the lack of water shall prevent their successful working, the whole region will, a few years hence, be honeycombed with mines of gold and silver, lead, copper, iron and coal.

Climate.—The climate of a mountainous country like Utah will vary considerably with its varying altitudes and exposures. The inhabited parts of the Territory range, in general, between 4,300 and 6,300 feet above the sea; but seventy per cent. of the population is settled in valleys not exceeding 4,500 feet in elevation, and probably fifty per cent. in the basin of Great Salt lake. In these lower valleys the climate is mild and agreeable. Its perpetual charm cannot be conveyed by meteorological statistics. The atmosphere is dry, elastic, transparent and bracing; and the temperature, while ranging high in summer, and not altogether exempt from the fickleness characteristic of the climate of North America in general, compares favorably in respect of equability with that of the United States at large, and especially with that of Colorado and the Territories north and south of Utah. Its range upwards is less than that of St. Louis, Philadelphia and New York, to say nothing of that of Arizona; while in the other direction there is no comparison, either with the Eastern States, intersected by the same isothermal, or with Colorado, Idaho and Montana. This description applies mainly to Northern and Central Utah within the Great Salt Lake Basin. Outside that Basin, across the Wahsatch Mountains, and at an elevation not much greater, at Coalville, for example, not more than seven or eight miles farther north, and perhaps thirty-five miles east, the difference of climate is very marked. The annual mean temperature at Salt Lake City is 51° 9′; at Coalville, 48° 65′; the spring means at the two places are 51° 7′ and 45° 9′; the summer means 75° 9′ and 69° 2′; the autumn, 54° 8′ and 48° 9′; and the winter means, 32° 1′ and 21° 9′.

In Southern Utah, both within and without the Basin, the climate is much more tropical, approaching to that of Arizona.

Meteorology of Salt Lake City and Camp Douglas.

MONTHS.	1877.						
	TEMPERATURE.				HUMIDITY.		MEAN PRESSURE.
	Mean.	Max.	Min.	Rng.	Per Ct.	Rainfall Inches.	Barometer Inches.
	°	°	°	°			
January	27.9	50	3	47	74.9	.87	30.071
February	33.7	55	15	40	75.3	.38	30.076
March	48.0	73	28	45	52.9	2.93	29.894
April	48.6	70	30	40	48.6	2.14	29.834
May	56.7	83	34	49	42.1	3.49	29.791
June	65.9	90	43	47	29.7	.80	29.927
July	78.2	98	50	48	24.1	.02	29.919
August	76.3	96	53	43	25.1	.28	29.971
September	65.0	90	42	48	31.5	.90	29.937
October	51.0	80	25	55	41.0	2.41	29.971
November	40.1	60	15	45	55.4	1.02	30.078
December	31.7	51	8	43	68.1	1.11	30.039
For the Year	51.9	98	3	95	47.4	16.35	29.950

MONTHS.	1878.						
	TEMPERATURE.				HUMIDITY.		MEAN PRESSURE.
	Mean.	Max.	Min.	Rng.	Per Ct.	Rainfall Inches.	Barometer Inches.
	°	°	°	°			
January	30.0	52	5	47	64.8	1.07	30.035
February	32.8	60	20	40	66.2	3.49	29.882
March	46.6	73	27	46	52.6	2.54	29.926
April	49.8	73	30	43	43.4	2.63	29.817
May	56.2	83	34	49	39.0	2.50	29.882
June	69.4	93	45	48	30.7	.35	29.939
July	77.7	96	52	44	26.2	1.08	29.900
August	78.5	97	60	37	33.7	.81	29.956
September	60.5	92	38	54	37.0	3.15	29.975
October	48.5	78	22	56	44.5	1.39	30.055
November	42.7	68	22	46	54.6	.63	30.081
December	29.7	56	8	48	59.1	.11	30.091
For the Year	51.9	97	5	46	45.9	19.75	29.979

We have no meteorological statistics of any points in the Territory, except Salt Lake City and Camp Douglas, which is near it, but 500 feet higher. The above tables give the tempera-

ture, rainfall, humidity and mean barometrical pressure at Salt Lake, and such particulars as are at hand concerning Camp Douglas. The latitude of Salt Lake City is 41° 10′; the longitude, 112°; the elevation, 4,362.25 feet.

The mean air pressure at Salt Lake City is 25.63 inches; water boils at 204.3°. The prevailing winds are from the north-northwest, and the most windy months are March, July, August and September. The mean velocity of the winds during the entire year is 5½ miles an hour. On the ocean it is 18 miles; at Liverpool it is 13; at Toronto, 9; at Philadelphia, 11. The climate of Utah, on the whole, is not unlike that of Northwestern Texas and New Mexico, and is agreeable except for a month or so in winter, and then the temperature seldom falls to zero, or snow to a greater depth than a foot, and it soon melts away, although it sometimes affords a few days' sleighing. The spring opens about the middle of March, the atmosphere becomes as clear as a diamond, deciduous trees burst at once into bloom, and then into leaf, while the bright green of the valleys follows the retiring snow-line steadily up the mountain slopes. The summer is not unpleasant in its onset, accompanied as it is by refreshing breezes and full streams from the higher melting snow banks. Springs of sweet water, fed largely from the surface, bubble forth everywhere. But as the season advances the drought increases, every stirring air, near or far, raises a cloud of alkaline dust until the atmosphere is full of it. Sometimes a shower precipitates it, but there are more dry than wet storms. The springs fail or become impregnated with mineral salts, and the streams run low or dry up. Vegetation dies in the fierce and prolonged heat and drought, if not artificially watered. Still, from the rapid radiation of the earth's heat, the nights are always agreeably cool, and the heat itself seems to have but slight debilitating quality. The presence or absence of the sun has a marked effect on the temperature from the great transparency of the air. Let his rays be cut off, even in July, and a fire is pleasant; while, if they have free passage, the fires are allowed to go out even in January. October ushers in a different state of things. The atmosphere clears up again as in spring, and the landscape softens with the

rich browns, russets and scarlets of the dying vegetation, which reaches up the mountain sides to their summits in places; but on them the gorgeous picture is soon overlaid by the first snows of approaching winter. The fall is a delightful season, and is generally drawn out nearly to the end of the year.

We have been more particular in stating the peculiarities of the climate of Utah because it is just now, and as we think justly, recommended for its sanitary qualities in certain diseases. The following summary of the classes and forms of disease in which it has been found most beneficial has the authority of four very eminent army surgeons—Surgeons P. Moffatt, Charles Smart, E. P. Vollum and J. F. Hamilton; and will, we believe, be found to be sustained by the experience of most of those who have gone thither for health. It is important, however, that health-seekers should spend as much of every day as possible in the open air.

High altitudes and areas of low barometric pressure quicken the respiration and circulation, and are therefore unfavorable in cases of pulmonary disease that are far advanced, and also in heart disease, and that form of chronic bronchitis associated with it. The other forms of chronic bronchitis, chronic pneumonia, and phthisis, are the diseases, par excellence, upon which such localities exercise a favorable influence. Consumption does not originate here, and where the monthly fluctuation of the thermometer does not exceed 50°, and the mean monthly temperature is at, or, within limits, above 50°, and the humidity is under 50 per cent., a residence is beneficial to consumptives, if commenced early enough. The best treatment known for consumption is a year of steady daily horseback riding in a mountainous country, diet of corn bread and bacon, with a moderate quantity of whiskey.* The beneficial influence of the climate on asthma is decided. It cannot exist here, except in a relieved and modified condition. Bronchitis appears in a mild form during the wet and thawing periods of spring and fall, but it always yields to treatment. Rheumatic fevers are scattered over the months without reference to season; but very few cases become chronic.

* The more moderate the better.—L. P. B.

The intermittents are imported, and the tendency in them is to longer intervals and ultimate recovery. A remittent, called "Mountain Fever," is indigenous. It yields readily to simple treatment if attended to in time, but if not develops into a modified typhoid, which is liable to prove fatal. Experience in the miners' hospitals at Salt Lake City shows that the climatic conditions are very favorable to recovery from severe injuries. The summer heat is great, but not debilitating, and the dry pure air and cool, invigorating nights, enable patients to sustain the shock of surgical operations that could not often be safely attempted in more humid climates. Pyemia, or blood poisoning, the frequent accompaniment of severe injuries and of surgery, is of extremely rare occurrence. One has a choice of altitude, ranging from 4,300 to 7,000 feet above the sea, with access to mineral springs, hot and cold, of decidedly efficacious qualities in the cure of many ills, as experience has amply shown; and for the whole of Salt Lake Basin, the softening and other healthful influences of at least 3,000 square miles of salt water, giving off a saline air, and affording the benefits of ocean bathing without its discomforts and dangers. The waters of the lake are so dense with the salt in solution that it is impossible to sink in it, and at the same time so pleasant that the bather can remain in the water all day without serious inconvenience or injury.

Temperature, etc., at Camp Douglas.

MONTHS.	7 A. M.	2 P. M.	9 P. M.	Diurnal Variation.	Percentage of Sick
January	28	35	29	7	33.60
February	23	34	24	11	31.30
March	33	47	39	14	32.33
April	38	50	41	12	36.42
May	45	55	47	10	28.74
June	61	77	65	16	29.28
July	68	85	73	17	23.86
August	65	80	69	15	25.38
September	56	74	62	18	20.00
October	41	56	45	15	21.97
November	38	53	41	15	38.68
December	22	51	24	9	40.50

The preceding table relates to Camp Douglas, which is on an

elevation two miles east of Salt Lake City and 500 feet above it, being 4,862 feet above the sea. This table gives the diurnal variation of temperature at 7 A. M., 2 P. M. and 9 P. M. for each month of the year, and the effect of this variation in reducing or increasing the percentage of the sick in the hospital connected with the camp.

The mean temperature of June to September inclusive at 2 P. M. was 79°; at 9 P. M. 57°; difference 22°; mean percentage of sick for these months, 24.63. For the other eight months the mean at 2 P. M. was 47°; at 9 P. M. 36°; difference 11°. Mean percentage of sick for these months, 32.93. The months of greatest mean diurnal variation seem to be the healthiest months. Attention is called to the mean temperature of the four warmest months, at 9 o'clock in the evening, viz., 57°; a night temperature which ensures quiet sleep.

The second of these tables shows the annual mean, maximum, minimum and range of temperature, and annual rainfall at Camp Douglas for sixteen years, 1863–1878.

YEARS.	TEMPERATURE.				RAINFALL.
	Mean.	Max.	Min.	Range.	Inches.
1863	52.93	103	7	96	7.47
1864	52.22	97	−4	101	14.92
1865	50.11	100	6	94	15.51
1866	51.87	94	9	85	22.29
1867	52.71	95	0	95	26.14
1868	50.66	96	5	91	17.25
1869	53.61	97	7	90	22.32
1870	51.66	96	4	92	20.96
1871	53.09	104	*8	96	23.12
1872	50.42	91	0	91	18.12
1873	49.26	98	−3	101	17.37
1874	50.18	97	8	89	19.55
1875	51.26	95	9	86	21.07
1876	50.64	99	8	91	18.31
1877	51.00	98	5	93	14.52
1878	51.29	93	8	85	17.86
Mean for 16 years	51.43	97	5	92	18.58

Soil and Agriculture.—There were surveyed of public lands in Utah, down to June 30th, 1879, according to the Land Office Report, 9,341,375 acres, including arable, timbered, coal and mineral lands. It is impossible to tell from any accessible data what proportion is arable land. Perhaps an estimate that one-fourth or about 2,350,000 could be cultivated by the aid of irrigation, would not be far out of the way.

We have in other parts of this book discussed fully the advantages and disadvantages of irrigation, and need not repeat here what has been already said elsewhere. Irrigation is almost universally required in Utah, but in different quantities in different localities, and it is usually done by colonies or communities uniting to divert part or the whole of a stream from its natural channel to the adjoining land, each member of the association there having his proportional right to the use of the water. But few of the standard crops of Utah ever require more than two or three waterings to perfect them, some of them, especially fall wheat, seldom needing more than one. Most of the smaller streams in Utah, that could easily be diverted from their natural channels, have been already utilized; but their full capacities as irrigating supplies, which can only be exhausted by means of dams, reservoirs and canals of considerable importance, have not as yet been called into requisition. Irrigation by means of artesian wells has not yet been seriously attempted in the Territory, probably because the necessity for it has not been seriously felt, but the few experiments in that line made by the Union Pacific Railroad have been so successful as to encourage a resort to it hereafter. Flowing water was obtained at a depth of less than a hundred feet. From a report made to the Legislature in 1875 it appears that one-third of the land under cultivation at that time in the Territory required no irrigation (this proportion since that time has been largely increased, it having been discovered that, by deep plowing, lands apparently entirely barren would yield twenty-five to thirty bushels of wheat to the acre without irrigation for many successive years). Of the lands requiring irrigation, one-fifth only needed one or two waterings;

five-sevenths required from three to four, and about one-eighth from four to ten.

The soil of Utah is partly volcanic, and contains elements of fertility which, when moisture can be had, cause it to produce enormous crops.

Timber.—Utah holds an intermediate position, with respect to its supply of timber, between the Atlantic and prairie States. Its arable lands are not interspersed with forests, nor yet is it without an adequate supply of timber within its own limits for building, fencing, mining and fuel. The valleys or plains are destitute of forest growth, and in early times willow brush was resorted to for fencing, adobe bricks for building, and sage brush for fuel. But the mountains are generally more or less wooded, almost wholly with evergreens, however. The best trees furnish lumber not technically clear, but the knots are held so fast that they are no real detriment, and the lumber is practically clear. The red pine and black balsam indigenous to the mountains make a fence post or railroad tie that will last ten years. The white pine is not so good. More than half of the forest growth of the Wahsatch is of the white or inferior variety. On the Oquirrh the trees are chiefly red pine. Scrub cedar and piñon pine are quite common in the south and west. They are of little value for anything but posts, ties and fuel. In 1875 there were perhaps 100 saw-mills in existence, if not in operation, in the Territory. Ordinary rough building and fencing lumber ranges in price from $20 to $25 a thousand. Flooring and finishing lumber is imported, and costs about $45 a thousand. Wood is obtained from the cañons for fuel, and soft coal of good quality can be had for $8 to $12 a ton in all Northern Utah. When the coal deposits of the Territory shall have been developed and made accessible by railroads, the price should be less by one-half, for there is an abundant supply and it is widely distributed.

Products, Yield.—All of the products of the same latitude, east or west, on or about the level of tide water, with the exception of Indian corn (for which the nights are too cool), are grown in Utah with great success, and the soil and climate seem peculiarly adapted to the growth of wheat and fruit. Following are statistics

of the area and yield of various crops for the year 1875, on the authority of a legislative commission:

Articles.	Acres.	Total Yield.	Yield per Acre.
Wheat	72,020	1,418,783 bushels.	20 bushels.
Barley	13,847	359,527 "	25 "
Oats	19,706	581,849 "	30 "
Rye	447	8,987 "	20 "
Corn	16,452	317,253 "	20 "
Buckwheat	11	243 "	22 "
Peas	1,701	30,801 "	18 "
Beans	127	3,176 "	25 "
Potatoes	10,306	1,306,957 "	130 "
Other Roots	1,433	278,712 "	125 "
Seeds	125	49,501 lbs.	396 lbs.
Broom Corn	200	713 tons.	3⅔ tons.
Sugar Cane	1,432	103,164 gals.	72 gals.
Meadow	81,788	112,529 tons.	1½ tons.
Lucerne	3,587	13,189 tons.	3⅔ tons.
Cotton	113	31,075 lbs.	275 lbs.
Flax	5	1,250 lbs.	250 lbs.

Total acres, 223,300. Total value of products, about $7,500,000.

Of the wheat crop of 1873, 100,000 bushels were exported. There was no surplus for export in 1874–75. Of the crops of 1876–77, 50,000 to 60,000 bushels were exported. There was a surplus of about 270,000 bushels raised in 1878, one-half of which was shipped to England via San Francisco; the rest remains in stock. Probably the acreage in wheat has not increased much since 1875, nor the hay crop, but dry farming has, and the growth of lucerne has doubled.

Improved lands are held at from $25 to $100 an acre, according to location. They are almost all adjacent to either towns or mines, or both. There are, in different localities, comparatively large bodies of government lands unoccupied, which can be entered at the Salt Lake Land Office under the United States land laws, the same as in other States and Territories, or bought of the Pacific Railroad companies at low rates, and on easy time; although, as a general thing, agricultural settlement and improvement in Utah will be undertaken to better advantage by colonies than by individuals. The construction of the main irrigating canals may

usually be accomplished by plow and scraper, each adjoining land-owner contributing his quota of the expense, and having a perpetual right to the water at the additional cost for repairs. Under the Desert Land Law, each person joining in such an enterprise is entitled to pre-empt 640 acres of land, paying one-fifth down and the rest in three years, on condition that the enterprise be consummated within that time.

Fruit.—The Salt Lake Basin throughout is unsurpassed in the adaptation of its soil and climate to the growth of all kinds of fruit common to the latitude; in the south, on the waters of the Rio Colorado, grape culture is followed with great success, and wine-making is there a growing industry; but in the higher mountain valleys, as well as in Cache and San Pete, the seasons are too short, and not so much attention has been devoted to it. The following table shows the area, the product, and the yield per acre, of fruits, for the year 1875, as returned and published by order of the Legislature:

Fruit.	Acres.	Total Yield.	Yield per Acre.
Apples	3,935	358,277 bushels.	90 bushels.
Pears	128	10,560 "	75 "
Peaches	2,687	330,535 "	120 "
Plums	259	43,585 "	165 "
Apricots	305	44,160 "	145 "
Cherries	62	4,661 "	75 "
Grapes	544	3,409,200 lbs.	6,260 lbs.

Total acres, 7,920. Value, $1,028,616.

No finer, thriftier trees, no fairer, better flavored fruit is produced anywhere. The trees are extremely bounteous bearers, having to be propped up to enable them to sustain the weight of their enormous burdens. The fruit market in Salt Lake City is almost perpetually deriving its supply from California, when native fruits and berries are not in season. This applies, too, to many kinds of vegetables, cauliflower, lettuce and asparagus. The season for most fruits, berries and vegetables begins in California a month or six weeks in advance of the same in Utah, and proportionally lengthens it. The extreme southern part of the Territory is adapted to the production of many semi-tropical and

some tropical fruits, but not much has been done in that line as yet. Cotton is grown in a small way, for use in the making of cloth. Figs and almonds have also been tried a little. The climate is not greatly different from that of Southern California, where oranges and many tropical fruits do as well as anywhere in the world.

Stock-Farming.—One great resource of Utah, and one easily discounted, so to speak, is the very extensive stock range. There is in such a country necessarily a great deal of land on the foot-hill slopes and river terraces which cannot be artificially watered, and yet is not cut off from water. The native grasses generally are possibly not as good as the buffalo and gramma grasses of the plains east of the Rocky Mountains, but the bunch grass, which seems to be indigenous to the broken and elevated regions between the Sierra Madre and the Sierra Nevada, is unsurpassed in excellence. Throughout this interior basin millions of acres are not absolute desert, only because of the existence of this grass. It grows in bunches in apparently the most barren places. Early in the season it cures, standing, retaining all its nutriment, and being hard to cover with snow beyond the reach of stock. Its seed is pyriform, and has remarkable fattening properties. In the high, dry, bracing altitudes of the interior, cattle grow and fatten on much less than on the sea-level, and the same degree of either heat or cold, as marked by the thermometer, appears to affect them less. The grazing lands of Utah are almost unlimited; including the second tables of the river courses, the slopes of the foot-hills and lesser ranges not too far from water; the shores of the sinks and lakes, and the coves and valleys of the mountains. In the Salt Lake Basin, generally, stock winter without fodder; farther south, they not only subsist, but thrive on the range the year round. In Cache, Bear lake, and other valleys more elevated, they require more food and shelter; and the stock-grower will do well to prepare for occasional cold and snowy spells in all the northern parts of the Territory. There is ample hay ground for this. Under ordinary circumstances, a five-year-old steer, worth $25, can be turned

out at a cost of $5. The statistics returned of stock in Utah in 1875:

Stallions	108
Mares	1,349
Mules	4,727
All others, not horned	45,206
Thoroughbred horned stock	510
Graded " "	3,511
All other " "	107,468
Thoroughbred sheep	15,620
All other sheep	287,608
Goats	304,806
Graded swine	1,397
Common swine	26,540

Total value, including poultry and bees, placed at about $6,500,000.

The number of blooded and graded animals has probably increased 200 per cent. since 1875, and that of sheep 150 per cent., while the strain of blood in all sheep has been so improved that double the wool is sheared from the same number. Considerable stock is kept in adjoining Territories by residents of Utah. It is estimated by stock-growers and drivers that the Territory turns out yearly 40,000 head of stock from one to five years old, averaging in value $15 a head; a total of $600,000.

Sheep-Farming.—The wool clip of 1875 was returned at 885,000 pounds, but it has quite doubled since. Mr. James Dunn, of the Provo Woollen Mills, estimates the clip of 1877 at 1,200,000 to 1,300,000 pounds; for 1878, at 1,600,000 to 1,700,000 pounds. Other large growers and dealers concur in this estimate. The clip of 1879 was nearly 2,000,000 pounds, and that of 1880 over 2,500,000 pounds. Of the clip of 1878 about 1,250,000 pounds was exported, and the remainder, say 400,000 pounds, was used by the Utah mills. Fleeces average about four pounds for ewes, six for wethers; part of the wool ranges with the best California wools as to quality, while part of it is inferior. Utah and Montana wools are considered better than the wools of the other Territories. Most of the Utah sheep came from New Mexico down to 1870. Since then ewes have been brought in from California, generally fine-wooled Spanish Mer-

inos, but little mixed; fine-wooled bucks from Ohio, and long-wooled from Canada. The same strain of blood in sheep does not produce quite so long a wool as in the East. It is so dry and dusty, the grease seems to absorb the alkali and mineral dust, which makes it harsher and more brittle. But since the large infusion of Merino blood, which has taken place in late years, there has been a marked improvement in the quality of Utah wool, in respect of length, softness and fineness of fibre. It realizes to the grower, here, crude, about twenty cents a pound.

Mr. Daniel Davidson, who has imported $30,000 worth of bucks within a few years, has a flock of 16,000 sheep, from which he sheared 90,000 pounds of wool in 1878. Among other large owners are the Provo Manufacturing Company, with 13,000; a Mr. McIntyre, with 9,000. Mr. Davidson thinks there are 550,000 sheep in the Territory. Castle Valley, near the corner post of Wahsatch, San Pete and Utah counties, is a great sheep range, several large flocks being kept there. They are worth about $2.25 a head as they run, do not require feeding in winter, and if properly attended to, under ordinary circumstances, will yield a profit of forty per cent. a year on the investment. They are beginning to be bought up to be driven away. A flock of 5,000, costing from $2 to $2.50 each, including lambs, was picked up and taken to Montana in the spring of 1878. By the time they got there the lambs were worth as much as the sheep, reducing the price in reality to about $1.50.

Governor Emery says on this subject:

Another serious drawback to the stock-growers of this country are immense herds of sheep, which have been driven into the Territories from California. Large flocks of fifteen, twenty and thirty thousand sheep not unfrequently make their appearance here from the West. It is not so much the grass they eat that the settlers complain of, but they poison and kill out what is known here as the buffalo or bunch-grass, which is the only grass of any value indigenous to this soil. Where sheep range for one season there is left a barren waste upon which grass will not grow for several years after. If Congress would pass some law whereby parties can acquire rights to this pasturage, it would

undoubtedly be a source of revenue to the government as well as to parties engaged in stock and wool-growing.

Mines and Mining Products.—With her increasing population, it is hardly probable that Utah will produce more grains, etc., than sufficient to supply the home demand for agricultural products. She may export some wheat, but she will import more corn; she may have more than a supply of some fruits and root crops, but she will import as much or more of others.

She may have cattle, sheep, and possibly horses and mules to export, and as her grazing lands become developed, there may be a large traffic in live-stock, for which she has good facilities.

But the chief attraction which Utah possesses for immigrants is its mineral wealth. Looking southward from one of the summits of the Wahsatch Mountains, just above their junction with the Uintah Range, and the smoke of the smelters and stamp mills is seen in the clear pure air for a hundred miles, and on both sides of the Wahsatch; while to the east and southeast the mines of copper, coal, sulphur, alum, borax, graphite and other minerals, with some gold and silver, are found in great abundance.

There is not a county in the Territory where mines have not been located, and mining districts in greater or lesser number organized. These mining districts now cover over 1,200,000 acres. They are, perhaps, most numerous in Salt Lake, Utah, Juab, Beaver, Box Elder, Tooele, Millard, Pi-ute and Iron counties, but Washington county, Weber, Davis and Summit are coming into prominence either for their silver mines, gold placers, or deposits of coal, sulphur, borax, alum, etc. We cannot undertake to name all these mines or mining districts; but a few notes in regard to some of the most prominent of them will be interesting. Bingham Cañon and its chief town, Bingham City, is about thirty miles southwest of Salt Lake City, and is a rift or cañon of the Oquirrh Mountains, through which a small muddy creek flows on its way to the Jordan river, about twelve miles south of Salt Lake City. It has had strange vicissitudes. In 1859 rich gold placers were found there by General Conner's soldiers, and were extensively worked and still yield fair pay for working. In

1869 extensive beds of silver lead ore were discovered and mined with decided profit, and some of the mines are still profitably worked; in 1876 it was discovered that the disintegrated rock which had been thrown aside from the silver mines as waste really contained from $19 to $25 of gold to the ton, and was very easily reduced, and as this paid better than the silver, the mining for these quartz-gold ores was immediately resumed. Meanwhile, however, some of the silver mines in the cañon had been written up and their productiveness eulogized, and one of these, the Old Telegraph, which was really worth perhaps from $700,000 to $1,000,000, was sold after examination to a French company for $3,000,000. The mine has not only never paid a dividend, but is run either at a loss or without profit, although all its reduction works and the appointments of the mine are of the first class. It was another instance in which silver mines in Utah have been sold to European capitalists at prices far beyond their actual value. The sales of the Little Emma, Flagstaff and McHenry, all Utah mines, are still fresh in the public memory, and have entailed an unwarranted disgrace upon mining properties, especially in Utah. The Little Cottonwood Mines, which included the Emma and Flagstaff, are now developing other mining properties there; but the frauds connected with those mines have destroyed confidence in them, and the present and prospective yield is not sufficient to restore it. The Parley's Park Mines, in the vicinity of Park City, of which the Ontario Mine is the principal, have an excellent property, though in their case the failure of the McHenry Mine to make good the representations under which it was sold, has proved a serious drawback. The mill connected with this mine shipped East, monthly, in 1879, from $135,000 to $145,000, and new mines in the vicinity are promising well. On the Oquirrh Mountains there is also the Ophir District, which has the Hidden Treasure and many other silver mines of note; the Stockton Mines, which have already yielded largely; and the Tintic Silver District, the mines in which carry gold, silver and copper. In Southern and Southwestern Utah, within the Great Basin and south of Sevier lake, there are many silver mines of great value, and which are

conducted on sound business principles. In this region the mines are richer as we proceed toward the southern boundary. In the Beaver Lake District there are valuable copper mines, and a little to the east and southeast are silver mines in the same district, and some valuable mines in the Ohio District. A little farther south are the Frisco Silver Mines, to which point a branch of the Southern Utah Railway is running. Among these mines, the Horn Silver Mine, about one mile from the village of Frisco, is said to be the richest silver mine in the world. Professor J. S. Newberry, who visited it in the autumn of 1879, and examined it very carefully, estimated that there was not less than $15,000,000 worth of ore in sight, and a fair prospect of at least as much more when the mine was fully developed. This ore is chlorides and horn silver. The Carbonate and Rattler Mines, and the Cave Mine in the same vicinity, are carbonates easily reduced and very rich; the last named carries considerable gold; as do the Picacho Mines. Around and just below Little Salt lake are the Silver Belt and the Sumner Mining Districts, and in the same vicinity immense coal beds and extensive deposits of iron and alum. Other coal measures are still farther south, and in the extreme southwest is the Leeds Silver Mining District, which has many rich mines; most of these are chlorides and easily reduced. East of the Leeds District, and on and near the Rio Virgen, is the Harrisburg District, in which are a large number of excellent mines. Among these are those of Silver Reef, where sandstone beds of cretaceous or tertiary age are found impregnated with silver, either native or in chlorides. The Stormont Silver Mining Company owns several mines on Silver Reef, and is steadily producing from $40,000 to $50,000 of bullion per month, with a fair prospect of increase with larger facilities for reduction. No smelting is needed, but the reduction is effected through stamp-mills and wet amalgamation. Just at the boundary of Utah, Arizona and Nevada is the Silver Park District, where the argentiferous deposit is an enormous but irregular vein lying in the contact between porphyry and limestone. Some of the ore is very rich, and Professor Newberry says that "it seems to present very much the same problems as the great

veins of the Shakspeare District, New Mexico, or the Ruby Hill District, Nevada; that is, they are very good or good for nothing, and considerable time and money will be required to decide which is true."

The eastern slope of the Wahsatch Mountains undoubtedly contains both silver and gold, though, whether it is likely to be of ores which will prove profitable for present working, is a question. The Great Colorado Basin, which has shown itself so rich in the precious metals in Colorado and Arizona, is probably equally rich here. But we know that copper, and iron, and coal are not only abundant but that they are of excellent quality and easily worked. The coal beds of Utah contain coal of good quality, sufficient to supply the entire region west of the Rocky Mountains. It is bituminous or semi-bituminous in character, and many of the beds, Professor Newberry says, are excellent coking coals. Whether it is a lignite of the Tertiary formations, or a true coal of the Carboniferous era, does not seem to be fully settled. Possibly the deposits of the north are of a later geologic age than those of the south. Volcanic action, here as in New Mexico, may have wrought some changes in it. The iron is of all varieties, and is pronounced by skilful iron masters equal in quality to any in the world, and the quantity is vast beyond conception. Its close proximity to good coking coals and the excellent fluxes close at hand insure very cheap production of the best qualities of iron, and already several large furnaces are at work.

Recently antimony has been discovered. The antimony mines are situated 200 miles south of Salt Lake, and on the headwaters of the Sevier river. The mineral occurs as a bedded or sedimentary deposit, in interrupted layers from a quarter of an inch to two feet in thickness. Its line of outcrop forms an irregular contour, which follows the windings of the cliffs. The quantity exposed varies greatly; in some places perhaps a thousand tons could be obtained immediately. There are large deposits of sulphur of great thickness, which are worked. Salt is produced from the waters of Great Salt Lake and other lakes in considerable quantities and of excellent quality. There are large

deposits of rock-salt in the Territory. Ozocerite, asphalt, jet and other minerals are known to exist in large quantities. Alum, borax, bicarbonate of soda and caustic soda can also be produced pure for market, with very little trouble.

Railroads.—There are now in operation in Utah somewhat more than 700 miles of railway, all of it except the small portion of the Union Pacific, between Evanston, Wyoming, and Devil's Gate, Utah, being within the Great Salt Lake Basin. All the railroads of the Territory belong to the Union and Central Pacific system, with which they connect at Ogden. Aside from the main line (the Union and Central Pacific) they consist of: The Utah and Northern Railroad, now extending from Ogden to Helena, Montana; the Utah Central, from Ogden to Salt Lake City; and the Utah Southern, a continuation of the last, already constructed to the Beaver river, with branches of narrow gauge to Stockton, to Bingham Cañon, to Alta, to Deer Creek, to Connelsville and the coal mines, and from Beaver river to Frisco. It may throw out another branch to Pioche, Nevada, where a short line running eastward has already been constructed, but its eventual destination is probably to a union with the Atlantic and Pacific at some point in Arizona, or in California west of the Rio Colorado. The extensive coal lands and grazing lands in the Colorado Basin must eventually lead to the crossing of the Wahsatch by some of the branches of the Utah Central or Southern, unless the Denver and Rio Grande, or the Denver South Park and Pacific, both of which are building rapidly toward Grand and Green rivers in Western Colorado, should enter Utah from the east, and thus form another route to the Pacific. The local business on these Utah roads is sufficient to make them profitable stock.

Objects of Interest.—In wild, grand, and terrible displays of the power of the forces of nature, Utah is perhaps unsurpassed by no State or Territory of "Our Western Empire." The cañons of the Green and Grand rivers and of the Rio Colorado, which they unite to form, as well as those of the San Juan, have been most graphically described by Colonel J. W. Powell and other writers who have descended these rivers for a part or

the whole of their course. The greater part of the main stream of the Green river, more than a hundred miles of the Grand river, and about 250 miles of the course of the Colorado, including some of the most remarkable cañons of each, are within the bounds of Utah, and east of the Wahsatch Mountains. Near the southern boundary of the Territory the Monument Cañon of the Colorado commences, and at the mouth of the San Juan is the famous Temple of Music, one of the most wonderful of the results of erosion on these rocks. But it is not the Colorado Basin alone which abounds in remarkable natural scenery. The Great Interior or Salt Lake Basin is full of wonders. Among these are the Temples on the Rio Virgen, the only affluent of the Colorado which has its sources in the Great Salt Lake Basin; while the Little Zion Valley, north of that river, is remarkable for its quiet beauty.

Farther north, in the Great Basin, are some very extraordinary combinations of cañon, cataract, valley and mountain spires. Of one of these—the American Fork Cañon of the Wahsatch Mountains, which opens upon the minor Basin of Utah lake, and has been called the Yosemite of Utah—a recent writer thus speaks:

"This cañon is noted not only for the towering altitude of its enclosing walls, but for the picturesqueness of the infinite shapes, resembling artificial objects, towers, pinnacles and minarets chiefly, into which the elements have worn them. At first the formation is granite and the cliffs rise to a lofty height almost vertically. Then come quartzite or rocks of looser texture, conglomerates and sandstones; the cañon opens to the sky and you enter a long gallery, the sides of which recede at an angle of forty-five degrees to a dizzy height, profusely set with these elemental sculptures in endless variety of size and pattern, often stained with rich colors. 'Towers, battlements, shattered castles, and the images of mighty sentinels,' says one, 'exhibit their outlines against the sky. Rocks twisted, gnarled and distorted; here a mass like the skeleton of some colossal tree which lightning had wrenched and burnt to fixed cinder; there another, vast and overhanging, apparently crumbling and threatening to fall in ruin. At Deer creek the cañon proper ceases, the road has

climbed out of it 2,500 feet in eight miles. This is the main resort of pleasure parties. Since the railroad was taken up, its bed has become a wagon road, which continues to Forest City, eight miles above. The surroundings are still mountainous, but there are breaks where the brooks come in, grassy hills, aspens and pines.

"To the sublimity of the cañon scenery in summer an indescribable beauty is added in the autumn, when the deciduous trees and shrubbery on a thousand slopes, touched by the frost, present the colors of a rich painting and meet the eye wherever it rests. To get the full benefit of this, one must go up and up till there is nothing higher to climb. In winter another and very different phase succeeds. The snows, descending for days and days in blinding clouds, bury the forests and fill the cañon. Accumulating to a great depth on high and steep acclivities, they start without warning and bury in ruin whatever may be in their track. Hardly a year passes that miners and teamsters, wagons and cabins are not swept away and buried out of sight for months. The avalanche of the Wahsatch is quite as formidable as that of the Alps. Probably forty feet of snow falls on the main range every winter. Seven miles of tramway in Little Cottonwood Cañon are closely and strongly shedded for defence against the awful avalanche. Even this is not always effectual."

The Great Salt lake itself is an object of great interest. The remarkable density of its waters, which at some seasons and particularly in times of great drought, is so strong a brine as to contain two pounds of salt to the gallon of water, its islands which contain rich deposits of silver and copper and abound in game, its shores covered with salt, and the buoyancy of its waters, in which one cannot sink, all excite the wonder of the visitor.

The *mineral and hot springs*, which abound throughout the Territory, are worthy of notice. The hot springs near Ogden are a favorite resort for tourists.

Finances.—"The finances of the Territory," says Governor Emery, in his report to the Secretary of the Interior, October 29th, 1879, "are in a most satisfactory condition. There is no indebtedness that is not covered by uncollected taxes. The

territorial scrip, which three or four years since was worth only forty cents on the dollar, to-day is worth ninety-eight cents on the dollar. There is assessed annually an *ad valorem* tax on the taxable property in the Territory of Utah, as follows: three mills on the dollar for territorial purposes; three mills on the dollar for the benefit of district schools; and such sum as the county courts of the several counties may designate for county purposes, not to exceed three mills on the dollar."

Population.—The growth of Utah has been moderately rapid, as much so perhaps as could be expected under the circumstances. The following table gives the particulars of it so far as they are attainable:

Year of Enumeration.	Total Population.	Males.	Females.	Whites.	Indians and Negroes.	Natives.	Foreigners.	Density of Population.	Ratio of Increase.	Illiteracy.	Of School Age, 5-20. Both Sexes.	Of Military Age, 18-45. Males.	Of Voting Age, 21 and upwards. Males.	Citizens. Males.
1850	11,380*	6,046	5,334	11,330	50	9,326	2,054	0.05	.....	154	4,076	2,560	2,765	1,535
1860	40,273*	20,255	20,018	40,125	149	27,519	12,754	0.18	255.0	323	13,788	6,744	8,134	4,520
1870	99,581†	44,121‡	42,665	86,044	13,538	56,084	30,702	1 63	147.25	7.363	33,367	14,603	18,042	10,147
1875	140.000†	66,125‡	63,875	130,000	10,000	81,000	49,000	1.75	40.59	.....	30,792‖			
1880	144.659†	74,471‡	69,436	142,381	1526§	99,974	43,933	1.78	10.62					

The population of Utah is very peculiar. It is the only one of the States or Territories of "Our Western Empire" which was settled on a professedly religious basis. The Mormons came here when the country was a howling wilderness, and established themselves as a religious hierarchy, and their plan of settlement from the first contemplated an empire as well as a faith. They have been from the first intolerant of any government except their own, of any immigrants who were not converts to their faith; of any business which did not contribute to the support of Mormonism; of any worship which did not recognize the supreme authority of their leaders; of any social order which did not recognize polygamy as a revealed ordinance of God, and did not give

*Tribal Indians not included. †Including tribal and other Indians. ‡Sex of Indians not ascertained. ‖Territorial report—only children from six to sixteen. §Including 204 negroes and mulattoes, 501 Chinese, 804 Indians and half-breeds and seventeen East Indians and half-breeds.

free rein to lust. Their power was for many years so absolute that the settlers, who professed another faith, were liable to assassination and to every indignity and oppression. Since the mineral wealth of the Territory was discovered, settlers have been pouring in, and in some of the mining camps, especially in Tooele county, the "Gentiles," as the Mormons contemptuously call them, are in the majority. The present census shows that about 107,000 of the 143,807 white inhabitants are Mormons and the remainder "Gentiles;" a decided gain since 1870, when there were not more than 15,000 Gentiles in the Territory. But the Mormons are artful and shrewd. Knowing that their polygamy and other offences against society and good order are violations of the laws of the United States, they are yet determined to hold on to them, and to diffuse them in other States and Territories, and with an aggressiveness worthy of a better cause they are planting their mission towns in Idaho, Nevada, Montana, Wyoming, Colorado and Arizona, and have even obtained some footing in California. In Idaho and Nevada they claim to have a majority of the inhabitants under their control. They send their missionaries to England, Wales, Scotland, Sweden, Norway and Denmark, and by a specious and plausible presentation of some of their doctrines (those that are objectionable being kept in the background), and of their country, they persuade many of the ignorant, excitable and superstitious class to emigrate to Utah. Once here they are completely under the control of the leaders; all that they have, and all that they can earn, belongs to the hierarchy, and if it is decided that they must go to the most unpromising desert region in Nevada, Arizona or Idaho, and aid in establishing a new town, however inconvenient or distressing it may be for them to break up their homes, there is no alternative; they must go, or death and eternal destruction will be their portion. If it is deemed desirable to put some troublesome or inquisitive Gentile out of the way, the means and the men for the work are speedily found. The large influx of "Gentiles" to the mining camps and to business connected with the railroads and mines has modified their open and outspoken opposition to non-Mormon immigration; but at heart they are as much opposed to this

immigration as ever, and more to the United States government than at any time in the past. At the same time they are very desirous of being admitted into the Union as a State, that they may legitimize polygamy: and when in their judgment the fitting time has come, they propose to secede, taking with them the other States and Territories they have won over to their views, and start a polygamous empire. They have offered their vote and support to whichever of the two great parties will secure their admission into the Union; but their practices are so palpably in violation of the constitution, that their admission is not probable.

Religious Denominations.—The non-Mormon inhabitants of Utah are of all religious denominations, or of none; but they have a great abhorrence both of polygamy and of religious despotism. In 1878 there were 167 Mormon church edifices, and four temples built and in course of construction at St. George, Logan, Manti and Salt Lake City, by the Mormons. They claimed at that time 108,907 souls as belonging to their church. Since that time they have sent out about 10,000 to other States and Territories, and have received about 8,000 immigrants from abroad. Mormonism does not increase by conversions at home, but by the immigration of converts from abroad. At the same time there were thirty-five Protestant congregations, having twenty-two church edifices and twenty-eight regular pastors, sustaining as a part of their work twenty-five mission schools, in twenty towns, with an enrolment of nearly 2,000 scholars. The number of communicants was about 1,400, and of adherent population about 8,000. Their church property amounted to about $250,000, while that of the Mormons exceeded $3,200,000. There has been some improvement in these particulars within the past two years. The number of Protestant churches now exceeds forty, the number of communicants is more than 2,500, and of adherent population about 13,000. There is also a much larger amount of church property, and an increase in the number of church edifices and schools. All the principal Protestant denominations have churches in the larger towns of the Territory, and there are Roman Catholic churches in Salt Lake City and Ogden, and perhaps at some other points.

Education.—Among the Mormons education is at a low ebb. The school population is reckoned only between the ages of six and sixteen, and of this scanty enrolment less than thirty-nine per cent., or only about 13,000 to 15,000, attended school. The whole number of schools in 1878 was 346; the time the schools were taught in days, 137; estimated value of school property, $382,112; the whole number of public school teachers was 489; pay of men, $35 per month; of women, $22 per month. The total income for school purposes was $113,413; the total expenditure, $113,193. There is no school fund. There are, as already stated, twenty-five or thirty mission schools under "Gentile" control, which, though opposed by the Mormon leaders, are prosperous, and afford better instruction than the Mormon schools. There are two or three secondary schools, especially the Salt Lake Academy ("Gentile"), in Salt Lake City; the Brigham Young Academy, at Provo, and two smaller institutions, one at Logan, and the other at Salt Lake City—endowed by Young with lands. These are all Mormon. The so-called University of Deseret, which is as yet only a preparatory school with a normal class, is also Mormon.

Morals and Social Condition.—The moral condition of Utah is very low. So far as the distinctive Mormon institution—polygamy—is concerned, it could not well be worse. Licentiousness in all its worst forms, is openly sustained under the forms of polygamous marriage, and incest of the grossest character is not uncommon. There is, among the Mormon population, nothing of the family relation, and the Mormon youth, the boys, especially, are early taught the most atrocious depravity. This condition of things has exerted in many instances an untoward influence upon the "Gentile" population. No man should emigrate to Utah who has not his moral principles firmly fixed. But to men of principle and character there is an opportunity of accomplishing much good by engaging in such enterprises as will aid in rescuing this rich and valuable Territory from the control of the most depraved and villanous despotism which ever prevailed in any country, in ancient or modern times.

Counties and Principal Towns.—There are twenty-three coun-

ties in Utah. The assessed valuation of these in 1877, exclusive of mines and mining improvements, neither of which were then taxed, was as follows:

Counties.	Population, 1880.	Ass'd Value of Property, 1877.
Salt Lake	31,978	$8,171,820
Weber	12,597	2,105,428
Utah	17,918	2,083,904
Box Elder	6,761	1,827,580
Cache	12,561	1,205,367
Tooele	4,497	1,060,190
Summit	4,240	868,536
Davis	5,026	812,132
San Pete	11,557	664,072
Washington	4,235	605,572
Juab	3,473	459,296
Iron	4,013	446,056
Morgan	1,783	428,928
Kane	3,085	343,944
Beaver	3,918	410,320
Millard	3,727	300,816
Sevier	5,138	287,528
Wahsatch	2,927	183,760
Rich	1,263	168,940
Pi-ute	1,651	119,512
Emery	556	
San Juan	204	
Uintah	799	
Totals	143,907*	$22,553.600

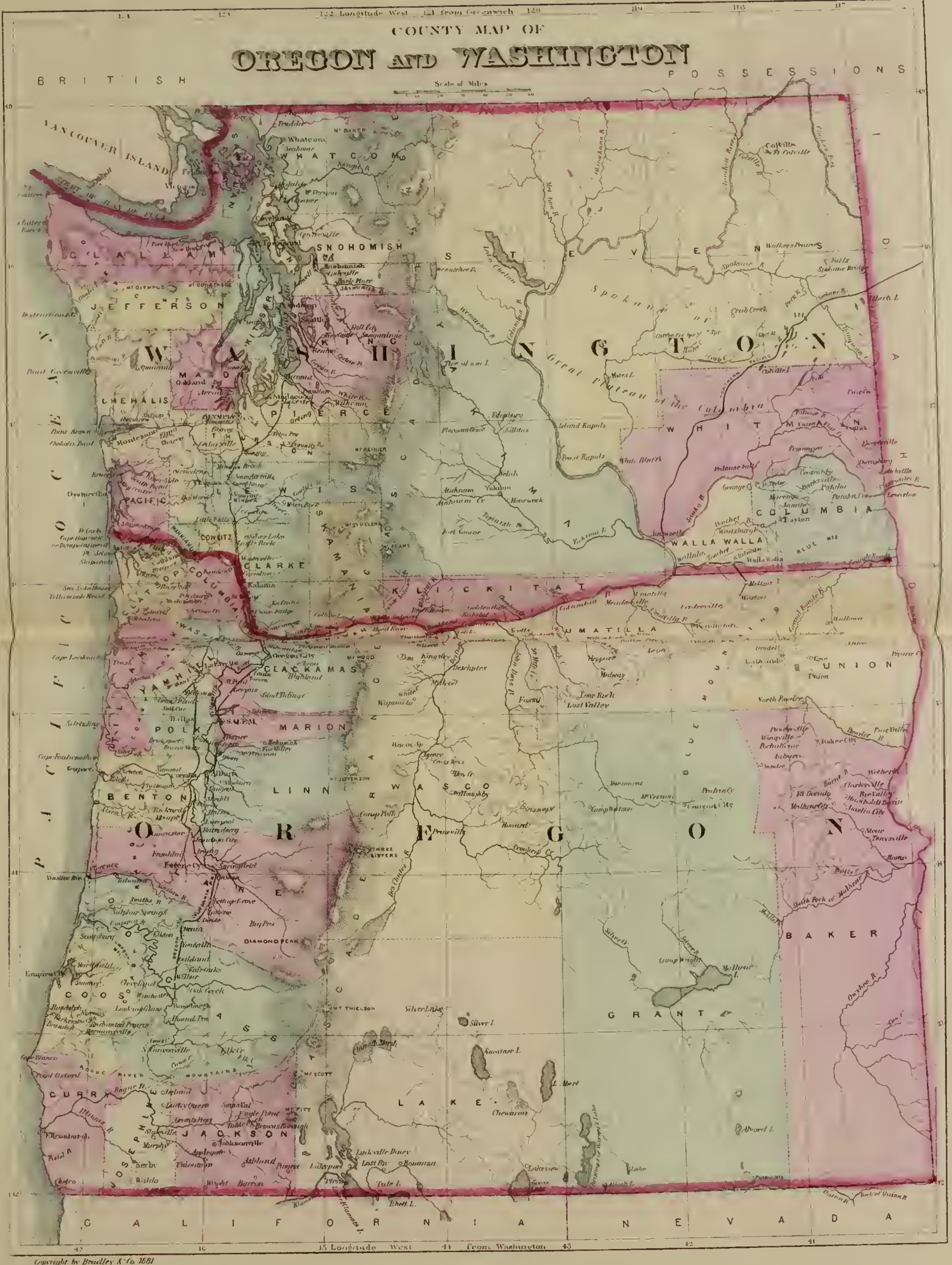
The very large mining interests would much more than double these assessed values.

Of the towns, Salt Lake City had in 1870 a population of 12,854. Its population in June, 1880, was 20,768. It is the chief seat of Mormonism, has the Tabernacle and the yet uncompleted Temple, and many other attractive public and private buildings. Ogden, on the Union Pacific, is a thriving town of 5,000 or 6,000 inhabitants. Provo, Logan, Ephraim City, St.

* Exclusive of tribal Indians.

George, Manti, Iron City, Frisco, Tooele, Mount Pleasant, Silver Reef, etc., are towns of considerable importance.

Historical Data.—Utah derives its name from the Utes, a tribe of Indians who were its original inhabitants. The Mormons, driven from Illinois and Missouri, emigrated hither in 1847 and 1848, and established themselves in a region then remote from other inhabitants. The title of this region passed from Mexico to the United States with that of New Mexico and California, in 1848, by the treaty of Guadalupe-Hidalgo. It was organized as a Territory in 1850 by the name of Utah; but the Mormons called it "Deseret," and in 1862 formed a Constitution, and demanded admission into the Union under that name. This was refused, and there has been much controversy, and sometimes threatened violence by the Mormons, since that time. In 1857 a most atrocious massacre of a large party of emigrants was perpetrated under Mormon direction at Mountain Meadow, in the southern part of the Territory. Some of the actors in that massacre were hung for it in 1877. Most of the mining enterprises which have brought in so considerable a non-Mormon population have been undertaken since 1869.



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CHAPTER XX.

WASHINGTON TERRITORY.

SITUATION OF WASHINGTON TERRITORY—BOUNDARIES—THE BOUNDARY LINE AT THE NORTHWEST, AND NORTH—ITS AREA—LENGTH AND BREADTH—COMPARATIVE SIZE—TOPOGRAPHY AND DIVISIONS—WESTERN WASHINGTON—THE PUGET SOUND BASIN—WHAT PUGET SOUND INCLUDES—THE BEAUTY, VALUE, AND IMPORTANCE OF THIS GREAT INLAND SEA—THE LOWLANDS AND THE MOUNTAIN SLOPES OF WESTERN WASHINGTON—RIVERS AND HARBORS OF WESTERN WASHINGTON—EASTERN WASHINGTON—ITS RIVERS—ITS LAKES—THE GREAT PLAINS OF THE COLUMBIA—RIVER VALLEYS—GEOLOGY—MINERALOGY—ZOÖLOGY—CLIMATE—METEOROLOGY OF WESTERN WASHINGTON—GOVERNOR FERRY'S REMARKS ON THE MILDNESS OF THE CLIMATE, AND THE REASONS FOR IT—THE CLIMATE OF EASTERN WASHINGTON—THE CHINOOK WIND—SOIL, VEGETATION, AND AGRICULTURAL PRODUCTIONS—THE ALLUVIAL FARMING LANDS—TABLE LANDS—FOREST GROWTHS—AGRICULTURAL PRODUCTS—TIMBER AND LUMBER—SOIL AND PRODUCTIONS OF EASTERN WASHINGTON—THE YAKIMA COUNTY—REMARKABLY FAT CATTLE—FROM WHENCE THEY COME—THE WONDERFUL FERTILITY OF THE SOIL—THE MOUNTAIN SLOPES AND MOUNTAIN TOPS AS RICH AS THE VALLEYS—THE IMMENSE YIELD OF WHEAT—THIRTY-FIVE TO FIFTY BUSHELS TO THE ACRE—EXPORTS—POPULATION-TABLE—INDIAN TRIBES AND THEIR RESERVATIONS—PARTIAL CIVILIZATION OF THE INDIANS—THEIR INDUSTRY—EDUCATION—COUNTIES AND PRINCIPAL TOWNS—TABLE OF POPULATION AND VALUATION OF COUNTIES—CHIEF TOWNS—RELIGIOUS DENOMINATIONS AND PUBLIC MORALS—HISTORICAL DATA—THE AMERICAN TITLE TO WASHINGTON AND OREGON—THE ARBITRATION IN REGARD TO THE ISLANDS IN THE GULF OF GEORGIA—THE EARLY SETTLERS—INDIAN WAR IN 1855—CONCLUSION—WASHINGTON TERRITORY DESIRABLE FOR IMMIGRANTS—THE BEST ROUTES THITHER—THE EARLY COMPLETION OF THE NORTHERN PACIFIC PROBABLE.

WASHINGTON TERRITORY is, with the exception of Alaska, which is not yet organized, the extreme northwestern member of "Our Western Empire," lying between the parallels of 45° 32′ and 49° north latitude; and between the meridians of 117° and 124° 28′ west longitude from Greenwich. It is bounded on the north and northwest by British Columbia, the boundary line being a zig-zag one to give Great Britain the settlements and lands she claimed. Our title ran legitimately along the 49th parallel

to the Pacific; but to have insisted on this would have given us the greater part of Vancouver Island, on which were already important British settlements. The line was finally run, not without a long and tedious arbitration, through the centre of the Strait of Juan de Fuca, the Canal de Haro, and the Gulf of Georgia as far as to the 49th parallel. From the centre of the Gulf of Georgia to the west line of Idaho, the northern boundary is along the 49th parallel. The eastern boundary is the Territory of Idaho, along the 117th meridian to Lewiston, where the Snake river makes a sudden bend southward, when that river becomes the eastern boundary to the Oregon line; southward, Oregon forms its limit, the line running along the 46th parallel till it reaches the Columbia river at about the 119th meridian, when the Columbia becomes the southern boundary to the Pacific; on the west, it is washed by the waves of the Pacific as far as the Strait of Juan de Fuca. Its length from north to south ranges from 200 to 250 miles, its greatest breadth from east to west about 360 miles. It is smaller than most of the Territories, and several of the States of "Our Western Empire," having but 69,994 square miles, or 44,796,160 acres; yet this area is one and a half times that of New York or Pennsylvania.

Topography and Divisions.—The Territory is popularly divided into Eastern and Western Washington by the Cascade Range of mountains, which trend north-northeast from Oregon in a very disorderly fashion from the Dalles of the Columbia river to the line of British Columbia, following for most of the distance the west bank of the Columbia river, and extending in parallel ridges west-southwest to Puget sound, and eastward in several spurs north, east-northeast, and east-southeast. Almost the entire region between the 47th and the 49th parallels lying between the Columbia river and Puget sound is broken, rolling and mountainous, though the mountains are not high.

Western Washington, the part of the Territory first settled, consists of a valley or basin, known as the Puget sound basin, and which lies between two ranges of mountains, the Cascade Mountains on the east and the Olympian or Coast Range on the west. The Puget sound or archipelago, the Mediterranean of

the Western Continent, as it is often called, extends from the British line on the north (the Gulf of Georgia penetrating several hundred miles into British Columbia) to Olympia on the south. It includes the Straits of Juan de Fuca, which furnish a broad channel into the Pacific, the Canal de Haro, Washington Sound, the Gulf of Georgia, Bellingham Bay, Rosario Strait, Admiralty Inlet, Hood's Canal, Lake Washington, several smaller passes and inlets, and Anderson's Bay, the latter items and some others going to make up the smaller Puget sound. It has a coast line in the Territory of 1,594 miles, and its area within the limits of the Territory is over 2,000 square miles. More than thirty-five years ago Captain (afterwards Rear Admiral) Wilkes, who had been engaged on a protracted voyage of exploration of the Pacific coast, said of this sound:

"Nothing can exceed the beauty of these waters and their safety. Not a shoal exists within the Straits of Juan de Fuca, Admiralty Inlet, or Hood's Canal that can in any way interrupt their navigation by a 74-gun ship. I venture nothing in saying there is no country in the world that possesses waters equal to these. They cover an area of about 2,000 square miles. The shores of all these inlets and bays are remarkably bold; so much so that in many places a ship's side would strike the shore before the keel would touch the ground. The country by which these waters are surrounded is remarkably salubrious, and offers every advantage for the accommodation of a vast commercial and military marine, with convenience for docks, and a great many sites for towns and cities, at all times well supplied with water and capable of being well provided with everything by the surrounding country, which is well adapted for agriculture.

"The Straits of Juan de Fuca are ninety-five miles in length, and have an average width of eleven miles. At the entrance (eight miles in width) no danger exists, and it may be safely navigated throughout. No part of the world affords finer inland sounds, or a greater number of harbors, than are found within the Straits of Juan de Fuca, capable of receiving the largest class of vessels and without a danger in them which is not visible. From the rise and fall of the tides (eighteen feet) every

facility is offered for the erection of works for a great maritime nation. The country also affords as many sites for water-power as any other."

The foothills and slopes of the mountains on both sides are almost wholly covered with immense forests of fir and cedar, reaching to the very summits of the mountains. Flowing down from the western slope of the Cascade Range, ten rivers empty into Puget sound, viz.: the Nisqually, Puyallup, White, Cedar, Snoqualmie, Snohomish, Stillaguamish, Duwamish, Skagit, and Nooksakh, affording many hundred miles of inland shore line for logging purposes, and having in their valleys an estimated area of two thousand square miles of alluvial agricultural lands. Most of these rivers are navigable for steamers of light draft, generally as far up as the alluvial deposits extend. The streams descending eastward from the Olympian or Coast Range, except the Skokomish and the Dungeness, are shorter and of less importance. The mountains approach close to the western shores of the sound, limiting the area of available territory; but their sides are covered with vast forests of valuable timber already known to the markets of the world. Between the Olympian or Coast Range and the Pacific are some arable lands, but the soil is not so rich, though well adapted to the growth of timber. There are two moderately good harbors here—Gray's Harbor, and Shoal-water bay, extensive and partially land-locked bodies of water, but in respect to depth and facility of loading and unloading bearing no comparison to the magnificent harbors of Puget sound. The Chehalis is the principal stream flowing into Gray's Harbor; it has numerous affluents. The Willopah and some smaller streams fall into Shoal-water bay. There are numerous small rivers flowing into the Pacific and the Straits of Juan de Fuca. The other streams of Western Washington are affluents of the Columbia. The Cowlitz and Klikitat are the most important. All of Western Washington is well watered.

Eastern Washington includes all that part of the Territory lying east of the Cascade Mountains, and consists of the Great Plains of the Columbia river, the Great Plateau of the Spokane, and numerous valleys or river bottoms, as of the Columbia, Snake

river, Walla-Walla, Clarke's fork, the Okinakane, Wenatchee or Pisquouse, Lake Chelann, the Grand Couleé, or Old Bed of the Columbia, the Spokane, Colville and Palouse rivers. This whole region is an elevated plateau, with a rich soil, well adapted to the culture of the cereals, and one of the finest grazing countries in the world.

There are many lakes in Washington, some of them of considerable size; Lake Chelann is the largest, but Lakes Kahchess, Washington and Whatcom are also important lakes.

Geology.—The shores of the Pacific, the lower valley of the Columbia, and the great valley drained by Puget sound, are Tertiary and Quaternary; the islands west of the Canal de Haro in the Gulf of Georgia are Cretaceous; the vicinity of Bellingham bay is Carboniferous; the Coast Range is Eozoic; the Cascade Mountains to about 47° 40′, and the Great Plains of the Columbia river in Central and Eastern Washington, south of the Spokane river, are volcanic; Northern Washington is Eozoic, except two narrow and small outcrops of Silurian age in the extreme northeast, one east, the other west of Clarke's fork.

Mineralogy.—Washington has probably some deposits of the precious metals in the extensive volcanic regions already noticed, but they have not yet been developed to any great extent. Gold has been found in the northeast near the Columbia river. There were discoveries of placer gold made in 1879, on the Skagit river in Whatcom county, Western Washington. The quartz lodes near the Columbia river, in Stevens county, yielded in 1879 about $300,000. All the different ores of iron are plentiful; but the greatest mineral wealth of the Territory consists in its extensive beds of excellent coal. The coal near Bellingham bay and Lake Whatcom, in Whatcom county, is of excellent quality and is extensively mined. Much of it is sent to San Francisco, where it is in great demand. This is a true coal from the coal measures, and is bituminous in its character. There is also a very good coal (probably lignite) back of Seattle, in King county, near Lake Washington, and also in the Coast Range. This coal is mostly bituminous, but it is claimed that deposits of anthracite coal have been found in Puyallup valley and on the Green river. This is

possible, as this is within the limits of the volcanic region, but it is probable that this is at most only semi-anthracite.

Zoölogy.—The wild animals are the same as in Oregon. In the northern part of the Territory moose are found in considerable numbers. Elk are also plenty. The cougar or panther is large and fierce. Game is abundant. Salmon are found in great numbers, not only in the Columbia but in Puget sound, and some of the rivers flowing into it.

Climate.—The climate of Western Washington is remarkably mild and temperate, notwithstanding its high latitude, resembling, in this respect, that of the British Isles, and demonstrating the truth of the law laid down by physical geographers that the *western* coast of a continent always has a much milder and more equable temperature than the *eastern*. Governor Ferry, in presenting, in his report of October, 1879, to the Secretary of the Interior, the meteorological table of Fort Blakeley, which we give on page 1195, makes some very judicious notes and explanations in regard to it, and the climate of Western Washington, which we here insert in full, and which are fully corroborated by the corresponding table of Olympia, which we have placed by its side. One point, which the governor has omitted, is worthy of notice, viz.: that where the extreme annual range of the thermometer does not exceed from 64° to 74°, its maximum not being over 95° nor its minimum less than 19° to 25°, the resulting climate is as agreeable, healthful and productive as can be desired. The rainfall is by no means excessive, but exerts a decided influence in promoting the gigantic growth of the timber, which crowns the mountain slopes and extends even to the summits of the Cascade and Coast Ranges.

Governor Ferry says:

"It will be seen that the lowest temperature during this period of twenty-six months was 25° above zero, in January, 1879, and the next lowest 26+°, in January, 1878. The highest temperature in 1877 was 88°; in 1878, 94°; and in 1879, 86°. The highest monthly average was 67¼°, in July, 1877, and the lowest 40½°, in January, 1878. It will also be seen that the annual average rainfall is very little greater than in the Eastern and Western

FORT BLAKELEY, Bainbridge Island, Kitsap Co.
Latitude 47° 36'. Longitude 122° 32' west from Greenwich.
Elevation about 36 feet.

TIME.	TEMPERATURE. Highest.	Lowest.	Average.	HUMIDITY. Rainfall.	Cloudy Days.	Clear Days.
1877.						
June	80	45	59¾	3.57	18	12
July	83	50	67¼	0.55	11	20
August	86	50	65	1.90	16	15
September	86	42	57¼	4.10	18	12
October	64	42	51	3.25	12	19
November	59	31	47¼	8.70	2	10
December	56	29	43½	4.40	21	10
Seven Months				26.47	116	95
1878.						
January	52	26	40½	5.98	18	13
February	64	32	45¾	10.22	19	9
March	70	38	50	5.17	14	17
April	76	33	52½	2.15	13	17
May	90	36	57¼	3.25	15	16
June	94	43	63	0.36	9	21
July	82	50	63½	0.76	5	26
August	84	44	62½	0.20	2	29
September	86	42	57½	3.35	10	20
October	68	34	50½	2.61	14	17
November	60	33	46½	9.27	19	11
December	56	30	41½	3.27	21	9
Year	94	26	52.6	46.59	159	205
1879.						
January	50	25	40½	5.85	20	11
February	58	28	45½	9.70	17	11
March	69	32	47¾	13.70	19	11
April	72	36	50	4.44	12	19
May	80	40	55½	5.00	12	19
June	80	42	58½	3.30	17	13
July	86	45	61½	2.55	7	21
Seven months				44.54	104	105

OLYMPIA, Thurston Co., Capital of Territory.
Latitude 47° 2'. Longitude 122° 56'.
Elevation, 36 feet.

TIME.	TEMPERATURE. Mean.	Highest.	Lowest.	Range.	HUMIDITY. Rainfall.	Mean.	BAROMETER. Average Mean Pressure.
	°	°	°	°	inches.	per ct.	inches.
1877.							
July	63.4	92	43	49	0.24	64.8	30.270
August	62.5	85	43	42	1.64	73.3	29.970
September	55.6	81	36	45	6.64	78.9	29.968
October	49.1	66	29	37	7.00	87.8	30.040
November	45.8	57	28	29	19.88	87.5	29.957
December	42.2	57	30	27	11.73	89.7	29.991
Six months					47.13		
1878.							
January	41.1	52	25	27	9.82	89.1	29.810
February	44.1	54	32	22	14.20	87.3	29.688
March	47.5	65	32	33	7.90	86.7	29.878
April	49.1	71	30	41	1.21	74.3	29.959
May	55.2	87	34	53	1.36	70.8	30.003
June	60.4	95	41	54	0.24	67.5	30.025
July	61.0	82	45	37	0.98	69.7	29.971
August	62.5	82	43	39	0.32	69.7	29.989
September	54.4	78	37	41	4.87	77.9	29.986
October	47.4	64	28	36	4.32	83.9	30.091
November	44.2	58	31	27	11.09	88.7	30.080
December	39.6	54	22	32	7.03	87.5	30.218
Annual	54.75	95	22	73	63.34	79.9	29.994
1879.							
January	36.2	48	19	29	5.96	83.4	30.045
February	40.2	54	24	30	15.59	88.3	29.966
March	44.8	65	29	36	14.46	85.8	29.871
April	48.6	69	32	37	2.10	75.9	30.030
May	52.4	76	35	41	4.72	78.6	29.998
June	57.8	76	38	38	0.44	69.9	30.050
July	67.0	83	45	38	2.62	69.7	30.268
Seven months					45.89		

States. From June, 1877, to January, 1879, a period of nineteen months, embracing all of one winter and half of another, there was no snowfall, and in January, February and March, 1879, only 7¼ inches, which disappeared almost as rapidly as it fell. The greatest rainfall is between the months of October and April, although, during this period, it will be seen that the cloudy days are very little in excess of the clear.

"The climatic phenomena indicated by these observations are readily accounted for.

"A thermal current, known as the Japan Current, having its origin at the equator, near the one hundred and thirtieth degree of east longitude, Greenwich, flows northwardly to the Aleutian islands, where it separates, one branch flowing eastwardly along the peninsula of Alaska, and then southwardly along the coast of British Columbia, Washington Territory and Oregon. This thermal stream, with its concomitant heated atmospheric current, striking the northwest coast of America, operates powerfully in mitigating a climate which otherwise would be cold and rigorous in the extreme. The effect of these currents upon the western portion of this Territory is the same as the effect of the Gulf stream upon the northwest coast of Europe. In fact the climate and natural productions of England are essentially the same as those of Western Washington. In addition to this, the prevailing winds in the winter are from the southwest. These warm atmospheric currents, coming from the tropical regions of the Pacific, laden with moisture, meeting the cooler currents from the Coast Range and Cascade Mountains, produce the winter rainfall. These southwest winds also moderate the temperature during the winter.

"The prevailing winds during the summer are from the northwest, which is the cause of the dry, cool weather during that period. There is a marked difference between the climate of Western and Eastern Washington. In the latter, being that portion of the Territory lying east of the Cascade Mountains, the four seasons are plainly distinguishable. I am unable to present meteorological statistics of this portion of the Territory, and can only say that the temperature is lower in winter and higher in

summer, and that the rainfall is about one-half less, than on Puget sound. The average annual temperature is reported as follows: spring, 52°, summer, 73°, autumn, 53°, and winter, 34°."

The summers are at times very hot, though with cool nights generally. A part of the winter is cold, and there are usually a few days in which the mercury falls to zero, or below; but with few exceptions the fall of snow is not heavy. The rainfall averages from twenty to twenty-two inches for the year.

The "Chinook winds," already spoken of under Montana, periodical warm breezes from the southwest, blow up the channel of the Columbia river, through the fall and winter, and along the foot-hills of the Blue Mountains, and in a few hours remove every vestige of snow in their path. Their influence is felt all over Eastern Washington and Idaho and into Montana.

Soil, Vegetation and Agricultural Productions.—The soil of *Western Washington* is of various qualities, and may be divided into river bottoms, lands along the sound, table-lands and mountain slopes.

The alluvial farming lands are subject to overflow, near the sound, but not usually to an injurious extent. The freshets generally occur during the months of January and June, and rarely last more than three or four days. The soil is composed of clay, sand and gravel—detritus washed from the mountains—mingled with decayed vegetation, the rank growth of centuries. Under cultivation it is quick, light and friable, and yields astonishing crops of hay, grain, hops, fruits and vegetables. These lands are mostly covered with vine-maple, alder, crab-apple and salal, with an occasional fir, spruce or cedar, and as a rule are confined to narrow valleys and limited, detached areas. Being covered with this deciduous forest growth, they are not like prairie lands, where the plow can be started as soon as a claim is staked out—but as compared with the more heavily timbered uplands, they are easily cleared—at an approximate cost of $10 to $15 per acre. The wood and lumber will usually pay for the work; and, for farming purposes, the settler will find no more desirable location west of the Cascades.

Between these bottoms and the mountains are large areas of

table-lands, quite level or gently undulating near the rivers; broken and rugged toward the foot-hills. The soil of these uplands is inferior to that of the river lands, varying from sandy-loam to clay-loam and unproductive gravel. The growths here are principally fir and cedar, with some hemlock, maple, willow, cherry, etc. South and east of the sound is a district where coarse gravel is found, with occasional granite boulders, extending back from the shore from ten to thirty miles in streaks and patches, and covering perhaps half the land. In the intervals the soil is a strong, brown clay-loam of excellent quality for farming. Owing to the durability of the fir and cedar, and the difficulty and expense of removing their stumps from the ground, it will be a considerable time before the lands now covered with these fir forests will be cleared and devoted to agriculture—but fortunately the timber is worth far more to its owners and to the country than the best open prairie would be. Considering the great diversity of the soil and the wooded, broken character of the country, West Washington is likely to be a region of small farms, devoted to a variety of crops, rather than to growing grain or stock on a large scale.

With the above explanation it is safe to say that in connection with the mild climate, the productive capacity of the soil of the Puget sound region is great, both as to quantity and quality. The small grains are at home in Washington Territory. The quality and yield of wheat on the Pacific slope are well known to be good, and in this regard Puget sound basin is no exception to the rule. Much of the finest portion of the grain that reaches the Eastern market as "California wheat" is grown in Washington Territory and Northern Oregon. All other cereals are grown to perfection; oats are particularly plump and heavy. Indian corn (maize) has been ripened thirteen years in succession in one locality, and as many as forty bushels to the acre have been raised, but this is exceptional, and as a rule the nights are too cool for the ripening of this crop. Pork is usually fattened upon peas, wheat and barley, and it is claimed can be made as cheaply as upon corn in the Western States.

Fruits of all kinds, except the peach and the grape, are raised

in great profusion, and are remarkable for size and flavor. Although California fruit is justly in good reputation, Oregon and Washington apples are exported to San Francisco, where they bring an advanced price on account of their excellence. The potatoes and other vegetables grown on the north coast are also in high favor in the San Francisco market.

A resident of Washington Territory, who has had extraordinary facilities for acquiring personal knowledge of the lands there, says:

"The agricultural lands of the Territory, while generally confined to the river bottoms, are not entirely so. It is frequently found that even on the sides, and sometimes near the summit of a hill or mountain, considerable tracts of rich *beaver dam* lands exist. A noticeable instance is near the summit of the immense hill immediately in the rear of Kalama. The river bottoms of the Columbia and its confluent streams, as well as the valley of the Cowlitz, contain large tracts of lands of unexcelled fertility. About midway between Kalama and Tacoma is the Chehalis Valley, embracing, with its confluents, over 2,000 square miles of the best agricultural lands in the Territory. This valley is to Washington what the Willamette is to Oregon. It varies in width from five to fifteen miles, and extends from the base of the Cascade Range to Gray's Harbor. Large quantities of rich lands lie in the bottoms of its lower tributaries. Flowing into Puget sound there are the Cedar, Nisqually and Puyallup rivers, on which are some fine arable lands. These river bottoms are usually sparsely timbered with alder, vine maple, crab apple, etc., which are quickly and easily cleared, at an expense ranging from five to thirty dollars per acre, and will then yield, on an average, from forty to sixty bushels of wheat per acre. The small grains are produced most abundantly, with a larger average yield than obtains in almost any other locality or section of the country, and command the highest market price at home. And so long as we have the large non-producing lumbering population, the farmers' market will be at home."

Timber.—At present the leading industry of the Puget sound region is the manufacture and shipment of timber. This timber

has carried its own fame to all parts of the world. In the East Indies, in Egypt, in the maritime States of Europe, in South America, the Pacific Islands, China and Japan, the fir timber of Washington Territory is an article of commerce.

Washington Territory, west of the Cascade Mountains, covers an area of about 20,000 square miles (exclusive of interior waters), three-fourths of which are timbered lands. The timber consists of yellow fir, cedar, pine, spruce, hemlock, oak, maple, cottonwood, ash, dogwood, alder and some of the smaller varieties. The amount of the fir exceeds all the other varieties combined, and the cedar stands second in quantity. As the fir exceeds all other varieties in quantity, so also it does in utility, being valuable for ship-building, house-building, fencing, spars, and indeed almost every purpose for which wood is used.

The quantity of all kinds of lumber produced in the Territory, in 1875, was estimated at 250,000,000 feet, valued at $3,000,000, and though the market for it was temporarily depressed, the demand is now rapidly increasing.

The size of the fir trees and the number growing on given areas in good timber districts are almost incredible to those who have not visited the north Pacific coast. Trees are not uncommon which measure 300 feet in length, two-thirds of the distance being free from limbs. Fifty, sixty, and sometimes eighty good timber trees grow upon an acre of ground. It is not seldom that 200,000 feet of merchantable fir lumber is taken from a single acre. The rule with Washington lumbermen has been to work no tract of (fir) timber producing less than 30,000 feet per acre.

Although lumbering has been carried on along the shores of the sound for twenty years, up to the present time logs have seldom been hauled more than a mile—to the estuaries of the sound, or some convenient stream where rafts are prepared for towing to the mills. The main timber region of the sound and lower Columbia has not yet been invaded by the ax. Many rivers and arms of the sound extend into the very heart of this vast Forest Preserve, and by clearing the river channels of drift the spring freshets can be availed of to run out the logs to the mills and the lumber to market.

The regular correspondent of the *San Francisco Chronicle*, writing under date of December 18, 1879, gives the following interesting account of the soil, situation and productions of *Eastern Washington:* Eastern Washington Territory is probably destined to become the richest and most renowned wheat-growing region in the world. The great body of its arable land is the southern portion, known locally as the Walla-Walla, Palouse and Yakima countries, which have an unbroken area more than 150 miles square, extending from the foot-hills of the Cascade Mountains eastward to the Idaho boundary line, and from the Oregon line northward beyond the Great Bend of the Columbia river. But Eastern Washington in its entirety is distinctively an agricultural region of great fertility; for, in addition to its vast scope of rolling prairies and plains in the southern and middle sections, there are in its more northerly portion, and extending as far as to the British possessions, numerous rich and well-watered valleys, such as the Chemakane and Colville Valleys, the latter of long-standing fame. Eastern Washington has been described as the "valley of the Columbia river in Washington Territory, lying east of the Cascade Mountains." The appropriateness of this description will readily appear by an examination of the map, showing the courses of this river and its numerous tributaries. Here the climate is most favorable to health, the soil yields the largest average return of wheat, drought is unknown, the crops never fail, and the ultimate capacity for production of cereals of the highest grade has been estimated by good judges as high as 150,000,000 bushels per annum.

The Yakima country is in the southern central portion of the Territory, between the Cascade Mountains on the west and the Columbia river on the east, and embraces the northern half of Klickitat and all of Yakima counties. It is traversed by a river of the same name, which, rising in the northern central portion of the Territory, flows southeastward, and empties into the Columbia a short distance from Ainsworth, at the mouth of the Snake river, the present western terminus of the Pend d'Oreille division of the Northern Pacific Railroad. The fertility of the Yakima country is declared to be not inferior to that of any other

part of this great wheat-field, not even excepting the Walla-Walla valley, farther east. The projected line of the Northern Pacific Railroad from the Columbia river at Ainsworth, across the mountains to Puget sound at Tacoma, passes through the heart of this region; and the construction of a road over it is all that is needed to fill up the country speedily with a teeming population. It is yet sparsely settled, but new-comers in their prairie-schooners are fast encroaching upon its unoccupied lands. Its climate and soil are admirably adapted for stock-raising, which is the chief occupation of its inhabitants. The food for cattle is a very rich, nutritious bunch-grass, almost as strong as grain, with which the prairies and hills are covered throughout all seasons of the year; and as the winters, with rare exceptions, are mild and dry, there is no need of housing and feeding the cattle, but they are without fear suffered to roam at will in the winter months, and grow fat on this remarkable grass. This bunch-grass is common all over that country, covering the foot-hills and plains alike, and sometimes even reaching to the mountain-tops.

J. Ross Browne, in an official report, says, "For grazing, these table-lands and side-hills of Eastern Washington cannot be excelled. They are covered with a luxuriant growth of native bunch-grass, of nutritious quality. During the rains of spring it seems to attain its growth; and through the dry season which follows, it stands to be cured into the best of hay, preserving its strength and esculent properties all winter. Stock abandon the green grass of the bottom-lands to feed upon it, and on it they keep fat the year round." The Yakima country produces the cattle for supplying the market on Puget sound and elsewhere in Western Washington, as well as in British Columbia, whither they are driven through the several passes in the mountains; and large droves of exceptionally fat cattle go annually out to the Union Pacific Railroad, and are transported to Chicago. Such is the great value of this region for stock-raising; but, as the soil is of a character and productiveness that invite the change, the cattle-range on the lowlands must give way before the more profitable wheat-field, and confine itself higher up on the foot-

hills and mountain-sides. To the limited extent to which the Yakima country has gone in wheat-raising, it may safely challenge the best record of Illinois, Ohio, or any of the other Eastern or Middle States; for it has performed some wonderful feats, as well as to quality and size of grain, as to the amount of yield per acre. The railroad only is needed. Even thus early in the agricultural history of Eastern Washington, it is to be recorded that the last crop was of such dimensions as to defy the present facilities for moving it to market; the approach of cold weather and low water in the river, finding still on hand, in the storehouses at Wallula, a large residue of 20,000 tons—the year's production, there to remain until the opening of spring. This fact is a very persuasive appeal for the building of a railroad to Puget sound.

Passing eastward from the Yakima across the Columbia, we enter the already famous Walla-Walla Valley, which is bounded on the south and east by the Blue Mountains, and on the west and north by the Columbia and Snake rivers. Its area runs into millions of acres, as does that of the Palouse country to the north of Snake river, watered by the Palouse river, and extending far northward to the Spokane. The Walla-Walla and Palouse countries are being rapidly settled by people from all parts of the United States. These two regions of Southeastern Washington do not materially differ in their general character; so little, indeed, that a description of the soil, products, and climate of one, may answer for all three. The soil is of an appearance likely to surprise the average wheat-grower, being, except in the bottom-lands, a very light-colored loam, containing an unusually large percentage of the alkalies and fixed acids, and covering practically the whole of Eastern Washington to a depth of from one to twenty feet. Near the base of the mountains it is mixed with a larger proportion of clay, which renders it somewhat darker in appearance; but in no respect does it resemble the black soils of the Mississippi valley. One of the most remarkable features of this country is, that the soil on the tops of high hills yields as many bushels of wheat to the acre, as does that of the lowlands or prairies. This fact is sought to be explained by the theory,

that this soil on both hill and plain was once the bed of a system of lakes, and was greatly enriched by volcanic ashes blown from the Cascade Range, or thence carried by the streams into the lakes, and thus widely distributed over the entire basin, including the hills in question, which are supposed to have been under water. In the Walla-Walla and Palouse countries, towns are springing up in all directions—mere trading-camps at the outset for the farmers who are crowding in round about; and the hurry and flurry of settlement, and bustle and haste of preparation for wheat-raising, lends to some of the settlements an appearance resembling that of a mining-camp hastily pitched together, with many of the incidents common to the latter. The Palouse country is traversed about through its centre by the Northern Pacific Railroad, Pend d'Oreille division, and extends from the Columbia at the mouth of the Snake, northeast to Spokane falls, about a hundred and fifty miles. To Dr. Bingham is credited the discovery that this was valuable agricultural land. Although it was subject to entry at a dollar and a quarter per acre, no one thought it worth taking, until the doctor got an idea to experiment. He planted twelve acres in alfalfa; and, to the amazement of himself and neighbors, it grew more profusely and to a greater height than they had ever before known it to grow. Elated at this splendid success of his experiment, he at once set about procuring all the land he was able to buy, and is now said to be one of the most prosperous planters in the northwest. He tried wheat with a like brilliant result, securing an average yield per acre that paid for the land over and over again; and thus suddenly the good people of that region were awakened to the astounding revelation that their vast expanse of country known as the Plains of the Columbia, and, indeed, the whole of Southeastern Washington, instead of being, as it had always been regarded, an almost useless waste, had a wealth-producing capacity far exceeding that of all the gold and silver mines of California and Nevada. Immediately scores and hundreds of people jumped into the business of wheat-raising; and the fame thereof went abroad, starting westward and northward large numbers of farming people, some going through California and by sea, but a larger proportion

arriving from surrounding Territories in their prairie-schooners drawn by oxen. The experience of Dr. Blalock near Walla-Walla illustrates what may be done in the way of farming in Washington Territory. He began comparatively poor a few years back, and has now the largest farm in the Territory. He has one large field of nearly two thousand acres, which was partly in wheat and partly in barley during the season just closed, and the average yield per acre is reported to have been forty bushels. At the last harvest, it was not regarded as extraordinary for particular fields to yield an average as high as forty-five and fifty and even sixty bushels to the acre.

Of the enormous average yield of wheat on these "Great Columbia Plains," Mr. Philip Ritz, for fifteen years a farmer in the Walla-Walla valley, wrote in 1869: "I have seen large fields of wheat average fifty-six bushels to the acre, and weigh sixty-two pounds per bushel; and have seen fields which yielded forty to fifty bushels per acre from a volunteer crop; that is, produced the second year from grains scattered out during harvest, sprouting during the fall and growing even without harrowing." Ten years later, in the autumn of 1879, the same gentleman wrote: "We are just about finishing our harvest, and such a harvest I am sure the world never saw before. Our 'Great Columbia Plains,' famous for her magnificent wheat crops, has this year outdone herself. She never had such a crop before. Our small, sparsely settled country has this year about two million bushels of surplus wheat. The average is reckoned by the best judges at from thirty to forty bushels per acre. My own judgment is that the whole country will go over thirty-six bushels to the acre. A great many large fields will average over fifty, and a field that would not average over twenty-six is hardly considered worth cutting. There is probably no country in the world, climate and other advantages considered, equal to this for growing wheat." In October, 1879, more than 20,000 tons of wheat were stored at Walla-Walla and vicinity awaiting shipment, the facilities for transportation on the Columbia river being inadequate for the carriage to that extent.

A large part of this production was not on new lands, but on

lands which had been cultivated with the same crop for ten or twelve years. The crop of 1880 was still larger, and its net cash value to the farmers of Washington Territory is reckoned at over $9,000,000.

Exports.—In addition to the exports of wheat already referred to, writes Governor Ferry in October, 1879, there have also been large exports of other cereals, wool, flour, and live-stock from Eastern Washington. Large shipments of flour have been made direct from Walla-Walla to Liverpool. From the lower counties on the Columbia river there have also been exportations of grain and canned salmon; of the latter, 160,000 cases, of forty-eight cans each.

From Puget sound the exports have been lumber, coal, fish, grain, potatoes, wool, hops, hides, barrels, lime, etc. The export of coal for the past year has been 190,000 tons.

The lumbering interests are somewhat depressed at present, owing to a falling off in the foreign demand. This depression is regarded as temporary only.

Manufactures are, of course, but of moderate extent in so new a Territory, and with as yet but a scanty population. The principal is lumber, of which 250,000,000 feet or more are produced annually. There are many flouring mills, establishments for canning and barreling salmon and other fish, barrel factories, some of them of great extent, etc., etc. The production of manufactured goods in 1880 was about $8,000,000.

Population.—The following table gives the population of Washington Territory at different periods:

Census Year.	Total Population.	Males.	Females.	White.	Colored, including Chinese and Indians.	Native.	Foreign.	Density.	Ratio of Increase.	Illiteracy.	Of School Age, five to twenty, both sexes.	Of Military Age, eighteen to forty-five, males.	Of Voting Age, twenty-one and upwards, males.	Citizens, males.
1860	11,594	8,446	3,148	11,138	456	8,450	3,144	0.06	.....	438	2,279	5,880	6,166	4,231
1870	37,432*	14,990†	8,965†	22,195	15,237	18,931	5,024	0.34	106.61	1,307	7,060	7,835	9,241	7,902
1878	64,411*	.....	.....	.....	15,660	.....	.....	0.92	72.10	.....	12,997			
1879	72,052*	.....	.....	.....	16,028	.....	.....	1.03	11.86					
1880	89,388*	45,977	29,143	67,349	22,039	59,259	15,861	1.28	24.06					

* Including 13,477 tribal Indians on reservations in the Territory. † Sex of Indians not given.
" 13,960 " " " " "
" 14,268 " " " " "
" 14,268 " " " " "

The population of the Territory is, to a very large extent, composed of citizens of the Eastern States, with a moderate proportion of sturdy and industrious Scandinavians and Germans, and some English, Irish, Scotch and British-Americans.

Indian Tribes and their Reservations.—There were, in the autumn of 1879, 14,268 tribal Indians in Washington Territory. They were collected on seven reservations, under as many distinct agents, and belonged to forty-three or forty-four bands or sub-tribes, many of them of most unpronounceable names. All of the tribes of this region belong to the Athabascan family, and their languages have, for the most part, a sharp click, which distinguishes them from most of the other tribes of the West. There was a severe war with the Indians in 1855, when they had nearly double their present numbers; but since their defeat at that time, they have been generally very quiet and friendly to the whites. In May, 1879, the non-treaty Indians in Eastern Washington were removed to a reservation on the west side of the Okinakane river, in Stevens county. These Indians have made greater advances in civilization than most of those farther east. Of the 14,268, 11,763 wear citizens' dress; 1,548 families are engaged in agriculture; 3,444 male Indians are engaged in other civilized pursuits; 980 houses are occupied by Indians, and of these houses 82 were built during the year; 510 of their children, 255 of each sex, were in school in 1879. The government spends $28,783 annually for their education. Of the adult Indians, 802 can read. They have 18 church edifices and 11 missionaries among them. The land of all their reservations amounts to 3,933,504 acres, of which 145,662 is reported tillable, and nearly all the rest good grazing land. A fair proportion of them are good farmers. Over 10,000 acres are cultivated, and they raised, in 1879, 46,950 bushels of wheat; 3,080 bushels of corn; 16,265 bushels of oats and barley; 36,810 bushels of vegetables; 3,179 tons of hay; and they own 23,213 horses and mules (very few of the latter); 8,178 cattle; 1,182 swine, and 408 sheep. A fair percentage of them earn from one-half to the whole of their living by civilized pursuits.

Education.—The Territory is awake to the advantages of public

school education. The school lands have not as yet been sold in sufficient amounts to afford anything more than a nucleus for a school fund, but a beginning has been made. We have no official reports of a date later than 1877, since which time education as well as population has made a great advance there. At that time there were 12,997 children of school age, of whom 5,385 were enrolled in the public schools. There were 262 school-houses and school-rooms, and the average duration of the schools in days was 130 days. There were 279 teachers employed, of whom 134 were men and 145 women. The average monthly pay of the men was $40, and of the women $30. The amount received and expended for school purposes was about $50,000. There were graded schools in the principal towns, a normal department in Washington University, covering two years' instruction; and schools of higher instruction at Walla-Walla, Seattle and some other points. The University of Washington Territory, at Seattle, is a part of the public school system, and is aided by the Territorial Legislature. It had, in 1879, eleven instructors and professors, 120 students, and four courses of study. It has the nucleus of a library and museum, and an appropriation has been made for necessary apparatus. The Holy Angels' College, at Vancouver, in this Territory, is a Roman Catholic institution, having, in 1878, four professors and eighty-five students, and a library of nearly 1,000 volumes.

Counties and Principal Towns.—Olympia, the capital, has about 3,000 inhabitants; Walla-Walla, between 4,000 and 5,000; Seattle and Steilacoom nearly as many; while Port Townsend, Vancouver, Kalama, Tacoma, and in Eastern Washington, Ainsworth, Wallula, Palouse, Spokane Falls and Colville are thriving and growing towns.

Religious Denominations and Public Morals.—No one of the States and Territories of "Our Western Empire" has a better moral and religious record than Washington Territory. Settled very largely by the best people from New England and the Middle States, its churches and religious institutions have more nearly kept pace with the growth and progress of the population than those of any other part of the West. In 1875, with a pop-

ulation estimated at not more than 36,000, there were 94 church organizations, 72 church edifices, 58 clergymen, priests or ministers, 2,398 communicants, and 21,465 adherent population, and church property valued at $105,700. Since 1875 the population of the Territory has more than doubled, and from the character of that increase, and the sacrifices it glories in making to establish religious institutions at the earliest possible moment, we are warranted in believing that the churches and religious denominations have kept pace with the population in their growth. Of these denominations the Methodists, under two or three distinct organizations, are here, as in most of the States and Territories of the West, the most numerous. The census of 1870 recognized only two, viz.: "Methodists" and "United Brethren in Christ." It may be, there were no Southern Methodist churches then, but there were certainly Protestant and probably Primitive Methodists there, as well as some Albrights or Evangelical Association Methodists there then and now. Of all these, the present number cannot be less than 68 churches, with about 50 church edifices, about 38 ministers, 3,000 members, and at least 15,000 adherents. Their church property might safely be reckoned at $60,000. The Catholics were next in 1875, and may be now, but at a long interval, with possibly 32 congregations, 30 church edifices, and the same number of priests, an adherent population of about 13,000, and church property worth $35,000. The Baptists and the Christian Connection come next, with at least 35 congregations, perhaps 28 church edifices, and about the same number of ministers, a combined membership of about 1,100, and an adherent population of over 6,000, and church property worth about $18,000. After these come in their order Episcopalians, Presbyterians, Congregationalists and five or six smaller denominations, the whole having an adherent population in all of perhaps 10,000 or 12,000. It is safe to say that five-eighths of the population are nominally, at least, the adherents of some religious denomination.

Population and Valuation of Washington Territory in 1878, 1879 *and* 1880.

Counties.	POPULATION. 1878.	1879.	1880.	VALUATION. 1878.	1879.
Columbia	5,820	6,894	7,103	$292,918 00	$304,081 00
Chehalis	720	808	921	132,362 00	154,351 00
Clallam	370	469	638	869,173 00	924,100 00
Clarke	4,288	4,294	5,490	1,521,434 00	1,948,050 00
Cowlitz	1,783	1,810	2,063	750,200 00	968,170 00
Island	600	633	1,087	391,570 00	372,821 00
Jefferson	1,577	1,427	1,712	512,025 00	468,191 00
Klickitat	1,999	2,898	4,937	2,242,804 00	1,937,670 00
King	5,543	5,183	6,910	989,780 46	1,044,673 00
Kitsap	1,548	1,799	1,788	570,313 00	732,737 00
Lewis	1,806	2,095	2,600	668,807 00	743,571 00
Mason	520	560	639	364,138 00	570,331 00
Pacific	1,411	1,351	1,645	362,380 00	379,258 00
Pierce	2,801	3,051	3,319	1,736,797 00	1,669,444 00
San Juan	700	838	948	154,268 00	182,147 00
Skamania	221	495	859	117,519 00	143,703 00
Snohomish	1,042	1,080	1,387	382,219 00	390,754 00
Spokane	.....	.....	4,262	.....	484,306 00
Stevens	846	2,601	1,245	341,652 00	
Thurston	2,971	3,246	3,278	1,652,848 00	1,627,184 00
Wakiakum	569	504	1,630	144,428 50	158,6 6 00
Walla Walla	5,701	6,215	8,716	2,711,010 00	2,971,560 00
Whatcom	2,115	2,331	3,137	612,202 00	735,003 00
Whitman	3,769	5,290	7,014	819,142 00	1,237,189 00
Yakima	1,711	1,912	2,811	589,585 00	811,932 00
Total	50,511	57,784	75,120*	18,930,964 96	21,019,832 00

Historical Data.—The region about Puget sound was a favorite resort of the Indian tribes for centuries. Both the hunting and fishing were such as to render the regular supply of food easy and certain. In 1840 there were 25,000 Indians who claimed Puget sound as their home. The number in the whole Territory is now but a little more than half as many, and the greater part of these are now domiciled along the upper Columbia river. As we have already said under Oregon, the Straits of San Juan de Fuca were first entered by a Greek navigator of that name in the Spanish service, in 1592; the coast was revisited in 1775 by Heceta, a Spanish navigator, and in 1787 and 1788 two English captains, Berkeley and Meares, successively entered the straits, and the latter revived the name of the old Greek discoverer. The priority of discovery of the coast and the straits certainly lay with the Spanish. In 1789 an American, Captain Robert Gray, in the sloop "Washington," discovered and entered several of the smaller bays and harbors along the coast, both in the Straits of San Juan de Fuca and below; and in 1790 Captain Kendrick, in

* Tribal Indians not included.

the same vessel, passed through the entire length of the Straits of San Juan de Fuca. In 1791 Captain Gray returned to the coast, and discovered and explored and gave his name to Gray's Harbor. It was in this same year also that he discovered and ascended the Columbia river about thirty miles. In 1805 Lewis and Clarke reached and explored the coast from the land side, having crossed the continent for that purpose. Meanwhile the title of the United States to the whole region watered by the Columbia river was further fortified by the settlement of Astoria, at the mouth of that river, by Mr. J. J. Astor, in 1811, and the title was perfected as against any European power by the treaty of Florida with Spain in 1819, which expressly ceded to the United States all the rights, claims and pretensions of the King of Spain to any Territory north of the forty-second parallel of north latitude. The Hudson's Bay Company attempted to take possession of it between 1825 and 1830, and from 1828 to 1841 it was held in joint occupancy by Great Britain and the United States, without prejudice to the title of either. The Ashburton Treaty of 1845 finally settled the right of the United States to the Territory up to the line of 49° north latitude, except at the Straits of San Juan de Fuca and the Gulf of Georgia. It was understood by that treaty that the American title took to the middle of the channel of those waters; but as there were several channels and some valuable islands in controversy, the matter was definitely and finally settled by arbitration in 1873, the Emperor of Germany being arbiter. American settlers began to come into the Territory in 1845. It was originally a part of Oregon Territory, but was organized as a separate Territory in 1853, and had a severe Indian war in 1855. From 1859 to 1863 it included most of Idaho Territory, but since that time it has had its present boundaries.

Conclusion.—It may be inferred from our sketch of Washington Territory that we regard it as a very desirable region for immigrants who desire to engage in farming, stock-raising, the preparation of timber or lumber for the market, or the packing and exportation of fish. Its mining districts are not yet developed to such an extent as to justify any immigration to them, but for

the other pursuits, and for many of the trades, there is certainly no section of "Our Western Empire" which offers greater opportunities for success to an enterprising and energetic man. As to the best route thither there is some room for an honest difference of opinion now, and will be more in a few months. Probably the best plan *now* is to take passage for San Francisco either by rail or by the Isthmus of Panama. From San Francisco a steamer may be taken for Portland, Oregon, and if by the Oregon Railway and Navigation Company's line, and it is desired to go to Eastern Washington Territory the immigrant can purchase a through ticket to Walla-Walla, or to any point on the Pend d'Oreille division of the Northern Pacific, or to the termini of the narrow gauge railroads from Ainsworth, Walla-Walla or Wallula. If, on the other hand, his destination is to any point in Western Washington, he should not go on to Portland, Oregon, but land at Kalama some forty miles nearer the mouth of the Columbia river, and take the Northern Pacific thence to Olympia, Tacoma or Wilkeson. If his destination is to Western Washington he may, if he chooses, take the Puget sound steamer from San Francisco and land at Bellingham bay, Port Townsend, Seattle, Tacoma or Olympia. These routes are long and somewhat wearisome, but safe and without other difficulties. There will soon be two other routes available. The best and most direct will be by way of the Northern Pacific, either from Duluth or Chicago, through Minnesota, Dakota, Montana and Idaho, which will traverse Eastern Washington diagonally from northeast to southwest, cross by one branch (the Cascade Mountain division) from Eastern to Western Washington, and make its terminus at Tacoma on Puget sound, while the Columbia River division will follow the north bank of the Columbia, and sending a branch to Portland, Oregon, traverse by the Pacific division the greater part of Western Washington. More than one-half of this long route is already completed, and with the ample funds they have at command this company will probably have the whole in operation by the spring of 1883.

The other route by the Union Pacific and Utah and Northern, in connection with the Oregonian railway (limited), is not yet fully

laid out, but will probably penetrate Southeastern Washington, and its principal connections will be with Portland, Oregon. With the completion of these lines Washington Territory will be as easily and readily accessible as Utah, Nevada, New Mexico or Arizona, and for a quiet and pleasant home much more desirable.

CHAPTER XXI.

WYOMING TERRITORY.

SITUATION—BOUNDARIES—LENGTH AND BREADTH—FORM—AREA—TOPOGRAPHY—MOUNTAINS—ELEVATION OF VARIOUS POINTS—RIVERS, LAKES, ETC.—REMARKABLE CHARACTER OF ITS DRAINAGE—ITS WATERS DISCHARGED INTO THE PACIFIC BY THE COLUMBIA RIVER, INTO THE GULF OF CALIFORNIA BY THE COLORADO, INTO THE SALT LAKE BASIN BY THE BEAR RIVER, INTO THE UPPER MISSOURI BY THE MADISON AND GALLATIN, INTO THE MIDDLE OF MISSOURI BY THE YELLOWSTONE AND BIG CHEYENNE, INTO THE LOWER MISSOURI BY THE NIOBRARA AND PLATTE, AND INTO THE GULF OF MEXICO BY ALL THESE—GEOLOGY AND MINERALOGY—COAL—PETROLEUM—GOLD AND SILVER—OTHER METALS—MINING OF PRECIOUS METALS NOT MUCH DEVELOPED—MARBLE AND OTHER MINERAL PRODUCTS—FORESTS, SOIL AND VEGETATION—ZOÖLOGY—CLIMATE—METEOROLOGY OF CHEYENNE—AGRICULTURAL PRODUCTIONS AND STOCK-RAISING—MANUFACTURES AND MINING—MINING PRODUCTS—RAILWAYS, EXISTING AND PROJECTED—POPULATION AND ITS DISTRIBUTION—EDUCATION—RELIGIOUS DENOMINATIONS—COUNTIES—AREA—POPULATION IN 1880, AND VALUATION IN 1877—PRINCIPAL TOWNS—OBJECTS OF INTEREST—THE YELLOWSTONE NATIONAL PARK MADE A SEPARATE CHAPTER—HISTORICAL NOTES—EARLY SPANISH OCCUPATION OF WYOMING—DISCOVERY OF ARASTRAS AND SPANISH BUILDINGS—FATHER DE SMET—CAPTAIN BRIDGER—HIS OCCUPATION RUNNING BACK TO A TIME "WHEN LARAMIE PEAK HADN'T BEGUN TO GROW"—ORGANIZATION OF THE TERRITORY—INDIAN CONFLICTS—THE CUSTER MASSACRE—ADVANTAGES OF WYOMING FOR CERTAIN CLASSES OF IMMIGRANTS—PROSPECTS IN THE NEAR FUTURE.

WYOMING is one of the central Territories of "Our Western Empire," both in its position on an east and west line, and in its relations to the States and Territories north and south of it. It lies between the 41st and the 45th parallels of north latitude, and between the 104th and 111th meridians of west longitude from Greenwich. It is bounded on the north by Montana, on

the east by Dakota and Nebraska, including in the northeast a considerable portion of the Black Hills region; on the south by Colorado and Utah; and on the west by Utah, Idaho and Montana. Its length from east to west is 335 miles, its width from north to south is 276 miles. It is a perfect parallelogram, all its boundaries being astronomico-geographical lines. Its area is 97,883 squares miles, or 62,645,120 acres, of which, up to June, 1879, only about one-seventh had been surveyed.

Topography.—The main divide of the Rocky Mountains, which, after traversing Northwestern Montana, turned suddenly southwestward and formed the southeast boundary of Idaho, separates again into two chains at the Yellowstone park, and enters Wyoming from the northwest in two distinct and nearly parallel ranges, the easternmost being known as the Shoshone range, and the westernmost as the Wind River range. Near the forty-third parallel, the Big Horn Mountains, a somewhat lower range from the north-northeast, meets them almost at a right angle, and from this point to the Colorado line both ranges break into a number of mountain groups extending in all directions, and rendering it difficult to define which has the best right to the name of the main range of the Rocky Mountains. Among the groups of this confused mountain mass may be named, beside the Big Horn range already mentioned, the Owl Creek Mountains, a spur of the Shoshone range, the Rattlesnake Mountains, and the Laramie Mountains, still farther east; the Sweet-Water and the Seminole Mountains, which seem to be continuations of the Wind River range. Near the forty-second parallel these mountain ranges subside into an elevated plateau from 8,000 to 9,000 feet above the sea, with occasional elevated summits, rising again to higher elevations on either side of the North Park in Colorado. This elevated plateau extends westward and southwestward to the foot-hills of the Bear River range on the west, and the Uintah Mountains on the south, both in Utah Territory. In the southeast there are the Medicine Bow Mountains, and some isolated peaks, like Laramie Peak, Iron Mountain, the Red Buttes, etc.; and in the northwest the Heart Mountains and the isolated peaks of the Yellowstone Park. In the northeast, east of the Big Horn

and north of the Laramie Mountains, there is an extended plateau of 4,000 to 7,000 feet elevation, rising at the east into the Black Hills, and in the northeast and north to the Powder River range and the Wolf Mountains.

The highest elevation in the Territory is probably Snow's Peak, in the Wind River Range, which is reported as 13,570 feet; the next is Gilbert's Peak, 13,250; Cloud Peak probably exceeds 13,000; and Lake Carpenter, in the Big Horn Mountains, is 11,000 feet above the sea. The average elevation of Yellowstone Park is 7,403 feet. The highest summit in the Wyoming portion of the Black Hills is Harney's Peak, 7,700 feet, while Red Buttes, in the southeastern part of the Territory, is 7,336 feet, and Laramie City, 7,123 feet. Laramie Peak is 10,000 feet and possibly a little more.

Rivers and Lakes.—No State or Territory of "Our Western Empire," or of the United States, is drained by streams which find their way to such widely separated seas, as Wyoming. In the northwest and west the Shoshone lake and its outlet through Jackson lake, the Gros Ventres creek, and the John Gray river, are all tributaries to the Lewis fork of Snake river, itself one of the constituents of the Columbia river, and these waters find their way to the Pacific by that route. In the southwest Bear river traverses Uintah county for fifty miles, and, flowing north-northwest around the range of the same name, turns suddenly south and discharges its waters into the Great Salt lake of the Utah Basin. Far up in the Wind River range the Green river has its sources, and receiving ten or a dozen affluents, flows southward through Northwestern Colorado and Eastern Utah to its junction with the Grand river, with which it forms the Rio Colorado of the West, and discharges its waters into the Gulf of California. In the northwest of the Territory we find the Madison and Gallatin, two of the sources of the Missouri, both rising in the Yellowstone National Park; the Yellowstone river, the largest tributary of the Missouri, rising in the Wind River Mountains, and traversing Yellowstone National Park and the Yellowstone lake; East fork, Clarke's fork, the Big Horn river and its numerous branches; the Tongue river, the Powder river and

its tributaries, all affluents of the Yellowstone; while the Little Missouri, the North fork or Belle Fourche river, and the Big Cheyenne with its forks and branches; the Eau qui Court or Niobrara and the North fork of the Platte river, which traverses half the Territory, are all affluents of the Missouri below the mouth of the Yellowstone, watering the northern, eastern and southeastern portions of the Territory. All of these carry their waters to the Gulf of Mexico.

There are two lakes of considerable size, Yellowstone and Shoshone, in the Yellowstone National Park, and several of somewhat smaller dimensions, in the southern and central portions of the Territory.

Geology and Mineralogy.—The crests, and, indeed, the bulk of the mountain masses of all the ranges of the Territory are eozoic, being composed mainly of red feldspathic granite and syenite and gneiss, while the lower slopes are silurian, forming narrow belts around the higher mountain slopes. To these succeed the more distinctly fossiliferous formations, Devonian, carboniferous, triassic, jurassic and cretaceous rocks, succeeding each other in regular order. Between the Big Horn and Wind River Ranges, the plateau is mainly carboniferous, triassic and jurassic, with a small tract of cretaceous groups in the centre. The elevated plains are mostly cretaceous, but overlaid with tertiary sands, gravel and drift, with occasionally extensive deposits of lignite or brown coal. The coal beds along and near the Union Pacific Railway, near Evanston, at Rockspring, from Point of Rocks to Table Rock, at Carbon Station, and, indeed, all along that road, are probably lignite, as they occur in tertiary deposits, but they differ in appearance and quality from the European lignites, containing from fifty to seventy-six per cent. of fixed carbon, and are equal to most of the best bituminous coals for all purposes of combustion. Some of them are true coking coals. They are used not only on the Union and Central Pacific Railways, but in the villages and towns on the line of those roads between Omaha and San Francisco. Recently the coal of Utah and Colorado has come in competition with them, and that of New Mexico will do so. The consumption of Wyoming coal in 1876 was

524,000 tons, and has since largely increased. But if these coal beds in Southern Wyoming are lignite, there is undoubtedly an abundance of true coal, from the coal measures of the carboniferous era, on the North fork of Platte river, above and below Fort Fetterman, at the head waters, and, indeed, along the whole line of Powder river, on the North fork or Belle Fourche river, and on the Big Cheyenne. There is also reason to believe that it will be found on the plateau between the Wind river and Big Horn Mountains.

At numerous points throughout the Territory there have been found petroleum springs, and wells have been sunk which have proved moderately profitable. These springs have been found on the Bear river, in the extreme southwest of the Territory, at several points on the North fork of Platte river, particularly near South Pass City, and near Fort Casper, and on the branches of the Big Cheyenne. The petroleum springs, near South Pass City, are said to yield a very large supply, and are adding materially to the freight receipts of the Union Pacific.

The precious metals are found at many points in the Territory, gold predominating, either in placers or in quartz veins in most cases, though in a few instances silver and gold occur together. On Crow creek, twenty miles west of Cheyenne, in the Seminole Mountains, and on the eastern slope of the Big Horn Mountains, and at some other points, silver (argentiferous galena) has been discovered in proximity to the gold. In the Bear Lodge Range, in the Black Hills, at Inyan Kara and other points in that region, in the vicinity of Laramie Peak, directly north of the North Park in Colorado, in the Sweet Water Mountains, on the Wind river, and at the sources of Crazy Woman's fork, quartz mines, yielding fair amounts of gold, as well as rich placers, have been found. Doubtless these deposits are not as rich nor as actively worked as those of some of the other States and Territories adjacent; for all of the mining enterprises of Wyoming have been but languidly pushed, either from the want of men, of means, of water, or of yield sufficient to stimulate active enterprise. The whole gold and silver production of Wyoming, which was known to have been deposited in the mints and assay offices of the United

States from the first discovery of gold and silver there to June 30, 1880, was but $728,760.33. Doubtless considerable amounts were sent through other States and Territories, and some was not deposited; but even if we allow as much more for these contingencies, the amount would be but little more than $125,000 per year.

Of other metals and minerals, several ores of iron, particularly hæmatite, magnetic oxide, and red oxide of superior quality, occur in immense quantities. The red oxide, at Rawlins' Springs, is used for making a mineral paint of great excellence. Copper and lead are found in paying quantities, but are not as yet developed. Near Laramie City are a cluster of lakes which yield a pure sulphate of soda, many feet in thickness; and about sixty miles north of Rawlins are two soda lakes, estimated to contain 125,000 tons of carbonate of soda of great purity. There are also soda springs near Fort Bridger and at other points in the Territory.

Sulphur deposits and sulphurous springs occur at many points. Wyoming claims that she has the finest beds of statuary marble in the United States, twenty-five miles north of Laramie, and easily accessible by way of Cooper Lake Station, on the Union Pacific Railway.

Forests, Soil and Vegetation.—The explorations of Professor Hayden and his party, and those of still later surveyors and explorers, justify the estimate that there are not less than 6,000,000 acres of arable lands, and that the grazing lands are not far from 35,000,000 acres. Most of the arable lands require irrigation for successful cultivation, but this is easily obtainable in all the lands fit for cultivation; and under its influence, even the alkaline and sage brush lands yield bountiful crops.

The grazing lands are very generally covered with buffalo grass, and even the desert lands have an abundance of the white sage brush, which, after it is touched with the frost, is preferred by cattle to almost any other food. The mountains are clothed with a thick growth of pine, spruce and hemlock trees, of large size; the foot-hills have some pine, spruce, aspen, walnut, elm, ash, box-elder, hackberry, and red cedar of smaller growth, while

the river bottoms are abundantly supplied with two species of cottonwood and thickets of willows. There are considerable tracts of alkaline lands among them. The United States Exploring Expedition, under Professor Hayden, described and named 195 species of plants, many of them peculiar to the Territory.

Zoölogy.—The wild animals of Wyoming are: the grizzly bear (not very common), black bear, gray wolf, prairie wolf, or coyote, badger, wolverine, otter, fisher, porcupine, mink, skunk, little ermine, buffalo, elk (more abundant in Wyoming and Colorado than anywhere else in the West), mule, or black-tailed deer, the common deer, big horn, or mountain sheep, prong horn antelope, the Rocky Mountain goat, or goat antelope, four species of hare or rabbits, four of squirrels, two of prairie dogs, gopher, muskrat, two species of mouse, etc. In all, more than thirty species of mammals have been described in the Territory, and 124 species of birds, including twelve or thirteen birds of prey; many game birds, including a dozen or more of the duck and teal family, six species of grouse, ptarmigan, etc., and a large number of song birds; there are more than eighty species of mollusks. Reptiles are not numerous. Trout are abundant in the mountain streams, and other fresh water food fishes are plentiful.

Climate.—The average mean temperature of the whole Territory is about 44° Fahrenheit. In the mountains it is, in some years as low as 36°, while on the plains in the east it averages 45° to 46°, and in the Green river region, in the southwest, it is about 42°. The summers are, for the most part, cool and comfortable, though in some years the temperature rises to 103° in the hottest part of the day. The nights are cool. The cold of winter is at times intense, the winds and snow sweeping over the vast plains with almost irresistible fury. The "blizzard" is a painfully familiar term in the winter months. The mercury falls from 15° to 25° below zero. Stock requires to be sheltered for two or three months, though stock-raisers too often neglect this, to their great loss. The annual rainfall ranges from 8 to 13.5 inches, and it is an objection, though not an insuperable one, to the settlement of the Territory, for irrigation can be resorted to at less expense

and with as much certainty of good crops resulting as in any State or Territory of "Our Western Empire." We give below the meteorology of Cheyenne, which is nearly a fair average of that of the whole Territory.

Meteorology of Cheyenne, Wyoming Territory.

Latitude, 41° 12′ north. Longitude, 104° 42′. Elevation above sea, 6,057.25 feet.

	Temperature.				Barometer.	Winds.		Humidity.		
Date. *Months.*	Mean temperature, three daily observations.	Maximum temperature.	Minimum temperature.	Range of temperature.	Mean barometer corrected for temperature and elevation.	Prevailing winds, from what direction.	Total number of miles travelled by wind.	Amount of rainfall in inches and decimals.	No. of days on which rain or snow fell.	Mean humidity.
1877.	°	°	°	°	inches.			inches.		per ct.
July	70.2	96	43	53	29 039	S.	6,621	0.43	4	31.4
August	67.9	91	44	47	30.073	S.	6,398	0.83	7	36.8
September	56.2	83	27	56	29.993	W.	6,654	2.02	5	42.4
October	40.0	77	3	74	29 973	W.	7,005	1.99	13	61.1
November	30.1	55	—12	67	29 942	W.	8,970	0.17	6	64.9
December	28.9	64	—10	74	29.953	W.	7,155	0.33	5	48.0
1878.										
January	25.3	49	— 9	58	29.876	N. W.	8,981	0.08	4	52.1
February	30.9	58	6	52	29 780	N. W.	7,493	0.13	7	48.4
March	38.7	70	13	57	29 868	N. W	10,024	1.16	7	58.9
April	43.5	71	19	52	29 773	N. W.	8,707	0.19	8	48.9
May	47.9	76	28	48	29.907	N. W.	4,857	4.46	20	58.3
June	58.6	86	35	51	30.025	N. W.	5,288	1.71	14	57.9
Totals for year	44.8	96	—12	108	29.933	N. W.	88,153	13.47	100	50.8
1878.										
July	70.2	92	44	48	30.049	S.	.....	1.43	....	52.1
August	68.3	91	45	46	30.094	N. W.	.....	2.50	....	59.2
September	52.4	87	23	64	30.023	N. W.	.....	0.75	....	51.4
October	42.4	73	— 4	77	29.976	N. W.	.....	0.04	....	46.6
November	36.7	67	2	65	29.998	N. W.	.....	0.00	....	55.3
December	20.0	56	—12	68	29.947	N. W.	.....	0.19	....	65.9
1879.										
January	24.3	60	—15	75	29.896	N. W.	.....	0.32	....	61.3
February	31.5	59	— 6	65	29.876	W.	.....	0.20	....	52.5
March	39.3	77	8	69	29.957	N. W.	.....	0.44	....	44.2
April	44.3	72	22	50	29.925	N., N.W., & W.	.....	1.66	....	52.1
May	56.3	86	30	56	29.947	S.	.....	1.30	....	41.6
June	64.1	92	32	60	29.961	W.	.....	0.07	....	33.4
Totals for year	45.8	92	—15	107	29.971	N. W.	.....	8.90	....	51.3

Agricultural Productions and Stock-Raising.—It is impossible to give any very definite estimates of the amount of agricultural productions of Wyoming Territory, until the census report on that subject is made public. There is very little land in the Territory which at the present time will produce good crops without irrigation, and the poorest arable lands of the Territory lie along

the route of the Union Pacific. The valleys in the Big Horn and Wind River Mountains, especially the former, are very fertile and easily irrigated. Probably not more than 300,000 acres of the 6,000,000 acres of fertile lands are as yet under cultivation, perhaps even less than that. Good crops of the cereals, except Indian corn ; potatoes and other root crops, and some of the varieties of sorghum, can be grown here; and when once the tide of development begins, Wyoming will be able to provide breadstuffs and vegetables for her own markets, and very possibly a surplus for the general market.

Her live-stock production is more encouraging. More than one-half of the area of the Territory is well adapted to grazing, and the buffalo-grass and bunch-grass are the best and most nutritious food for cattle to be found anywhere on the continent. The stock-growers have not given so much attention as they should to improving the breeds of their cattle and sheep, purchasing Texas cows and steers and fattening them for market, though some of them are now introducing Durham, Devon and Holstein bulls, and improving their poor and scrawny Mexican sheep by an infusion of the best Merino, Southdown, Cotswold or Lincoln blood; but a large majority content themselves with raising Texan steers, which, at four years old, sell for $28, when, at an expense of not more than fifty cents per head more, they might raise a grade Devon or Durham steer, which at the same age would bring $45 ; or, if they are sheep-farmers, will rear the Mexican sheep, which will yield from two and a half to three and a half pounds of long, coarse wool, when they might, for fifteen cents a head more, raise a grade Cotswold or Merino, which would yield from five to seven pounds of better wool. In 1877 a careful examination indicated that there were 150,000 cattle and 100,000 sheep in the Territory. General Brisbin thinks that in 1880 there were about 250,000 cattle and over 200,000 sheep there. The cattle sent to Chicago and St. Louis from Wyoming in 1880 brought a little more than $2,000,000, and the wool about $250,000. The number of horses is rapidly increasing, and several wealthy stock-growers have gone into this business very largely. There are probably 100,000 horses and mules in the Territory.

The Territory is less favorable for swine-breeding, and there has not been much done in that line.

Manufactures and Mining.—Manufactures are yet in their infancy in the Territory. In 1870 the products of manufactures were stated in the census as $874,824. In 1877 Mr. Robert E. Strahorn, after careful inquiry, estimated the amount of products at $3,918,120. The largest items were machinery, railroad repairing, etc., which amounted to $1,429,420; railroad ties, poles, posts, etc., $455,360; sawed lumber, $345,000; sales of tanned robes, hides and furs, $295,000; charcoal, $240,000; and milled quartz, $215,000; and blacksmithing, $235,500; in all, about $3,200,000 of the $3,900,000 in manufactures, requiring very little skilled labor. Some branches of manufacture have been largely developed since 1877, and the amount of products is not now probably less than $4,500,000. Mr. Strahorn estimated the mining product in 1877 at $2,911,000, of which the greater part was coal. There are now some iron mines and petroleum wells, which had not then been discovered or worked, and the mining product, though there has been some falling off in gold, has probably increased in all to about $3,500,000.

Railways.—The Union Pacific Railway traverses the southern part of this Territory from east to west, having a length of 470 miles in it. There is no other railway in operation in the Territory except five or six miles of the Colorado Central, extending from Cheyenne to Denver. Two or three other railways have been projected, but none of them are yet built. One was proposed to the Black Hills from the Union Pacific; but if it is ever built, it will probably start from Sidney, Nebraska, and may not enter Wyoming at all. Another was proposed from Point of Rocks or Green River City to the Yellowstone Park, but this has been forestalled by the construction of the Utah and Northern Railroad, which now proposes to build a branch from Market lake or some other point in that vicinity to Shoshone lake, in the Park, and in that case will not enter Wyoming. Lastly, the Northern Pacific has projected a branch from the point where its Yellowstone Division crosses the Yellowstone river, to follow that river up to Yellowstone lake, in the Park. This road may be built before the close of the present year (1881).

Population.—The following table gives the particulars of the population of Wyoming in 1870 and 1880, the only years in which anything like an enumeration has been had:

Population.

Census Year.	Total.	Male.	Female.	Native.	Foreign.	White.	Colored.	Indians.
1870	11,518*	7,219	1,899	5,605	3,513	8,726	183	2,466
1880	22,938†	14,157	6,637	14,943	5,845	19,436	299	2,289

Census Year.	Chinese.	Density.	Ratio of Increase.	Illiteracy.	Of School Age, 5–18. Both Sexes.	Of Military Age, 18–45. Males.	Of Voting Age, 21 years and upward. Both Sexes.	Citizens.
1870	143	0.09	.....	602	856	6,056	7,156	5.297
1880	914	0.18	99.8					

Education.—The educational statistics of Wyoming are not so late as could be wished. There were in the Territory in 1877, which is the latest report which we have been able to obtain, 16 school buildings, 27 schools, a school population of 1,690 children, 1,543 pupils enrolled in the schools; the amount of wages paid to teachers was $18,169; the value of school property, $60,500. All the counties had surplus school funds, and some of them were arranging to erect new buildings and make other improvements. There are good schools at Cheyenne, Laramie and one or two other points. There are no collegiate schools, colleges or universities in the Territory. Provision is made at the expense of the Territory for deaf mutes and the blind.

Religious Denominations.—There were, in 1875, 20 church organizations, 17 church edifices, 11 clergymen, ministers or priests, 427 communicants, 3,570 adherent population, and $56,-

* Including 2,400 tribal Indians. † Including 2,150 tribal Indians.

500 of church property. Among these there were 2 Baptist churches, 1 ordained minister, 50 members, 300 adherent population, and $7,000 church property; the Congregationalists had about the same numbers throughout. There were: 4 Episcopal churches, with 3 church edifices, 2 clergymen, 116 communicants, 696 adherent population, and $12,000 church property. The Methodists had just about the same numbers, but their church property was not estimated at more than $9,000; the Presbyterians had almost the same figures, and $12,000 of church property. The Roman Catholics had 3 churches and 10 stations, 2 priests, about 1,000 adherent population, and $10,000 of church property. There were two or three of the minor denominations, with one church each. Since 1875 these numbers have materially increased, but we cannot give exact figures.

Counties.—There are seven counties. The following table gives the names, area, population and assessed valuation of each:

Counties.	Area, sq. miles.	Popular'n, 1880.	Ass'd Valuation, 1877.
Albany	10,400	4,625	$1,850,000
Carbon	22,080	3,438	1,900,000
Crook	new	239	
Laramie	16,800	6,409	3,500,000
Pease	new	637	
Sweetwater	29,532	2,561	1,918,449
Uintah	17,064	2,879	800,000
	95,876	20,788*	

Principal Towns.—Cheyenne, the capital, has a good location and good trade. The population probably exceeds 4,000. Laramie, fifty-six miles farther west, is a thriving town of over 3,000 inhabitants. Rawlins and Evanston have each over 1,000, and Green River City, Rock Springs, Hilliard, South Pass and Atlantic City are growing towns.

* Without tribal Indians.

Objects of Interest.—There are many of these in the Territory, some the results of erosion, others of volcanic action, and others still of subterraneous convulsions and chemical action in the great laboratory of nature. But the greatest wonder of all—rather the greatest collection of wonders—the Yellowstone National Park—deserves and shall have a consideration more full than can be given to it in a single paragraph, for it is unrivalled in the variety and grandeur of its attractions by any other known tract of the earth's surface. But before proceeding to portray as vividly as we may this wonderland in the heart of the continent, we must give a little space to the early history of this Territory and its natural wonders.

Historical Notes.—Wyoming Territory, and especially the Big Horn region and the country about Yellowstone lake and the sources of the Yellowstone, was probably known to the Spanish adventurers of the early part of the seventeenth century. That they were cut off by the Indians some time between 1650 and 1680 is a matter of tradition among the Mexican priests. More than a century later (in 1781), an expedition, accompanied by Jesuit missionaries, set out for this region from Santa Fé, but did not return. In 1866 the remains of an old Spanish arastra—a contrivance for crushing quartz, which we have elsewhere described—was found near Lake de Smet, in the Big Horn Mountains, and subsequently other Spanish ruins of houses and fortifications were found in the same vicinity. The more recent discoveries in Wyoming are due mainly to two men, Father Peter John de Smet, a Jesuit priest and missionary, who visited and explored much of the Territory in 1838 and 1839, and Captain James Bridger, who, with his partner, Vasquez, built a trading fort near the present site of Fort Laramie. There had been, however, a fur-trading post established in that vicinity as early as 1834, and rebuilt by the American Fur Company in 1836. Captain Bridger says, with the Western habit of humorous exaggeration, that he was there when Laramie Peak hadn't begun to grow, and was a hole in the ground (Laramie Peak being now 10,000 feet above the sea), but he probably does not much antedate 1839. Fort Bridger was held by Messrs. Bridger and Vas-

quez till 1854, when they sold it to the Mormons, who burned it in 1857, but it was rebuilt by the United States in 1858. Several forts and camps, six in all, have since been built for the protection of the Union Pacific Railway and the mining settlements. The Territory was organized by Act of Congress, approved July 25, 1868. Its growth has been slow, partly because the Indians were troublesome, and partly because the land was not as easily or successfully cultivated as in some of the other Territories. There had been no serious fighting with the Indians until 1876, when the Sioux, in the extreme northeast of the Territory, in the Black Hills, attacked General Custer's command and completely destroyed it. The Sioux have since been expelled from the Territory, and there are now only a band of the Eastern Shoshones, numbering 1,250 and partially civilized, and a smaller band of the Northern Arapahoes, numbering 900, in the Territory. These are both on the Shoshone Reservation, which contains 1,520,000 acres, with a fair proportion of tillable land, and are peaceable and quiet.

The Territory is deserving of a better reputation than it has had in the past, and will be found desirable for those who are disposed to engage in stock-raising or the breeding of horses; while parties who have some means can invest them very profitably in some of the rich valleys of the Big Horn or Wind River Mountains, and with a moderate irrigation can produce abundant crops, for which they will find a ready home market. The construction of railways, to render the Yellowstone National Park readily accessible, will not only call many thousands to Wyoming, but will greatly increase the demand for agricultural products, which ought to be supplied by Wyoming farmers.

CHAPTER XXII.

THE YELLOWSTONE NATIONAL PARK.

SITUATION—BOUNDARIES AND AREA—ITS RECENT DISCOVERY AND EXPLORATION—THE ACT OF CONGRESS SETTING IT APART AS A NATIONAL PARK—THE PARK DRAINED INTO THE PACIFIC AND THE GULF OF MEXICO—ITS VOLCANIC CHARACTER—NOT OF MUCH VALUE AS AN AGRICULTURAL REGION—INACCESSIBLE EXCEPT FROM THE NORTH AND WEST—EASTERN PART NOT FULLY EXPLORED—NO MINERAL WEALTH YET DISCOVERED EXCEPT IN THE NORTHEAST CORNER—THE APPROACH TO THE PARK AT THE NORTH—THE CAÑON OF THE YELLOWSTONE, OUTSIDE THE PARK—CINNABAR MOUNTAIN—"THE DEVIL'S SLIDE"—ENTRANCE TO THE PARK—RAPID REVIEW OF THE OBJECTS TO BE VISITED—SEPULCHRE MOUNTAIN—CAÑON OF GARDINER'S RIVER—MAMMOTH HOT SPRINGS—TOWER CREEK AND FALLS—THE COLUMNS AND TOWERS OF TOWER CREEK CAÑON—MOUNT WASHBURN—THE GRAND CAÑON OF THE YELLOWSTONE—YELLOWSTONE LAKE—THE LAKES OF THE SOUTHERN TOUR, HEART, LEWIS AND SHOSHONE—THE CROSS CUT WHICH AVOIDS THESE—THE UPPER AND LOWER GEYSER BASINS OF THE FIRE HOLE OR UPPER MADISON RIVER—THE GEYSER BASINS OF GIBBON'S FORK—THE WONDERS OF BEAVER LAKE AND THE OBSIDIAN CLIFFS—RETURN TO MAMMOTH HOT SPRINGS—TIME IN WHICH THE TRIP CAN BE MADE—THE WONDERS IN DETAIL—MAMMOTH HOT SPRINGS—MR. STRAHORN'S DESCRIPTION—THE ROUTE TO TOWER CREEK FALLS AND CAÑON—HON. N. P. LANGFORD AND LIEUT. DOANE'S EULOGY OF THEM—THE ASCENT TO MOUNT WASHBURN—REV. DR. HOYT'S ELOQUENT PICTURE OF THE VIEW FROM ITS SUMMIT—THE DESCENT FROM MOUNT WASHBURN—THE OLD AND THE NEW TRAIL—THE GRAND CAÑON OF THE YELLOWSTONE—ITS BED INACCESSIBLE AT MOST POINTS—THE UPPER AND LOWER FALLS OF THE YELLOWSTONE—THE LATTER AT THE HEAD OF THE GRAND CAÑON—DR. HOYT'S ELOQUENT DESCRIPTION OF THE FALLS AND THE CAÑON—THE TRAIL TO YELLOWSTONE LAKE—THE LAKE ITSELF—ITS SHAPE COMPARED TO THE HUMAN HAND—PROFESSOR RAYMOND'S CRITICISM OF THE COMPARISON—THE ELEVATION OF THE LAKE—PROFESSOR HAYDEN'S STATEMENT ONLY CORRECT IF APPLIED TO LARGE LAKES—HEIGHT OF COLORADO LAKES—THE YELLOWSTONE RIVER FLOWS THROUGH THE LAKE—THE LAKE NOT ITS SOURCE—AFFLUENTS OF THE LAKE—MINERAL AND HOT SPRINGS ON ITS BANKS—ITS WATERS GENERALLY VERY PURE AND SWEET—THE TROUT INFESTED WITH WORMS—BEAUTY OF THE LAKE—MARSHALL'S DESCRIPTION—STRAHORN'S POETICAL PICTURE—PROFESSOR RAYMOND'S EULOGY—REV. DR. HOYT'S PEN PORTRAITURE OF IT—MOVING FORWARD—THE UPPER AND LOWER GEYSER BASINS—EXPLANATIONS IN REGARD TO GEYSERS—THOSE OF ICELAND

THE ONLY OTHERS OF NOTE IN THE WORLD—CHARACTER OF THE GEYSER ERUPTION—OLD AND RECENT GEYSERS—THE UPPER GEYSER BASIN—REV. EDWIN STANLEY'S "PARADE OF THE GEYSERS"—THE GEYSERS NOT ALL IN ACTION AT ONCE—LIEUTENANT BARLOW ON THE FAN AND WELL GEYSERS—THE GROTTO—MR. NORTON'S DESCRIPTION—LIEUTENANT DOANE ON THE GRAND GEYSER—PROFESSOR RAYMOND ON THE LOWER GEYSER BASIN—THE LANGS OR EXTINCT GEYSERS—GEYSERDOM NOT PARADISE—DR. HOYT'S DESCRIPTION OF THE DESOLATION—THE GEYSERS AND HOT SPRINGS OF GIBBON'S FORK—BEAVER LAKE—THE OBSIDIAN CLIFFS—MOUNTAINS OF GLASS—REVIEW OF THE WHOLE—ACCESSIBILITY OF THE PARK—ITS FUTURE ATTRACTIONS—ITS QUIET AND BEAUTIFUL VALLEYS AND GLADES—DISTANCES WITHIN THE PARK.

THE Yellowstone National Park is a region about sixty-five miles long by fifty-five miles wide, situated mostly in the northwest corner of Wyoming Territory, but on its north and west sides stretching a few miles into the adjacent Territories of Montana and Idaho. It covers an area of about 3,578 square miles, or 2,298,920 acres, having an extent a little greater than that of the combined States of Rhode Island and Delaware. In this region there are assembled so many grand, sublime and picturesque natural objects, and such a variety of unique and marvellous phenomena, that when an account of some of the most remarkable of these wonders was brought before Congress in the report of the United States Geological Survey, under Professor Hayden, an act was passed by the unanimous vote of both Houses, and approved by the President, March 1, 1872, withdrawing from sale and occupancy, and setting apart as a National Park, or perpetual public pleasure ground, for the use and enjoyment of the people, the area above described, with boundaries designed to include the chief wonders of the region, and described as follows: "Commencing at the junction of Gardiner's river with the Yellowstone river, and running east to the meridian passing ten miles to the eastward of the most eastern point of Yellowstone lake; thence south along said meridian to the parallel of latitude passing ten miles south of the most southerly point of Yellowstone lake; thence west along said parallel to the meridian passing fifteen miles west of the most western point of Madison lake; thence north along said meridian to the latitude of the junction of the

Yellowstone and Gardiner's rivers; thence east to the place of beginning."

The region, thus bounded, stretches a few miles east of the meridian of 110°, and about as far west of the meridian of 111° west longitude from Greenwich, and a few miles north of the parallel of 45°, and not quite so far south as 44° north latitude. These boundaries show at once that this National Park is not like the parks of Colorado, which are strictly natural divisions of land, being great areas, level or slightly undulating, enclosed by a rim of lofty mountains, whereas the boundaries of the National Park are purely artificial, merely referring to certain natural objects for their location.

"Situated," says Professor William I. Marshall, who has made this great wonderland a special subject of study, "along the highest part of that great culminating area of North America which has been aptly termed 'The Crown of the Continent,' and from which pour down to the Gulf of Mexico on the southeast, to the Gulf of California on the southwest, and to the open Pacific on the northwest, the mightiest rivers of both coasts of the continent, the Park embraces within its boundaries, on the west side of the main range of the Rocky Mountains, the country about some of the headwaters of the Lewis or Snake river, the great southerly fork of the Oregon or Columbia, the greatest river of the Pacific slope, which no longer

"'Hears no sound
Save its own dashings,'

since the steamer's wheels now vex its waters, the hum of varied industry rises from its fertile valleys, and the roar of the railroad startles the echoes along its dales. Most of the Park, however, is on the east side of the main range, and embraces the country about the headwaters of the Madison and Gallatin rivers, which are the middle and eastern of the three streams which unite to form the Missouri river, and much of the upper valley, though not the extreme headwaters of the Yellowstone river, which is a stream as long as the Rhine or the Ohio, far surpasses them in the sublimity of its scenery, and is the greatest tributary of the upper part of the Missouri river.

"Being a volcanic region, the Park (except a little of the northeast corner of it, where silver mines exist) is valueless for mining purposes, except for sulphur, and as that exists in unlimited quantities at points nearer the main line of the Union Pacific, notably at a point forty miles southeast of Evanston, the extra freight on it will make the Park deposit economically valueless. As the lowest valleys of the Park are more than 6,000 and most of them from 7,000 to 8,000 feet above the sea, its altitude and latitude make it worthless for farming purposes, there being few nights without frosts. Though not adapted for a permanent residence of any considerable population, the Park, with its opportunities for sailing, and rowing, and fishing, and hunting, with the grandest of mountains within it and upon its borders, and the purest of air ever sweeping over it, and with the inducements to open air life and exercise offered by its unique and enchanting scenery, is preeminently fitted for a public pleasure ground, from June to October, and especially from about the first of August to the middle of October. Though a volcanic region, there is nowhere in the Park any opening from which flame, smoke, ashes or lava issues now, or, as far as known, has issued for ages past, the only manifestations of the volcanic forces now being limited to eruptions of steam and hot water; though almost everywhere in the Park, and outside its boundaries in many directions, are vast beds and streams of ancient lava, showing how terrific was the former intensity of the volcanic forces, whose declining activity now only suffices to produce steam and spout boiling water, instead, as anciently, of melting down into indistinguishable ruin the adamantine framework of the continent, and spreading it, as a foaming torrent of fiery devastation, over the surface of mountains and plains for an area of scores of thousands of square miles."

The Park is not readily accessible from Wyoming; on its eastern side the Wind River Range presents an impassable barrier of lofty walls of rock, through which none of the exploring parties have ever been able to find a practicable pass even for pack animals; on the southern side a stage road extends from Green River City to Camp Brown, a distance of 155 miles; thence a tolerable wagon road exists to the head of Wind river, a distance

FALLS OF THE YELLOWSTONE—(*Geysers of the Yellowstone*).

of 110 miles more; but from thence to Yellowstone lake, a distance of fifty miles, is a difficult trail, which can be traversed only on foot with pack animals and with considerable danger. On the west side, by way of the Utah and Northern Railway, from Ogden, Utah, stopping at Pleasant Valley, there is a wagon road by way of Red Rock and Henry lakes, which reaches the Upper Geyser basin by about sixty-five miles travel. A still better route is that by the Utah and Northern Railway to the vicinity of Bozeman, Montana, from thence a wagon road by way of Boteler's Ranche, only about thirteen miles distant from the Park, with a good wagon road to Gardiner's river and the mammoth Hot Springs. Before the close of the present year (1881), the Northern Pacific Railway will undoubtedly be completed to Fort Ellis or beyond, and probably its branch to the Park, so that this great wonderland will then be for the first time easily accessible by the shortest and swiftest route.

It should be said that that portion of the Park lying east of the Yellowstone river and lake is so rough and mountainous and possesses so few attractions, that it is not often visited. The lofty mountain chain which extends from the southeastern arm of Yellowstone lake to Slough creek and the Tower creek falls of the Yellowstone, has but a single and very difficult pass over it.

The elevated plateau enclosed between this mountain range and the Yellowstone lake and river affords a fine pasture-ground for the elk, black buffalo, deer, bighorns and moose, which, on the other side of the Park, are so ruthlessly slaughtered by wanton tourists, and after being deprived of their skins, antlers, or horns, and tongues, are left to be the prey of wolves, panthers and coyotes. Amid these lofty pasture-grounds specimens at least of our great game animals might be kept. In the extreme northeast corner of the Park, on Clark's fork of the Yellowstone, are some mines of gold and perhaps silver, which might better be ceded to the miners than suffered to encroach on the Park.

The attractive features of the Park are all on the west side of the Yellowstone river, and west of the east or southeast shores of the Yellowstone lake. Approaching the Park from the north, from

Bozeman and Boteler's Ranche, the road passes first along what is called outside the Park the Upper Cañon of the Yellowstone, a narrow passage of that river between perpendicular, rocky walls, from 2,000 to 3,000 feet in height. This extends for about three miles. Ten miles farther on, Cinnabar Mountain, so called from its surface of brilliant red clay (the color being due, however, to red ochre and not to cinnabar), is passed, with its immense "Devil's Slide," a huge stone trough, which extends to its summit, with smooth, dark, nearly vertical parallel walls, thirty feet apart and 200 feet in height. A short distance beyond this we enter the Park, passing between Sepulchre Mountain, the northern terminal mountain of the Upper Madison Range, on the right hand, looking south, and the cañon of Gardiner's river, an affluent of the Yellowstone, which here has a course nearly west by south, through deeply worn banks. Shortly after leaving Sepulchre Mountain we come to a terraced hill, quite steep and of various colors, in which are situated the Mammoth Hot Springs, whose wonderful forms and character we will allow an eye-witness to describe presently. Crossing at the foot of these terraces the Gardiner river at the point where its cañon commences, we ride along by the side of a succession of cascades of one of its eastern affluents, and striking due east, at a distance of twenty miles, reach Barronette's bridge over the Yellowstone, and a little above, just where the Yellowstone emerges from its Grand Cañon, Tower creek comes in from the west, plunging down 156 feet, and within the next two hundred yards by a succession of rapids leaping into a dark and dismal gorge, 260 feet in depth. Basaltic tufa cones and columns, in the form of towers, turrets, pinnacles and cathedrals, in the vicinity of the falls, have suggested its name. At these falls the Grand Cañon of the Yellowstone, twenty miles in length, and one of the great wonders of the Park, terminates. Southward from the Tower falls commences the long, rolling, and somewhat difficult ascent to Mount Washburn, the Pisgah of the Park, from the summit of which can be seen, in near or distant view, all its glories. Descending from the mountain, the trail takes us again to the Yellowstone and to the great falls which precede its plunge into the Great Cañon. Reserving

a description of these for the poetic language of an eye-witness, we follow the course of the river to Sulphur Mountain, with its boiling springs of sulphuretted water, then four miles farther to the Mud Volcano, or Mud Geysers, spouting springs, which throw up mal-odorous mud instead of water, and one of which, from its preternatural activity, is named "The Devil's Workshop." Eight miles farther on, we reach the northern extremity of the beautiful Yellowstone lake, at the point where the Yellowstone river leaves it. This lake, the surface of which is 7,788 feet above the sea, is twenty-two miles in its greatest length, and about fifteen miles in width, and has a shore line of more than 300 miles, from its very irregular form. There are a number of islands in it, and its beauty is too great for description. To comprehend its loveliness several days should be spent in camping on its borders. From this lake we may take either of two trails, the one going nearly south, past the Geysers of the Yellowstone lake, on the east side of the great divide of the Rocky Mountains, and across a spur of that divide to Heart lake, at the foot of Mount Sheridan, where there are other geysers, and thence by a new trail westward past Lewis lake and Shoshone lake, where there are more geysers and a lake four feet higher than the Yellowstone, and thence northward by a difficult pass over the Rocky Mountains to the Upper Geyser basin, on the Upper Madison river, from which point there is a good road (the Norris road) to the Midway Springs and the Lower Geyser basin, on the Fire Hole river. Or, we may go from the geysers on the Yellowstone lake by a shorter though difficult trail directly west to the Upper Geyser basin, without visiting Heart, Lewis and Shoshone lakes. From this Upper Geyser basin we pass by the Norris road, as we have said, to the Midway Springs, the Lower Geyser basin, in the Fire Hole river, the Gibbon's Fire Hole basin and geysers on the Howard road, the falls and cañon of Gibbon's fork, the Monument Geyser basin, the Norris and Fire Hole basins, of geysers and craters of spent volcanoes, the remarkable formation of Pine and Beaver lakes, the Obsidian or volcanic glass cliffs, and the road of glass over them, and so back to the Mammoth Hot Springs at the entrance to the Park.

We have purposely avoided in this mere itinerary any description of these wonders, that we might do them better justice in the vivid portrayal of eye-witnesses. The tour of the Park thus described covers 164 miles, and cannot well be gone over in less than twelve days.

Turning now to these various points of interest, let us go over them in detail, using the descriptions of those who have studied them most thoroughly, and been most deeply impressed with their grandeur and beauty.

Let us begin with a description of the Mammoth Hot Springs of Gardiner river, from the facile and skilful pen of Robert E. Strahorn, Esq.: "The first impression of these Springs which the beholder receives is that of a snowy mountain beautifully terraced, with projections extending out in various directions, resembling frozen cascades, as though the high, foam-crested waves, in their rapid descent over the steep and rugged declivity, were suddenly arrested and congealed on the spot in all their native beauty. There are fifty or sixty of these springs of greater and smaller dimensions, extending over an area of about a mile square; though there are remains of springs of the same kind for miles around, and mountains of the same deposit, overgrown with pine trees, perhaps hundreds of years old. Most of the water is at boiling heat, and contains in solution a great amount of lime, sulphur and magnesia, with some soda, alumina and other substances, which are slowly deposited in every conceivable form and shape as the water flows along in its course down the mountain side.

"On each level, or terrace, there is a large central spring, which is usually surrounded by a basin of several feet in diameter, and the water, after leaving the main basin at different portions of the delicately-wrought rim, flows down the declivity, step by step, forming hundreds of basins and reservoirs of every size and depth, from a few inches to six or eight feet in diameter, and from one inch to several feet in depth, their margins beautifully scalloped with a finish resembling bead-work of exquisite beauty. Underneath the sides of many of the basins are beautifully arranged stalactites, formed by the dripping of the water; and, by

digging beneath the surface at places where the springs are inactive, the most delicate and charming specimens of every character and form can be obtained—stalactites, stalagmites, grottos, etc., all delicately arranged as the water filtrates through the crevices and perforations of the deposit. It is a scene sublime in itself, to see the entire area, with its numerous and terraced reservoirs, and millions of delicate little urns, sparkling with water transparent as glass, and tinged with many varieties of coloring, all glistening under the glare of a noonday sun.

"The largest spring now active, situated about half way up the mountain on the outer edge of the main terrace, has a basin about twenty-five by forty feet in diameter, in the centre of which the water boils up several inches above the surface, and is so transparent that you can, by approaching the margin, look down into the heated depths many feet below the surface. The sides of the cavern are ornamented with a coral-like formation of almost every variety of shade, with a fine, silky substance, much like moss, of a bright vegetable green spread over it thinly, which, with the slight ebullition of the water keeping it in constant motion, and the blue sky reflected in the transparent depths, gives it an enchanting beauty far beyond the skill of the finest artist. Here all the hues of the rainbow are seen and arranged so gorgeously that, with other strange views by which one is surrounded, you almost imagine yourself in some fairy region, the wonders of which baffle all attempts of pen or pencil to portray them.

"Besides the elegant sculpturing of this deposit, imagine, if you can, the wonderful variety of delicate and artistically arranged colors with which it is adorned. The mineral-charged fluid lays down pavements here and there of all the shades of red, from bright scarlet to rose tint, beautiful layers of bright sulphur-yellow, interspersed with tints of green, all elaborately arranged in Nature's own order.

"At the foot of the mountain are several springs whose waters have effected remarkable cures in cases of chronic rheumatism, eruptive diseases, etc. The medicinal properties of each fountain seem to be different, and the invalid can find which are best adapted to his or her own case."

On leaving the Hot Springs to make the circuit of the Park, the favorite course is that leading eastward to the Yellowstone Cañon. The route passes up Gardiner's river, with its three falls, through a pleasant country, twenty-two miles, to Tower creek, a rapid, snow-fed brook, twelve or fifteen feet wide, and one or two feet deep, which here joins the Yellowstone. Tower creek rises in the high divide between the valleys of the Missouri and Yellowstone, and flows for about ten miles through a cañon so deep and gloomy that it has earned the appellation of the "Devil's Den." About two hundred yards above its entrance into the Yellowstone, the stream pours over an abrupt descent of 156 feet, forming one of the most beautiful falls to be found in any country. These falls are about 260 feet above the level of the Yellowstone at the junction, and are surrounded with columns of volcanic breccia, rising fifty feet above the falls, and extending down to the foot, standing like gloomy sentinels, or like gigantic pillars, at the entrance of some grand temple. Of these columns the late Hon. N. P. Langford, the first superintendent and historian of the Park, said: "Some resemble towers, others the spires of churches, and others still shoot up as little and slender as the minarets of a mosque. Some of the loftiest of these formations, standing upon the very brink of the fall, are accessible to an expert and adventurous climber. The position attained on one of these narrow summits, amid the uproar of waters, and at a height of 260 feet above the boiling chasm, as the writer can affirm, requires a steady head and strong nerves; yet the view which rewards the temerity of the exploit is full of compensations." Below the fall the stream descends in numerous rapids with frightful velocity, through a gloomy gorge, to its union with the Yellowstone. Its bed is filled with enormous boulders, against which the rushing waters break with great fury. Many of the capricious formations wrought from the shale excite merriment as well as wonder. Of this kind, especially, is a huge mass, sixty feet in height, which, from its supposed resemblance to the proverbial foot of his Satanic Majesty, is called the "Devil's Hoof." The scenery of mountain, rock and forest surrounding the falls is very beautiful. The name of "Tower Falls" was, of

course, suggested by some of the most conspicuous features of the scenery. The sides of the chasm are worn into caverns, lined with variously tinted mosses, nourished by clouds of spray which rise from the cataract; while above and to the left, a spur from the great plateau rises over all with a perpendicular front of 400 feet.

"Nothing," says Lieutenant Doane, "can be more chastely beautiful than this lovely cascade, hidden away in the dim light of overshadowing rocks and woods, its very voice hushed to a low murmur, unheard at the distance of a few hundred yards. Thousands might pass by within a half mile and not dream of its existence; but once seen, it passes to the list of most pleasant memories."

A fine view of Tower falls can be had from an easily ascended cliff above them, but a better one, a prospect that is simply enchanting, can be obtained by walking down to the mouth of Tower creek, 200 yards, and following up stream, through the beautiful gateway, to their foot. Two hundred yards above the falls is a finely sheltered, picturesque camp, with grass, wood and water abundant.

From Tower creek and falls we have a choice between two routes, one leading along the western bank of the Yellowstone river, and overlooking the Grand Cañon for twenty miles, the other ascending by a long and wearisome climb the northern slope of Mount Washburn, 10,388 feet above the sea, from whose summit all the points of interest in the Park can be discerned with a good field-glass in the clear and transparent summer air. Most visitors prefer this ascent first, as giving them a more comprehensive idea of the magnificence of the Park. We will follow their example, in imagination at least, and will allow Rev. Wayland Hoyt, D. D., of Brooklyn, who visited the Park in 1878 in General Miles' party, to describe to us the glorious vision:*

"Let us take our stand for a little now upon Mount Washburn. Its rounded crest is more than 10,000 feet above the level

* This glowing picture of the view from Mount Washburn, as well as some other eloquent passages farther on, are copied, by the kind permission of the author, from an address on the Yellowstone Park, which Dr. Hoyt prepared after his return, but which is as yet unpublished.

of the sea, and perhaps 5,000 feet above the level of the valley out of which it springs. Its smooth slopes are easy of ascent. You need not dismount from your horse to gain its summit. Standing there you look down upon the whole grand panorama, as does that eagle yonder, holding himself aloft upon almost motionless wings. I doubt if there is another view at once so majestic and so beautiful in the whole world. Your vision darts through the spaces for 150 miles on some sides. You are standing upon a mountain lifting itself out of a vast saucer-shaped depression. Away yonder, where the sky seems to meet the earth, on every side, around the whole circumference of your sight, are lines and ranges of snow-capped peaks shutting your glances in. Yonder shoots upward the serrated peak of Pilot Mountain, in the Clark's Fork Range. Joined to that, sweep on around you, in the dim distance, the snowy lines of the Madison Range. Yonder join hands with these the Stinking Water Mountains, and so on and on and around. Do you see that sharp, pinnacle-pointed mountain, away off at the southwest, shining, in its garments of white, against the blue of the summer sky?—that is Mount Everts, named after the poor lost wanderer, who for thirty-seven days of deadly peril and starvation sought a way of escape from these frowning mountain barriers, which shut him in so remorselessly, and it marks the divide of the continent.

"Take now a closer view for a moment. Mark the lower hills, folded in their thick draperies of pine and spruce like dark green velvet, of the softest and the deepest; notice, too, those beautiful park-like spaces, where the trees refuse to grow, and where the prairie spreads its smooth sward freely toward the sunlight. And—those spots of steam, breaking into the vision every now and then, and floating off like the whitest clouds that ever graced the summer sky—those are the signals of the geysers at their strange duty, yonder in the geyser basins, thirty miles away. And—those bits of silver, flashing hither and thither on the hillsides amid the dense green of the forests—these are waterfalls and fragments of ice-glaciers, which for ages have been at *their* duty of sculpturing these mountains, and have not yet completed it. And—that lovely deep blue sheet of water, of such a dainty

shape, running its arms out toward the hills, and bearing on its serene bosom emeralds of islands—that is the sweetest sheet of water in the world—that is the Yellowstone lake. And—that exquisite broad sheen of silver, winding through the green of the trees and the brown of the prairie—that is the Yellowstone river, starting on its wonderful journey to the Missouri, and thence downward to the gulf, between six and seven thousand miles away. But, nearer to us, almost at our feet, as we trace this broad line of silver, the eye encounters a frightful chasm, as if the earth had suddenly sunk away, and into its gloomy depths the brightness and beauty of the shining river leaps, and is thenceforward lost altogether to the view—*that* is the tremendous cañon or gorge of the Yellowstone."

Contrary to the Latin adage, "*Facilis descensus Averni*," the descent from Mount Washburn to the Grand Cañon of the Yellowstone is one of considerable difficulty by the old trail; but by a new one traced by Mr. P. W. Norris, the present superintendent of the Park, it is much easier. The old trail, more than twenty miles in length, followed the Washburn Range at a considerable distance from the river, through tangled forest and along rocky and precipitous passes, to the upper and lower falls of the Yellowstone, just where Cascade creek discharges its waters into the river. This is above the Grand Cañon, or, rather, at the point where it commences; for these two falls, the upper of about 150 feet, and the lower of 350 feet, with the rapids which follow, constitute a part of the tremendous depth to which the Grand Cañon sinks, and which it maintains to the point of emergence at Tower creek falls, twenty miles below. At one or two points near its lower terminus daring and adventurous spirits have reached the floor of the cañon, but have found it extremely perilous and difficult to clamber out of it; they describe it as having its full share of disagreeable sounds, sights and smells, from the great number of hot springs of sulphur, sulphate of copper, alum, etc. The water is warm and impregnated with a villanous taste of alum and sulphur, and along the dark margin of the river are numerous chemical and corrosive springs, some depositing craters of calcareous rock, and some casting up vol-

umes of mud or muddy waters. The greater part of the Grand Cañon, however, and especially its upper two-thirds, had always been regarded as entirely inaccessible, till the summer of 1878, when Messrs. Hoyt and Rouse, of Cleveland, Ohio, succeeded at the imminent peril of their lives, in descending to it, a little below the Great falls. They describe it as fearfully gloomy and uncanny. Rev. Dr. Hoyt and his party took the old trail and approached the river at the mouth of Cascade creek, between the upper and lower or Great falls, at the point where they could look down into the Grand Cañon at the place of its greatest magnificence, and of the many descriptions of this great wonder of the world, that which he has given may justly be esteemed the most graphic and beautiful. It is as follows:

"Well, we have reached Cascade creek at last; and a beautiful grove of trees, beneath whose shade sparkles a clear stream, whose waters are free from the nauseous taste of alkali, furnishes a delightful place in which to camp. Now—dismounting and seeing that your horse is well cared for, while the men are unloading the pack-mules and pitching the tents—walk up that trail, winding up that hillside; follow it for a little among the solemn pines, and then pass out from the tree-shadows, and take your stand upon that jutting rock—clinging to it well meanwhile, and being very sure of your footing, for your head will surely grow dizzy—and there opens before you one of the most stupendous scenes in Nature—THE LOWER FALLS AND THE AWFUL CANON OF THE YELLOWSTONE.

"And now, where shall I begin, and how shall I, in any wise, describe this tremendous sight—its overpowering grandeur, and at the same time its inexpressible beauty?

"Look yonder—those are the lower falls of the Yellowstone. They are not the grandest in the world, but there are none more beautiful. There is not the breadth and dash of Niagara, nor is there the enormous depth of leap of some of the waterfalls of the Yosemite. But here is majesty of its own kind, and beauty, too. On either side are vast pinnacles of sculptured rock. There, where the rock opens for the river, its waters are compressed from a width of 200 feet, between the upper and

lower falls, to 150 where it takes the plunge. The shelf of rock over which it leaps is absolutely level. The water seems to wait a moment on its verge; then it passes with a single bound of 350 feet into the gorge below. It is a sheer, unbroken, compact, shining mass of silver foam.

"But your eyes are all the time distracted from the fall itself, great and beautiful as it is, to its marvellous setting—to the surprising, overmastering cañon into which the river leaps, and through which it flows, dwindling to but a foamy ribbon there in its appalling depths.

"As you cling here to this jutting rock, the falls are already many hundred feet below you. The falls unroll their whiteness down amid the cañon glooms. Hold firmly on, and peer over the rock to which you cling and gaze down; that apparently narrow stream is the large river flowing nearly 2,000 feet below you; it is sheer that distance; these rocky sides are almost perpendicular—indeed in many places the boiling springs have gouged them out so as to leave overhanging cliffs and tables at the top. Take a stone and throw it over—you must wait long before you hear it strike. Nothing more awful have I ever seen than the yawning of that chasm. And the stillness, solemn as midnight, profound as death! The water dashing there as in a kind of agony against those rocks, you cannot hear. The mighty distance lays the finger of its silence on its white lips. You are oppressed with a sense of danger. It is as though the vastness would soon force you from the rock to which you cling. The silence, the sheer depth, the gloom burden you. It is a relief to feel the firm earth beneath your feet again, as you carefully crawl back from your perching place.

"But this is not all, nor is the half yet told. As soon as you can stand it, go out on that jutting rock again, and mark the sculpturings of God upon those vast and solemn walls. By dash of wind and wave, by forces of the frost, by file of snow plunge and glacier and mountain torrent, by the hot breath of boiling springs, those walls have been cut into the most various and surprising shapes. I have seen the middle age castles along the Rhine; there, those castles are reproduced exactly. I have seen

the soaring summits of the great cathedral spires, in the country beyond the sea; there they stand in prototype, only loftier and sublimer.

"And then, of course and almost beyond all else, you are fascinated by the magnificence and utter opulence of color. Those are not simply gray and hoary depths and reaches, and domes and pinnacles of sullen rock. The whole gorge flames. It is as though rainbows had fallen out of the sky and hung themselves there like glorious banners. The underlying color is the clearest yellow; this flushes onward into orange. Down at the base the deepest mosses unroll their draperies of the most vivid green; browns, sweet and soft, do their blending; white rocks stand spectral; turrets of rock shoot up as crimson as though they were drenched through with blood. It is a wilderness of color. It is impossible that even the pencil of an artist tell it. What you would call, accustomed to the softer tints of nature, a great exaggeration, would be the utmost tameness compared with the reality. It is as though the most glorious sunset you ever saw had been caught and held upon that resplendent, awful gorge!

"Through nearly all the hours of that afternoon, until the sunset shadows came, and afterwards amid the moonbeams, I waited there, clinging to that rock, jutting out into that overpowering, gorgeous chasm. I was appalled and fascinated, afraid and yet compelled to cling there. It was an epoch in my life."

But we must hasten forward. The trail above the upper falls follows closely the right or west bank of the Yellowstone to the Yellowstone lake, a distance of eighteen or nineteen miles. On the way Sulphur Mountain is passed on the right, and the Sulphur Hills on the left, east of the river, though neither of them are more sulphurous than many other hills and mounds in the Park. Eleven miles from the Great Falls is the Mud Volcano, an interesting though somewhat dirty object. Eight miles more bring the traveller to the Yellowstone lake, one of the most beautiful sheets of water in "Our Western Empire," and hardly surpassed in beauty by any lake on our globe. It is twenty-two miles in length, and from twelve to fifteen in breadth. Its shape is peculiar, several long peninsulas extending into it from the southern

shore, so that it has been compared to the human hand, though as Professor R. W. Raymond humorously suggests, "the imaginative gentleman who first discovered this resemblance must have thought the size and form of fingers quite insignificant, provided the number was complete. The hand in question is afflicted with elephantiasis in the thumb, dropsy in the little finger, hornet bites on the third finger, and the last stages of starvation in the other two." The shore line of the lake is over 300 miles in length; its superficial area is nearly 300 square miles; its greatest depth, by a series of careful soundings, is found to be 300 feet. Its elevation above the sea, by repeated observations, has been ascertained to be 7,788 feet. Professor Hayden very enthusiastically declares that "only four lakes are known to have so great an elevation in any part of the world, up to this time, namely, Lakes Titicaca, in Peru, and Uros, in Bolivia, which are respectively 12,874 and 12,359 feet above the sea-level; and Lakes Manasasarowak and Rakastal, in Thibet, Asia, both of which lie at the great height of 15,000 feet." With all due respect to the Professor, we think that this statement should be taken with some reservation as to the size of the lakes; for in the very article from his pen which describes the Yellowstone Park and contains this sentence, we find that Shoshone lake has an elevation of 7,870 feet (Mr. Norris' report of 1879 makes this 7,792 feet, four feet higher than Yellowstone lake), and Madison lake, 8,301 feet. Both these are in the Park, and though smaller than Yellowstone lake, they are entitled to be called lakes. Moreover, we find in "Whitney's Survey of Colorado" the following elevations assigned to some of the lakes of that mountainous State: Chicago lakes, 11,500 feet; Green, 10,000 feet; Grand, 8,153 feet; Mary or Santa Maria, 9,324 feet; San Miguel, 9,720 feet; Twin lakes, 9,357 feet; San Cristoval, 9,000 feet; and Osborn's, 8,821 feet. Lake Carpenter, in the Bighorn Mountains, is about 11,000 feet.

We might enumerate some others, but these will suffice. They are none of them as large as Yellowstone lake, though all of sufficient size to be properly denominated *lakes*. One other popular notion, which is often repeated in the descriptions of

Yellowstone National Park, may as well be corrected in this place: the Yellowstone lake is in no sense the source of the Yellowstone river. That river rises by two forks at least forty-five or fifty miles southeast of the Yellowstone lake, one affluent having its source in a small lake in the Shoshone Mountains, presumably higher than Yellowstone lake, and the other in the elevated plateau between the Shoshone and Wind River Mountains. One of these sources is in about latitude 43° 45′, and the other in about 43° 50′. The Yellowstone river flows through the Yellowstone lake, just as the Rhine flows through Lake Geneva.

But let us return to our lake itself. Situated upon the very crown of the continent, the lake receives but few tributaries of any considerable size, the upper Yellowstone being much the largest, and Beaver Dam creek and Pelican creek, both on the eastern side, the next in importance. There are, in all, sixteen or eighteen small streams from the mountain ranges, on the north, east, south and southwest sides, which bring to the lake their tribute from the snow-line; several of these affluents are strongly charged with sulphur, alum or alkalies, and these and the springs on the banks of the lake render its waters near the shore, at some points, turbid and unpleasant; but at a little distance from the shore, at all points, and at the very brink of the lake at many, the water is clear, pure and sweet. It abounds with fish, mainly trout, as does the Yellowstone above the Great falls; but it is a most remarkable fact, that very many of the trout, both in the lake and river, above the falls, are infested by an intestinal worm, of a species not hitherto known as a parasite of any of the *salmonidæ*. In some cases the worms eat their way out, and the fish, if not too severely injured, recovers, but with deep scars. It is said that the larger fish sometimes have from five to fifty of these parasites, and that their presence makes the fish very voracious, snapping viciously at the hook, "which is strange," as Professor Raymond remarks, "when one considers that they have already more bait in them than is wholesome." Of course, not all the trout are thus infested, and usually the visiting parties, after rejecting the diseased fish, find enough that

are sound to supply their demand. Below the Great falls the fish are not diseased, and there are grayling and white fish in almost as great numbers as the trout.

The remarkable beauty of the lake cannot be too highly extolled. All the visitors to it have been charmed by its loveliness. Mr. Marshall, who is not given to sentimental writing, says: "It contains several beautiful islands, is surrounded by some of the grandest mountains in North America, and is of so irregular a form as to give an uncommon beauty alike to its bold bluff shores and its stretches of sandy, pebbly beaches. Its waters, pure and cold, in places 300 feet deep, shine with the rich blue of the open sea, swarm with trout, and are the summer home of countless swans, white pelicans, geese, brant, snipe, ducks, cranes and other water fowl, while its shores, sometimes grassy, but generally clothed with dense forests of pine, spruce and fir, furnish coverts and feeding grounds for elk, antelope, black and white-tailed deer, bears and mountain sheep. Scattered along the shores of the lake, and on the mountain slopes which overlook it, are many clusters of hot springs, solfataras, fumaroles and small geysers. At one point a hot spring, boiling up in the edge of the lake, has deposited the mineral carried in solution by its waters, and built up a rocky rim about itself, so that wading out into the lake you can climb on the rim of the spring, and standing there can catch trout out of the cold water of the lake, and without detaching them from the hook, plunge them into the boiling spring and cook them."

The more poetic Strahorn thus eulogizes it:

"In the early part of the day, when the air is still and the bright sunshine falls on its unruffled surface, its bright green color, shading to a delicate ultramarine, commands the admiration of every beholder. Later in the day, when the mountain winds come down from their icy heights, it puts on an aspect more in accordance with the fierce wilderness around it. Its shores are paved with volcanic rocks, sometimes in masses, sometimes broken and worn into pebbles of trachyte, obsidian, chalcedony, cornelians, agates and bits of agatized wood; and again ground to obsidian sand sprinkled with crystals of California diamonds."

The enthusiastic Langford* says:

"Secluded amid the loftiest peaks of the Rocky Mountains, possessing strange peculiarities of form and beauty, this watery solitude is one of the most attractive objects in the world. Its southern shore, indented with long, narrow inlets, not unlike the frequent fiords of Iceland, bears testimony to the awful upheaval and tremendous force of the elements which resulted in its erection. The long pine-crowned promontories, stretching into it from the base of the hills, lend new and charming features to an aquatic scene full of novelty and splendor. Islands of emerald hue dot its surface, and a margin of sparkling sand forms its setting. The winds, compressed in their passage through the mountain gorges, lash it into a sea as terrible as the fretted ocean, covering it with foam. But now it lay before us calm and unruffled, save as the gentle wavelets broke in murmurs along the shore. Water, one of the grandest elements of scenery, never seemed so beautiful before."

Besides its entrancing shore line, the lake is dotted with numerous islands, which lend rare beauty by their luxuriant vegetation. Fish abound in the lake, game of all kinds inhabit the surrounding forests, and the placid surface of the water and grassy margins render this mountain-locked sheet the earthly paradise for myriads of water-fowl.

Professor Rossiter W. Raymond, the man of facts and figures, "with no nonsense about him," felt himself constrained to say:

"The scene presented to our eyes by this lake, as we emerged from the thick forests on the western side and trod with exultation its sandy shore, was, indeed, lovely. The broad expanse of shining water, the wooded banks and bosky islands, the summits of lofty mountains beyond it faintly flushed with sunset, the deep sky, and the perfect solitude and silence, combine to produce a memorable impression."

We add a paragraph or two from Rev. Dr. Hoyt's eloquent address, from which we have already quoted so largely:

"From a gentle headland, at last we overlooked the lake. It was like the fairest dream which ever came to bless the un-

* Late Superintendent of the Park.

troubled slumbers of a child. How still it was! What silence reigned! How lovingly it laid its hush upon you! I cannot tell you of it better than in those words of Scripture—'for they *rest* from their labors.' To me that vision must henceforward be the best illustration of the unvexed, transparent sea of glass, and the rest of the Beyond.

"And yet it was not a stillness and a rest devoid of music and of motion. You could hear the murmur of the breezes through the tree-tops; you could see where they roughened the lake's surface, and strewed new brightness on its waters. Fleets of pelicans, white-breasted and white-winged, with swans, large and inexpressibly graceful, sailed majestically out upon the waves. Birds sang in the edges of the groves; eagles and wild fowl filled the upper air. The whole scene was redolent of a glad and happy life."

But we must move forward, or our exploration will occupy too much time and space. As it is, we must forego any tour into the almost wholly unexplored region east and north of the Yellowstone lake, and must also postpone to another season our hoped-for visit to Heart, Lewis, Shoshone and Madison lakes, all of which have small geysers, or, rather, spouting springs, on their banks. Very fair and beautiful are these lakes, set as gems in the rocky and frowning heights of the "Great Divide," and in the not distant future they will be among the most interesting of the many attractions of the Park; but until they are rendered more accessible by good, or at least passable, roads, we must neglect them.

There are two routes, both as yet only trails, from the Yellowstone lake and river westward to the basins of the Upper Madison and its largest branch, the Fire Hole river—the home of the geysers. The southernmost takes us from the geysers or boiling springs, on the banks of the lake, over two arms of the Great Rocky Mountain Divide (which here takes a horseshoe form, enclosing Shoshone lake), directly to the Upper Geyser basin, on the Upper Madison river. This trail is more difficult, and crosses the mountains at a greater elevation than the other, but it is shorter, not exceeding fourteen miles, and it does not require

any retracing of our course. The northernmost requires a return over the route along the Yellowstone river, already travelled for about fifteen miles, to the mouth of a small creek, and then a journey along the valley of that creek to Mary's lake, the source of the East Fork of Fire Hole river, and along the valley of that stream to the Lower Geyser basin, which is situated at the Forks of the Fire Hole river. This trail is about twenty-three miles in length, and involves a retracing of our course several times—first, as we have seen, in the descent of the Yellowstone river from the lake to the base of Sulphur Mountain; next, a journey to the Upper Geyser basin, and from it back to the Lower basin. We will, therefore, take the southern trail in our imaginary journey.

Before attempting a description of the wonders of these and the other geyser basins, a few words of explanation in regard to geysers may be desirable. From our childhood we have all been familiar by name at least with the geysers of Iceland, and have read of their performances with wonder. There have been reports of geysers in other countries, and in other portions of our own country; but on examination all the reputed geysers of California and elsewhere have proved to be only *fumaroles*, *solfataras* or boiling springs, and the only true geysers known are those of Iceland and of our own Yellowstone National Park; and as between Iceland and our Park, our geysers are in number as fifty to one of theirs; and as to power and beauty altogether beyond them. "Here," says Mr. William I. Marshall, "are more geysers than in all the world beside, and they spout columns of boiling-hot water, of sizes varying with the dimensions of their orifices, from a few inches to twenty feet in diameter, and to heights ranging all the way from ten or fifteen up to 250 or 275 feet, the eruptions being accompanied by a constant succession of miniature earthquakes, by a terrible noise like almost continuous underground thunder, and by the evolution of immense masses of steam, which tower hundreds of feet above the water. The subterranean explosions, from twenty to seventy a minute, sounding and jarring the ground like a heavy artillery duel, manifest themselves in mighty pulsations along the column, shooting it upwards and outwards

in jets, rising to ever-varying heights, and constantly dividing and subdividing, and shivering into milk-white spray.

"A geyser eruption is not at all like the play of an artificial fountain, in which the water is pushed up by pressure to a uniform height, or if made to vary must do so with a regularity which soon becomes wearisome, but is like a cataract of crystal-clear, boiling-hot water—not falling in despair of resistance to gravity, but, as if instinct with life, leaping towards heaven, shivering upwards (precisely as a cataract does downwards) into rockets of milk-white spray, each as it ceases to rise emitting a little puff of steam, which proclaims what was the force which lifted it, and which now, like the soul deserting the body, leaves it, no longer able to triumph over gravity, but, unsupported, to fall to the steaming mound below in showers of shining pearls and flashing diamonds, while the central portions of the column drop down in immense volumes that strike the mound with a roar like a cataract, or like the thunder of distant surf. Every instant the column is changing its height and shape, as the mighty and mysterious forces of the under world, shaking the mountains in their struggles for freedom, pulsate along it; and it is always enveloped and surmounted by vast banks and lofty pillars of steam, ever swaying with the wind, constantly assuming fantastic forms, and crowned and fringed with rainbows. These indescribably magnificent displays occur with some geysers at fixed periods, as in the case of Old Faithful, which spouts from an orifice seven feet long by two feet wide, every sixty-seven minutes, its eruptions lasting from four to six minutes. It is the only large geyser known in the world, which spouts so frequently and with such unfailing regularity; whence its name. In more than one hundred eruptions of it, which I witnessed during my two visits to the Park in 1873 and 1875, I never knew it to be more than three minutes behind its appointed time. Most of the great geysers, however, spout at very irregular intervals, varying from three or four hours to several days, or even two or three weeks, their eruptions lasting from fifteen or twenty minutes to two or three hours, and sometimes even as long as nine hours.

"No geyser spouts constantly, though some of the small ones

spout most of the time. Between eruptions, some pour out from their beautifully ornamented craters great puffs of steam, like immense high pressure engines, little jets of scalding spray being constantly thrown to the top of the crater, or a little above it, while there is all the time a sound of fierce boiling below, and in others the hot water stands, a wonderfully transparent pool, in vast saucer-shaped basins, from ten to seventy-five feet across, within each of which is the well or tube from which the eruption occurs, at which the water slowly boils. No language can adequately describe the gracefully curved and scalloped forms in which the silicious rock deposits on the bottoms and margins of these basins, nor the beauty of the countless vivid and delicate colors with which they are dyed.

"Standing or lying all about the geyser craters and hot springs are trees, killed by the hot silicious waters or by their mineral deposits. Nothing in nature can be more spectral than these naked trunks of trees, stripped of bark and bare of branches, and bleached white as snow, seeming like the ghosts of the groves and forests buried beneath these mounds. When the wood falls in the immediate line of overflow of spring or geyser, the hot water soon soaks it soft and petrifies it. Immense quantities of wood may be seen here in all stages of petrifaction.

"It is plain that while the amount of hot spring and geyser action in the Park has been about the same for ages past, its centres of activity have always been, and are now, constantly changing. Several of the largest geysers, whose age we do not know, are plainly of very recent origin—notably 'Old Faithful' and the 'Castle'—since high up on the mounds of each are lying, partially imbedded in the rock, and not yet wholly petrified, the trunks of large pine trees, which, had they been there very many years, must have been completely buried by the rapid deposit of the rock, while alike in the woods and in the open ground are numerous extinct craters, and many others which are plainly dying out. Two of the greatest among the geysers of the Upper Geyser basin of the Fire Hole are certainly of very recent origin, having broken out between the autumn of 1873 and the spring of 1874; and many pulsating and boiling springs, which do not spout, are plainly but a few years old.

"No one knows how many geysers and hot springs there are in the Park. Dr. Hayden estimates that in the two Fire Hole River Geyser basins, within an area about equal to that of an ordinary township, say thirty-five or forty square miles, there are at least 2,000, and in the whole Park there are supposed to be at least 10,000 hot springs, steam jets, geysers and mud springs. The solfataras, fumaroles and salses, of which some are found scattered through the geyser basins, but most of which are in groups here and there outside the Geyser basins, especially at Brimstone Mountain, on the summit of the divide between the Yellowstone and Fire Hole Valleys; at numerous points about Yellowstone lake, on Pelican creek, at Crater Hills, and at Mud Volcanoes, on the west bank of the Yellowstone river; on Alum creek, along the Grand Cañon, and on the slopes of the Sierra Shoshone and the Elephant's Back Mountains, follow naturally in our catalogue of attractions. These from thousands of vents, pour out sulphurous hot water, or steam charged with sulphuretted hydrogen and other gases commonly emitted from volcanic craters, or boil and spout mud, slate-blue, or white, or pink, or lavender, or blackish green, or brown, some thin as mush, some thick as hasty pudding, with much puffing and rumbling and hissing of steam escape-pipes, and often with much trembling of the ground.

"About many of them are deposited beautiful incrustations of sulphur and silica, of a light buff-color, or solid sheets or delicate feathery, frost-like crystals of bright yellow sulphur, together with alum and other volcanic products. Some of the larger of these sulphurous steam jets, pouring out of openings several feet in diameter, keep up a continual roar, like a hoarse fog-whistle; others, night and day, maintain a steady series of explosions, like distant thunder, from twenty to fifty peals a minute, audible for miles around, and each jarring the ground, so that you may, in some cases, plainly feel it, sitting on your horse, a half a mile away from them.

"Some of these, also, are plainly of quite recent origin; for, walking about among them at Brimstone Mountain, where, over many acres, the vegetation is utterly destroyed, and the surface

of the earth blasted and burned, and streaked red, and yellow, and white, seems a mere heap of ashes mixed with sulphur, near the centre of the great area of desolation, we saw the prostrate trunks of several pine trees not yet entirely destroyed by the corrosive, stifling vapors, but so far decayed that we could kick them to pieces easily. The waters of this cluster flow towards the Yellowstone, and in a hollow have formed a miniature Dead sea, whose steaming, sulphurous, heavy, green waves support no form of life, and beat sullenly on a shore whose desolation is in marked contrast to the luxurious, grassy slopes which stretch for miles to the east towards and across the Yellowstone."

We shall not attempt in this place any explanation of the philosophy of the geyser, for two reasons: one, that scientists are not agreed in their views of it; the only thing fully ascertained in regard to it is that the hot water (from whatever source it may be derived) passes up through long tubes or pipes of different diameters; and the other, that their explanations are too abstruse to be understood by the masses, even if (which is doubtful) they understand them fully themselves.

Let us, then, turn to a contemplation of these geysers, and especially of those of the Upper Geyser Basin, where, though somewhat fewer in number than in the Lower basin, they are of much greater power and magnificence. And, first, let us follow Rev. Edwin Stanley, a visitor to the Park, whose "Rambles in Wonderland" gives a very interesting account of this Upper basin, as he marshals the geysers in a grand parade:

"Let us imagine ourselves for once standing in a central position, where we can see every geyser in the basin. It is an extra occasion, and they are all out on parade, and all playing at once. There is good Old Faithful, always ready for her part, doing her best—the two by five feet column playing to a height of 150 feet —perfect in all the elements of geyser action. Yonder the Beehive is sending up its graceful column 200 feet heavenward, while the Giantess is just in the humor, and is making a gorgeous display of its, say, ten feet volume to an altitude of 250 feet. In the meantime the old Castle answers the summons, and putting

on its strength with alarming detonations is belching forth a gigantic volume seventy feet above its crater; while over there, just above the Saw-mill, which is rallying all its force to the exhibition, rustling about and spurting upward its six-inch jet with as much self-importance as if it were the only geyser in the basin, we see the Grand, by a more than ordinary effort, overtopping all the rest, with its heaven-ascending, graceful volume, 300 feet in the air. Just below here the Riverside, the Comet, the complicated and fascinating Fantail, and the curiously-wrought Grotto, are all chiming in, and the grand old Giant, the chief of the basin, not to be left behind, or by any one outdone, is towering up with its six feet fountain, swaying in the bright sunlight at an elevation of 250 feet. In the meantime a hundred others of lesser note, we will say, are answering the call at this grand exposition, and coming out in all their native glory and surpassing beauty. Just listen to the terrible, awful rumblings and deafening thunders, as if the very earth would be moved from its foundation—the thousand reports of rushing waters and hissing steam, while Pluto is mustering all his forces, and Hades would feign disgorge itself and submerge our world. But then look upward at the immense masses of rising steam ascending higher and still higher, until lost in the heavens above; while every column is tinseled over with a robe of silver decked with all the prismatic colors, and every majestic fountain is encircled with a halo of gorgeous hues."

As a matter of fact, however, the geysers are never all in action at the same time. Their periods of activity are different at different times, and with some of them are at increasingly long intervals, and probably they will eventually cease to act, as so many others have done. New geysers are constantly forming, and may take the places of the silent ones. Some of the most remarkable of the number are so uncertain that parties have remained at the basins for two or three weeks without witnessing their action, and again perhaps soon after they have sent up a magnificent column twice or thrice in twenty-four hours. One explorer, Lieutenant Barlow, tells us that near the edge of the basin, where the river makes a sharp bend to the southeast, is

found the initial geyser—a small steam vent—on the right. Soon on either side of the river are seen the two lively geysers, called the "Sentinels," because of their nearness to the gate of the great geyser basins. The one on the left is in constant agitation, the waters revolving horizontally with great violence, and occasionally spouting upward to the height of twenty feet, the lateral direction being fifty feet. Enormous masses of steam are ejected. The crater of this is three feet by ten. The opposite Sentinel is not so constantly active, and is smaller. About 250 yards from the gate are three geysers acting in concert. When in full action the display from these is very fine. The waters spread out in the shape of a fan, in consequence of which they have been named the Fan Geysers. One hundred yards farther up the side of the stream is found a double geyser, a stream from one of its orifices playing to the height of eighty or ninety feet, emitting large volumes of steam. From the formation of its crater it was named the Well Geyser.

Still above are found some of the most interesting and beautiful geysers of the whole basin. First are two smaller geysers near a large spring of blue water, while a few yards beyond are seen the walls and arches of the Grotto. This is an exceedingly intricate formation, eight feet in height and ninety in circumference. It is by many called the gem of all the geysers. It is absolutely magnificent—a sight of resplendent beauty, that greets the eyes nowhere outside of the region of the National Park. It is simply a miniature temple of alabaster whiteness, with arches leading to some interior Holy of Holies, whose sacred places may never be profaned by eye or foot. The hard calcareous formation about it is smooth, and bright as a clean swept pavement. Several columns of purest white rise to a height of eight to ten feet, supporting a roof that covers the entire vent, forming fantastic arches and entrances, out of which the water is ejected during an eruption fifty or sixty feet. The entire surface is composed of the most delicate bead-work imaginable, white as the driven snow, massive but elaborately elegant, and so peerlessly beautiful that the hand of desecration has not been laid upon it, and it stands without flaw or break in all its primal beauty—a grotto of pearls, "the beautiful princess of all the realm."

Proceeding 150 yards farther, and passing two hot springs, a remarkable group of geysers is discovered. One of these has a huge crater, five feet in diameter, shaped something like the base of a horn—one side broken down—the highest point being fifteen feet above the mound on which it stands. This proved to be a tremendous geyser, which has been called the Giant. It throws a column of water the size of the opening to the measured altitude of 130 feet, and continues the display for an hour and a half. The amount of water discharged is immense, almost equal in quantity to that in the river, the volume of which during the eruption is doubled. But one eruption of this geyser was observed. Another large crater close by has several orifices, and with ten small jets surrounding it, formed probably one connecting system. The hill built up by this group covers an acre of ground, and is thirty feet in height.

Harry J. Norton, Esq., formerly of Virginia City, made the rounds of all the geysers, and describes the leading ones as follows: "In our opinion, there is no geyser in the entire region that is so richly deserving of mention as our ancient-looking, steadfast friend, Old Faithful; for its operations are as regular as clock-work, of most frequent occurrence, and of great power. Standing sentinel-like on the upper outskirts of the valley, at regular intervals of sixty-seven moments, the grim old vidette sounds forth his 'all's well' in a column of water five or six feet in diameter, throwing it skyward to a distance of 150 feet, and holding it up to that height for eight or ten minutes' duration. The stream is nearly vertical, and in descending the water forms a glittering shower of pearl-drops, plashing into a succession of porcelain-lined reservoirs of every conceivable shape and many-colored tints. The mound is not far from twenty feet in height, and gradually slopes down to the south in regular terraces to a neighboring hot spring. One of the artistic reservoirs nearest the crater is half-filled with irregularly shaped, perfectly polished white pebbles, which must have been thrown out at the different eruptions. When the eruption ceases the water recedes, and nothing is heard but the occasional escape of steam until another exhibition occurs. Old Faithful will ever be the favorite of

tourists, as it never fails in regularly giving a display of its powers.

"Crossing the river, and proceeding down its east bank an eighth of a mile, we come to the Beehive. Early in the afternoon an eruption took place without a moment's warning. The column of water ejected filled the full size of the crater, and shot up at least 200 feet. So nearly vertically does the stream ascend that on a calm day nine-tenths of the volume would fall directly back into the aperture. From this cause, probably, there is no mound of any consequence built around it. At the time we witnessed its action, the ascending torrent was interposed between us and a bright, shining sun, and through its cloud of spray there was formed a rainbow of magnificent proportions, lending the fountain a crowning splendor and glory that it could not otherwise possess.

"To the right, and down stream a few hundred yards from the Beehive, is the Giantess, with a crater eighteen by twenty-five feet. We came upon it during one of its lucid intervals, and looking down into the gaping chasm could just discern the water a great distance below, as in a state of apparent tranquillity. Presently, however, there came up from its gloomy depths a dismal groan, quickly followed by a dense volume of steam and a rumbling sound beneath our feet, as of terrific underground thunder. In a moment more the seething elements below were in wildest commotion. The rolling and clashing of waves, the terrible steam-clouds rushing to and fro under the frail crust, the thunder of the raging waters, as, lashed into fury by the pursuing steam, they sought to burst apart their prison wall and escape—all were but too distinctly heard and felt. Spell-bound we stood, and, with enraptured awe, silently awaited the result of this terrible confusion. Spasm succeeded spasm; the agitated flood boiled up to the surface of the crater, and with a deafening report the immense body of water was hurled into the air over a hundred feet. Like some gigantic fountain impelled by an engine power that could have revolved a world, the boiling jet continued to play for several minutes. Surrounding this majestic liquid dome is a circle of smaller jets issuing from the same

crater, but from lesser apertures below, giving the main column the appearance of a fountain within a fountain. Playing hither and thither in the mellow sunlit mist, miniature rainbows were seen, and the air glistened with the falling water-beads as if a shower of diamonds were being poured from the golden gates of the Eternal City.

"Suddenly, just below us on the opposite bank of the river, a vast column of steam burst forth and ascended several hundred feet. On the *qui vive* for new wonders, we hurried over a slight knoll in that direction, and arrived just in time to witness the Fan Geyser getting up steam for an eruption. It requires more inside machinery to operate this geyser than any of the others. In fact, it is a massive natural engine, 25 by 100 feet, with two small valves, two escape pipes, and at the extreme upper end a large smoke-stack—five separate and distinct craters. When we arrived, we could hear a sound as of cord-wood being thrown into a mammoth furnace. This continued several seconds, ceased, and was followed by great quantities of steam from the smoke-stack; then the two valves opened, shooting out swift, hissing jets of steam. The next moment there would be an unearthly roar from the double craters; both would fill, and from each aperture a column of water two feet in diameter shot upward over eighty feet, one ascending nearly vertical, and the other at an angle of about forty-five degrees, thus forming the 'fan.' The eruption would continue from two to four minutes, then the flow cease for eight or ten seconds, and then the entire movement would be repeated. These repetitions continued for about twenty-five minutes, then ceased altogether. It requires no great flight of fancy to see in this marvellous natural mechanism a vast engine running under the guidance of a ghostly engineer, and being 'stoked' from Pluto's wood-pile by a thousand goblin firemen."

Near the middle of the Upper Geyser basin is the "Grand Geyser," the most remarkable in many respects in the world. Lieutenant Doane, U. S. A., who spent several days in its immediate vicinity in 1877, thus describes it: "Opposite camp, on the other side of Fire Hole river, is a high ledge of stalagmite,

sloping from the base of the mountain down to the river. Numerous small knolls are scattered over its surface, the craters of boiling springs, from fifteen to twenty-five feet in diameter; some of these throw water to the height of three and four feet. On the summit of this bank of rock is *the grand geyser of the world*, a well in the strata, twenty by twenty-five feet in diametric measurements (the perceptible elevation of the rim being but a few inches), and when quiet having a visible depth of 100 feet. The edge of the basin is bounded by a heavy fringe of rock, and stalagmite in solid layers is deposited by the overflowing waters. When an eruption is about to occur, the basin gradually fills with boiling water to within a few feet of the surface, then suddenly, with heavy concussions, immense clouds of steam rise to the height of 500 feet, and the whole great body of water, twenty by twenty-five feet, ascends in one gigantic column to the height of ninety feet; from the apex of this column five great jets shoot up, radiating slightly from each other, to the unparalleled altitude of 250 feet from the ground. The earth trembles under the descending deluge from this vast fountain; a thousand hissing sounds are heard in the air; rainbows encircle the summits of the jets with a halo of celestial glory. The falling water plows up and bears away the shelly strata, and a seething flood pours down the slope and into the river. It is the grandest, the most majestic, and most terrible fountain in the world. After playing thus for twenty minutes, it gradually subsides, the water lowers into the crater out of sight, the steam ceases to escape, and all is quiet. This grand geyser played three times in the afternoon, but appears to be irregular in its periods, as we did not see it in eruption again while in the valley. Its waters are of a deep ultramarine color, clear and beautiful. The waving to and fro of the gigantic fountain, in a bright sunlight, when its jets are at their highest, affords a spectacle of wonder of which any description can give but a feeble idea. Our whole party were wild with enthusiasm; many declared it was 300 feet in height; but I have kept, in the figures as set down above, within the limits of absolute certainty."

"In some of the elements of beauty and interest," says Pro-

fessor R. W. Raymond, "the Lower Geyser basin is superior to its more startling rival. It is broader and more easily surveyed as a whole; and its springs are more numerous, though not so powerful. Nothing can be lovelier than the sight, at sunrise, of the white steam-columns, tinged with rosy morning, ascending against the background of the dark pine woods and the clear sky above. The variety in form and character of these springs is quite remarkable. A few of them make faint deposits of sulphur, though the greater number appear to be purely silicious. One very large basin (forty by sixty feet) is filled with the most beautiful slime, varying in tint from white to pink, which blobs and spits away, trying to boil, like a heavy theologian forcing a laugh to please a friend in spite of his natural specific gravity. . . . . The *laugs* or extinct geysers are the most beautiful objects of all. Around their borders the white incrustations form quaint arabesques and ornamental bosses, resembling petrified vegetable growths. The sides of the reservoir are corrugated and indented fancifully, like the recesses and branching passages of a fairy cavern. The water is brightly but not deeply blue. Over its surface curls a light vapor; through its crystal clearness one may gaze, apparently, to unfathomable depths; and, seen through this wondrous medium, the white walls seem like silver, ribbed and crusted with pearl. When the sun strikes across the scene, the last touch of unexpected beauty is added. The projected shadow of the decorated edge reveals by contrast new glories in the depths; every ripple on the surface makes marvellous play of tint and shade on the pearly bottom. One half-expects to see a lovely naiad emerge with floating grace from her fantastically carven covert, and gayly kiss her snowy hand through the blue wave.

"In one of these *laugs* the whitened skeleton of a mountain buffalo was discovered. By whatever accident he met his fate there, no king or saint was ever more magnificently entombed. Not the shrine of St. Antony of Padua with its white marbles and its silver lamps, is so resplendent as this sepulchre in the wilderness."

Did space permit we might give a score of other testimonies

to the beauty of these vast and exquisitely sculptured and jeweled cups filled to the brim with scalding water, yet so entrancingly beautiful that you cannot resist the temptation to thrust in your hand and pluck the silver flowers and gather the gleaming jewels—but we are compelled to desist.

Yet Geyserdom is not a paradise. "The Geyser basins in themselves," says Rev. Dr. Hoyt, "are very ghastly places.' Save the jeweled cups, and the upward plunge of the white water, there is little beauty in them that we should desire them. Where the geysers spurt up their hot and hissing waves, and scatter them about, and then deposit as the scattered waters cool, the lime, and magnesia, and sulphur, with which they are charged, nothing green can grow. The aspect is that of a desert, except only that the sand instead of being brown is white. It seems more like a place of death than life—your horse's feet are scalded in the hot streams—you must be very careful where you tread, lest the thin crust break beneath you, and let you down into the boiling pools, and sudden death below. The air is stenchful with the breath of noxious gases. Flowers do not bloom; grass cannot spread its greenness; trees, if they come within the circle of the geyser action, stand bleached, leafless, lifeless. It is the terrible side of nature which you see."

Turning our faces northward we follow the Firehole or Upper Madison river for four or five miles from the Lower Geyser basin, till at a point opposite a forty foot fall of the river we enter upon the New Norris road, constructed by Superintendent Norris in 1878, which leads to new wonders of various kinds. The Gibbon's fork of the Firehole or Madison river, which has its source in or near Beaver lake, in the upper Madison Range, from its source to its mouth abounds in geysers, hot-springs, and fumaroles. These are not only found on its banks, in its cañons, and in the vicinity of its numerous water-falls, but along the slopes of the mountains adjacent there are four or five of these Geyser basins. The southernmost of these, near the mouth of the fork known as Gibbon's Firehole Basin, is on the Howard road. Norris's road is some miles east of this, and passes through a valley till it strikes Gibbon's fork just at the foot of the

long and deep cañon of that river. In that cañon and on a branch or creek which unites with it there are numerous water-falls from eighty to one hundred feet in height. The cañon itself, though not so deep and carrying less water than that of the Yellowstone, is full of romantic beauty and wildness. Along its bed and near it are pulsating geyser cones of both yellow and crimson, paint springs, and rivulets of nearly every color, geysers, throwing their jets, some at least 100 feet at angles of from 40° to 60°, instead of vertically, as in the old basins, and in the open basin along the road, beside many small but beautiful geysers, is a large crater formed so recently that many pine trees in and around it still retain their seared and mud-laden leaves.

Ascending the Grand Cañon of the Gibbon, we find at its head, upon the crest of the western mountain spur, which rises nearly vertically full 1,000 feet above the highest point of the Cañon Walls, a geyser basin of not more than five acres in extent, which is one of the most beautiful and interesting in the park. To this basin, as its first discoverer, Mr. Norris has given the name of Monument basin. In this there is at least one powerful and active geyser—a hissing fumarole plainly audible for miles; two other fumaroles, one tall and pulsating like the exhaust pipe of a huge Corliss engine, and the other with the orifice and terminal of its cone horizontal instead of vertical. There are also twelve pulsating geyser cones, from two to thirty feet in height, and similar in appearance to the famous Liberty Cap. A part of these are now extinct and slowly wearing away. Mingled with these are numerous hot springs and spouting geysers. A short distance above this Monument basin we come to another, at the upper cañon of the Gibbon, and here after ascending the inevitable water-fall come to the Norris and Firehole basins of the Norris fork of the Gibbon. Here is a beautiful grassy park, and sunny glades five or six miles in extent, and the whole dotted and begirt with huge boiling springs, sputtering paint-pots, spouting geysers, and several extensive craters, with some active geysers which throw up their waters with great frequency and regularity. One of these has been named "the Minute Man." Three miles more bring the traveller to Beaver and Pine lakes,

the former, though of considerable extent, being artificial in the sense of having been formed by a succession of beavers' dams. These lakes abound with feathered game, and on their banks are fumaroles and hot springs heavily charged with alum.

On the bank of Beaver lake there is a wall of vertical columns of obsidian or volcanic glass, many hundred feet in height and for two miles in length. There are cliffs of impure obsidian elsewhere in the Park and in this and other countries, but nowhere has there been found any of this volcanic glass so pure and perfect as this, or in such vast quantity. The columns are of black, yellow, mottled, and banded obsidian, but as regular in form as the basaltic columns of the Giant's Causeway. Great masses of this volcanic glass had fallen from the columns and formed a barricade some 250 or 300 feet in height, at an angle of 45° to the margin of Beaver lake. Mr. Norris had large fires kindled on this sloping barricade, and then, suddenly cooling it by throwing cold water on it, broke it in pieces and then with great labor crushed it and made a good wagon road over this barricade of glass.

From the obsidian cliffs there is a good wagon road to the Mammoth Hot Springs, and thence to the northern entrance to the Park. We have thus completed our tour of the most important objects of interest in the Park at the present time. What new wonders will be brought to light when the whole region east of the Yellowstone river and lake shall be thoroughly explored, when the southern portion, now almost wholly unknown, shall have been carefully investigated, and when even the northwest portion, drained by the Gallatin river, shall become better known, remains for other and future travellers and tourists to describe. What is already known, stamps it as the most remarkable region on the globe.

"This whole region," says Dr. Hayden, "was, in comparatively modern geological times, the scene of the most wonderful volcanic activity of any portion of our country. The hot springs and geysers represent the last stages—the vents or escape pipes—of these remarkable volcanic manifestations of the internal forces. All these springs are adorned with decorations more beautiful than

human art ever conceived, and which have required thousands of years for the cunning hand of Nature to form." "It is probable," he remarks elsewhere, "that during the Pliocene period, the entire country, drained by the sources of the Yellowstone and the Colorado, was the scene of volcanic activity as great as that of any portion of the globe. It might be called one vast crater, made up of a thousand smaller volcanic vents and fissures, out of which the fluid interior of the earth, fragments of rock and volcanic dust, were poured in unlimited quantities. Hundreds of the nuclei or cones of these vents are now remaining, some of them rising to a height of 10,000 to 11,000 feet above the sea."

Up to the present time the access to the Park has been only by long and difficult journeys, involving too great fatigue for any but the most robust, and almost entirely excluding, by its very wearisomeness, the visits of the gentler sex. Moreover, the necessary absence of any considerable hotel accommodations, or other provisions for a stay of at least ten or twelve days in the Park, and the frequent presence of hostile bands of Indians within it, have prevented any very large influx of visitors to it. These difficulties are now almost wholly obviated. The Utah and Northern Railway is within fifty miles of Yellowstone lake, and swift coaches over good wagon roads traverse the remainder of the way. Before the opening of the next season (the season is from the middle of August to the middle of October), the Northern Pacific Railway will be running through trains from Chicago and St. Paul to Fort Ellis, and not impossibly to the Park itself. The hardships of the journey will all be gone, and the time of reaching there will be reduced to about eight days, and the expense to one-half what it is at present. The Indians have gone for good, and the era of fast coaches, good hotels, restaurants and bathing-houses is coming on.

The impression that there is little of interest in the Park except the phenomena we have described should be carefully and forever dispelled from the minds of the public. "Few, I suppose," says Mr. William I. Marshall, "would care to live long among spouting geysers and boiling springs, or even upon the banks of

the brilliantly colored Grand Cañon of the Yellowstone; but these cover only a small part, probably not more than two or three per cent., of the surface of the Park, which embraces 3,578 square miles, or 2,298,920 acres, an area almost one-half as large as the State of Massachusetts, and, of course, extensive enough to contain an immense variety of scenery. There are scores of miles of beautiful valleys traversed by rivers of the purest water, swarming with trout, grayling and whitefish, and furnishing the finest hunting-grounds for ducks, geese, swans, and other water-fowl. These valleys are generally covered with fine grass, on which numerous antelopes pasture, while the greater part of the mountains which bound them is covered with the forests (interspersed with those great grassy slopes which are so marked a feature of the timbered areas of the Rocky Mountains) in which those fond of rifle-shooting can find elk and black-tailed deer and white-tailed deer and mountain sheep, and occasionally a band of mountain buffalo and other large game. There are countless quiet nooks where one can camp under the fragrant pines, besides green meadows gemmed with lovely wild flowers and watered by bubbling brooks, across which the beaver still builds his cunning dam, and beneath whose banks and in whose deep pools the dainty little speckled brook-trout watches for his prey. Not only are there scores of grand mountains lifting their craggy sides and rugged summits (few of which have ever felt the tread of civilized man) far up among the clouds, but innumerable sunny glades and shady dells, charming bits of quiet, picturesque scenery, where one will see nothing of the striking, but only the gently beautiful.

"I presume the head-quarters for tourists, when the Park shall be made a little more accessible, will be established on the shores of the lovely Yellowstone lake, which, lying at an altitude of 7,778 feet above the sea, or 1,500 higher than the summit of Mount Washington, in New Hampshire, covers 300 square miles with cool, clear water, which in places is 300 feet deep, and rolls its waves, of as deep a blue as the open sea, on 300 miles of shore line, now of loveliest beauty, and now of wildest grandeur. With its opportunities for rowing and sailing and fishing and hunting,

with the grandest of mountains bordering it and the purest of air ever sweeping over it, and with the inducements to open-air life offered by its surroundings, it is surely destined to become a most delightful summer resort for those who love nature, and who, when they wish to see her strangest and most wonderful phases, can sail or ride in a few hours to the spouting geysers, the boiling springs, the stifling solfataras, the roaring mud volcanoes, the lofty cataracts, and the gorgeous Cañon of the Yellowstone; and when they would enjoy her quieter and more subdued aspects can find them on every hand in endless profusion. Those who travel to see the triumphs of industry and the treasures of art, to behold the ruins of an ancient era or splendor of modern cities; those who wish to revive historical associations, or to survey the beauty of the earth as affected by human effort, and connected with human life, will, of course, go to the old world; but there are many, and the number seems to be constantly increasing, who, for a longer or shorter time, love yearly to leave behind them the bustle of towns and the roar of cities, the vexations of business and the conventionalities of society, and live face to face with nature, resting in her solitudes or communing with her ceaseless health-giving activities, and to these the endless features of the Park will offer varied attractions and constant charms."

CHAPTER XXIII.

ALASKA.

RELATION OF ALASKA TO OUR WESTERN EMPIRE—ANOTHER KAMSCHATKA—ABSURDITY OF THE STORIES TOLD OF ITS PRESENT OR PROSPECTIVE PRODUCTIVENESS—ITS FURS, FISHERIES, AND TIMBER, SOMEWHAT VALUABLE—PECULIAR FORM OF THE TERRITORY—THE BULL'S HEAD WITH TWO LONG HORNS—ITS THREE DIVISIONS, SITKA, YUKON, AND THE ISLANDS—AREA—POPULATION—TOPOGRAPHY—MOUNTAINS—RIVERS—THE LIMITS AND AREA OF EACH DIVISION—GEOLOGY—VOLCANOES AND GLACIERS—MINERALOGY—COAL—METALS—MINERALS—GOLD AND SILVER—RECENT DISCOVERIES—ZOÖLOGY—THE DIVISIONS IN DETAIL—THE SITKAN DIVISION—ITS FUR TRADE, FISHERIES, AND TIMBER—ITS AGRICULTURAL PRODUCTIONS CONFINED TO A FEW VEGETABLES—2. THE YUKON DISTRICT OF LITTLE VALUE, EXCEPT FOR ITS FUR TRADE, WHALE AND OTHER FISHERIES ON THE COAST—3. THE ISLAND DISTRICT—SOME ARABLE LAND ON THE LARGER ISLANDS, AND A POSSIBILITY OF FUTURE DAIRY-FARMS THERE, THOUGH AT TOO GREAT COST FOR MUCH PROFIT—THE CAPTURE OF THE FUR SEAL ON THE PRIBYLOFF ISLANDS THE PRINCIPAL INDUSTRY, THOUGH FISHERIES MAY INCREASE—DETAILED ACCOUNT OF THE FISHERIES—THE POPULATION, NATIONALITIES, AND CHARACTER—THE NATIVES—KOLOSHIAN TRIBES—KENAIAN TRIBES—THE ALEUTS—THE ESKIMO—PRINCIPAL TOWNS AND VILLAGES—METEOROLOGY OF FORT ST. MICHAEL'S AND UNALASHKA—OBJECTS OF INTEREST TO THE TOURIST—HISTORICAL NOTES—CAN IT BE COMMENDED TO IMMIGRANTS?

ALASKA, the unorganized Northwestern Territory of the United States, bears about the same relation to "Our Western Empire" that Eastern Siberia and Kamschatka do to the Russian Empire; it is remote from the rest of the Empire, of vast territorial extent, but desolate and cold to the last degree, and can never become very populous, or of any remarkable economic value, until the plane of the ecliptic changes, and what is now an Arctic climate becomes torrid, or at least temperate.

We know very well what is said about the ameliorating effect of the Kuro-Siwo or Japan current upon the climate of those high latitudes; but the Gulf stream, a similar but more powerful current, has not rendered Iceland a paradise, or Novaya Zemla a fit habitation for men, though both are in quite as low latitudes

as most of Alaska. We hope for some return of the national outlay from the fisheries, the fur trade, and the timber of Alaska. The precious metals may be found there—probably they will; and it may be possible on some favored spots to raise oats and barley, though not, to any extent, wheat or corn; but in a climate which is "nine months winter and the other three months late in the fall" how can either mining or agriculture be expected to prosper? As to the absurd prediction, that within a few years it will become the principal region of our country for dairy products, it is sufficient to say that Mr. Walker Blaine, son of the Senator, after a careful exploration of Alaska in the spring and summer of 1880, wrote to the New York *Tribune* on the 20th of June, 1880, that there was not a single cow in the whole of Alaska. Even the ice, which is always abundant, does not prove profitable as an article of export, the manufacture of ice by machinery having been so far perfected that it can be produced in San Francisco as cheaply as it can be imported from Alaska. No ice is now exported from the Territory.

That we may do no injustice to this great northwestern land, let us proceed to say what can justly be said in its favor.

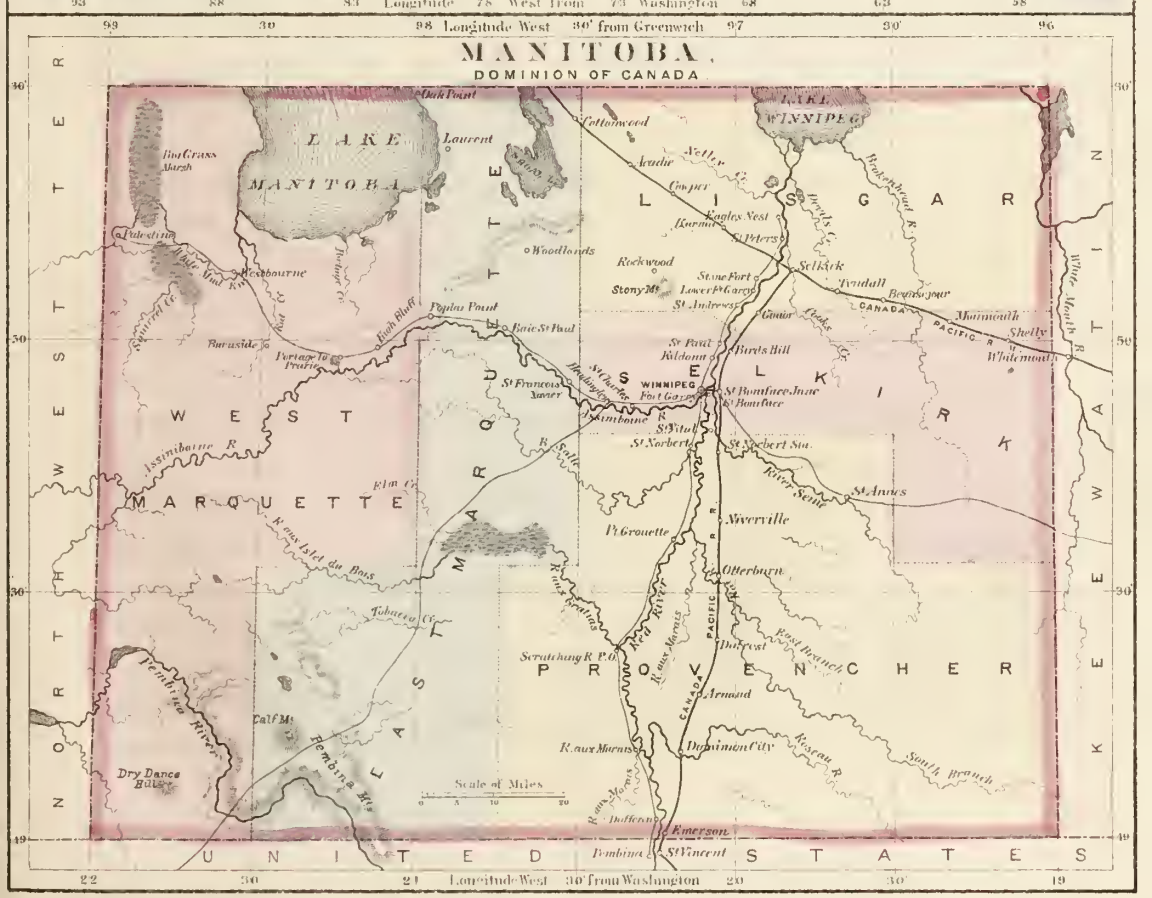
Alaska is not, as is supposed by those who have given but little attention to the subject, a vast compact tract of territory. It has been not inaptly compared to the head and horns of a Texas bull—Yukon district forming the massive head, the Sitkan shore and archipelago forming one horn, and the Aliaskan peninsula and the Aleutian Islands the other. The tips of the two horns are 60° of longitude or 3,000 miles apart; and from the southernmost of the islands of the Aleutian group to Point Barrow in the Arctic ocean, the northernmost point of Yukon is a little more than 20° of latitude, or about 1,400 miles.

The area, according to the last report of the Land Office, is 577,390 square miles, or 369,529,600 acres. The shore lines around the islands and peninsulas are roughly estimated at 25,000 miles, or the entire circumference of the globe. The entire population of this Territory at the time of its acquisition from Russia was said to be about 29,000, of which 26,800 were said to be Indians and the remainder Caucasians and creoles. It has not materially increased since.

Topography—Mountains.—The Alaskan range, which seems to be a combination of the Coast, Cascade and Rocky Mountain Chains, passes northwestward through British Columbia a little east of the Sitkan Division of Alaska, enters the Yukon Division between the sixtieth and sixty-second parallels, and keeping a course parallel with and at a little distance from the left bank of the Yukon river, extends north nearly as far as Fort Yukon in latitude 66°, turns sharply south and forming the backbone of the Aliaskan peninsula and the Aleutian islands, each of which is a peak and generally a volcanic peak of the range, till finally its summits are all sunk in the deepest part of the northern Pacific ocean. This range has the loftiest peaks in North America outside of Mexico. Among these are Mount St. Elias, 19,500 feet in height; Mount Cook, 16,000 feet; Mount Crillon, 15,900; Mount Fairweather, 15,500; while of the partially submerged volcanic peaks, Sheshaldin is 9,000 feet above the water; Unalashka, 5,691 feet; Atka, 4,852 feet; Kyska, 3,700 feet; while poor Attu, the westernmost of the group, can only lift its head 3,084 feet above the deep valley of the Pacific.

In addition to the Alaskan range, there are several other mountain ranges of less elevation: among them are the Shaktolik and Ulukuk Hills, near Norton's sound; the Yukon and Romanzoff Hills, north of the Yukon river; the Kayiuh and Nowikakat mountains east and south of the river, and a low range of hills bordering on the Arctic coast.

Rivers.—The great river of the Territory is the Yukon, whose sources are in the Chippewayan and Alaskan range, in British America. It is more than 2,000 miles in length, and is navigable, when not frozen over, for 1,500 miles. The delta across its five mouths is seventy miles wide, and the river itself is from one to five miles wide for the first 1,000 miles of its course. One of its largest tributaries, the Porcupine river, has most of its course above the Arctic circle. The Tananah, 250 miles in length, and the Nowikakat, 112 miles, are also tributaries of the Yukon. The Inland river, which flows into Kotzebue sound, and the Colville, which discharges its waters into the Arctic ocean, are the only other rivers north of the Yukon. South of it are the Kons-



koquim, about 600 miles in length, the Nushagak, the Sushitna, the Atna or Copper river, and in the Sitkan division the Chilcat, the Takou and the Stickine. The last is about 250 miles in length.

It is divided by natural lines into three grand divisions, varying each from the other in natural characteristics and value:

1. The Sitkan Division, triangular in shape with the latitudinal line of 54° 40′ north for the southern boundary, and the longitudinal line of 141° west for the western, and on the north and east following the summits of the Coast Range of mountains between these points, with a proviso that this strip of shore shall never exceed ten marine leagues in width.

2. The Yukon Division, consisting of all the continent west of 141° as far north as the Frozen Ocean.

3. The islands not included in the Sitkan Division, comprising all the important islands of the Pacific Ocean north of 54° 40′, from Alaska to Kamschatka, known generally as the Aleutian Islands, and also the Aliaskan peninsula and the Kodiak or Kadiak Islands, east of that peninsula, and the Pribyloff group, which are remarkable for the vast numbers of the fur-seal caught there.

In the first or Sitkan Division, there were in 1867 about 800 natives and some 800 whites and creoles; in the Yukon, 8,000 natives, and 100 whites and creoles; and in the remainder of Alaska, the Island Districts, 17,300 natives and 1,300 whites and creoles.

This meagre population is grouped entirely around the seaboard and large rivers. A glance at the best map will show that of the interior of the Yukon District geographers know very little. What rivers and lakes are traced upon the maps are usually located upon slight and inaccurate information, derived from the natives. The interior of the islands and coasts longest peopled by a civilized race is almost altogether *ignota terra*. The coast line of Baranoff Island, on which Sitka is located, is well known and accurately defined upon the charts, but the interior is entirely unexplored. The only road at Sitka runs into the woods to the distance of a mile, and then stops before a wall of dense

forest and undergrowth. The growth of stunted trees all along the shores of the islands and main land of the Sitkan Division is so thick as to be almost impenetrable. There is one instance, at least, of a man's having given an entire day to the work of penetrating inland, and at the end of his labor finding himself less than a mile from the shore.

Geology.—The greater part of this vast Territory has undergone changes from volcanic eruptions which have completely altered the character of its rocks. This is particularly the case in the Sitkan and Aleutian Divisions, in which there are sixty-one volcanoes which have been active within 150 years. The violence of the volcanic action seems to be decreasing, and of these sixty-one only ten are now in a condition of active and constant eruption. There are also very many extinct volcanoes in the Sitkan Division, and several are known in Yukon.

The immense shore line and the mountain slopes are crowded with glaciers; some of these are the most stupendous in the world. One of these is described as fifty miles in length, and terminating on the sea-coast in a perpendicular ice-wall 300 feet high and eight miles broad; another, thirty-five miles above Wrangell, on the Stickine river, is said to be forty miles long at the base, four or five miles across, and variously estimated at from 500 to 1,000 feet in thickness.

Mineral Wealth.—Alaska is known to possess coal beds of good quality and of great extent. Most of the coal beds are in the tertiary, and are properly lignite, though of the best quality. That in the Sitkan District has been so far changed by volcanic action that it is in some places a semi-anthracite. Petroleum is said to have been found of excellent quality and nearly odorless near the Bay of Katmai and on Copper river.

Copper, native, or very rich copper ores, have been found on Copper river, at Kasa-an bay, at Whale bay, below Sitka, and in Kadiak Island.

Iron exists all over the Territory, and graphite in several places. There is bismuth of fine quality on Vostovia Mountain, and gypsum, kaolin, marble, and the more common of the precious stones, agate, carnelian, amethyst, etc., are sufficiently plentiful.

Gold undoubtedly exists in the Territory, and probably at several points. In the Sitkan District there are several mines which have been worked to some extent on Baranoff (or Sitka) Island; two or three formerly worked on the streams falling into Stephen's passage, about seventy-five miles north of Fort Wrangell, at the mouth of the Stickine river. Mr. Walker Blaine says:

"The gold mines of the Stickine river are all located in British Columbia, and as the stores from which the most of the miners' supplies are furnished are upon the river, the business is diverted to the British possessions. Very many miners, however, winter at Wrangell, and freight bound to points on the Stickine river is at this place transferred to the small river steamers. Some gold claims have been located near Sitka, and specimens of ore sent to the assay office at Victoria have been found to contain a fair quantity of the precious metal. A quartz mill was erected during 1878, and it was intended to develop one of the mines, but the unpleasant weather and short days of winter will render it extremely difficult to carry on operations during more than six months of the year. No sufficient amount of capital has as yet been invested, nor have the mines been sufficiently worked to determine the mineral wealth of the Territory. Many who have given the subject great attention are fully convinced that valuable deposits of the precious metals exist. Mr. Francis, now and for many years past our Consul at Victoria, is sanguine in the belief that considerable quantities of gold will yet be mined, and his son, who was until recently the Deputy Collector at Sitka, speaks in still more confident terms of the value of the ore beds."

As we write a report comes from Sitka, dated December 22, 1880, saying that about two months previous a report was circulated that gold had been discovered at Tahon, an Indian settlement on the river of the same name, about 150 miles north of Sitka, and near the border of British Columbia. Further reports only increased the excitement, and when specimens of the ore were brought to Sitka, which yielded $200 of pure gold to 300 pounds of ore, the excitement became so intense that the people began to migrate thither in such numbers that the town was almost depopulated. It remains to be seen whether these mines

prove as rich as they seem to promise. If they do, they will be profitable, although they cannot be worked more than four or five months in the year. The Alaskan Mountains curve southwestward in the District of Yukon, and extend along the Aliaskan peninsula and through the Aleutian Islands. They seem to be the consolidation of the Rocky, Cascade and Coast Ranges. These mountains, according to all analogies, should contain both gold and silver, and in all probability they do. If the lodes are very rich, it may pay to work them, though the expense will be much greater than that of working mines farther south.

Zoölogy.—The animals of Alaska belong rather to the fauna of the Arctic than the Temperate Zone. The musk ox is found in Yukon District, and the reindeer, though of a different species from the European. The polar bear frequents the shores of the Arctic Ocean, and sometimes ventures as far south as Kotzebue sound. The elk and moose are seen, though rarely; the Rocky Mountain goat and sheep (the bighorn), several species of fox, the mink, beaver, marten, lynx, otter, sea-otter, black bear, wolverine, whistler, ermine, marmot, skunk, muskrat and wolf. Of *amphibia*, the seal, sea-otter, whale, porpoise, narwhal, etc., are abundant. Its birds are largely game birds, the ptarmigan, grouse, wild geese, teal, ducks, brant, etc., at certain seasons, and eagles, fishhawks, gulls, the great owl, etc., etc. Of the fish we speak elsewhere.

Let us now take up the divisions in detail, and endeavor to ascertain what each can produce with profit. And, first, of the

Sitkan Division.—"Here," says Mr. Blaine, "no grass has been grown, and the small gardens at Sitka and Wrangell produce only a few of the hardiest vegetables. So great is the moisture that hay cannot readily be cured, wheat ripened, nor potatoes raised. Even cabbages will not head. While our troops were in the Territory, a few cattle were with great difficulty kept in the District, but there is not at present a cow in the whole military Division of Alaska. Beef is a luxury most highly prized, the only meat being an occasional haunch of venison, and, in the proper season, small game. The mountains as a rule descend abruptly to the sea, and the small patches of level land are few

and far between. In a word, agriculturally this whole district is absolutely worthless. There is no fodder for cattle, and the ground under the most careful cultivation yields nothing but the poorest varieties of the most insignificant vegetables. The hand of man can do little to add to the value of the Sitkan Division.

"The Sitkan Division does, however, possess a great abundance of most valuable ship-timber. The wood, known as yellow cedar, and sometimes called camphor-wood, which is the most durable of all woods for purposes of ship-building, is found in large quantities, and the Sitka spruce, inferior to this, but of very great value, is most plentiful. Logs of either of these woods can be easily procured at very small expense. Lumber has been sawed at a total cost of three dollars per thousand, which would easily command from twelve to fifteen dollars in San Francisco. There has been for some time a small saw-mill in Sitka, and another has recently been built in Klahwoch, but only trifling quantities of lumber have as yet been sawed at either place. The vast tracts of timber land in Oregon, Washington Territory and Northern California will, for many years, supply the market of the Pacific coast.

"The fur trade of the Sitkan Division is at present the most important interest. The small amount of business now transacted at Sitka is entirely dependent upon the exchange of commodities for furs and peltries. For the past few years there has not been a sufficient demand for furs to make high prices or large gains. Fashion has frowned, at the dictation, perhaps, of the hard times, and competition among traders has assisted in reducing the profits. All the merchants profess to have lost money, and it is the general opinion that none have made any. The fur-seal is not found in the waters adjacent to Sitka, but large quantities of other valuable furs are brought to this place and to Wrangell by the Indians and accumulated by traders. Fur-trading is in its very nature little suited to the permanent prosperity of a country. It demands the frontier and the wilderness as the seat of operations, and is perforce killed, as a country is settled and its resources developed. It is the enemy of civilization, and the more profitable it is, the sooner does it come to

an end. Year by year, as the circle of population widens, the trappers are driven farther to the north. Astoria, for years the centre of the trade, long ago yielded its supremacy, and to-day no furs are sold in that market at first hand. A large part of the world's supply must henceforth come from Alaska. She has no rival on this continent, and in the most important branches no formidable competitor on the globe.

"The fisheries of the Sitkan waters will perhaps ultimately prove the most valuable resource. They have, however, until very recently been of but little practical value. A few barrels of salted fish have been annually exported, and the inhabitants have to a large extent sustained life on the products of the sea. Within the past two years two salmon canneries have been built, and quite a large amount of money invested in this enterprise, but lack of information does not permit me to say whether the venture has proved successful.

"It was said in support of the Alaskan purchase that all the ice of the Pacific coast was imported from that Territory; but the value of the export was never in a single year more than $30,000, and the successful introduction of machinery for the production of ice artificially has caused the business to rapidly decline and disappear. No ice is now exported from any portion of the Territory."

2. *The Yukon District.*—Of this region the massive head of the bull, whose left horn, the Sitkan Division, we have just been considering, it has been the fashion with some writers to speak in the most glowing terms. It was "the garden of Alaska." Here wheat and all the other cereals except corn, and all the tubers and vegetables required in the market gardens or the markets of the Pacific coast, could be raised in the greatest profusion. In the hot, short summer, everything, it was said, grew so rapidly that a vast population could be sustained here. The later commissioners and explorers do not corroborate these glowing accounts. "The second division, called the Yukon," says Mr. Walker Blaine, "has been less explored than either of the others. There were formerly a few Russian posts in the Territory, but these have now been abandoned. At Cook's Inlet, at the mouth of the Sutchino

river, and at many points on the Yukon river, sufficient grass is found to afford the best of fodder for cattle, and wild berries and smaller fruits flourish in abundance. The range of the thermometer at a distance from the sea-coast is far greater than in Sitka, or near the sea-line, and the summers are so warm as to produce the most luxuriant vegetation. On the Yukon river the sun has been known in the month of July to burst a spirit thermometer, graduated up to 120°, and the winters are Arctic in severity. There is no trouble in curing hay at these points, and there is said to be good grazing land for cattle. It will of course be necessary to shelter the herds during more than half of the year, and fattening for market will not therefore be profitable. Fruit-trees will not flourish, and while some experiments have been made with barley and oats, which are said to have been satisfactory, not a grain of wheat has ever been brought to maturity. South of the Alaskan Range, save at Cook's Inlet and on the peninsulas, there is no good land, and north of the mountains only persistent and careful cultivation will enable the farmers to reap satisfactory results. The only evidence which we have as to the land is from experiments made by the Russians and the scientific officers of the Western Union Telegraph Company. They are both very unsatisfactory, especially those of the former, as they were intrusted to Indians, who, being utterly ignorant of agriculture and cattle-breeding, conducted them most unskilfully. There are also said to be valuable coal-beds, but as no examination was ever made by competent geologists, this cannot be safely affirmed. Undoubtedly there is considerable free copper in the district, as the natives formerly employed this metal in the manufacture of wagons and domestic articles, but its location is at present unknown. Fur animals abound, especially those living upon the land. Fort St. Michael was formerly one of the chief trading posts of the Russians, and many of the fox and beaver skins now sent from the north Pacific are trapped upon the Yukon. Good timber is also found in many portions of the division, but it is not so accessible nor so valuable for ship-building as that about Sitka. Fish of all kinds, especially cod and halibut, are very abundant at Cook's Inlet and along the entire coast.

3. *The Island District*, which includes the Aliaskan peninsula, the large island of Kadiak and the group of islands which surround it, the Aleutian Archipelago, comprising the three groups of the Fox, the Andreanowsky, and the Blijnie or Rat Islands, the whole constituting the right horn of the bull; and with these the Pribyloff group (the home of the fur seal), Nounivak, Lawrence, and the St. Matthew group, come next in review. "These islands," says Mr. Blaine, "are the most valuable portion of our Russian purchase. The island of Kadiak and others of the Aleutian group contain very good arable land. The cattle distributed by the Russian Commercial Company succeeded here far better than in any other part of the Territory. There is good pasture land, and hay can be made with greater ease than at the mouth of the Columbia river. There is also an encouraging report that a good variety of potatoes can be grown, although 'the tubers are said to be small.' There is not much timber of good quality upon these islands, but the fisheries are of very great value. The Aleuts, who are the chief native race, are by nature the most honest people in the world. On the islands where there are no forests, driftwood furnishes the principal supply of fuel, and it is said that the unwritten law with reference to the rights of property is so strong that, should an Indian discover a log of wood which it is not then convenient for him to carry away, he may, by carrying it above high-water mark and placing it at right angles to the line of the beach, leave it with full assurance that it will not be disturbed until his convenience warrants the removal.

"The chief sources of our revenue from Alaska are in what is known as the Pribyloff Islands. St. Paul and St. George, two of the group, now furnish almost all of the seal-skins used in the world. These islands abound with seal, and being the property of the United States, are leased by the government to the Alaska Fur Company. The number of seals killed each year is limited by law to 100,000, and for these a royalty of two dollars each is paid. If the law restricting the number of seals annually killed is strictly enforced, this industry will for many years furnish the chief part of the revenue from Alaska, and constitute the most valuable product of the Territory."

A correspondent of the *Portland Oregonian*, writing from Sitka in the summer of 1880, gives the following account of the fisheries:

"Alaska is destined to supply the world with fish. Its waters abound in halibut, herring, cod, and salmon; indeed there is hardly a species of which representatives cannot be found. While those above named exist here in endless profusion, flounders, black bass, rock-cod, trout, and the delicious eulocous, with other varieties, appear in vast schools, supplying the natives with abundant food at all seasons of the year.

"At Klowak, sixty miles from Fort Wrangell, the North Pacific trading and packing company have a large fishery in operation, where during the present year especial attention has been paid to herring. The catch this spring was very successful, the fish being in prime condition, and not only larger in size but of better flavor than ever before sent to market. 170 barrels were sent to Portland for the purpose of introducing the fish to dealers, and if desired ten times that amount could have been secured.

"Five miles from the town of Sitka the firm of Cutting & Co. have a large cannery erected where thousands of salmon are put up every year to meet the demand made for Alaska salmon from the Eastern markets. While the salmon from these waters have not the gustable richness, and lack the savory flavor of Columbia river salmon, there are many that prefer the Alaskan species, particularly in the Eastern States and foreign countries. This may be, perhaps, accounted for, in part, for the reason that Columbia river salmon labels find their way on thousands of cans of what is purported to be the genuine article, while in fact their contents are dog-fish. The establishment of Messrs. Cutting & Co. is complete in every detail, and is under the superintendency of Mr. A. Hunter. A large number of white men and Indians find steady employment at the cannery during the summer, and it is remarkable to witness the proficiency attained by some of the Indian boys in making cans. Some idea of the extensive business of this establishment may be had by the shipments made, and this year the superintendent will send 40,000 cases of fish to San Francisco and the Eastern markets.

"The catching of cod-fish in Alaskan waters is becoming yearly a more prosperous pursuit, and this season Mr. James Haley, of Fort Wrangell, secured a schooner-load of cod at the Knout-Znu bank, in Chatham straits. He found the bank swarming with fish, but the Indians of that locality, the Knout-znous, are 'hiyu sullux,' over the coming of white men in their waters, refusing to allow the men to fish, performing that work themselves and charging one cent for each and every fish caught. In this way a full load was secured, which is now in process of curation at Wrangell. A ready market for the fish is found at home for supplying the mining camps, the entire cargo being readily disposed of at $100 a ton, delivered at Wrangell. The Alaska cod, when once fairly introduced to Oregon and California markets, will rapidly become a favorite with all lovers of that fish, and in time supplant the eastern-caught fish."

Population, its Nationalities and Character.—We have already stated the probable number of the population, though as no census has been taken, it is impossible to fix it accurately. Of the 2,200 whites and creoles reported in 1867 nearly one-half were half-breeds with Indian mothers. The number of whites and creoles has increased, perhaps, 500 since that time; but the increase has been almost wholly in the half-breeds. The native tribes were divided by General Halleck's report of 1869 into four groups—1. The *Koloshian* tribes, which occupy the Sitkan Division, and extend as far as the Atna or Copper river. These tribes, which have been variously estimated at from 800 to 15,000 (the latter estimate, however, including the coast Indians of Northwestern British Columbia), are those with which our people have been brought most in contact. They are, like the other Indian tribes of this coast, of the Athabascan family, and originally probably of Mongolian or Northern Tartar stock. They are as a rule more intelligent and possess more mechanical skill than the Dakota or Sioux family, but are more superstitious and idolatrous, and quite as low morally as any of the Indian tribes. Some of these tribes have been hostile to the whites, and have murdered the crews of vessels, but they are now generally peaceful, except when they are intoxicated. They distil a fiery

and wretched rum, which they call "Hoochinoo," from refuse molasses brought there by some of the ships, and become very fiendish and violent under its influence. Missionaries are now laboring among them, and a considerable number have been converted.

2. The *Kenaian Tribes*, who occupy the whole of the Yukon Division south of the Yukon river. They are more numerous than the preceding, ranging from 15,000 to 20,000. They are said to be peaceful, quiet and well disposed, though there is not much known of them.

3. *The Aleuts.* These are the Indians of the islands and the Aliaskan peninsula. They strongly resemble the Eskimo, and are industrious, honest, peaceable and ready for instruction.

4. *The Eskimo*, who inhabit the region north of the Yukon river. These, like their fellows of Greenland and the eastern coast, are very industrious, patient and hospitable. General Halleck estimated their number at about 20,000. Later writers think there are not more than 5,000.

Want of Laws and a Legal Government.—There is to-day no legal government in Alaska, and only two laws in force in the Territory, one the revenue law for the collection of customs and the prevention of smuggling, and the other a law prohibiting the importation of liquor into the Territory. There are no efficient means of enforcing even these laws. There is no provision for arresting or punishing a murderer, highway robber or pirate. A few simple laws would be sufficient, but though the attention of Congress has been repeatedly called to the matter by the Secretary of the Treasury, nothing has been done.

Principal Towns and Villages.—In the Sitkan Division, Sitka, the present capital of the Territory, and Fort Wrangell, are the only important settlements. They have about 1,300 and 800 inhabitants respectively. In the Island Division, St. Paul's, on Kadiak Island, the former capital under the Russians, and Unalashka, the refitting station and trading post of the Alaska Commercial Company, are small villages. In the Yukon District, Fort St. Michael's and Cook's Inlet are the only places of any importance.

We have given some notes of the climate of Sitka. Perhaps a few items from the Signal Service reports in relation to a station at Fort St. Michael's, in Yukon, and Unalashka Island, in the Aleutian Archipelago, may be worth noting:

	FORT ST. MICHAEL'S, Yukon District, Alaska. Latitude 63° 48′. Longitude 161° 0′. Elevation 30 feet.							UNALASHKA ISLAND, Alaska. Latitude 53° 25′. Longitude 166° 49′. Elevation ab. 20 feet.					
	Temperature.				Humidity.		Barometer.	Temperature.				Humidity.	
Year and Months.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Temperature.	Rainfall.	Mean Humidity.	Mean Pressure.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Temperature.	Rainfall.	Mean Humidity.
1878.	°	°	°	°	in.	per ct.	inches.	°	°	°	°	8 mon.	
Year.....	73	—31	104	21.9	15.6	87.2	29.734	.....	.....	.....	.....	30.74	
July.....	73	36	37	52.1	3.48	77.2	29.778						
August. ...	66	42	24	52.4	2.16	83.3	29.695						
September..	58	26	32	46.0	2.29	89.4	29.707		36		48.0	2.55	86.0
October....	41	10	31	29.1	0.66	87.4	29.659		26		40.8	3.97	92.0
November..	32	—12	44	15.6	0.95	89.9	29.278	48	21	27	33.5	3.78	89.0
December..	45	—31	76	16.6	1.86	90.0	29.763	45	19	26	35.1	10.02	85.0
1879.													
January....	43	—21	64	14 9	1.89	99.3	29 642	48.5	20	28.5	34	2.88	84.5
February...	30	—30	60	3.5	0.07	91.1	30.179	44	7	37	29.2	1.35	84.0
March.....	40	—20	60	13.6	0.15	88.7	29.751	49	15	34	32.2	3.26	80.9
April.....	37	—20	57	19.0	0.42	87.0	29.677	52	21	31	33.1	2.93	82.3
May.....	53	— 2	55	31.5	0.30	85 4	29.945						
June	64	32	32	46.3	1.40								

The Attractions of Alaska to the summer tourist are very great. At Sitka and its vicinity the midsummer night is almost as attractive as at Tromsoe or the North Cape. At Kotzebue sound it is quite as beautiful. Later in the season the brilliant aurora borealis, or Northern lights, are of unsurpassed beauty and magnificence.

Mr. Blaine thus describes the voyage from Nanaimo, the last port of British Columbia, to Sitka:

"The picturesque parts of the voyage are found between Nanaimo and Sitka. The steamer sweeps through a narrow strait guarded on either hand by snow-capped mountains, and so narrow that despite all your knowledge of perspective it seems as if the shores meet as you look up the channel from the bow of

the ship. On either side mountains, green at the base and white at the summit, overhang the water. A patch of marble cropping through the trees forms an occasional and welcome spot of color in the monotonous green, and the ripple of a cascade agreeably breaks the stillness which everywhere reigns supreme. For days not a living thing is seen; no animal upon the land, no Indian on the water, no bird in the air. The waves, washed by the wheel against the shore, tremble into silence; the hills which echoed the whistle sullenly grow calm once more, and you seem shut in by the forces of nature, and in the power of the genii of sea and strand. There is apathy everywhere, activity nowhere. High up in the sky the sun rolls lazily along, completing the task in twenty hours which elsewhere he accomplishes in fourteen. The nights glitter with weird light. The sunset is reflected by the sunrise. The west yet glimmers with the streaks of day, while in the east jocund morn stands tiptoe on the misty mountain-top. At 10 at night the finest print is read with ease, and at 3 in the morning the sun streaming into the state room wakens you from sleep."

We can hardly commend Alaska as a favorable point for emigrants, unless it be those hardy Norsemen whose constant encounters with the Arctic climate have rendered them proof against its hardships; but development, though slow in coming, will yet surely reach this far-off land of ice. There will probably be no great change in the climate. Neither wheat nor dairy products will be exported in any large quantity, but the seal and sea-otter furs, and the furs and pelts of land animals, will increase in value and perhaps in numbers; the magnificent forests will supplement the fast diminishing timber product of the Pacific coast, and the fisheries will furnish abundant and healthful food to millions who to-day hardly know that Alaska exists. Then there will be a place there for the hardy and adventurous emigrant, and his toil will be rewarded.

PART IV.

THE LANDS OUTSIDE OF "OUR WESTERN EMPIRE."

CHAPTER I.

THE NORTHWESTERN PROVINCES OF THE DOMINION OF CANADA.

I. British Columbia—Boundaries—Area—Islands—Soil of Islands and Coast—Soil and Surface of the Interior—Mountains—Rivers—Geology and Mineralogy—Coal—Gold, Silver, etc.—Fisheries—Timber—Fur-Trade—Population—Indians—Chief Towns—II. The Northwest Territories—Extent—Recent Division—Lakes—Rivers—Mountains—Soil—Climate Warmer than Manitoba—Wild Animals and Game Plenty—Rivers and Lakes Stocked with Fish—Population—Indians—Religion—III. Keewatin—The New Territory—Not much known of it—IV. Manitoba—Its Territory too Small—No Good Reason for this—Its Boundaries—Its Rivers—The Province nearly a Dead Level—Climate—Rainfall—Meteorology of Fort Garry—Agriculture—Conflicting Accounts—Report of an "English Farmer"—Reply of "a Canadian"—Climate very Severe in Winter—Mr. Vernon Smith's Description of the Rivers and Lakes and their Future Usefulness—Earl Dufferin's Description—Mr. Vernon Smith on the Crops—Later Statistics not available—Transportation—The Canadian Pacific—Its Present Condition and Prospects—Religion—Education, etc.—Principal Towns—Historical Notes—The Red River Settlement—Pembina—Assiniboia—Riel's Revolution—The rapid growth of the Province since it became a Part of the Dominion.

I. British Columbia.—This is the most western province of the Dominion of Canada, lying between the 48th and the 60th parallels of north latitude, and the 114th and the 139th meridians of longitude west from Greenwich. It is bounded on the north by the Arctic portion of the Northwest Territory; on the east by the same; on the south by the United States (the Territories of

COUNTY MAP
OF
ONTARIO
DOMINION OF CANADA.
Scale of Miles
80 Longitude West 79 from Greenwich 78
4 Longitude West 3 from Washington
1 Longitude East 2 from Washington
LAKE HURON
GEORGIAN BAY
LAKE ONTARIO
LAKE ERIE
MICHIGAN
QUEBEC
NEW YORK
ONTARIO
PARRY SOUND DIST.
NIPISSING DIST.
MUSKOKA DIST.
GRAND MANITOULIN
NORTH CHANNEL
NIPISSING LAKE
Ottawa River
RENFREW
LANARK
CARLETON
PRESCOTT
RUSSELL
OTTAWA
GLENGARY
STORMONT
DUNDAS
GRENVILLE
LEEDS
FRONTENAC
ADDINGTON
HASTINGS
PETERBOROUGH
VICTORIA
NORTHUMBERLAND
DURHAM
PR. EDWARD
ONTARIO
YORK
PEEL
SIMCOE
GREY
BRUCE
HURON
PERTH
WELLINGTON
CARDWELL
WATERLOO
HALTON
WENTWORTH
LINCOLN
WELLAND
MONCK
HALDIMAND
BRANT
OXFORD
NORFOLK
MIDDLESEX
ELGIN
LAMBTON
BOTHWELL
KENT
ESSEX
Toronto
Kingston
Montreal
Buffalo
Rochester
Detroit
London
Hamilton
Port Huron
Syracuse

Washington, Idaho and a small part of Montana); on the west by the Pacific Ocean and the Territory of Alaska. Its area is variously stated at from 220,000 to 293,000 square miles. It includes several important islands, as well as many smaller ones. The largest of these, Vancouver Island, was itself at one time a separate province. Among the other important islands are those of the Queen Charlotte group, which contain mines of excellent anthracite coal. The whole coast forms an archipelago, which is continued along the Sitkan Division of Alaska. There is a complete sheltered waterway, navigable for the largest steamers, between these islands and the coast, and many of the rivers of the province have extensive estuaries or *fiords*, called by the inhabitants "canals," which penetrate far into the interior, walled in by lofty and often perpendicular cliffs.

The soil of the islands and of the lands near the sea is very good, and the climate mild, though rainy. In the interior, the surface is extremely rugged and barren, and the climate severe. The main chain of the Rocky Mountains forms the eastern boundary between this and the Northwestern Territory, while the Cascade and Coast Ranges, which unite farther north, here form separate chains of mountains. There are several elevated summits, ranging from 10,000 to 13,000 or 14,000 feet, but none approaching very near to the Alaskan peaks. The rivers are numerous, and some of them of great size. The Columbia river and its affluents, the Okinakane and the Kootanie, drain the southeastern part of the province, the former flowing through several small lakes in its course; the Frazer river, rising from two sources, one in the Rocky Mountains, and the other in the Cascade Range, drains the central portion of the province, and discharges its waters into the Gulf of Georgia. On the west side of the province, a half-dozen considerable streams, among which are the Salmon, the Simpson and the Stickine, find their way from the Cascade Range into the Archipelago. In the north, two important tributaries of the Mackenzie river traverse the valleys between the mountains, and one of them crosses the Rocky Mountains by a low-lying pass from west to east. In the northeast the Finley branch of the Peace river, which falls into

the Athabasca lake, has its source in the Cascade Mountains, and crosses the Rocky Mountains by another pass near the 56th parallel. There are numerous lakes in the province. The best harbor is at Esquimault. Vancouver Island and the coast along the Gulf of Georgia would be a good wheat country if the rains were not so profuse. Oats and barley do better, and the root crops are very good. North of this island there is much fine grazing land. The fisheries on the coast are very important. Cod, haddock, herring, halibut, salmon trout, sturgeon, anchovies, and, above all, salmon, are very abundant. There are many gold mines on the Frazer, Salmon, Simpson and Stickine rivers, and the yield is large. Silver, copper, zinc, and quicksilver are also mined to some extent. There is coal on the mainland, but not of as good quality as that on the Queen Charlotte Islands. Marble of great excellence is found in the southern part of the province. There is an abundance of good timber. This province and Alaska are now, and are likely to be for many years to come, the chief seats of the fur trade.

The population of British Columbia in 1871 was: whites, 14,043; Indians and creoles, about 36,000. The Indians have not increased materially in the last decade, but the white population now probably exceeds 25,000. The capital is Victoria, in the southeastern point of Vancouver Island. New Westminster is the next town in size, and is the see of an English bishop. There are a number of forts, but few other towns of considerable size. The province has a lieutenant-governor, and is represented in the Dominion Parliament by three senators and six representatives.

II. *The Northwestern Territories.*—This has been until recently the titular designation of all that part of the Dominion of Canada which lay north of the United States and west of the province of Ontario and Hudson's bay, except the provinces of British Columbia and Manitoba. The Parliament of 1880, however, made some changes which restrict the extent of this vast and almost unknown domain. It still retains more than 2,000,000 of square miles; but while it extends from the 49th parallel to the Arctic Ocean, its eastern limit is found in the chain of lakes

which mark the rim of the Hudson Bay basin—Lake Winnipeg, Lake Nelson, Deer lake, Lake Wollaston, etc. All the land east of Manitoba and Lake Winnipeg, to the boundaries of Ontario (which have been considerably extended westward and northwestward), are comprised in the new and as yet not fully organized province of Keewatin, or Kewaydin.

This vast Territory of the Northwest is but little known except by the hunter and trapper. It is a land of great lakes and mighty rivers. Between the foothills of the Rocky Mountains and the Great Arctic Plain and the rim of the Great Hudson Bay basin stretches the Low Central Plain, which extends from the Arctic Ocean, at the broad delta of the Mackenzie river, southward through all the long valley of that river, the Slave river and lake, the Athabasca, the Peace, the Saskatchewan and the Red river, with all the lakes in their course, to the head waters of the Mississippi, in Minnesota (which are not two miles distant from those of the Red river), and thence down the Mississippi Valley to the gulf. Nowhere else in the world is there such a continuous valley through the whole length of a continent. The soil of these river valleys is very good, even up to the limit where the cold season is too protracted for most agricultural products. There are great tracts, called barrens, and which deserve the name, where hardy lichens and mosses form the only vegetation; but the valleys of the Saskatchewan, the Peace river, the Athabasca and the Nelson, have a good soil, and a climate said to be better than that of Manitoba* or Northern Minnesota. In this valley, as far north as Peace river and Athabasca lake, it is asserted that one-half the prairie land is arable, and most of this is suitable for wheat-growing, or at least for the cultivation of some of the cereals. Along the foothills of the Rocky or Chippewayan Mountains the soil is not so good, and the water has a tendency to be alkaline. The northern portion, and, indeed, nearly the whole of this vast Territory, has been the favorite hunting-ground of the Indians, the French voyageurs, and the

* Battleford, in latitude 53°, 700 miles northwest of Winnipeg, has a climate averaging seven degrees warmer than that city, and the whole north Saskatchewan Valley is materially warmer than Manitoba.

Scotch traders and trappers. It is, with the provinces and Territories west of it, the main dependence of the civilized world for furs. Buffalo, beavers, sables, martens, wolves, foxes, bears, otter, fishers, etc., are very numerous, and the uttermost diligence of the hunters and trappers does not materially diminish their numbers. The musk ox, the polar bear, and the blue and Arctic foxes are found toward the mouth of the Mackenzie river and along the coasts and islands of the Arctic Archipelago. Deer are abundant in the south and west, and the elk and moose are often seen. Geese, ducks, swans, ptarmigans and various kinds of grouse are found in great quantities on and near the numerous lakes. The lakes and streams are well stocked with fish.

The population until 1871 was mainly Indian, with a small number of Canadian-French *voyageurs*, Scotch, Irish and American trappers and hunters, and some half-breeds. Within the last decade, however, the immigration to Manitoba has very largely migrated from that province to the better and dryer lands along the Qui Appelle, or Assiniboine, and the Saskatchewan rivers, and the land has been found well adapted to wheat culture, and the climate more favorable than that of Manitoba. The white population of the southern part of the Territory has thus largely increased. It was computed in 1871 that there were about 67,000 Indians in the Territory, and not over 1,000 whites. There may be now 10,000 whites in the Territory.

The completion of the Canadian Pacific Railway through the southern portion of the Territory within a few years will probably greatly accelerate its growth. Battleford is the capital, though until very recently the lieutenant-governor and the bishop of the diocese resided at Winnipeg, in Manitoba. It is not represented in the Dominion Parliament.

III. KEEWATIN, OR KEWAYDIN.—Of this new and unorganized Territory there is little to be said. It is almost wholly in the basin of Hudson's bay, and its numerous lakes and rivers all drain, directly or indirectly, into that bay. Its southern boundary under the report of the commissioners is not lower than 52° of latitude, and this in that longitude insures for it a rigorous climate. The Canadian almanacs state its area as about 500,000

square miles, of which not more than 30,000 are fit for culture. It is probably a good country for hunters and trappers. We have no means of ascertaining its population, though we know it to be mostly Indians and trappers;* but the census of the whole Dominion will be taken during the present year (1881). If there is mineral wealth in this Territory, it is as yet undiscovered.

IV. MANITOBA.—This province of the Dominion of Canada was organized, with its present boundaries, in 1871. The circumstances attending its organization probably had much to do with its somewhat restricted area. That in a region where it was as easy to carve out a territory or province of 75,000 or 100,000 square miles as of any less extent, and still leave immense tracts of unorganized territory, it does seem surprising that the founders of the province should have contented themselves with an area of only 14,340 square miles, less than one-third of that of Pennsylvania, and only one-sixth of that of Minnesota, its nearest neighbor on the south. And this wonder is heightened when we find that its present limits exclude almost the whole of the two great lakes, Winnipeg and Manitoba, as well as the large rivers, whose valleys are so fertile, and whose lands are so much more desirable than those included within its boundaries. The first requisites for a new Territory are: that it shall have an abundance of good, arable land, with large, navigable rivers, if possible; a climate not too moist, even if it is somewhat cold; and good grazing lands and timber, as well as a large farming area. All of these Manitoba might easily have had by extending its boundaries northward and westward. Manitoba is bounded on the north and west by the Northwest Territory; on the east by Keewatin, or Kewaydin, which interposes a narrow tract between it and Ontario; and on the south by the State of Minnesota and the Territory of Dakota, or, as it will speedily be called, the Territory of Pembina. It lies between the parallels of 49° and 50° 30′ north latitude, and between the meridians of 96° and 99° west longitude from Greenwich. Its area, as already stated, is 14,340 square miles, or 9,177,600 acres.†

*Whitaker's Almanac for 1881 estimates the population at about 10,000.

†An official statement in Whitaker's Almanac for 1881 gives the area as 13,923 square miles.

Surface, Soil, and Geology.—The province lies almost entirely in the valley of the Red river, and is nearly a dead level, though rising very gently toward the south. Lake Winnipeg, on its northern boundary, is a little more than 100 feet lower than the Red river where it enters the province on the southern boundary; the surface of the lake being 628 feet above the sea; Fort Garry, which is at some height above the river banks, 724 feet, while the Red river at Emerson is about 760 feet. So level is the area around Winnipeg that it is often overflowed by the Red river when it is swollen by the melting of the winter snows. West of the river, the streams have cut their way through the yielding soil and flow in deep troughs, or, as they are called in the provincial Canadian voyageur's French, *coulees*, a corruption of *coulisses*. The roads, in the spring and autumn especially, are miry and wretched, and animals, carriages, and wagons are frequently stuck in the mire.

Most of the country where not cultivated is covered with tall, coarse grass. There is a sufficiency of timber in the province for all immediate wants, and the banks of the lakes and rivers outside of the province are heavily wooded. The soil is alluvial, this whole region having once been the bed of a great lake. The floods in the lower Red river may make the soil richer, but they interfere at times very seriously with the crops and with the comfort of the settlers. East of the Red river, there is more forest than west of it, and the land is not quite so uniformly level. There are, however, extensive marshes.

The climate is remarkably healthful, but the winters are very severe. The rainfall is slightly greater than at Pembina, Dakota, on the southern border, and with the humid atmosphere from the adjacent lakes, is amply sufficient. We give on page 1289 the reports of the Canadian Signal Service of the temperature at Fort Garry, Winnipeg, Manitoba, and as the Canadian authorities do not report the rainfall, we have added that at Pembina, which is only a little less than that of Fort Garry.

Agriculture and Agricultural Productions.—There is hardly any inhabited region of the globe about which so many conflicting statements have been made, as Manitoba. These contradic-

TEMPERATURE AT FORT GARRY, MANITOBA, FOR TWO YEARS.

Latitude 49° 52′. N. Longitude 97° W. from Greenwich. Elevation 724 feet.

	TEMPERATURE.				HUMIDITY AT PEMBINA, DAK.			TEMPERATURE.				HUMIDITY AT PEMBINA, DAK.	
YEAR AND MONTHS.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Temperature.	Rainfall, monthly and annual.	Mean Humidity.	YEAR AND MONTHS.	Maximum Temperature.	Minimum Temperature.	Range of Temperature.	Mean Temperature.	Rainfall.	Mean Humidity.
1877.	°	°	°	°	inches.	per ct.	1878.	°	°	°	°		
July	95	44	51	69.5	1.47	69.3	July	94.5	44	50.5	69.2	4.57	74.5
August	88.5	40	48.5	64.2	0.51	68.9	August	88.5	42.3	46.2	65.4	3.01	72.6
September	87.5	30	57.5	58.7	1.40	68.1	September	84.6	24	60.6	54.3	1.95	78.6
October	72.5	20.5	52	46.5	0.69	71.4	October	64.5	9.3	55.2	36.9	6.61	77.7
November	50.5	—5.5	56	22.5	0.55	75.9	November	53.3	10.3	43	31.8	0.32	83.5
December	47.4	—3.2	50.6	22.1	1.08	79.9	December	40.5	—24.3	64.8	8.1	0.62	93.6
1878.							1879.						
January	33	—25.3	58.3	4.2	0.12	76.9	January	29.5	—34.3	63.8	—2.4	0.58	86.4
February	44.5	—5.4	49.9	19.7	0.26	77.0	February	28.5	—43.6	72.1	—7.5	0.98	92.2
March	64	12.5	51.5	38.2	4.50	73.8	March	50	—22.4	72.4	13.8	0.94	88.7
April	70.5	22.5	48	46.5	5.78	67.7	April	71.5	—10.3	81.8	30.6	0.34	75.0
May	74.6	24.5	50.1	49.5	2.54	66.6	May	78.5	28.3	50.2	53.4	1.54	71.3
June	91.4	37.3	54.1	64.3	3.57	69.4	June	88.3	33.0	55.3	60.6	3.90	73.0
Year	95	—25.3	120.3	42.16	22 47	72.1	*Year*	94.5	—43.6	138.1	34.5	25.36	80.6

tions concern its climate, its soil, its farm products and its grazing lands, and live-stock. Here are some brief specimens from two Manitoban farmers, one signing himself "an English farmer," the other "a Canadian." "The English farmer" says:

"In my opinion a good farming country should possess the following essentials—viz., good soil, a regular succession of seasons and a climate that will admit of outdoor work being performed during at least eight or nine months in each year." He admits that the land in Manitoba is much of it good, but complains that most of that which is worth anything is either "half-breed reserve," or bought up by speculators; and says that if settlers want free-grant land worth working, they will have to go beyond Manitoba into the Northwest Territory to get it. Having obtained this, he says, the list of advantages becomes exhausted, for good land is absolutely all that the Canadian Northwest can give the settler.

"In the next essential, the regular succession of the seasons, those who come here are woefully disappointed—there being only one season that you can reckon upon with any degree of certainty, and that is a winter extending over more than half the year, and surpassing in its frequency of storms and intensity of cold any region yet discovered outside of the Arctic Circle. It is a winter that Europeans can form no adequate conception of, exceeding in its severity even the cold of Iceland. This is no random assertion, as the following will show:—At the latter end of last winter I was transacting some business with an Icelander, who has been living in Manitoba for the last five years, and in the course of conversation I asked him if it was much colder in Iceland than it was in Manitoba? With a look of mingled astonishment and amusement he said:—'What! colder in Iceland? Oh, dear, no! We not haf so mooch steady cold in Iceland as we haf here in Manitoba.' So if any who happen to read this letter are desirous of coming to a country colder than Iceland let them by all means pack up and start off at once, so as to be in time for the beginning of the 'beautiful winter,' which will soon be upon us.* But if any such be heads of families, I would urge upon them

* This complaint of the severity of the winter climate seems to be well founded. Rev. H. J.

to spend one winter here themselves before bringing the wife and little ones, or, like some of us who are here now, they may have to regret with a lifelong sorrow the folly of bringing delicate organizations to suffer the rigors of a winter such as only hardy men could hope to endure. It is not only humanity that suffers during the winter, but the horses and cattle get into a miserable condition through the intense cold and poor food. The handbooks for emigrants describe in glowing terms 'the beautiful meadows, the vast fields of rich prairie hay.' I have been here since June, 1879, and have travelled during that time over a considerable portion of Manitoba and for some distance into the Northwest Territory, and have not yet met with anything that I could call good hay. There is an abundance of hay here, but it is very inferior; it is a long, coarse grass, dry and tasteless, having none of the sweet aroma that good hay always gives out. It is also sadly wanting in nutritive properties, but what it is deficient here may be made up in bulk, as there is an abundance of it, such as it is. Any one who has had an opportunity of testing his teeth upon Manitoba beef can easily understand that the food must be coarse indeed to produce such hard, dry, almost tasteless meat.

"Sheep-farming, sheep-breeding, and wool-growing, are also urged upon the settler as being the most profitable branches of industry the settler with capital can engage in. Estimates are made and long calculations are worked out proving beyond a doubt that there is a fortune in it. What is the truth in relation to this matter? Just this. Several attempts have been made in this direction, but the result has been pretty much the same in every instance that I have heard of—either complete failure or a success that was very little better. I have seen three flocks of sheep since I came here, and of all the ragged, scabby, attenuated embodiments of sheep-life they were the worst. I have seen sheep trying to bite a living off a hillside in Spain where there

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Vandyke, Jr., who visited Manitoba in the autumn of 1879, found very conclusive evidence of it. The table of the Signal Service, page 1289, indicates a very severe winter climate and a brief but hot summer. Think of a climate where the thermometer sinks below zero (and more than 43° below) for five successive months, where the mean temperature is 34°5, and the annual range 138°.

was scarce grass enough for a half-grown rabbit. I have watched the little Welsh mountain sheep browsing upon the nourishing refuse of a slate quarry. Yet any of these would have stood forth as veritable Southdowns compared with the sheep I have seen in Manitoba. And then the quality of the mutton! Imagine the flavor of 'seven-day veal' combined with the firmness of fifteen-year-old male mutton and you have it exactly. Some will wonder why this should be the case. The reasons are simple, but yet they are such as cannot be easily overcome. In the first place the prairie grass is too coarse for sheep. In the next place there is a fatal enemy to sheep here in the form of a weed called 'wild barley.' It seems to be growing all over the prairie. The seed of this weed is scarcely a fourth the size of a barleycorn, and it is armed with a hard, sharp spear. This goes into the sheep and the point breaking remains in the skin, causing continuous irritation and pain quite sufficient to prevent sheep from ever thriving where such a pest prevails.

"Another difficulty that the settlers in Manitoba and the Northwest will have to contend with is alkali. It is present in such large quantities throughout the soil that the water everywhere is impregnated with it. To such an extent does this prevail in some places that I have frequently known settlers have to dig five or six wells before they could get one sufficiently free from alkali to admit of its being used. This bad water is, I feel certain, the principal cause of the death of such a large proportion (eight out of every ten) of the horses that are brought into Manitoba from Ontario and elsewhere, within eighteen months of their arrival. In fact I know of one family, father and sons, who brought fourteen horses with them from Ontario, and in two years there was only one alive out of the fourteen. These are matters that should certainly be made known among intending emigrants.

"When the three seasons—*i. e.*, the spring, summer, and autumn—are squeezed into some four or five months at the most, the thoughtful mind will easily realize that this alone is sufficient to prevent Manitoba from ever being a good farming country; for you must bear in mind that within this four or five months the

whole of the farm work for the year has to be completed. Breaking the sod, backsetting, sowing, planting, fencing, haying, harvesting, well-digging, house-building, besides a long list of other jobs that cannot possibly be done while land and water lie in the icy grip of winter. All these have to be done in the brief interval occurring between the beginning of June and the middle or end of October. Take the last spring as an instance of the wonderful adaptation of this country for farming. May was nearly gone before spring was really come, and for a fortnight or three weeks after the surface of the ground had thawed the whole country was so saturated that, except in a few instances where the land lay high, it was quite impossible either to plough or sow, and the result was that by the end of seed-time the majority of the farmers of Manitoba had put in only one-half the number of acres of wheat and oats they had intended doing. The consequence of this will be that our farmers, who are heavily indebted to the machine agents for implements of various kinds bought on time, will be unable to meet their notes, and will either have a visit from the sheriff or will be forced to get cash from the money-lenders at from fifteen to twenty per cent., or by giving a mortgage on their property they may get the money at twelve per cent., and this I am assured is already the condition of more than half the farmers of Manitoba. This state of things is not at all surprising when we consider that the resources of the country are limited to the production of wheat, oats, potatoes and beets."

As a means of health and enjoyment for the family, as well as a source of profit to the farmer, fruit culture, where practicable, is really a necessity. The Clerk of the Legislative Assembly, Mr. Thomas Spence, in a book for emigrants entitled "Prairie Lands of Canada," asserts "that there is no reason why every farm may not have its orchard in this as in other parts of the Dominion."

The "English farmer" replies, "If Manitoba is so well adapted to the growth of fruit, how is it that at the Provincial Agricultural Exhibition, held at Portage la Prairie in October, 1879, the whole display of Manitoba-grown fruit amounted to two

plates of crab apples almost as large as walnuts—having a smell and taste that would give any one the idea that they were grown in a bed of iron filings and watered with vinegar?

"The general testimony of those I have met, who have been here five, six, and seven years, is that 'scarcely any of the fruit-trees planted here outlive the second winter.' This is no hearsay, but the testimony of men thoroughly conversant with fruit culture, who have tried over and over again to grow apples, pears, peaches, etc., but always with the same results—failure and disappointment. I met with a nursery agent here last spring, who told me that he had sold several thousand fruit trees of various kinds during his trip through Manitoba, but he rather thought he should not come again, for from what he saw and heard of the winter he should not expect to find any of the trees alive next year. So the settler in Manitoba will save time and money by leaving the fruit trees alone, as an orchard here is totally out of the question."

Per contra, a "Canadian" says, of the climate:

"As to Manitoba it possesses a climate exactly the same as Minnesota, at Moorehead, or Dakota, at Fargo. The winters are known to be severe, that is, as the thermometer shows; but they are probably less trying than the more humid winters on the seaboard. The snowfall is very light, not more than a foot and a half. The horses of the country graze out all winter; and sometimes, after having been turned out in the fall, return in the spring with increased numbers, from the mares having foaled. They paw the light, mealy snow off the grass and find plenty of nutritious food."

Of the lands, he says, "They are contiguous to those of Minnesota and Dakota, and the same, being only separated by an astronomical line. If there is any difference in as far as the lands themselves are concerned, it is that the farther you proceed down the Red river of the North, say from the point of Moorehead or Fargo, the nearer you get to what was undoubtedly in previous geologic ages the centre of the great lake which at one time covered the whole of this territory, and the deeper you find the alluvium resting on a lacustrine clay formation. This fact gives

the advantage to Manitoba, although it is undoubted that the banks of the river above the boundary line are of the same formation. This deep alluvium, held by a closely retentive clay sub-soil, has been enriched by ashes from fires, decaying vegetation and the droppings by animals and birds, for ages, until it has naturally become the richest on the face of the globe, and especially adapted to the growth of wheat. It would be folly for anybody to attempt to deny this fact, so well known to thousands and susceptible of such easy proof.

"The country is, however, quite new, and English farmers may find many things which are both new and strange to them; for instance, the roads are of the most primitive kind, and in the early spring, when the snow and frost go away, before the surface dries, it is not so easy to drive over them as it is over the roads of the Central Park, New York. But as the season advances they do dry, and then the roads become as smooth and hard as any in the world. All this is fully stated in the government pamphlets referred to, and the very clearest and fullest warnings are given to emigrants as to the kind of difficulties they may have to encounter. A section of the Canadian Pacific Railway, 100 miles west of Winnipeg, will be completed this fall; and this will open up very great facilities for settlers along its line.

"There are undoubtedly many marshes in the province of Manitoba, and these are very fully set forth in the government pamphlets and maps. But they are all susceptible of very easy drainage; and large drainage operations are now being carried on by the provincial government, under an arrangement with the Dominion government. Your correspondent says that these cannot be drained because the rivers are too near the level of the prairies. A difference of four feet is given. It is folly to make such an assertion as this in the face of the fact that the Red river and the Assiniboine have cut their winding ways very deep below the level of the prairies, twenty-five or thirty feet at the very least, and there are everywhere natural coulies entering these rivers, making the task of drainage very easy and inexpensive, while the land so drained will become the most valuable in the province and naturally the richest in the world.

"As to the government land regulations, it is perhaps not of very much interest to discuss these at length in your columns; but in view of the reference your correspondent has made to them, perhaps you will permit me to say that they are the same as those of the United States government, with the exception that the fees are a little less. Any man can get a homestead of 160 acres free on any unoccupied surveyed government lands on condition of three years settlement, and he can pre-empt 160 acres more. The lands granted for railway purposes are sold in the same way as in the United States. The government lands open for free settlement are divided in alternate sections with the railway lands. The 'eighty acre' restriction, to which your correspondent refers, was done away with about a year ago."

It seems, however, that there is some ground of complaint even now, in regard to land grants in Manitoba, and the migration of some large bands of Mennonites across the line to Minnesota and Dakota on this account the last year would indicate that there had been some favoritism, at least.

The descriptions of the region north and west of Manitoba by Mr. Vernon Smith in the "Nineteenth Century," and by Lord Dufferin, at Winnipeg, are very eloquent, and though perhaps a little overstated are worthy of quotation here:

"In the very centre of this great Dominion of Canada, equidistant from the Gulf of Mexico and the Arctic Ocean, and midway in the other direction between the Atlantic and Pacific, lies the low depression of Lake Winnipeg, 300 miles long, fifty to sixty miles wide—the future Black Sea of Canada. Its shape is roughly a parallelogram lying north and south; at three of its four corners it receives the waters of a large river; the main trunk of a hundred smaller ones. At the remaining northeast angle a fourth and larger river—the Dardanelles of the system—conveys the accumulated waters of nearly a million square miles into Hudson's bay. This Lake Winnipeg receives the drainage of the future wheat-field of the world. The Red River of the North, with its affluents, the Assiniboine, the Quiappelle, the Red Lake river, the Souris and a score of others, discharge their waters into it through the grass-covered deltas at the southwest angle. At

the southeast, and only twenty-five miles distant along the shores of the lake, the large, impetuous river, which gives its name to the fresh-water sea into which it rushes, pours its wild majestic flood from the Lawrentian highlands, which separate the waters of Lake Superior and the affluents of the St. Lawrence from those that seek Lake Winnipeg. In Lord Dufferin's speech at the capital of Manitoba, he describes so felicitously this noble river that any more meagre description than his appears almost presumptuous. After describing the route of the traveller from Lake Superior up the Kamanistaguia, over the height of land, down the beautiful Rainy river into the lovely Lake of the Woods—

"'For the last eighty miles of his voyage (he says) he will be consoled by sailing through a succession of land-locked channels, the beauty of whose scenery, while it resembles, certainly excels the far-famed Thousand Islands of the St. Lawrence. From this lacustrine Paradise of sylvan beauty we are able at once to transfer our friend to the Winnipeg, a river whose existence in the very heart of the continent is in itself one of nature's most delightful miracles, so beautiful and varied are its rocky banks, its tufted islands; so broad, so deep, so fervid is the volume of its waters, the extent of their lake-like expansions and the tremendous power of their rapids.'

"The Winnipeg, in its short but picturesque course of 125 miles from the Lake of the Woods, falls 500 feet, and though not navigable, in consequence, for steamers, was for over two centuries the route by which all the trade of the interior continent was conducted by the great fur companies from and to their depots at Mackinaw and Montreal. The Lake of the Woods itself is a noble expanse of water, and with its 2,000 islands offers some lovely places for settlement. At the outlet to the river an Icelandic colony has been lately formed, and its Indian name of Keewatin has been attached now to the whole province, which covers the area between the old province of Ontario and Manitoba, the pioneer of the new western provinces.

"This (the Winnipeg) is the body of water that falls into the southeastern angle of Lake Winnipeg. Passing now to the northwest corner of the same inland reservoir, the mouths of the

two rivers being diagonally across the lake, about 275 miles apart, we find another great river—the Danube of North America—stretching its long twofold channel, each 1,000 miles in length, to the foot of the Rocky Mountains of the West. This is the Saskatchewan, whose two arms or branches, rising not very far asunder in the great backbone of the continent, gradually diverge until the distance between them is over 300 miles, and then converging up, finally join at a point 773 miles from the source of the north branch, and 810 by the south branch, from whence the united stream runs 282 miles to its debouchure in Lake Winnipeg, making the total length from the lake 1,054 miles by one branch, and 1,092 by the other, to their sources in the Rocky Mountains. Both these rivers run their whole length through the prairie land of the Northwest, and it is from isolated settlements on these rivers, such as Prince Albert and Carlton, that the largest returns of agricultural yields have been received. Both rivers are navigable throughout, excepting the three and a half miles near the mouth, where the river passes over rapids and falls of a total height of forty-four feet into the lake. Last year the Hudson's Bay Company constructed a tramway four miles long to overcome these obstructions, and they also placed a steamer, the 'Northcote,' at the head of this tramway, which during the season made five double trips from the Grand Rapids to Carlton, 550 miles, and one trip up to Edmonton, over 1,000 miles from the lake, along the north branch.

"Last season a second steamer was placed on the river, and during the year the navigation of both branches was thoroughly tested. The two Saskatchewans drain what is especially known as the 'fertile belt,' containing not less than 90,000,000 acres of as fine wheat land as can be found in any country.

"Such are the three main rivers that pour their accumulated waters into Lake Winnipeg, all of them of a size and capacity which in Europe would class them as first-class rivers. Their united length, with their most important affluents, is not less than 10,000 miles, of which, certainly, 4,000 are available for steam navigation. The outlet of this magnificent and comprehensive water system is the large but little known Nelson, which, issuing

from the northeast angle of the lake, discharges its surplus waters into Hudson's bay. This river—broad, deep, first-class in every respect—may have probably an important bearing on the future prospects of this northern section of America. Lake Winnipeg is 700 feet above the ocean level; as far as known the Nelson has neither rock, nor shoal, nor excessive rapid to interfere with its navigation by properly constructed steamers. Its even gradual slope of twenty inches to the mile is not more than is constantly and safely worked on other American rivers. The Upper Missouri and Yellowstone, with far worse water to contend with, were constantly navigated in 1877 by twenty-seven steamers; whilst the old Danube at its Iron Gate has water quite as strong to contend with, and not half the breadth and depth of water for a vessel to pick her way in. The question remains to be solved whether this river is really available or not for ocean steamers to work through to the lake above, and, if not, whether the lake steamers can be trusted to bring their cargoes down with a certainty of being able to reascend again. The outlet of Nelson river is a harbor, a mile wide, and with any depth of water. It is called Port Nelson, and not very far from it is the old York Factory, for a long time the head-quarters of the Hudson's Bay Company, and from which, for the last 200 years, from two to five vessels have annually sailed for England, and not unfrequently under the convoy of a man-of-war. Port Nelson, although situated in ninety-three degrees of west longitude, in the very heart of the continent, is eighty miles nearer to Liverpool than New York is. For four certainly, probably five months in the year, it is as clear of ice as any other of the North Atlantic ports. There is no question about its accessibility for ordinary ocean steamers from June to October, and it only remains to be proved whether these same vessels cannot force their way up the great Nelson river and load their cargoes directly at the mouth of the Saskatchewan, the Red river or the Winnipeg, in the very centre and heart of this great wheat-field of the Northwest, where 200,000,000 acres now await the advent of the farmer to be rapidly brought into cultivation.

"Mr. Vernon Smith says of the yield of cereal and root

crops in this Northwestern region, not confining his statements, it will be observed, to Manitoba: The fact established by climatologists, that the cultivated plants yield the greatest products near the northernmost limit at which they grow, is fully illustrated in the productions of the Canadian Territories; and the returns from Prince Albert and other new settlements on the Saskatchewan show a yield of 40 bushels of spring wheat to the acre, averaging 63 pounds to the bushel, whilst one exceptional field showed 68 pounds to the bushel, and another lot of 2,000 bushels weighed 66 pounds, producing respectively 46 and 42½ pounds of dressed flour to the bushel of wheat. In southern latitudes the warm spring develops the juices of the plants too rapidly. They run into stalk and leaf, to the detriment of the seed. Corn maize, for example, in the West Indies runs often thirty feet high, but it produces only a few grains at the bottom of a spongy cob too coarse for human food.

"Whatever be the cause, the ascertained results in this new Northwest seem to prove that its soil possesses unusually prolific powers. In 1877 carefully prepared reports were made by thirty-four different settlements, and although lessened in many cases by circumstances local and exceptional—as, for instance, a series of very heavy rain-storms which caught the wheat just as it was ripening—the yields per acre were: Of wheat, from 25 to 35 bushels, with an average of 32½; barley, from 40 to 50, average 42½; oats, 40 to 60, average 51; peas average 32½, potatoes 229, and turnips 662 bushels to the acre. Individual cases were enumerated of 100 bushels of oats per acre, barley as high as 60 bushels, and weighing from 50 to 55 pounds to the bushel. Potatoes have yielded as high as 600 bushels to the acre, and of a quality unsurpassed, as are all the root crops. Turnips have yielded 1,000 bushels to the acre, 700 being common, whilst cabbage, cauliflower and celery grow to an enormous size, and of excellent quality and flavor."

We regret that we are unable to procure later statistics of the crops of the Northwestern wheat region. The earlier crops on these northern alluvial prairies are generally much larger than later ones. But for spring wheat and some of the other cereals

there is probably no more prolific region than the Red River Valley and the Saskatchewan country.

Transportation.—As yet the larger part of the grain product of Manitoba finds a market by way of the railway which connects Winnipeg with the Northern Pacific, and then carries it either to Duluth or Chicago. What may be its route when the Canadian Pacific is completed to the Saskatchewan country, or when the ocean steamers shall ascend the Nelson from Hudson's bay to Lake Winnipeg, cannot now be predicted.

The Canadian Pacific Railway demands a notice as one of the five great trunk lines now constructed or in process of construction to the Pacific coast. It has been for some years in progress, but has been embarrassed by the lack of means and efficient government aid. It is now taken up by an association of English and American capitalists, the Dominion government rendering liberal assistance by land grants, subsidies, and the gift to the company of the portions of the road already completed. The chief points of the compact are alleged to be:

The total length of the projected system is to be 2,200 miles, of which it may be said that 600 miles are either completed or under construction. The government, it is announced, are prepared to grant a subsidy of $20,000,000 in cash, payment to be spread over the period of ten years, assumed to be necessary for the construction of the line, an amount equal to $10,000 per mile, or about one-third of the estimated cost. A further grant will be made of 35,000,000 acres of land, to be located in alternate sections along the route, as was done in the case of the Union and Central Pacific companies. The 600 miles under construction will be handed over to the company without cost.

Two hundred and twenty-two miles more were placed under contract before the new company took charge of it. The total cost is estimated at $64,750,000. A submarine telegraph from Vancouver's Island to Yeddo, Japan, is also projected as a part of this system of communication.

Religion, Education, etc.—*Manitoba* has a large Roman Catholic population, that religious system having been long ago established here by the missionaries among the Indians. A Roman

Catholic archbishop has his see at St. Boniface. There is also an Anglican bishop, whose see is at Fort Garry. The board of education is composed of equal numbers of Catholic and Protestant members. Separate schools are established, and are maintained partly by fees and assessments and partly by a provincial grant. St. John's College (Anglican) and St. Boniface's (Roman Catholic) were incorporated in 1872. There is a very considerable Scotch-Presbyterian element in the population, and Methodists, Baptists, Congregationalists and Mennonites are also represented in the province.

Principal Towns.—Winnipeg, the capital, has grown up around Fort Garry within the past decade. It is reported as having about 12,000 inhabitants, and has considerable business and enterprise. St. Boniface, Selkirk, Shelley, Emerson, Arnaud and Dufrost are growing towns.

Historical Notes.—Manitoba is the northern part of the region purchased by Thomas Douglas, Earl of Selkirk, in 1810, from the Hudson's Bay Company. He planted here the famous "Red River Settlement," called also "Pembina," and later "Assiniboia." The first settlers here were Scotch Highlanders. In 1815 a considerable number of Canadians, of English, Scotch and French descent, and some half-breed Indians, joined the colony. When, some years later, the United States boundary line was run through, it was found that the greater part of the colony was south of that line, and especially that what are now Pembina, Dakota, and St. Vincent, Minnesota, were peopled by these colonists.

Meanwhile the population did not increase rapidly, owing to the attacks of the Northwest Company, then hostile to the Hudson's Bay Company, the severity of the winters, and repeated destructive visitations of grasshoppers, which destroyed their crops. The Hudson Bay Company at length took possession of so much of the colony as remained north of the boundary, and established a local government, with the title of "The Council of Assiniboia," which continued to administer the government till March, 1871. In 1869 and 1870 there was a movement to transfer the authority to the Dominion of Canada, then just

organized. This was opposed by the French Canadians and half-breeds, and under a Canadian-French leader, Louis Riel, they organized an armed resistance, took possession of the treasury, and imprisoned many of their opponents. In July, 1870, an armed force from Canada appeared in the province, captured the insurgent leaders, and gave opportunity for an elective government, which soon united with the Dominion, and is represented in the Dominion Parliament. The growth of the province since that time has been rapid.

CHAPTER II.

HOMES FOR IMMIGRANTS ON THE ATLANTIC SLOPE.

WHY MANY IMMIGRANTS DO NOT LIKE TO GO TO THE WEST—VIEWS OF MANY OF OUR OWN PEOPLE ON THE SUBJECT—ARE THERE NOT HOMES FOR THESE ON THE ATLANTIC SLOPE?—ADVANTAGES OF THE EAST—WISCONSIN AND MICHIGAN—OHIO, INDIANA AND ILLINOIS—TENNESSEE—MAINE, NEW HAMPSHIRE AND VERMONT—MASSACHUSETTS AND CONNECTICUT—NORTHERN NEW YORK—LONG ISLAND—ADVANTAGES OF NEW SYSTEM OF ENSILAGE HERE AND IN NEW JERSEY—NEW JERSEY—THE SOUTHERN COUNTIES—WEST VIRGINIA—NORTH CAROLINA—EAST TENNESSEE—NORTHERN GEORGIA—FLORIDA—CONCLUSION.

WHILE we have given a full and fair description of the advantages which the West offers to the intending immigrant, and have demonstrated its superiority to any other portion of the globe which is now inviting immigration, we are not unmindful of the fact that there are very many of the nearly 600,000 immigrants who have landed on our shores during the past year to whom the continuation of their journey to the far West is either a very great hardship or an impossibility. They have friends in the Eastern States, who are comfortably situated, and who desire to have them near them; or they are somewhat advanced in life and have but scanty means, which would be entirely exhausted on reaching the West; or they have children or grandchildren whose homes are on the Atlantic slope, and to whom they would be again united; or they are not in robust health, and the Western lands

seem so far, the climate so unlike that to which they have been accustomed, and all the little comforts of an old civilization have become so indispensable to them, that they dread, as those advanced in life always do, the privations to which they will be exposed. These things did not seem so real and formidable when they were on the other side of the Atlantic as they do now; and if they persist in going West, these matters will grow more and more distasteful to them, till they develop into a genuine homesickness and serious discontent.

There are also very large numbers of our Eastern people who, after all, make up the larger part of the emigration to the West, who, for one reason or another, while they do not care particularly about going to the West, prefer some change, and for many reasons would be better satisfied with an Eastern than a Western location. Their friends and acquaintance are here. They can find here good schools and churches, the land is all broken, ready for their crops, and there is a home market, readily accessible, where they can sell at fair prices all they have to sell, and buy at a reasonable rate all they need to buy.

It is from these classes that we oftenest hear the inquiry: "Is there not some region east of the Mississippi where, all things being taken into the account, a man or a family can live as well and make as much money as in the West, and at the same time avoid the hardships, inconveniences and discomforts of a life on the frontier?"

We answer: That depends upon several considerations; money is not made quite as rapidly in agricultural and pastoral pursuits in the East as in the West, because a larger capital is required for extensive operations, and it is more difficult to procure the necessary quantity of land; but with the same resolute will, there is nothing impossible (as Kossuth says) to him who wills; and the achievement of a great fortune is not a task which is more impossible to a resolute spirit at the East than at the West. It is also to be considered that many men are not ambitious to accumulate large fortunes, if to do this they must forego all the comforts and pleasures of society for a considerable time. To them a competence is the extent of their ambition, and with

it, if they can have friends, society and abundant advantages of intellectual and moral culture, they are as happy as men well can be in this life.

To these classes we have to say: You will find a larger measure of enjoyment east of the Mississippi than you would west of it. There is the same choice of occupations here as at the West. Land is not quite so low, generally, but on the other hand you avoid the long and expensive journey to the West. The agricultural production, under favorable circumstances, does not differ materially; but there prices are low and the cost of transportation to a better and higher market is very heavy, while here you have a market almost at your doors, and that one which pays the highest price for produce. If there is a difference, as there certainly is in some sections, the Eastern climate is healthier, neither the heat nor the cold so oppressive, the rainfall sufficient to prevent any apprehension of a drought, the insect pests much less formidable, and the danger from malarial fevers less serious. The intensity of the cold of winter is greater in the northern tier of States and Territories of the West than in the middle Atlantic States, and the heat of the Southwestern States and Territories in summer has no parallel in the East.

"But where," it may be asked, "are these lands which are so desirable?" It is, we answer, hardly possible to go amiss of them. *Wisconsin* and *Michigan* are as truly States for immigrants as Iowa and Minnesota; more so than Missouri. Northern Wisconsin and the Northern Peninsula of Michigan have, it is true, a severe winter climate, though not more so than Northern Minnesota or Dakota, and in general the winter mean temperature is not lower than that of Iowa. In both States there are good lands, yielding with proper culture as large crops of wheat, barley, oats, and, in ordinary seasons, Indian corn, and as many bushels of the root crops as the trans-Mississippi States. In both these States there are extensive grazing lands, and both stock-raising and dairy-farming are already conducted on an extensive scale. Both States are rich in minerals; gold and silver are found in moderate quantities; but copper, zinc, iron and lead abound, and so nearly pure as to be easily reduced; while the

rarer metals are found in ample quantities. Coal is less abundant as yet, but the immense forests furnish not only vast amounts of timber and lumber, but all the fuel which will be required for many years. Those who prefer the isolation of a new country can find homes here reasonably free from neighbors, while their crops can be speedily conveyed to market at a very moderate cost.

Ohio, *Indiana* and *Illinois* have now no desirable government lands for sale, but there are valuable State lands (school and swamp lands), and Illinois especially has yet some excellent railroad lands which can be purchased at moderate prices. A skilful farmer, buying his land low, can always be sure of making his farm pay in either of these States. There are also extensive coal and iron mines in all three.

Portions of *Kentucky* are desirable for immigrants, but both Middle and Eastern *Tennessee* are more so. The soil is not as rich as in some of the Western States, but there is a close clay sub-soil, and the land retains and is permanently benefited by manures, and under their influence yields liberal crops. There is much heavy timber, and most of the land has to be cleared before cultivation. Hitherto much of this region, especially the Cumberland Plateau of Middle Tennessee, has been inaccessible to markets; but now railroads have been built, and several colonies have established themselves there. One of these, sent out under the direction of an association of which Thomas Hughes, M. P., ("Tom Brown at Rugby") is President, have founded a colony called Rugby, and are making very fair progress in developing the region, for the time which has elapsed since their colonial enterprise was commenced. The English members of the colony are satisfied that they can accumulate property much faster than they could have done in England.

East Tennessee has not a rich soil, but its mineral wealth is very great, especially in coal and iron of the best quality. There are also some gold and silver ores, though the mining for them is only moderately profitable. These mineral deposits exist throughout the region occupied by the Appalachian chain of mountains, and render *West Virginia, Western North and South*

Carolina, and *Northern Georgia and Alabama* desirable localities for those who desire to engage in mining, or who prefer to prosecute the timber or lumber trade. But while the principal deposits of gold and silver are found in North Carolina, South Carolina and Northern Georgia, West Virginia and East Tennessee have the most inexhaustible resources in coal, iron and lime in close proximity to each other and to the railways; and the best salt springs and petroleum springs and wells in the country, with large tracts of black walnut and other hard-wood timber. When cleared, the lands with proper tillage yield good crops, and will continue to do so permanently.

East of the Alleghany or Appalachian range there are many desirable localities. In *Maine* the Scandinavians, Finns and Northern Russians will find a climate much like their own, an abundance of timber, and land which, with good farming, will yield fair crops. The other New England States have many old farms which are capable of becoming profitable under intelligent cultivation. There are here also opportunities for employment for mechanics and operatives in manufactories. In Northern New York the vast area known as the "North Woods," "John Brown's Tract," "The Adirondacks," etc., offers some desirable lands to an industrious farmer. The country is well watered, and its numerous lakes abound in fish and its forests in deer and other game. With the completion of some projected roads, it will be easily accessible.

But the best region for immigrants in the State of New York is on *Long Island*, and mainly in Suffolk county. It seems almost incredible that 600,000 acres of land, lying between thirty-five and ninety miles from New York city, the best and most inexhaustible market in the world, with a good soil, a very healthful climate, well watered, and having a sufficient but not excessive annual rainfall, should, from the apathy of its owners lie unimproved, and be at the present time for sale at from five to fifteen dollars per acre. And the wonder is all the greater, when we find that a railroad passes through the whole length of this tract, with several branches, and that no part of it is more than twelve miles from the railroad, and much of it within from one to

five miles of it, and that this railroad is now offering every facility to farmers to transport their produce to market, and to bring from the city the needed fertilizers. The shores of the island abound in the best qualities of edible fish, oysters, clams, mussels, scollops, lobsters, crabs, etc., and the game-birds and four-footed game of the whole region are abundant. On the island are forty factories for the production of oil from the menhaden, and the fish-scrap, or guano, one of the best fertilizers known, is now sent away from the island, because there is little or no demand for it there. This apathetic condition is now passing away and the Long Island farms are in demand.

The land can be cleared at from five to ten dollars per acre, some of the timber being large enough for building purposes or for railroad ties. It will yield from twenty-five to thirty-five bushels of wheat, or from twenty to twenty-eight bushels of rye, to the acre, from 250 to 350 bushels of potatoes of the best quality, and with good cultivation and fair manuring, the whole region can be transformed into market gardens, fruit orchards, and strawberry, blackberry and raspberry lands of the greatest productiveness, and for all these products there is an unfailing demand, at the highest prices, in New York and Brooklyn and the cities adjacent.

This is a very paradise for the market-gardener. The great cities of New York, Brooklyn, Jersey City and Newark, and the smaller cities and towns of Hoboken, Bergen, Bayonne, Long Island City, Yonkers, Garden City, Breslau, Hempstead, Flushing, Jamaica and Huntington—having together a population of two and a half millions—are all largely dependent upon this region for market-garden produce. The great summer resorts of Coney Island, Rockaway Beach, Long Beach, Fire Island, Montauk, etc., all on Long Island, which are visited by more than two millions of people every season, furnish additional markets for all the fruits, vegetables and root crops which can be raised.

The new system of Ensilage is destined to work wonders on these Long Island and New Jersey lands.* By its use and the

* *Ensilage* is the name given to a preparation of green forage plants for winter feeding. The plants may be corn (the taller and larger growing varieties preferred), cut when it is "in the silk;"

soiling of the cattle in summer a farmer can keep a dairy nerd of from eighty to one hundred cows on a farm of fifty acres, and raise in addition at least $2,500 or $3,000 worth of market vegetables and small fruits, while in the West, on the old system, he would require at least 640 acres for the same purpose. At the same time, the large amount of manure produced will enable him to keep his whole farm in the highest condition for productiveness. The system is very simple, and not beyond the means of even the poor emigrant; for the returns are so speedy that the cost of the necessary structures can be paid for from the milk receipts of the first year.

The island affords also great opportunities for successful manufacturing. The great city of Brooklyn, at its western extremity, has more than $250,000,000 invested in manufacturing, and there is now rapid progress in the establishment of manufactories in the counties of Queens and Suffolk.

The climate of Long Island is healthful and mild, the mean annual temperature being 50° and the extremes 98° or rarely 100°, and zero, or at lowest —5°. The cool sea-breezes moderate the summer heat and mitigate the winter's cold.

Another region which possesses exceptional advantages for fruit-culture and market-gardening and dairy-farming is *Southern New Jersey.* The Secretary of the Bureau of Statistics of Labor and Industry of New Jersey furnishes us the following interesting facts relative to this region.

There are more than a million acres of uncleared lands in the eight southern counties of New Jersey, which can be purchased at from five to twenty dollars per acre. They have been held by large proprietors, and most of them have their titles direct from the "Lords Proprietors," Penn, Fenwick, Byllinge and others, who received their grants from Charles II. These great

Alfalfa, Hungarian grass, Egyptian rice corn, pearl millet or sorghum. Either should be sowed very thick and cut up at the roots, chopped up, ears and all, into pieces an inch and a half in length and then placed in a close pit with cemented walls and floor, trampled down well till the pit (which is called a *silo*) is well filled, when it is covered with six inches of straw, and upon this are laid heavy planks, jointed or tongued and grooved, and heavy weights put upon the top either of stone or grain. It keeps perfectly and is fed through the winter, rendering any use of hay unnecessary.

estates are now broken up, and the use of anthracite and other coals for the furnaces and glass-works, and for fuel, has rendered their former business less productive.

The soil of these lands is good, a light loam, but easily cultivated; it can be readily fertilized by the use of marl, which is abundant in the immediate vicinity, and is worth from $1 to $1.75 per ton; lime, which is worth from twelve to fifteen cents a bushel; or fish guano, which is a very powerful manure, worth from $15 to $18 per ton. It will produce almost any crop which you may desire to cultivate, and yields fine crops of the cereals and Indian corn (thirty to sixty bushels of the latter), root crops, melons, market-garden vegetables of excellent quality, fruit of great excellence, and all the small fruits. Railroads traverse all these counties, and both New York and Philadelphia furnish excellent markets.

The climate is very mild, the mean annual range of the thermometer being only 43½°, the mean average being about 51°, and the extremes being about 90° and 15° Fahrenheit.

The rainfall is about forty-eight inches. Ploughing can be done every month in the year. The culture of the grape is a favorite industry, and the grape attains great perfection from the long season without frost. The region is remarkably healthy and free from all malarious influences. It is especially commended for sufferers from pulmonary complaints.

Here are glass-works, silk factories, iron mines, artificial-stone works, iron furnaces, and a great variety of other manufacturing and mining industries.

There are desirable lands at moderate prices also in *Central Pennsylvania*, *Northern Maryland*, and large tracts of some of the best lands the sun shines on, though now exhausted by the slovenly farming of the period before the war, in *Virginia*. These lands can be easily reclaimed, and can be bought at reasonable prices.

The lands in Eastern *North Carolina*, though fertile, are very often subject to malarial fevers. Where they can be freed from these by drainage or the extensive planting of the Eucalyptus, there are no better farming lands on the Atlantic coast.

Florida has received more emigrants and settlers from the North than any other Southern State. Its fine climate, which has had quite as much reputation as it deserves for the relief of pulmonary diseases, its orange culture, and its fine hunting and fishing, have been its great attractions. The cultivation of the orange has been greatly developed, and is profitable to those who can wait for the maturity of the orange groves. They should not be permitted to bear a full crop till they are ten years old, and from the tenth to the thirtieth year they are very profitable. At long intervals, however, a severe frost destroys the fruit, and kills or blights many of the trees. The present winter (1880–1881) has been most destructive to the crop. Some parts of the peninsula are subject to malarial diseases.

CONCLUSION.

I hear the tread of pioneers
Of nations yet to be;
The first low wash of waves, where soon
Shall roll a human sea.

I hear the far-off voyager's horn;
I see the Yankee's trail—
His foot on every mountain-pass,
On every stream his sail.

Behind the scared squaw's birch canoe,
The steamer smokes and raves,
And city lots are staked for sale
Above old Indian graves.

The rudiments of empire here
Are plastic yet and warm;
The chaos of a mighty world
Is rounding into form!—J. G. WHITTIER.

Our task is done, our work completed. For the first time since we became a nation has an attempt been made to portray with accuracy and completeness of detail, the region beyond the Mississippi. We have sought to show its vast extent, its mineral wealth, its varied climate, the bountiful production of its fields of golden grain, the flocks and herds on its myriad hills and mountain slopes, its rapid progress in civilization and material development, the manner of men who are occupying this vast empire of the future, their advance in population, organization, education, morals and religion. We have shown the phenomena which

make this Western Empire the wonderland, not alone of the globe, as it is to-day, but of all the ages; we have uncovered the graves of the geologic races of animals, and described the monsters of the ages before there were any measurements of time; and we have searched the leaves of unwritten history to learn something of the races who reared, ages ago, the temples and shrines, the fortresses and towers, which are now without record or inhabitant.

And not content with this, but looking forward to that not distant future, when this continent, from the Arctic sea to the Mexican gulf, and from Atlantic's surf-beat to the pulsating waves of the Pacific, shall all be part and parcel of the mightiest and grandest of empires; we have briefly sketched the provinces of the Frozen Zone, and the western portion of that Dominion to the north of us, to whom we stretch forth the hand of welcome; and yet more briefly, have noticed the advantages which still attract immigrants to our Atlantic States.

The efforts of the railroad companies, State boards and emigration societies to picture each State and Territory with which they were connected as an earthly paradise, and the unwarrantable depreciation of the lands of other organizations, in which they and others have indulged, have been alike foreign to our purpose; and having nothing but the truth to utter, we have sought to "nothing extenuate, nor set down aught in malice."

That this fair land may develop far more rapidly than it has done in the past, in wealth, intelligence and virtue, is our most earnest wish and prayer; and then shall we rejoice to realize the truth of the just uttered prediction of the genial and witty Holmes:

"I see the living tide roll on;
It crowns with flaming towers
The icy cape of Labrador,
The Spaniard's land of flowers.
It streams beyond the splintered ridge
That parts the Northern showers;
From Eastern rock to sunset wave,
The continent is ours!"

THE END.

Our Western Empire