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Send this Bulletin on to your Eastern friends who are looking for new locations.



BULLETIN No. 26

THE MONTANA
EXPERIMENT STATION

MONTANA AGRICULTURALLY CONSIDERED

S. M. EMERY, Director

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BOZEMAN, MONTANA,
MAY, 1900.

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INTRODUCTORY.

The great transcontinental lines, the Northern Pacific and the Great Northern, parallel each other irregularly, passing through the state from east to west, and averaging perhaps three hundred miles apart. Travel is heavy on these lines, and the cars are crowded with new faces; passengers en route for the great West.

Sound the occupants of these railway coaches, and you will find that the majority of them are bound for Washington, Oregon and the North Alaska gold fields. It is a comparatively rare occurrence to find a stranger whose destination is Montana and it is a proper question to inquire as to why this is so.

Ignorance of conditions prevailing in the state, together with a lack of concerted action on the part of those who have most powerful influences on immigration are no doubt responsible in large measure for the lack of Montana-bound immigrants.

The writer claims to be fairly well posted as to Northwestern conditions; was for twenty-five years a resident of Minnesota, and remembers a clearly cut episode, together with well written, descriptive articles, with which the Eastern press—notably that of Minnesota—was filled concerning the severity of the winter of '86. These described the terrible loss among the flocks and herds of Montana; that the park travel ceased in September, and I acknowledge with shame that a projected winter business trip from Eastern Minnesota to Western Montana in '85 was postponed for fear of the disagreeable possibilities that might ensue. And so no doubt it is with others. They glance at the maps, note the fact that Montana's northern boundary is for nearly six hundred miles the great boundary line between Canada and the United States, and instinctively shiver at the idea of wintering in such a boreal zone.

Alluring descriptions are given of the charms of the tide-water countries beyond, of the matchless fruits and flowers, of the moisture-laden atmosphere; and per contra there are dire accounts of the hardships and privations of the country where irrigation is necessary in order that the conduct of farm operations may reach a successful issue.

Such reasons are good and sufficient; they cause settlers to move on, and if not, that railway official never existed, and never will, who, all things being equal, would not prefer to secure the long haul to the short one. This is where the great corporations have made the mistake of their lives; for given the ordinary railway passenger family of five souls coming West, say on three tickets, where from \$75 to \$120 is received for hauling them to their destination; such a family will represent a tonnage of at least three car loads of farm products

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per year in any country, and if farming the fertile soil of Montana, the annual yield will easily double such an output. A child will know that Montana's local consumption will never be equal to her productive capacity, once its broad, generous acres are all tilled; a market for her surplus must be found at tide water, either East or West, and Montana being farthest removed from the ocean boundaries of the United States has the longest relative haul of any of the states traversed by these lines; hence a ton of Montana freight is worth more to common carriers than a ton produced elsewhere.

The uninformed traveler in traversing Montana on either of these great thoroughfares carries with him from the state exceedingly hazy and unreliable impressions. Coming over either route he is half way across the state before striking the mountains or the richest valleys—those which to date have been the best improved.

In coming to Montana, he passes the dry uplands of North Dakota, for the most part untilled; and finding much the same conditions in Montana (the line between North Dakota and Montana being imaginary rather than geographic), and having likewise been well educated in the severity of Dakota winters, he imagines that the sage brush plains, the sparsely grassed plateaus, the long reaches of naked, apparently barren intervals, populated only by straggling bands of horses, or sheep, are to be classed in the same category with Dakota. He is not advised that after crossing the state line and progressing westward that every mile covered toward the setting sun brings him nearer better conditions, and that once within fifty or sixty miles of the great mountain ranges he begins to encounter the land of the chinook.

In this land the burden of the prayer of the stockmen and farmer is for more snow. This for the double purpose of supplying a substitute for drink to the herds and moisture for the succeeding crops.

Chinook winds are peculiar. One versed in mountain climatology recognizes as their precursor, a state of atmosphere, which brings the timbered mountains out in bold distinctness and paints the deep rich green of the conifer growth to a blue black; soon the wind springs up; it may come from the northwest, the west or the southwest, but it chills to the marrow, and the novice would scout at the idea that these gigantic Pacific trade winds, moisture laden, apparently, and freezing in temperature, would lick up as with a consuming tongue every vestige of snow upon which it could get direct action.

The writer once retired at night, when the surrounding country was covered with eight inches of dry, powdery snow (in the holiday week); the wind roared all night, and in the morning one could not have found the material for a snow ball, save in some sheltered cove, where the wind could not get full action; in the surrounding country a dog could not have assuaged his thirst had he been dependent upon the standing pools of moisture naturally to be expected under the existing circumstances. Such is a startling phenomenon and is in large part responsible for the mildness of the usual Montana winter.

In the winter of '92 and '93, a father and son, natives of Massachusetts, were located in Jacksonville, Fla., and Helena, Mont., respectively. They were of a scientific turn of mind, and studied

weather conditions very closely. In the spring, upon comparing notes they found that the weather in Montana, taking the winter as a whole (except two weeks of exceptionally severe winter weather in February), was milder than that of Jacksonville, Fla.

Montana winters will average much milder than will any of the states lying north of the Ohio river.

It is this salubrity of climate that makes of the ranges of the state ideal grazing grounds, especially since in later years unnatural contingencies are discounted by putting up a supply of hay equal to one-half to three-fourths tons of hay per animal of cow kind, and the fortieth part of a ton for sheep. This is not required so much on account of the depth of the snow or the coldness of the season, as it is in the event of a crusting over of the snow, occasioned by a half-hearted chinook, followed by a sudden snap of cold weather.

Food is seldom provided for range horses, as they can paw through any ordinary condition of snow or crust to the short, nutritious grasses with which the winter ranges are carpeted.

The novice in passing from Minnesota to the states westward of Montana will doubtless be impressed with the much greater luxuriance of vegetation to be found in Western Minnesota or Central Dakota. He may unwisely jump at the conclusion that the former states supply better stock range regions than Montana, whose vegetation, save in exceptional seasons, seldom attains a greater height than from six to twelve inches (this applies to the best forage grasses, and not to the rank herbage bordering the water courses). A brief reference to prevailing conditions may not be amiss. Montana grass is made by winter snows, supplemented by April, May and June showers. By the latter part of June or the third week in July, the best grasses have fully matured and all growth ceases. The spring rains cease only in exceptional seasons by the 20th of June, the surface of the ground rapidly loses its supply of moisture by evaporation, the grasses turn sere and yellow, and by August the fire would run in the wind if the torch were applied to the grass.

It is more than likely that upon these natural sun-cured meadows not a drop of moisture will fall for the balance of the year. About November 15th, a sharp change of temperature will be experienced, and a light fall of snow follow the rise in temperature. This remains for a few days and then disappears, winter in dead earnest not coming until from the 15th of December to the 15th of February, so that the dry, sun-cured herbage, fully matured, much of it carrying a full crop of fruit (grass seed), meets with no moisture, that is so fatal to the Dakota or Minnesota fall pastures. Much rain in the fall will rot, or render unpalatable and unnutritious the standing forage, in exactly the same way it would tame grass in the cock. It becomes saturated, and the days at that season of the year do not give sufficient light and warmth to dry them out and arrest decay. So it is that the grama, or bunch grass, of the great cattle and sheep ranges of Montana will not only sustain life, but will fatten animals to such an extent as the tame meadows of the Eastern states cannot do. It is the invariable experience of the Western breeders that the range cattle taken off the upland natural meadows of Montana always lose

in weight after transfer from their natural habitat to the Eastern stock yards, where timothy hay (good according to their lights) is the staple food.

Nor is it only a question of climatic conditions governing the development of harvesting, so to speak, of these wild meadow crops. Chemical analyses reveal a marked difference in the food value of the forage and cereal crops. The natural fertility of the soil manifests itself by charging crops there grown with much higher nutritive values, and if the growing season of the low, clustering grasses were amplified by seasonable rains, occurring simultaneously with the customary snow of the state named, the rankness of the herbage of Montana would be co-equal with that of the states.

It is simply a case of arrested development in which nature makes up for diminished quantity by adding quality.

A WORD AS TO IRRIGATION.

The writer is of the opinion that if the tillable area of Montana (and this area is one of immensity, the state containing 145,800 square miles, about equally distributed between mountains, grazing and tillable lands), in round numbers about 50,000 square miles (or 32,000,000 acres), were plowed to a depth of 12 inches, the soil perfectly pulverized and this land summer fallowed each alternate season, that without a drop of water being artificially applied to the surface of the earth, and the same care taken in fitting the soil for the reception of seeds that is practiced in older states, that one year with another, the thirty-two million acres thus tilled would yield better average crops for ten, twenty or a hundred years, than would the same areas in Dakota and Minnesota.

In round numbers, the rainfall of the state averages eighteen inches, or fifty per cent more than is required for successful crop production, if applied in the proper season.

No doubt there would be years when the harvested crop would not return the seed sown, but on the other hand these years would be offset by crops yielding twice or three fold the average of Eastern crops.

In proof of this assertion the wheat (five) crops of Hon. Paris Gibson, of Great Falls, have from the period from 1890 to 1900 averaged twenty-nine bushels to the acre grown without irrigation.

Then you inquire, why irrigate? Simply as a crop insurance. The premium you pay being so infinitesimally small (about \$1 per acre each season), in comparison with the gross returns, that one can well afford to provide water for growing crops. No matter how intense the prejudice of the stranger may be to this method of farming, after an experience of a year or two in growing crops under irrigation, you may be certain that thereafter he will always be an earnest advocate and promoter of irrigation.

Estimating 32,000,000 acres of land in the state as being susceptible of tillage, what per cent of this can be irrigated? Reliable information puts it at twelve million acres. Twelve million acres of Mon-

tana irrigated lands means a production equal to that of from twenty-four to thirty-six million humid acres, simply that these lands produce from two to three fold as much as do the lands of the Union farmed without water. The most common error of the Eastern man is to suppose that given, say eighteen to twenty-four inches of rainfall, oftentimes twice or three times that much, depending upon locality, that the results from that are the same as are derived from irrigation. A little explanation is said to make the sense clear: First of all, no man can tell long beforehand exactly when the rain will fall. If they did, crops could be planted so as to coincide with the rains and when the most good would be derived. Notable stages, when rains are grateful to growing crops, are just as they are well out of the ground; warm refreshing rains at that period hasten the development to the time when the young plant will attain sufficient size to occupy the ground and shade it, so that evaporation will be cut off, and the weeds outstripped in their mad race to the front; again as grain is heading out, it needs the impetus of moisture to develop the length of the straw and heads. In this connection it is interesting to know that, under irrigation, grain begins to make rapid growth frequently just as it begins to head, and that straw will frequently more than double its size after it has begun to force its heads. The time of most benefit to grain, in seasonable rains, is as the grain is reaching the following three stages:

First, covering the ground; second, when heading; third, when filling; these are the times when water counts in adding to the normal grain crop, and it is at these stages that the ranchman or irrigation farmer tries to supplement nature.

On lands at all inclined to be clayey, grain should cover the soil before being irrigated or else the sun will rapidly bake the surface. A second irrigation should follow the time of heading; this is the application that fills the sheaths to the topmost branch of the panicles with big, full, plump kernels that outweigh unirrigated grains fully twenty per cent.

There is no intimate relation between the half-bushel measure and the standard legal weights in Montana under irrigation; for example, the barley crops of '94 of the Montana Experiment Station averaged 55.6 pounds per bushel, against forty-eight pounds legal bushel, oats 42.2 pounds to the bushel, against thirty-two pounds, the legal bushel, wheat 61.5 pounds to the bushel, against sixty, the legal weight. These were the average weights of nearly 150 different kinds, while there were individual instances of barley weighing 65.5 pounds to the bushel, and wheat sixty-one to sixty-two pounds. This is a striking difference in favor of irrigated grains.

Why are results from irrigation different from rainfall? Only that this is a case where art is an improvement over nature.

That area of tilled land cannot be found that does not have natural surface drainage, no matter how slight. An inch of rainfall comes to the grain field, falls upon a mass of earth occupied with fibrous roots, a perfect protection against the ingress of moisture from above, and it passes off to the point of least resistance. It is a rare occur-

rence to find a grain field so rain-soaked that one will sink into the soft mud over the shoe-top, and more frequently the wafer has not penetrated beyond the first two or three inches below the surface.

The irrigator lays off his fields with a level and starts the water from the highest point. He runs laterals (small canals) well guarded by damming up the sides, so frequently that when he releases the water from the high level, it flows out and creates a pool or shallow lake over the surface of the area between the lateral canal, from which he draws his supply, and the next lower lying lateral level, the more uneven the land the more frequent the ditches or laterals.

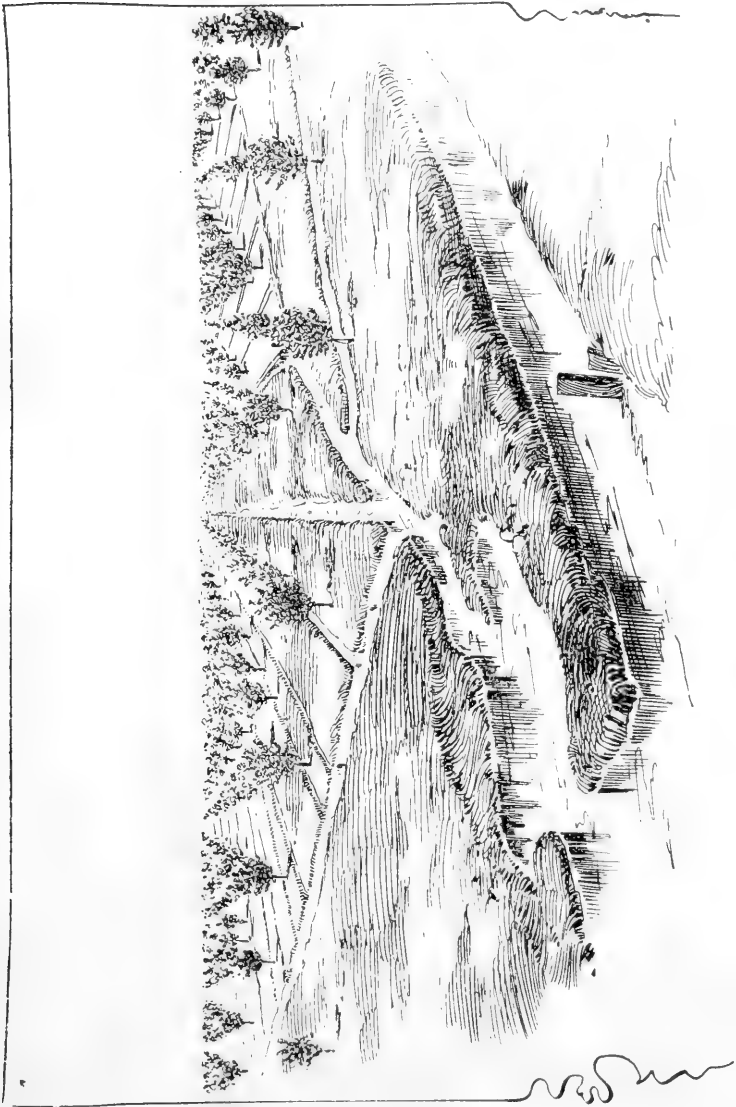
This water is applied not at the rate of one, two or three inches of surface water, but from six to eight inches in depth. It is held there until the soil is not only moistened, but literally soaked to a depth of twelve to sixteen inches. It is this super-saturation that dissolves and renders available fertilizers and mineral constituents present in the soil, that are unavailable to the plant that does not have this great help to the digestion of its food. Given natural moisture to germinate the seed grain and to give it six inches growth, which is present nine years out of ten, and two such soakings as these described, at the critical time in the life of the plant, and small wonder that Montana yields are so abnormally large, and that the relator is near in kin in the Eastern mind to a romancer.

What is the cost of this munificent benefaction to the agriculturist? Montana can be supplied with ditches to twelve million acres of land at a cost of about \$7 per acre.

After the ditches are provided, fields can be fitted to be irrigated at about twenty cents per acre for laterals, dams, etc., though the crop and the irrigation proper will cost a trifle over \$1 per acre to apply. Understand, please, that the \$7 is a fixed permanent charge, which, once established properly, will last for generations, and the \$1.20 per acre is the regular annual charge. How far would this \$8.20, expended annually, go toward keeping up the fertility of Eastern land, once you begin to apply barnyard fertilizer.

It is hard to assume that, were the lands of the Dakotas and Minnesota as intelligently watered (and much of it could be), that they would not be as productive, but we question if they would. Nature is credited with having made the mountain region the last of all, and we are guilty of no blasphemy in assuming that the mistakes of the anterior creation were revised and corrected in the case of her last work. Certain it is that chemical analyses show from one-third to one-half more phosphoric acid and potash in the average of the soils of Montana than are to be found in an average of the soils of the United States, including that of Montana, and this superior richness of mineral contents, coupled with the facilities for rendering them available, are what do the business.

Powerful factors in vegetable production are light, heat and moisture. Think of the aids to growth to be found in a climate, where good eyes can read newspaper print nineteen hours per day, as is the case in Montana in the early days of July. Think, too, of the rarefied air in an altitude of more than 3,000 feet above sea level, and how forceful is the effect of the sun's rays with so little to obstruct or



IN THE SENIC-ARID REGION.

hinder them. No wonder that Jack's bean stalk is duplicated in every well-tilled Montana field.

The transcontinental traveler after leaving St. Paul sets back his watch twice; an hour each time, between St. Paul and the western border of Montana. This means that he is then 1,400 miles nearer the setting sun than at St. Paul, or that when the sun is touching the western horizon at St. Paul, that it is two hours high over the better part of Montana. Two hours of the evening sun is a much greater stimulant to vegetation than two hours of morning sun. The evening sun finds the earth receptive to the sun's rays, while the inertia of nature, so to speak, occasioned by the paralyzing effects of the night chill, has to be overcome before growth is resumed. This is in favor of Montana's vegetation and explains the greater development of plant life. Montana clover and alfalfa growers harvest three crops easier than the farmers of Minnesota can secure two. The Iowan, the Nebraskan, the South Minnesotan attune their harps to the one strain, "Corn is King;" we of Montana make sweeter, more entrancing strains of divine harmony in sounding the praises of the clovers. Montana is essentially a clover state and in no other place do the legumes thrive as they do here. Little matter what kind is tried, medium, mammoth, alsike, white alfalfa, esparcette, sanfoin and vetches, all these lupines are prize winners when given an opportunity.

Did you ever think of making a comparison between the cost of an acre of corn and an acre of clover? The Montanan elects to grow an acre of barley; he fits his land in fine shape, seeds it (and the Montanan who irrigates is among the best farmers of the land), and as an after-thought elects to sow a barley field to clover, he broadcasts seed at the rate of seven pounds to the acre, costing \$1, about, for seed. It is irrigated twice to make a fine barley crop. That fall he finds a magnificent aftermath on his grain stubble worth two or three times the cost of the seed for fall pasture, so that it practically enters the harvest year on the same footing as to cost with the unsown acre of corn. The clover field will cost \$1 per acre for two irrigations and can be contracted to be put into stack (less thirty cents an acre for mowing) for ninety cents; the total cost of an acre of clover then would be \$2.20. The yield of hay will be from two and one-half to four tons per acre, worth \$6 per ton, or from \$15 to \$24 per acre for a crop that costs \$2.20. On the other hand, the acre of corn cannot be produced for anything like \$2.20. The yield will be, say thirty bushels, which brings five to ten dollars, depending upon the whims of the stock feeders. The Montana farmer will produce as many pounds of as good beef or mutton from the acre of clover as will the Eastern farmer from the acre of corn, there being about five times the tonnage. Then, too, the clover field is in fine trim for a grain crop, and can be broken and fitted for seeding much deeper than can the corn field.

Experiments at the Montana station have established the fact that it is not profitable to combine grain with clover in livestock feeding, at least but a very small amount of grain has proved to be profitable. This may seem incredible to the feeder of Eastern clover, but Eastern growers never open clover stacks out of which may be taken hay, whose color is almost as vivid both as to stalk, blade and bloom as

when it was mown. It stands to reason that hay that is cured without material change other than a removal of a part of the moisture is a more valuable food than that which is rendered half rotten in the process of curing. Remember, in speaking of haying and hay weather, that it is not unusual to have clear skies from hay harvest until the advent of winter.

The process of haying is reduced to a science in parts of Montana. In the Yellowstone valley forty tons of alfalfa from the windrow to the stack is a day's stint for three men and five horses. In the process it never makes the acquaintance of a hay fork nor knows a wagon. It is a clear cut case of machinery from start to finish. Small wonder that seventy-five cents is accounted reasonable remuneration for transferring the crop from the windrow to its resting place, until the bleating lambs, driven in from the open range at the advent of winter, cause its transfer to the feeding racks and yards. It is then shifted from the stacks to yards on hay wagons and fed as required.

Summer fallow has been referred to as an accessory to dry-land farming.



A MONTANA WHEAT FIELD.

What relation does this sustain to Eastern farming? Fallowing land means to permit it to lie fallow, or idle for a season, in a comparative state of cultivation. It is practiced to a much greater extent than is necessary in some of the irrigated sections of the state, though the more progressive farmers are rapidly adopting wiser methods.

Fallowing is almost a necessity to the man owning land in excess of his supply of help, teams and machinery; but it is on the bench lands and foothills, i. e., lands above the present water supply sources, that this system will prove to be most profitable.

For example, a man in early spring breaks up a piece of sod that cannot be irrigated. The process of turning the sod facilitates the escape of moisture and, except in phenomenal cases, it would practically be impossible to secure a crop thereon the first season. By fall the disk and harrow will reduce it to a good mellow state and leave

it in a receptive condition for the winter's moisture. Early the following spring, perhaps in February or March, he may seed the land to wheat. This germinates and starts growth ordinarily before a period at which he could begin to plow the lands cropped the previous season.

The May, June, and possibly the early July rains, stimulate a growth that is not surprising if one remembers the nature of the soil in which it has been fostered and the latter days of July or the first of August find the field ripe for harvest. Possibly conditions may be such that he can fall plow and have ready for another crop in the early spring or late winter of the succeeding season. Usually the land will stand another crop without rest or rotation, but he does not attempt three crops in succession on the same land. Rather than this, he puts the plow to work after seeding the following spring and turns up the soil an inch or two deeper, and in the late summer goes on the land with a sixteen-inch disk and the scotch harrow and again fits it for a prime crop. Thus he proceeds, fallowing from the alternate to the third year, and grows heavy crops therefrom.

How long can this be maintained, and what figure does the naked fallow cut?

Presumably, the practice is wrong; it is unscientific, wasteful and extravagant if one can possibly avoid it, but some of Montana's fields have been thus tilled for thirty to thirty-five years, and the end is not yet; no manure has been applied either.

Messrs. Lawes and Gilbert, of Rothamsted, England, have cropped continuously and fallowed adjacent fields for more than fifty years to wheat, and the variation is too trifling to mention between the annual wheat crop totals and the alternate year crop totals.

If a man is ever justified in fallowing, it is when he has large areas and no water. No doubt a better practice than fallowing, if moisture were available, would be to seed to rye or any other clover crop, expecting to turn it under in early fall. We question, however, whether one would be able to superinduce a sufficient growth to warrant this expense and labor. No doubt a crop will be developed that will be able to exist with so much moisture and the alternate year's use of land conserved.

Montana farmers have in the field pea a crop which is far and away ahead of Indian corn, as an easy money maker for its grower. As nutritious a crop as the field pea, which yields from thirty to fifty bushels of prime feed at as small an expense as is involved in its production can but be valuable in farm economy; again the straw, after the field pea is threshed, is quite as valuable a roughage food as is the wild hay of the Dakotas or Minnesota, or even the average run of clover, and we have records of the production of this equalling four tons to the acre. The dairy cow, swine and poultry all appreciate the value of the pea as an article of food.

As to Montana's claims in regard to being the home of the clover, where else can be sown, grown and harvested inside of one hundred days one and one-half tons of cured clover to the measured acre. This has been repeatedly done at the Montana Experiment Station. Think of it, you so-called clover country farmers, who expect to require a full season to establish a clover stand, to be pieced and

patched out the ensuing year, reseeding the thin spots, and, after standing fourteen to fifteen months, to be supremely happy and abundantly blessed if you are able to harvest a ton per acre of clover. Contrast, and confess that you have never known clover conditions in your agriculturally starved and stunted lives.

Scientists will tell you that nitrification of soil must occur (that is the bacteria of the clover plant be present in the soil) before the clover plant will become established. The writer has seen white clay dug from cellars several feet below the surface and hauled as fillers to city lots, the surface barely leveled off, white clover seed sown thereon, and in ten weeks' time a luxuriant mantle of green spread over the clay subsoil.

Nor is the state a bad corn state. In parts of Montana records of ninety bushels of Dent corn, prime in quality, to the acre have been made. The only difficulty encountered in parts of the state in its culture is that the nights are too cool. Corn is a plant calling for continuous hours of warm growing, increasing weather. No country in which folk can be comfortable at night under a pair of blankets in the midst of summer is adapted to this crop; this condition is the case always after one passes the 4,000 feet point of altitude. Flint corn can, however, be grown quite successfully in the majority of the higher valleys. It is too easy, however, to produce such abundant yields of wheat, barley, oats and peas as sown crops to lose sleep over an apparent inability to cope with other sections in corn culture as a hoed crop.

THE HEALTH OF MONTANA.

On a westbound train, recently, I encountered a family en route from Missouri to the Yakima valley, Washington. Father, mother and six children, from the babe in arms to the sturdy stripling, able to hold a plow or do his share of farm labor. They were keenly alive to all that was new to one from a prairie state visiting the mountains for the first time. It was a study in human nature to note the effect that the ever-changing panorama had upon them. They intelligently divided the party on either side of the train and the approach of anything new was the signal to have the others come trooping across to enjoy the fresh novelty. The family was more than an ordinarily intelligent one, and never did they manifest their intelligence to better advantage than when they left Kansas for the cool, bracing Northwest. Each and every one, from father to the nursing babe, was saturated with malaria. Their complexions were as dark as that of a newly arrived Chinese; the flesh on their faces was shrunken and hidebound; stomachs distended, and while a close examination was not made, no doubt they would have shown a scarcity of finger and toe nails shaken off by the numerous attacks of chills and fever. Finally the mother remarked: "Oh, if I could only have a drink of the good Kansas water." As the words were spoken, I glanced out of the window at a swiftly-flowing trout stream, clear as crystal and as pure as unfiltered water ever becomes on earth. On either hand of the narrow

canyon, through which the road ran, the mountains towered into the clear depths of ether until it was difficult from the train to locate their summits. I looked to see the mountains roll over and crush one so ignorant of what was good, wholesome and palatable. Likely never before had her eyes encountered so pure a fluid, but the poor soul was longing for the flesh pots of Egypt, and was sincere in the thought that the sweetly alkaline water of Kansas, to which she had been accustomed all her life, was good, and the clear, cold aqua pura of the mountains was not palatable, simply that it was tasteless in its purity.

This expression of the homesick plains-woman started a chain of thought as to what health accessories were, and as to whether we of the mountains possessed them in a reasonable degree.

Two great factors affecting the health for good or ill, are the air we breathe and the water we drink. It is reasonable to suppose that the loftier the elevation at which we are placed, the greater freedom from pestilential odors and vapors, to say nothing of disease-breeding germs to be encountered in greater numbers at the low-lying levels. This is simply a question of the law of gravity. Air flows down hill the same as water does, carrying with it impure particles heavier than itself, much the same as driftwood is carried along in the water current. Again we know that the higher, dryer altitudes are desirable for those afflicted with pulmonary or tuberculous trouble. The why of this, once understood, is simple. That lungs and trachea are benefited by pure air is that their linings are inflamed, and that they heal only as they are supplied with an atmosphere free from irritating elements. Remove the cause of disease and nature speedily rectifies our mistakes. So well understood is this principle that Colorado and California, the one possessing the purity afforded by altitude and the other that from heat, transmitted from the deserts bordering her on the one hand, and the free breezes of the ocean on the other, are today half populated by folk or their descendants forced thither, in order that they might escape the death penalty incurred by long residence in lung-destroying climates.

So alarming is the influx of tuberculosis that both of these great natural sanitariums are agitating or have already passed laws looking to the prevention of residence of those thus diseased.

With no disposition to advertise Montana as a cure for consumptives, and no desire to add to her population a single pest-ridden victim (for consumption is certainly contagious), we do have the right to state that the death rate from this dread disease is the smallest of any state in the Union, notwithstanding the fact that a large per cent of her labor population suffer more exposure to the elements in the ordinary transaction for business, than do those of any other state. Think of her thousands and tens of thousands, who labor daily hundreds of feet below the surface in damp mines; of the thousands of stockmen, who are exposed to every change of weather, in giving stock their attention; of the many who know no habitation the year around, except the canvas walls of a tent; and we can but admit there must be an exceptional tonic in a climate, that can so reinforce nature as to enable her to withstand exposure that would, of necessity, be fatal if encountered at any lower lying levels.

As to the purity of her water; the supply for the city of Bozeman (and this is a fair sample of the mountain water of Montana), is taken from a stream called Lyman creek, a tributary of Bridger creek. It is one of the many water courses flowing down and out of the Bridger mountains, a low-lying range to the northeast of Bozeman. This stream is reservoired some four miles from the city, and the reservoir is 280 feet higher than the main portion of the city. The water is conveyed in iron pipes, laid six feet underground from the reservoir. At one of the farthest points from the source of supply a chemical analysis was made by the Montana Experiment Station, and the following is the analysis:

TABLE OF ANALYTICAL RESULTS.

“REPORTED IN MGS. PER LITRE—PARTS IN 1,000,000.

No.	AMMONIA		CHLORINE	TOTAL SOLIDS	NITROGEN AS NITRITES	NITROGEN AS NITRITIES
	FREE	ALB.				
211.	.02	.02.	.00	406.00	.00	.00”

PARTS IN ONE MILLION.

This water is remarkably pure, and there being in a million parts but two-hundredths of 1 per cent of free ammonia and albuminoid ammonia, is evidence of its healthfulness.

“Free Ammonia—This constituent results from the decomposition of nitrogenous animal and vegetable matter, and exists in the water in the form of a salt of ammonium, from which the ammonia is easily set free. The test for ammonia is very delicate, the presence of one part of ammonia, in one hundred million parts of water being readily detected.”

“This constituent and the following one, are regarded by most chemists as the most important upon which to base an estimate of the potability (drink value) of waters.

“Albuminoid Ammonia.—This represents the nitrogen present in the water in the form of nitrogenous animal and vegetable matter in a more or less advanced state of decay. The nitrogen is liberated from these compounds in the form of ammonia by the action of an alkaline solution of potassium permanganate.

“Nitrogen in Nitrates and Nitrites.—The presence of nitrates and nitrites indicates a contamination which occurred sufficiently long ago to allow the organic matter, particularly the nitrogen, as indicated by the test, to become oxidized. The nitrates represent a more complete oxidation than the nitrites, and, under similar conditions, a more remote source of contamination.”

In 1899 station tests were conducted to determine the amount and fertilizing value of organic matter transferred to fields from the mountains by irrigation waters. Many samples were taken and these

results averaged. It was supposed that much of the fertility of Montana soil and attendant bounteousness of crops came from fertilizing matter diffused over the fields by this means. A surface acre foot of water (namely the amount of water that would cover an acre to the depth of one foot) was considered and the chemical determination showed that the money value of the fertilizer thus added was 23 cents per acre, estimating the valuable elements of fertilizers at 9 cents to 15 cents per pound, a liberal amount. It is seen that but a small per cent of matter injurious to health is present even in the irrigation waters of the state.

Catarrh, that loathsome disease, so frequently developing into consumption, is almost unknown in Montana. Those suffering with it on coming here, if exercising due care, entirely recover. Conditions are all in favor of longevity, and the physician is the most poorly paid of all the professions. Children's contagious diseases are of course to be found, but they are usually much milder than are the same diseases in a different climate and altitude.

NATURAL SANITARIUMS.

Bordering on the southern line of the state and nearly midway east and west is the Yellowstone National Park, Nature's "Wonderland." It is not the intent to now speak of this section except to refer to the wonderful manifestations there presented, strongly indicative of a close relationship existing between these regions and the internal fires that scientists tell us are to be found, once we penetrate deeply into the bowels of the earth. Not only is hot water found in this park, but could the chemist make his reductions and separate the various individual elements there found, no doubt he could supply a respectable pharmacopia, so far as an assortment would be necessary. Sulphur is especially abundant. Nor is this deposition confined to the park alone. There are great natural sanitariums, especially useful for controlling diseases rheumatic in nature. Boiling springs impregnated with sulphur and other remedial medicaments occur at Hunter's Hot Springs, Park county; in Chico, the same county; White Sulphur Springs, Meagher county; Pipe Stone Springs, near Whitehall, Jefferson county; Boulder Hot Springs, Boulder, Jefferson county, and except in the case of Lo Lo Hot Springs, Ravalli county, and of Chico, Park county, there are improvements which for the Western country are elaborate; where invalids may be comfortably entertained and intelligently treated. Many marvelous cures are related at these places, and all have cane and crutch collections that would outfit a regiment, left in grateful remembrance of what has been done for them by nature and science combined.

Away up in the headwaters of the north fork of the Sun river, close in against the eastern ribs of the range of the Rockies, are hot springs of great repute among the Indians, the hunters and the trappers who have visited them from time immemorial. So remarkable are the curative powers of these waters that men scarcely able to mount into vehicles ride over sixty miles of natural roadway and live in tents and bathe in the most primitive of accessories in the

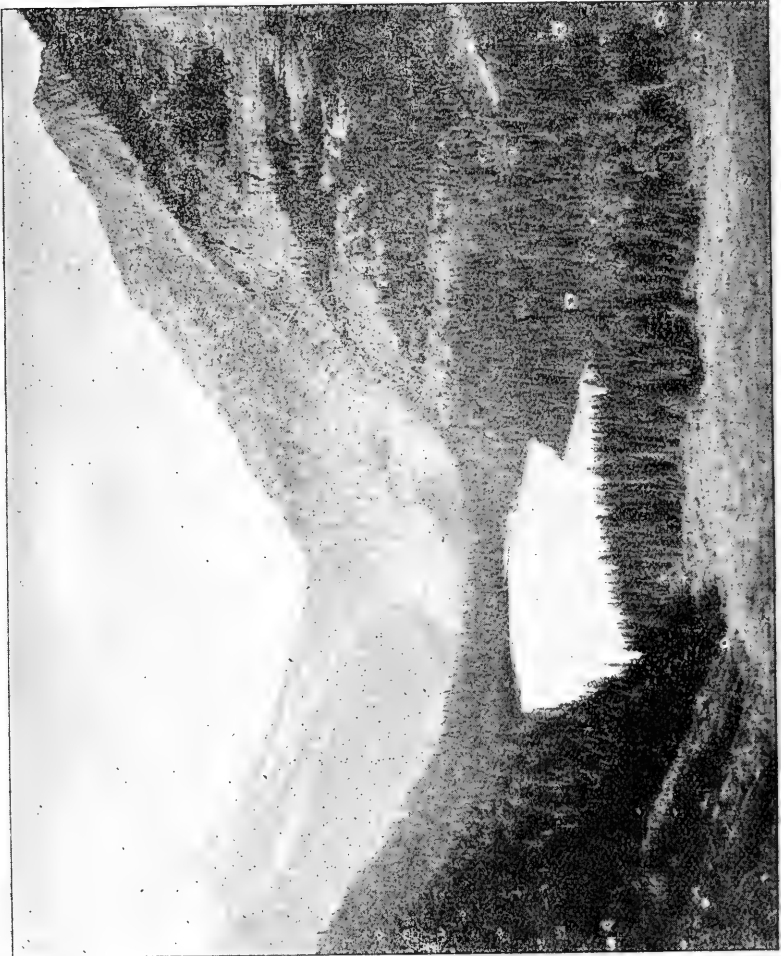
way of pools and bath houses, invariably returning to civilization as good as new. No doubt, as the country opens up, there will be found in this country of wonderful creations many such places for the healing of the nations. It seems like a wise provision of nature, that in a state so abundantly supplied with all that is valuable in minerals, and where men in quest of these ores should encounter exposure most trying; that in working in the stock camp they imperil life and limb from rheumatic and kindred affections; yet to render him capable of carrying on his work that there should be a greater number of health cures; and so, these wonderful creations stud the state and are easily accessible from all quarters.

There is as little encouragement to the members of the medical profession in Montana as there is in any state of the Union. It is no uncommon thing to find families, who live a hundred miles from a physician, and when they go for the doctor it is that he is wanted. The ozone-laden atmosphere, the clear, nipping, bracing effects of living in the clouds, divorces man from aches and pains and except for the hypochondriac there is little call for the healer, from those who take proper care of both mind and body.

GAME AND FISH.

That we are all of savage descent is evidenced by the almost universal passion for the sports of the field. This crops out in the scion, the farthest descended from original man, no matter how gentle the breed, nor how far removed from the wild man, the love of sport is universal and widespread. Men are prone to love hunting and fishing even as "the sparks fly upward," and finding one not such we are apt to regard him with suspicion and fear, as we have cause to fear the man of "no small vices," knowing that nature has wrought her compensation by making of him a master villain. That opportunities for the gratification of these laudable ambitions are abundant in Montana is well known to all familiar with the state. Montana waters are pure, abundant and well supplied with the natural food for fishes. Many of her streams are virgin to the fisherman, where the finest of brook trout live and die unmolested by man. Commencing on the eastern side of the state in the waters of the lower Missouri and Yellowstone are found the fishes of the Mississippi. Rarely do we find these as high as the Great Falls of the Missouri; their upward course is obstructed by this miniature Niagara, which thunders its mighty volume of water 90 feet over a sharp precipice to the level below. This is a bar to the upward march of the catfish, buffalo, pike, pickerel, and the coarser fishes of the lower country.

A stranger would think that these predatory fish would find their way up stream as far as their course was unobstructed by natural barriers; but once past the limit of alkali water carried into the limpid Yellowstone by streams such as the Powder, Tongue and Big Horn rivers, these fish of low degree do not seem to thrive, and are rarely if ever caught above the mouths of these streams; hence the pure waters are left to game fish. An exception is found, however, in the whitefish, which disputes possession of every deep hole



LAKE McDONALD, MONTANA.

with the gamy trout. To the Easterner it is a strange sight to see the fisherman whipping big rivers with flies for trout, and it is no uncommon thing to catch trout three to four pounds in weight; indeed, this is a common occurrence in all of the main streams of the state. In the Gallatin river and Tenderfoot (the latter a tributary to Deep creek), the graylings of Montana are found. These are most beautiful creatures, very gamy, with meat most delicate, lacking the oiliness so common to members of the salmon family.

When first taken from the stream, one would be hard to please indeed, were he not charmed with the exquisite form and the brilliancy of coloring of the grayling. They are also models of symmetry, being built on more delicate lines than the heavier-bodied trout; the dorsal fin of this fish is a study for the artist, with its vivid, highly colored spots fairly rivaling the eyes of the peacock tail.

The United States government has located a fish hatchery at Bozeman, and they are accomplishing that which has never been done before in the United States—the successful hatching of grayling eggs, and the breeding of these magnificent fish. Here they also make a specialty of “steelheads” or salmon trout. These at the age of three years attain large size and are a valuable addition to the waters of the country.

The location of this plant renders it possible for every Montana brook to be regularly and abundantly stocked with the best of game fish.

CAMPING OUT.

Summer parties are very popular in Montana, when the entire family seek the rest and quietude of some gorgeous mountain canyon. Montanans are good campers, and they can give points to the best of old sportsmen.

It is very difficult to state which of the classes of sportsmen—the wing shot, the big game hunter or the fisherman—has the best of it.

In bird shooting there are the ruffled grouse or pheasant, the sharp tail grouse, or the prairie chicken (commonly so called), the sage hen, and the blue, or mountain grouse. The first are usually found along water courses in the willow coverts, and are sufficiently abundant to give fine sport. The pinnated grouse, or the true prairie chicken, are not found in Montana, but to all intents and purposes “the sharp tails” afford equally fine sport.

It is strange how the habits of birds will change with habitat. “The sharp tail” grouse seldom ventures far into the grain fields on the states bordering on the Mississippi, but frequents the timbered openings; but in Montana they are found in vast numbers in the larger valleys, where for miles and miles there is nothing but a succession of grain fields and meadows.

I have seen them so numerous in the Moccasin mountains of the Judith basin that there were morning and evening flights, as with the pigeons, geese or ducks, when countless thousands would seek the timbered mountain sides, where they would roost, flying forth to the more open country in the morning. On a cold morning they

would be loath to leave the snug, warm, sheltered hillsides, but would occupy the spruce or fir woods by thousands, awaiting the warming up of the more open country.

In some sections they have a peculiar habit, in cold weather, when the snow is deep, of burrowing at night in the snow. They fly up into the trees, and as night approaches will make a swift downward flight, plunging headlong into the soft snowdrift completely out of sight. If one wants fun let him ride a half-broken broncho through such roosting grounds, at the near approach of the horse they will come up out of the snow just under the horse's nose, like a bomb bursting. They are so abundant as often to be a great nuisance in deer hunting, as they will, from their perches in the heavy timber,



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A CAMP IN THE MOUNTAINS.

see the hunter long before his near approach, and the deer which he has tracked so long and patiently is likely to be frightened from the thicket, in which it is temporarily resting, by the cackle of the birds and the whizz of their wings as they noisily fly away to escape the hunter.

Unfortunately, at this season of the year, the flesh is apt to be tainted with the odor of the spruce and fir buds of which they seem to be very fond.

It is the blue grouse, the king of all American game birds, which affords prime sport. These birds are one and one-half times the size of the "sharp tail" grouse. They spend the most of their lives

in the high mountains, but in the spring at mating time come down to the foothills and rear their young in the gulches and draws. Their diet is largely the young and tender grass, grasshoppers and the many wild fruits with which the state is so well supplied. They are especially fond of service berries, and in the latter days of August and the fore part of September they have attained sufficient size to be strong of flight. Their flesh is white, like the ruffed grouse, and firm, and highly flavored, owing to the delicate nature of their food.

The Montana law restricts the hunter to twenty birds per day, and it does not take long to reach the limit if one strikes a good gulch, two or three miles in length, and has a good dog to aid him in making his bag. Twenty big, lusty fellows are all one wants to pack on his back to camp.



Hunting the sage hen is not ignoble sport. When the birds are half-grown, they are found contiguous to the sage brush plants, where they subsist on grasshoppers and affect the tender buds of the sage brush just enough to season the flesh well. They are extremely fond of visiting grain fields (particularly wheat) that may be in the near vicinity of sage brush thickets. The young, half-grown birds, are not tainted with sage, and the older ones can be rid of the objectionable odor by parboiling in two waters prior to cooking. That they are the largest of all the grouse family makes them by no means the easiest of sport. Their size and the extreme length of wing and tail feathers makes me think of nothing so much as the flight of the wild turkey; the novice is always swept off his feet by the taking to wing of a covey of these big birds. A strange peculiarity of them is that they lack the gizzard common to other members of the grouse family.

The water fowl makes quite as much use of the great western water routes (the Missouri and its tributaries) to and from the northern breeding grounds and the southern winter quarters as they do of the so-called Mississippi route. Teals, mallards, canvasbacks, geese and brandt make the spring and fall shooting very fine, while in many parts of the state teals and mallards breed; in fact, it is not uncommon for all these birds, as well as the English snipe and killdeers, to winter in Montana. This phase of animal life will give an idea of the openness of the Montana winter.

It is the big game hunting, however, that places meat in the smokehouse. Antelope, deer, both black and white tail, elk and bear.

There is no such abundance of big game as there was twenty-five to fifty years ago, when from the top of the mountains one with a good field glass would see the plains and bench lands dotted with bands of antelope, deer, elk and buffalo, even as the same plains are to-day populated with flocks and herds of sheep, cattle and horses. They have been killed off, or driven back into the bad lands, the broken and rolling foot hills. Here they will always be found, simply that the country is so rough and broken that they can always find secure covert. Hunting big game with hounds is absolutely prohibited by law in Montana, and still-hunting in open season only is permitted.



The antelope have been badly decimated by scab, contracted from domestic sheep, and as they cling to the plains, they have been out-generaled by the hunter, armed with the small bore, smokeless powder, long range gun. But the elk and black tail deer delight in the lofty mountain parks, venturing out of these only as the November snow warns them that it is time to "pull their freight" to lower levels. They descend very leisurely, oftentimes not reaching the winter feed grounds until the law has expired, and they are safe for the nonce.

The white tail deer is very abundant in the state; and while much wilder and warier than its near relative, the black tail, is to be found in the willow coves lining the streams, often venturing inside the enclosed fields, hiding in the heavy undergrowth along the water courses. There is scarcely a trout stream in Montana, along whose sandy reaches may not be tracked the cleanly cut footprints of the white tail. They become quite tame during the close season, and it is no uncommon sight for the angler to encounter the beautiful, graceful animals as he quietly slips along the stream, about sundown or sunrise.

For many years the state offered a generous bounty for the destruction of bears and lions; latterly this has been abandoned or reduced to so low an amount that it is small inducement to hunt them. Since then, undoubtedly, they have increased in numbers, and the hunter who really desires to find bears can be accommodated if in the hands of a reliable guide.

The fact is that the third of the state is so broken, so rough, so precipitous and almost impassible to man that there will always be big game in the mountain fastnesses.

Then, too, the stringent regulations of the government enforced in the Yellowstone National Park, a part of the boundary of the state, and covering 4,000 square miles, has made of that section,

together with the Teton forest reserve joining the park on the east, and covering half as much land, a vast game reserve in which deer, antelope and elk are annually bred, to be distributed over the neighboring lower lying lands on the advent of severe winter weather.

As yet Montana requires no game license laws, and her citizens as well as outsiders are welcome to enjoy the magnificent sport to be found here, providing they observe the very reasonable and liberal state laws for the protection of game.

One class of hunters will be gladly welcomed, that is experienced wolf hunters.

The great numbers of sheep, cattle and horses on the vast plains of the state are a great temptation to the timber wolf and big gray or buffalo wolf. These are slain by the thousands each season, but the number does not seem to appreciably decrease, and good wages can always be earned by the experienced, temperate hunter, who means business.

Wolfing is often carried on by men with packs of stag hounds. This, as well as jack rabbit coursing with hounds, affords exciting sport to those participating.

Montana has been a popular rendezvous for sportsmen from abroad, who have been able to choose their own ground, and have hunted here because they were uniformly successful.

SELECTION OF A HOME.

Great judgment should be used by the intending settlers as to the conditions governing localities. There is always a local coloring imparted in time by the residents to settlers which cannot be ignored. For example, a resident of Gallatin valley visited an old friend, a former Montanan, now residing in South Carolina, where he had lived many years after leaving Montana. While in Montana he was noted for his love of order and system; his outbuildings, machinery, implements, live stock were always kept in apple pie order. He was a man notably regardful of appearances, and his place was a poem from the view point of the practical utilitarian. At the Carolina railway, the visitor was met by the friend in a ramshackle conveyance, drawn by a span of lazy mules, outfitted with rope traces, lines, etc., and the conveyance was the index to the style of general surroundings. It was an exemplification of an absolute surrender to surrounding conditions. The languorous lassitude of the South had accomplished its deadly work; the spiritless, characterless, doleful negro, his only dependence for labor, had inoculated the place with an air the reverse of progressive, and the superior white man had succumbed to the paralyzing influences. He was succeeding financially, but think of the sacrifice to pride in being compelled to live in a fashion amid surroundings despicable to a driving, enterprising individual.

Think again of the equally discouraging conditions to be encountered where the Mexican peon sets the gait for agricultural enterprise, handicapped also by an enervating climate.

In Montana all is different. The altitude, the bracing, driving, forcing atmosphere here stimulates to progress, and while much remains to be done, there is no excuse that it is not done by one long enough here to have accomplished.

The industrious man coming to Montana to become a resident is gladly welcomed, and while her citizens are not demonstrative, they have a cordial greeting and fair treatment to accord to him, who in good faith casts in his lot with them, and desires to be a useful member of society.

Many of the old timers are from the south, and they have brought with them the hospitality so delightfully refreshing to one accustomed to the cold, hard, calculating "down easter." The pursuit of life, liberty and happiness can be as successfully undertaken in Montana as in any state of the Union, and nowhere can better or more law-abiding citizens be found. The rights of property are highly respected and none need fear to find lacking here the protection to person and property to which they have been accustomed. Nor does the Montanan do right from fear of the law. He exercises better motives; he is just and fair to all mankind; he is willing "to live and let live."

THE AGRICULTURE OF MONTANA.

The miner, the manufacturer, the lawyer, the physician, these are men of professions who when in search of "green fields and pastures new" seek not for a country of diversified possibilities, but for one in which they can exploit their own particular line.



A MONTANA FARM.

To such the Montana monograph is not addressed. The farmer is the man upon whose brawny shoulders civilization is upborne and it is primarily to him that we address this bulletin.

That farming is a science is undoubted; that ultimate success financially and physically will eventuate only in countries and sections having a wide range of agricultural possibilities is also true, and the writer is of the opinion that more and better potentialities are

locked within the fertile soil of Montana, to be awakened by the hand of the intelligent laborer, than are to be found in any other portion of the great West.

Diversified farming, well followed, will always be successful here, and while the stockman and grain farmer, the owner of the hay meadows, have prospered bounteously heretofore, the large, sure returns will be his who does not risk all the eggs in one basket. Among farm crops the following succeed excellently well.

Wheat, both spring and winter, soft wheat and hard wheat alike, are abundant in quantity and prime in quality. Barley does in Montana what it never has done and never will do in the great Eastern barley fields of the country, namely, develops into strictly No. 1 barley. Visit if you please the barley markets of Minnesota, the Dakotas, Iowa and Wisconsin and No. 2 barley is the highest grade quoted and No. 3 is the usual best grade in excellence. That this is so in Montana is owing to the matchless climate, the long summer days in which, in the shade, the thermometer never passes the 92 degree mark, to the dewless nights, and cloudless harvest and threshing days. Said a Dakota German the past week on being shown a handful out of a 1,200 bushel bin of barley, "Vell, but this you haf pleached with sulphur or something." Not so. For six years past the sample shown was the poorest that could have been found in this particular granary.

Gallatin County had a yield of 6,640 bushels of prime No. 1 barley in 1899 harvested from an eighty-acre field.

OATS.

One must see a Montana oat field, breast high to a six-footer, even, level, the heavy cow boy hat can be thrown at random onto the standing grain, and it will lie there buoyed up by the stiff rank straw. Cut a stalk at the ground and examine it critically, it is of the diameter of a pipe stem, 48 to 60 inches tall, its upper 16 to 18 inches occupied by the branching panicles, their sheaths all fully occupied by big, plump kernels. Small wonder that the measured bushel offsets the 42 to 48 pound notch of the steel yard, and that yields in excess of 100 bushels to the acre, and as high as 129 bushels per acre, have been harvested and threshed in Montana.

Think of it, a record of an excess of three tons of grain from an acre of land, a greater tonnage of choice grain in Montana than of the best clover hay of the Eastern states. Here is the natural location of the oatmeal mill, where raw material incomparable in quality can be found.

While the hoofage of Montana sheep, cattle and horses exceeds that of other states, it should be borne in mind that it is the third largest state in the Union, and that for 75 per cent of the year these animals roam the open pastures of the state, when it is not possible to harvest their droppings to be added to the tilled fields to supplement depleted fertility, for we do not pretend to tell you that these lands are productive beyond the dreams of man, or will never require to be nourished to maintain their present fertility, and while under

present conditions it may not be feasible to spread barnyard manure on every needy acre, yet we have other and better means of restoring depleted fertility in the legume and root crops for which the state is so justly famous.

Pass through the great Mississippi valley, you may cover mile after mile and never pass a clover field. Why is this? Surely the scientist tells us that the legume (member of the clover family) is the only available nitrogen trap in which the great etherized chemical soil necessity may be imprisoned and held captive for the benefit of the plant, so dependent thereon for its perfect development. Do not these fields need the revivifying effect attendant upon the application of nitrogen to the growing plant? Most assuredly. For almost half a century these fields have been cropped to the depleting fertility crops of grain and timothy hay; and had it not been for the dairy cow, that has been a soil savior to all this vast region, the land would long since have ceased to be a reliable means of support to the farmer, let alone the provision for the wants of millions, who look to these areas for daily food. But does not the cow and clover field move on in harmony and unison? They do; but unfortunately two things are essential in the best clover culture; the natural nitrification of the soil, i. e. (the presence of clover bacteria without which the clover plant will not start up into vigorous existence) and a certain reliable source of moisture to stimulate the plant to its best development; lacking these, the result is a sickly, spindling, tedious form of growth, oftentimes requiring 16 months or 500 days to become thoroughly established; while in the irrigated parts of Montana it has frequently happened that 3,000 pounds of cured clover hay has been harvested from an acre inside of 115 days from seeding. Clover bacteria are present throughout the state in abundance and the results often equal 14,000 pounds of cured hay per acre per annum.

Green clover is never turned under in Montana. Were this to be done the land would be so stimulated that future grain crops would not stand up from sheer weight of straw.

The field pea, the superior of Indian corn at every comparable point, is nowhere at home as it is in Montana. Forty to fifty bushels of peas, 8,000 pounds of cured forage from the straw, vines 12 feet in length. This is one of the most powerful stimulants to vegetation as a rotation factor. Roots are here produced in such vast profusion as to make the jealous Scotchman green with envy.

POTATOES.

In the American agriculturist competition of the seventies a Yellowstone farmer harvested 1,213 bushels of potatoes from a measured acre of land, and 50,000 pounds of sugar beets have been produced on a Bitter Root acre. Mangels, carrots, turnips, all yield beyond expectation on mellow, irrigable lands.

Cabbage that span five feet in diameter, and when dressed for market weigh 40 pounds, are not uncommon. Squash and pumpkins weighing 100 pounds and upwards are often harvested.



FOUR FEET OF CABBAGE, RAISED UNDER IRRIGATION.

Celery that does not run to seed or rust is a usual crop on the farm.

With the exception of the tomato, water and musk melon, egg plant, okra and sweet potato, the vegetables of the East all succeed well and thrive in an unexampled manner. That these exceptions do not thrive is the penalty paid for being so high up in the clouds, where the thinness and rarity of the atmosphere insure cool nights with the going down of the sun. Nights too cool to insure the ripening process, the continuity of which must not be broken by rapid changes in temperature. Nature is kind to Montanans, however. In exchange for this trifling disability, they are insured that immunity from tuberculous and catarrhal disease so fatal in sections where these vegetables and fruits thrive so perfectly.

It is in the perfect measure of success attendant upon fruit culture that Montana prides herself. The writer confesses to a fairly intimate acquaintance with the state, and is of the opinion that there is not an eighty-acre tract in the state upon which small grains can be successfully grown, but that the annual family fruit supply may not be provided. Some sections of the state, notably the part west of the main range, produce abnormally fine apples, crabs, pears, plums, apricots, peaches, nectarines, grapes and all the small fruits, beautiful in form, rich in color, choice in flavor.

Select the best acre of clover in the Mississippi valley, give it every opportunity to develop, harvest, cure and weigh, and unless its yield exceeds 10,000 (5 tons) to the acre, the tonnage of hay can be equaled by the normal strawberry crop of Montana, 10,000 quarts per acre being a fair yield, where good varieties under good culture and irrigation are practiced.

The culture of Indian corn as well as broom corn has been remunerative in the low valleys on the east side of the state, where the nights are warmer. Alfalfa seed has also yielded nine bushels to the acre.

Montana could well be classified as a vast seed garden for the many sorts of vegetables, grains and grasses that do well in this section. Seed grains would invariably be improved in character by introduction to our soil and climate. The tobacco plant does well, also buckwheat, rye, rape, millet, flax and beans.

It may be safely said that for any crop of the temperate zone, a congenial location can be found in some part of the great State of Montana.

After ten years' residence in Montana I am convinced that 40 acres of prime soil under irrigation and cultivation will equal in yield and net returns fully as much as would 160 acres in any other part of the humid states.

RAILWAYS OF MONTANA.

The question of transportation is one of vital import to the would-be settler, as it means to him opportunity for marketing produce and disposing of his surplus. That Montana is the third largest state in the Union would imply that much of its area is remote from rail-

ways. But there are about 3,000 miles of railway within its borders—or enough to span its width five times from east to west.

There is but one county that is not traversed by rail, and that is Fergus, almost the center county of the state, and it is confidently expected that it will soon be reached by the Montana Railroad Co., which is rapidly building in that direction.

That the state is traversed in part by four of the leading Western trunk lines, the Northern Pacific, the Great Northern, the Burlington, and the Oregon Short Line, is a guarantee as to the character of the service afforded the state by its railways. Montana traffic and travel is appreciated by these lines, as is shown by the great activity manifested by them in throwing branch lines into every district contiguous to their main lines, productive of business. The relative percentage of travel in Montana is larger to its population than in any other state in the Union. An extremely liberal policy is manifested toward the railways with respect to the enactment of legislation inimical to them.

The feeling prevails in large part that it is to the railways that development is due, too many old-timers are still on deck who too well remember days when they were compelled to pay from seven to ten cents per pound for carriage of freights to endorse a policy that would be prohibitive to railway extension. On the other hand, the roads and their management are disposed to be fair and liberal with Montana patrons. Important, self-imposed reductions in passenger and freight tariffs are being made voluntarily; and an immense tonnage is being developed in mining operations. It is not only the carriage of the refined ore as it leaves the smelters, but this ore is hauled to the smelters in a crude, bulky form, and not only is the native ore as it comes from the mines a severe tax on transportation facilities, but there must be carried to the smelters coal and limestone, the latter used in fluxing the ores.

The item of the carriage of mine machinery alone is a great source of revenue to the railways. Again, the mines call for timber; literally by the millions of feet, for timbering up tunnels and shafts. So that it can readily be seen that a state of such great mineral development calls for all the resources available of both labor and transportation; all of which inures to the general benefit of the farm population of the state.

Great pride is taken by the railway management in keeping their lines in the best of order, in stocking them with the best patterns of locomotives, and their passenger trains are marvels of neatness and strength. Accidents in the mountains are extremely rare, a really bad passenger train wreck has never happened in the history of the railways in the state.

EDUCATIONAL OPPORTUNITY IN MONTANA.

Naturally the man of family, the one who would be a desirable addition to a community, is interested in knowing what the state offers to youth along the lines of schooling.

For years the great West was cut off from Eastern opportunities by lack of railway communication, and only men and the hardiest of women were able to bridge the intervening gaps and to reach the mountains by a long, tedious and dangerous wagon journey. In those days education was not possible, but with the extension of the trans-continental lines all this has changed. The very deprivations of schools, churches and other civilizing institutions begat in the minds of the pioneers a keen desire for the very best of its kind in all these directions. And these pioneers were striking characters; puny men and women did not brave the toils and privations of the overland route, and a class found their way to the mountains able to make history. They gave their sturdy, energetic impress to their adopted state, and in no other respect is this to be so plainly seen as in educational lines. With other Western states, the common schools have an eighteenth part of the public domain as an annuity from whence to draw for their support, and this is no mean thing where it amounts to more than five million acres. None of these lands can be sold for less than \$10 per acre, so the value of the state endowment from the general government for free tuition is more than fifty million dollars. In addition to this, the wants of higher education have been well cared for in the establishment of the State University, Reform School, School of Mines, the State Normal School, Deaf and Dumb Asylum and the Agricultural College. These have a donation of 580,000 acres, worth more than five million dollars. As a matter of fact, but little land has been sold at the present time for the benefit of any of these institutions, but the state has an active, energetic board of state land commissioners, which is leasing the lands of these institutions, so as to bring to the state treasury, for their benefit a quarter of a million dollars annually. And not only from this source but from direct taxation, for the benefit of public schools, large sums of money are annually raised to promote education.

Every man, woman and child (of the age of intelligence) is proud of the state's means for the diffusion of knowledge. The percentage of illiteracy is lower in Montana than in any of the states in the Union. Better wages are paid instructors than elsewhere. A peculiar system prevails in the state; every year a special tax is levied for the maintenance (in large part) of the schools. The legislature of 1898 provided for this annual tax, by a law amending the original law, and through some inadvertency that portion of the bill which provided for the special levy was found to be defective and unconstitutional and therefore the usual tax could not be levied nor collected. This ordinarily, in the majority of Eastern states beyond doubt would have closed the schools, but not so in Montana. Private citizens, all over the state, put their names to subscription papers for the support of the public schools, and almost without exception the public schools have been kept open and running the usual full term of the school year.

The motto of the Montanan in the matter of teachers and instructors is "the best are none too good." This policy has stocked the schools with a class of teachers of superior intellect and ability.

Aside from the higher public institutions named, there are colleges of higher learning at Deer Lodge and Helena; also there are numerous business colleges in the state.

Few of the states of the Union enjoy the same class of educational facilities as does Montana, and no one need fear the sacrifice of educational opportunity in seeking a Montana home.

SUGAR BEET CULTURE.

Some years ago the department of agriculture, through its chemical division, issued what was termed a sugar beet chart, showing the sugar beet belt in the United States. Beginning about Long Island it finds its way eventually to Los Angeles, Cal., apparently as if blindfolded, pursuing its route by the most devious ways across the continent. I take it that this was made from the data of tests in the possession of Dr. Wiley made by the department and based on production of beets containing 12 per cent saccharine matter. This was issued in 1898, and leaves Montana very much "out in the cold," spite of the fact that one could not ask for better conditions for growth of beets than are to be found in Montana.

Sugar consumption is a no inconsequential item considered merely from the point of the cost of transportation of the article from the Western seaboard to Montana. The sugar consumption of the state is about 10,000,000 pounds per year. This means 250 cars of 40,000 pounds to the car or about \$100,000 paid for freight. Even if the sugar cost as much to produce in Montana as it costs on the coast (much of the sugar consumed in Montana comes from the Hawaiian islands), and the single item of freight could be saved, it would be well worth while. Can sugar be produced advantageously in Montana? For four years the Montana experiment station has been testing beets for sugar content, yields, etc. Beets should contain 12 per cent of saccharine matter to be commercially valuable, and such command from \$4.50 to \$5 per ton, depending upon locality. Beets averaging a less content are relatively less valuable, while those containing more than 12 per cent are correspondingly more valuable. We have data for the following averages on experiment station grounds:

1895—Sugar in beets, 14.1 per cent.

1896—Sugar in beets, 15.1 per cent.

1897—Sugar in beets, 17 per cent.

1898—Sugar in beets, 13.6 per cent.

Average for four years, 14.9 per cent.

In 1896 an experiment was made to determine when the beets would carry sufficient sugar to be profitable to dig. Beginning September 18th the sugar content was 15 per cent. November 1st the sugar content was 15.8 per cent. This gave a season in which beets could be harvested over a period of forty-two days. Co-operative tests of 1896 of many farmers in different parts of the state showed an average of 13.9 per cent sugar content.

In these tests was one of a common red beet, which contained only 4.8 sugar content.

Fifty-eight co-operative tests of beets in various parts of the state in 1897 showed an average of sugar content of 14.03 per cent. Twenty co-operative tests of beets in various parts of the state in 1898 showed an average of sugar content of 14.5 per cent.

Individual analyses during these years have shown as high a sugar content as 20.2, 21, 17.8, 18.4, 19.2, 20.

Montana is certainly entitled to a place on the sugar beet chart, if sugar content indicates anything.

Sugar beets grown under irrigation are much more cheaply produced than in the humid states, simply that the stage of development from the sowing of the seed to the time when the ground is shaded with beet foliage and weed growth checked is much shorter under irrigation. This is true of all crops to which water can be artificially applied advantageously. It almost doubles the crop and halves the period of time required to the deposition of sugar to the point where beets can be profitably harvested for manufacture.

Our opinion is that beets could be worked into sugar by the first week in August, leaving a season of more than a hundred days for the campaign of harvesting into sugar.

Winter seldom shows its teeth in good earnest until after November 15, and ample time could be assured to manufacture the beets. Beet culture will supersede the practice of summer fallow, and with fifteen tons of beets per acre worth \$75 gross, there will be a handsome margin between the crop production and the sum realized. The beet pulp will supply valuable materials for fattening live stock.

Few states offer the same tempting opportunity to make beet sugar as does Montana.

DAIRYING IN MONTANA.

Three states in the Mississippi valley have a right to give credit to this industry for their financial redemption. These are Wisconsin, Minnesota and Iowa.

Exclusive, long-continued grain culture had left the lands minus fertility and their owners minus hope. The writer once heard Governor Gear of Iowa state that he had known Iowa when one could start from the Mississippi river in the southeast corner of the state, drive to the western boundary, and never be off a mortgaged farm. This was under a grain culture system; but that thanks to "the cow with the crumpled horn," this condition had passed away, and general dairying had reversed conditions, making of the state a fountain of perennial wealth to the tillers of the soil.

The same is true of Minnesota. In the years of '79, '80 and '81, a few of us having faith in the dairy cow, interested ourselves in the promotion of dairying in that state. Two decades later, as the fruit of our labors, more than eight hundred creameries and cheese factories are clearing houses for the million dairy cows of the state, and more than \$30,000,000 are added annually to Minnesota's bank account from this one source. Rash would he be who would undertake to total the gross financial benefit to the state resulting from the cow.

There are many counts to be made, a total revision of crops, bringing soil fertility, the by-products of pork and poultry, neither of which can be most profitably grown without milk being used as a prominent factor for their food; but, best of all, is the placing of the farm upon a permanent cash basis and the elimination of the greatest curse of the farmer, "the running store account," which, like a cancer, will eventually eat out the heart of the victim.

Wisconsin has even greater results from the cow than have Iowa or Minnesota. These facts and experiences present food for thought to Montanans. Can we derive the same benefit from this line as the above named states? Physical conditions enter largely into the success of any agricultural undertaking. Can the cow be profitably sustained in Montana?

A partial reply to this is the experience of the wild cattle, the buffalo, the elk, the deer, the antelope and mountain sheep. All these in countless numbers of the finest development covered Montana ranges until driven off or slaughtered by skin hunters.

Their place is filled to-day by millions upon millions of sheep, cattle and horses.

There is an excess of food upon the ranges of the state, under a system of fencing and pasturage, to carry double the present number, without an acre of tame forage being added. So much for the native grasses and forage plants.

Are these choice dairy product producers?

Better than anything in the line of the improved forage plants grown in the three great named dairy states.

Can anything better be grown under cultivation in Montana?

Unquestionably the legumes (red, white, medium, mammoth clovers, alfalfa, alsike, sain-foin, field peas) are an improvement over native food plants.

Will they thrive in Montana?

Montana is the natural home of the clover plant. Nearly all the mountain canyons carry native clovers. No soil nitrification is necessary to insure clover thrift. In any of the great valleys of the state, notably the Yellowstone, the Gallatin, the Bitter Root and the Flat-head, the early summer air is redolent with the sweet perfume from the countless clover acres.

Are silos common in Montana?

They are not, nor are hay barns, barracks or sheds.

From July 1st until New Year, when the bulk of the hay is consumed, there is but little falling weather; clover hay goes into the stock, robbed of but little of its rich coloring of green, and a button-hole bouquet can be culled from any well cured clover stock at almost any season of the year, the deep rich crimson of the bloom having lost but little of its matchless beauty by being harvested and housed.

From two to five crops, under irrigation, are harvested, and 14,000 pounds per acre is not an uncommon annual crop from red clover or alfalfa.



ON A DAIRY FARM NEAR GREAT FALLS.

So much for roughage. In addition, sweet corn for fodder is unequaled when irrigated. It produces so rank and heavy a growth that a single row is all that a big team can cut with a mower or a binder. Again, the grain crops are so heavy and the yield so abnormal that the every food want of a cow can be satisfied in Montana as in no other region outside of the Rocky mountains.

The comparative mildness of the winters, the purity of the atmosphere, the abundance of 42-degree spring waters, clear and pure beyond the conception of the native of the Mississippi valley, all of these make ideal conditions for dairying.

What of dairy stock? Can it be procured in Montana?

One finds better blood on the open ranges of Montana than inside of the eastern fences. A single instance will afford light. Six two-year Shorthorn heifers, cut out of a range bunch, turned inside fences, on good blue joint and timothy pastures, without a pound of grain or bran, gave in their two-year form sixteen hundred pounds of butter in a twelvemonth.

Such foundation stock needs only to be mated with pedigreed dairy bulls to make world beaters.

What of the markets?

From fifteen to twenty million pounds of imported (purported) butter is consumed annually in Montana. The regular, undeviating price is 25 cents per pound.

This is a good business from the local demand, to begin with, and situated on the great highway to the Orient, there can be no question but that dairying in Montana can be made a first-class business proposition by those who are familiar with the business.

No state in the Union to-day offers such a field to the dairyman as does Montana.

BEAVERHEAD COUNTY.

Beaverhead county is a prominent southwestern county of Montana, it borders on the Rocky mountains, and its altitude is well toward 5,000 feet.

Its name is an Indian appellation. Some state that its streams were so well stocked with beaver as to give the name to the region, others to the general shape of the county, its outlines being said to resemble a beaver's head. This is unlikely, as the county's name is of more recent origin than the stream. Certain it is that the Indians considered the words Beaverhead and Wisdom to be interchangeable (the Wisdom or Big Hole and the Beaverhead rivers being the leading streams of the county), as they looked upon the beaver as being the wisest and brainiest of all the beasts.

This county takes high rank as a range section.

The fame of the flocks and herds of the Big Hole country (i. e., the valley of the Big Hole or Wisdom river) is state wide.

This, spite of the fact of its extreme altitude; many erroneously suppose that high altitudes stand for feeble vegetation. This is true in a measure, as to the growth of timber, as all mountaineers recognize "timber line" (about 9,000 feet) as being that altitude on the moun-

tains at which timber ceases to thrive. It is an open question, if this be owing to the lowness of the temperature or that moisture is not available for the development of the tree; certain it is, however, that herbage good in quality is to be found at such height as soil is present in which to find root. The old saying, "The higher up the mountain side, the greener grows the grass," is a true one, and we can usually expect to find the choicest summer feed in the lofty mountain parks, where from six to eight months of the year all the face of nature is buried under many feet of snow. This snow gradually melting under the revivifying effects of the summer sun fills the soil with a welcome supply of moisture. Strange it is that it is not an infrequent occurrence for the snows to fall and lie the winter through on unfrozen soil.

This is easy of explanation if we remember that after the fall equinox that which is rain in the valleys is invariably snow on the higher levels, and that these periodical storms come without much warning or a lowering of the temperature.

Were it not for this the springs and stream sources would not receive a reliable supply, as in much of the country in which the deepest snows fall, the ground is very broken and precipitous and if the soil was frozen prior to snow fall the surface run off would be so rapid that but little moisture would find its way to the inner reservoir sites.

So that we may expect that high lying valleys are fine grass valleys, and that the wealth of live stock will always be in direct proportion to the supply of subsistence thereof.

Beaverhead is a fine alfalfa region, and the area devoted to this magnificent legume is constantly increasing.

The supply of water for irrigation purposes is good and its agricultural future is bright.

Dillon, the county seat, is charmingly situated on the Beaverhead river. Here is located the State Normal School and it is taking deserved rank as an educational center.

Extensive mining operations, both placer and quartz, are conducted in the county. The value of its mineral output in 1899 was about \$600,000.

The relative consumption of food material, both by man and beast, in mining camps is much higher than in pastoral or civic communities, and, as reliable mining plants are always on a cash basis, the value of such market to the farmer and stockman cannot be overestimated.

This county had for many years a great advantage in that it was on the line of the overland route to the Eastern railway, and stage travel in all the early days of the territory coming via the Union Pacific to Corinne, Utah, thence overland to Virginia City, the first capital of Montana. Later the Union Pacific built a line of railway from Ogden, Utah, north through Beaverhead, Silver Bow and Deer Lodge counties to Garrison, Mont.

This early influx of travel had no doubt, much to do with the county's prominence in state affairs and its general development. Certain it is that it will always be a good section for mixed husbandry, for cattle, sheep, horses, swine and dairy interests.

Railway and market communications with Butte, that great hive of human industry, will always insure a good market for farm products.

BROADWATER COUNTY.

This is the smallest county in the state, containing less than 1,000 square miles, but it is one of the oldest in point of settlement. The placer mines in Confederate gulch yielded enormously in the early days; and after the ground was worked over many remained and engaged in farming and stock growing. Its eastern boundary is the Big Belt mountains, and the western part is a series of foot hills thrown out from the Boulder mountains. The Missouri river bisects the county equally; and while one would think it good business policy to use streams of this magnitude as county boundaries, it is not so important in this section of rapid falls to streams and attendant immunity from the floods that are so destructive in lower altitudes. A bridge once properly located and constructed, stands for years; such structures are not so numerous as in more densely settled sections, and the acquisition of the rich bottom lands pertaining usually to both stream margins is to be desired.

Broadwater has a relatively mild climate, and has three principal sources of revenue; these in their respective order are mining, live stock and farming. Farming and stock raising do not go hand in hand in Montana, as many of the heaviest cattlemen do comparatively little farming. This is changing, however, year by year, and many of the farmers find it valuable to own sufficient cattle to glean the stubbles in the winter months. With the advent of spring, everything is branded and the band goes out into the uplands and foot hills for the summer and fall months.

The statement has been made that cattle thus handled learn the seasons, and that when the whistle of the steam thresher is heard in the land, the wise, old dames who head the herd, begin to move toward the farms and winter pastures.

On the north bank of the Missouri there are desirable farming lands, easy of irrigation, the river traversing the entire length of the county. On the south side there are also extensive stretches of land between the mountains and the river, but much of it lies too high to admit of successful irrigation without very heavy expenses. In the extreme southern part of the county, known as the Crow creek and the Hot Springs valley, there is a large scope of country that can be irrigated by a high line canal from the Jefferson river. These lands will be extremely valuable for farm crops as soon as irrigated. At present they are mainly useful as stock ranges. Adjoining the Big Belt foot hills wherever water is accessible, are fine orchard sites on all northern and western slopes. Fruit is doing finely. The hardy apples, crabs, plums and cherries are unequalled, and small fruits, especially the strawberry, succeed better nowhere. Many young and promising commercial orchards are planted, and the first harvests are being received therefrom. The apple is the Wealthy. A peculiarity of Montana altitude and climate is that this apple, which, at its best

in its original habitat, Minnesota, is a fall apple or very early winter, is in Montana a fairly good keeper, frequently being found in prime condition in March. This is owing to two conditions. The rare, dry climate gives to the texture of the fruit a more durable substance, while from irrigation the fruit reaches maturity with all of the fruit interstices well occupied with moisture. Under care, this evaporates slowly, and there is not that shrinking and shriveling so common to this most delicious of apples in a climate tending to extreme drying at the time when the fruit is maturing.

Broadwater county is attaining distinction as an alfalfa county, and will prove to be naturally adapted to sugar-beet culture.

Lands are very low in comparison to their value. Nearly a third of its area has been claimed and this is a safe criterion as to its relative value.

Its mines turned out a half a million in 1899, and there is a vast outcome to them.

Broadwater is an attractive county to the immigrant. Traversed by the Northern Pacific railway, the pioneer line, and having access to the markets of Helena and Butte, there is great opportunity for the industrious tiller of the soil.

CARBON COUNTY.

Carbon county is one of the lately formed counties, having been created in 1896. It contains 2,520 square miles and derives its name from the inexhaustible beds of bituminous coal which underlie large areas of its surface. The Bear Tooth mountains, a spur from the main range, lie on its southern boundary, and the Pryor mountains, which are a continuation of the Big Horn range in Wyoming, form a large part of the eastern boundary. Prominent streams of the county are the Stillwater river, which forms a large part of the eastern boundary, the Little and Big Rosebud, Red Lodge and Rocky Fork creeks, and the Clarke's Fork of the Yellowstone, while the Yellowstone river forms its northern boundary. Five years ago Carbon county was a portion of the great Crow reserve of South Montana, and the most persistent effort was necessary to secure its opening up to settlement. The Indians were extremely loathe to cede this, as it was their favorite hunting ground. The effort to secure its cession was so long continued as to advertise it very thoroughly, and soon after it was legally opened all lands were filed upon under the homestead law act. Settlers, however, were required by special act to pay \$1.50 per acre in addition to a fixed period of residence, the cash payment being used to pay the government for the moneys used in acquiring Indian title. As it happened those who secured homesteads were men from adjoining counties, large numbers being from Gallatin county, this being considered the foremost of all Montana counties in irrigation methods. The influx of settlers familiar with existing conditions has had a marked effect upon the opening up and improving of the farm lands.

This county has a larger irrigated area in proportion to its gross size than any county in the state except Gallatin.

The general lay of the land is most favorable for turning the water out of the smaller streams onto the land. Ditches are cheaply constructed, and there is not a single large ditch proposition in the county.

Coal mines are being opened at Red Lodge, Gebo and Bridger, the former having been in operation for some ten years or more, with a shipment of 2,000 tons of coal per day. The mines in full operation employ 2,000 miners, which will represent a population of about 10,000 to be supplied with agricultural products. This home market has been the factor in the development of agricultural products here.

Clarke's Fork is one of the principal tributaries of the Yellowstone, and carries a large amount of water available for irrigation. Clarke's Fork bottoms are extended and embrace a large area of agricultural land, and owing to a large admixture of silica in the soil is the warmest and quickest soil in Montana.

Small grains succeed excellently, as do Indian corn, fruit, pumpkins, tomatoes, watermelons and other farm and garden crops, the successful cultivation of which is debarred in many parts of Montana by reason of the high altitudes with attendant cold nights through the ripening period of crops. Fruits are also being most successfully cultivated. Wild plums of superior quality are indigenous to Carbon county, as are currants, gooseberries, raspberries and strawberries.

Along the higher bench lands extending out from the slopes of the foot hills and the mountains are extensive areas of land, too high to admit of irrigation. From their contiguity to the lofty mountains they secure a greater moisture deposit than do the valley lands. These have induced a very rank growth of grass and such slopes have always been considered as among the best for stock grazing for all seasons of the year except in the dead of winter. These lands are destined to become great producers of winter cereals, wheat and rye, so much so that the lower irrigable lands need never be taxed for wheat and rye production, but can be reserved for barley, stock, grain and forage production.

This county is traversed by two branches of the Northern Pacific railway, the Rocky Fork and the Bridger branches, while the main line skirts its northern boundary.

This county of all in Montana offers the greatest promise of being devoted to the small farmer, the one operating eighty acres, and as such has a great future ahead of it.

CASCADE COUNTY.

Cascade county was organized in 1887, from portions of Choteau, Meagher and Lewis and Clark counties. Its area is 2,600 square miles. Recent legislation has added to the area the territory embraced in the mining camp of Neihart, this being connected with Great Falls—the county seat of Cascade—by railway. The existence of this county and the phenomenal development of the city of Great Falls and the surrounding country is due to the water power in the Missouri river, which flows through the county, Great Falls being near the center and situated on both banks of the river. Within the

space of ten miles there is a fall in the bed of the river of 514 feet. The river from the foot of White Bear island to the Great Falls of the Missouri river, a distance of about ten miles, is a series of falls and rapids, the whole culminating in the Great Falls, with a height of ninety feet.

There is within the city limits of Great Falls a water power equivalent to 350,000 horse power, and there are located here the extensive smelting and electrolytic plant of the Boston & Montana Copper Co. and that of the Silver Smelting Co., as well as numerous other manufacturing concerns, the monthly pay roll averaging about a million dollars.

FALLS OF THE MISSOURI.

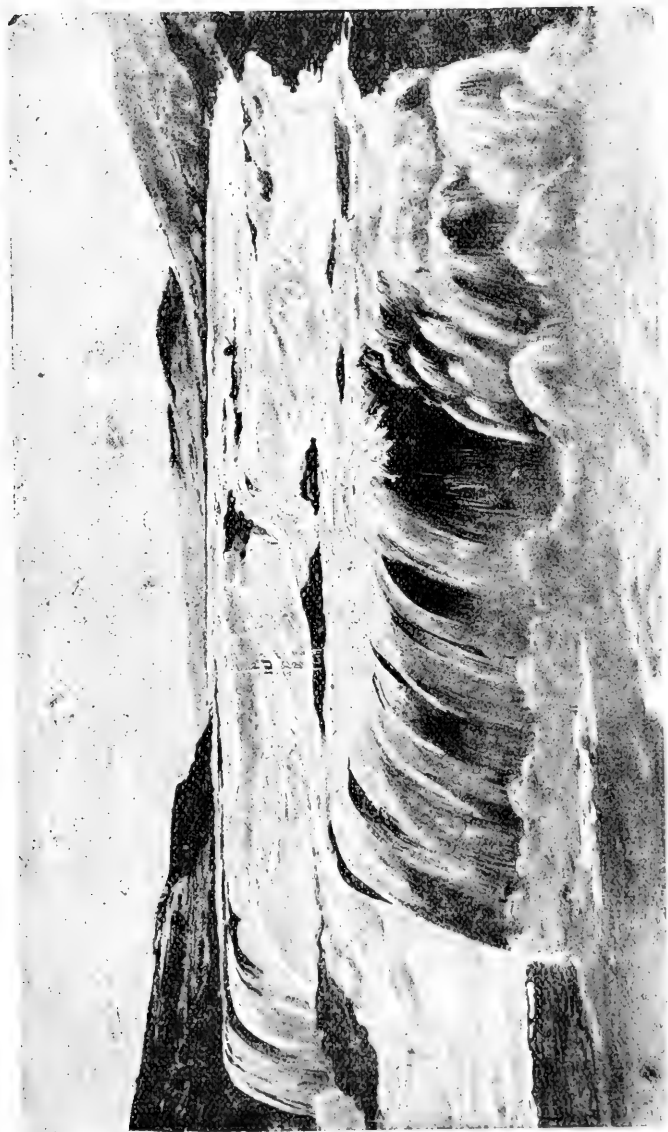
One of the largest flour mills in the West is here located, the Royal Milling Co. It is said of Great Falls that it is "down hill from every mine in the state," a fact that renders it possible to move ore for treatment from the mines by rail at a very low cost for motive power. There has grown up in a little over ten years a modern city of about 15,000 inhabitants, with a wonderful future ahead of it. Up to date the interests of Cascade county have been associated largely with mining and range stock enterprises, but the day is not far distant when its principal source of revenue will be from the development of the marvelous agricultural possibilities of the county in and around the city. Were one to describe a circle with Great Falls as the center its radius having a length of twenty miles, there would be included within this circle, whose diameter was forty miles in length, scarcely a square rod of land, that is not tillable, lands of wonderful fertility and capable of enormous productiveness. The outer circumference of the circle would rest not, far, on the east, from the Highwood mountains, on the south the Little and Big Belts, and upon the skirts of these mountains, as well as in much of the foot-hill environment of both these ranges, are many thousand acres of land, suitable for winter grain, which will never require irrigation for crop production. If fact, one of the greatest bars to irrigation enterprises in this county has been the successful cropping of dry land farms, independent of any water supply.

Cascade county, notwithstanding the fact that phenomenal grain crops have been made without irrigation (wheat crops for ten years past having averaged twenty-nine bushels per acre), is destined to be the seat of intense activity in canal operations.

In the immense scope of country in the described circle in and about Great Falls, there is but little land lying too high to be covered by water taken from the Missouri river, near its exit from the Big Belt mountains, near the gate of the mountains, at Hardy, Mont.

This is the beginning of the Great Plains region of the Upper Missouri country, and is now wonderfully productive of range grass and forage plants. These lands lie along the south side of the river, the river at this point swinging from north to a northeasterly course, the natural fall of the country being southeasterly.

On the north side of the river approaching the city from the main range of the Rockies, from the westward is the Sun river, which, with its tributaries, carries nearly enough water to irrigate the lands lying to the north and west of Great Falls. The water in these



THE GREAT FALLS OF THE MISSOURI RIVER, AT GREAT FALLS, MONTANA.

streams, together with that of the smaller ones, now used to some extent in irrigation, Deep creek, Belt creek, Little Belt, Otter, Willow and others carry a sufficient water supply to place under irrigation large quantities of lands, perhaps a sufficient amount, which, if lands on which irrigation is not required are considered, would be ample to place under successful cultivation the entire area of farm land in the county, thus adding enormously to the productive capacity of the county.

Careful estimates have been made by reputable engineers of the cost of placing the bench lands lying to the south and east of the city under irrigation, and it has been found that the expense would be about \$7.50 per acre. Certainly a small amount when the increased value of such irrigated land is considered.

Much of the 2,500 bushels of wheat consumed daily by the Royal Milling Co. is produced in the section named. Yields are excellent, and the quality is of the best. These lands, too, are remarkably well qualified for the production of *export barley*, the soil being heavier than that of the Gallatin, with a longer growing season.

In the valleys of the Belt and Deep creek as well as along the Missouri river bottoms, in sections favorable to the cheap transfer of water on to the land, a profitable market garden business has been conducted for the local trade of Great Falls, and the coal mine camps of Belt and Sand Coulee. Fruits, too, have been tested with the best of results, in apples, crabs, cherries, plums, and the small fruits generally. In no part of Montana is there a greater opportunity for expansion in agriculture; and in no other county is the farmer thrown so completely upon his individual resources. Primarily the lands now occupied by this county were devoted solely to pastoral purposes. Much of its area is now thus used and naturally those who have a financial interest in the free use of these valuable government lands do not offer warm encouragement to the farmers to take up these lands to fence and to farm them, simply that by so doing he curtails the open range to that extent. Again, since the establishment of Great Falls, its main support has come directly or indirectly from the mines, and the interest and attention of the citizens has been along mineral and stock rather than agricultural lines.

The population most valuable to any new country is that which is acquainted with existing conditions, and, while many have settled in Great Falls from the irrigable areas of Montana, they have gone there to embark in business apart from farming, and many of the settlers have followed the line of the railway from sections where farming is conducted without irrigation; to such the irrigation problem seems too large to compass, and so all the water that might be supplied through individual effort has not been taken out, and that which has been handled has not always been made the most advantageous.

It is likely that if a balance were struck between the irrigated and non-irrigated farms of Cascade county that the lands under dry farming would exceed those that are irrigated.

Six years ago it was found as the result of a careful canvass by the business men's board of trade of Great Falls that there was imported into the city from other states, notably North Dakota, almost

a half-million dollars worth of farm products for consumption in Great Falls alone, not a single article of which could not be produced within the limits of Cascade county.

The Eastern farmer from sections with twenty-five inches of rainfall and upwards comes to Montana bringing Eastern methods, turns prairie sod two and one-half to three inches with two or three light horses and a small plow, in the proper season, fines down the soil to this depth, seeds his crop and as a result, unless the annual eighteen inches of rainfall, is largely concentrated during the ninety days required to secure a crop, is doing well to recover his seed. On the other hand, the experienced mountaineer provides himself with a plow of deep draught and broad cut, to it is attached from four to seven horses (horseflesh is cheap in Montana), inverts a furrow from ten to thirteen inches deep, cuts this absolutely to pieces with the spring-tooth harrow and the disk harrow and cultivates its surface to garden tilth with a Scotch harrow.

The following spring, perhaps in the month of February or March, depending on the earliness of the season, he seeds liberally to wheat (oats and barley doing better sown in April or May), using a drill which plants the seed from three and one-half to five inches below the surface, following the drill, if not too wet, with a heavy land roller, and behind this cross harrowing with a Scotch harrow, the result is that the seed grain germinates evenly and quickly, and before the drying spring winds the surface of the ground is completely covered with a rank lush growth of vegetation; this in turn prevents evaporation of the moisture stored in the generous depth of the furrow from the snows of the previous winter, supplemented by early spring rains.

Lands thus farmed will in ninety-nine cases out of a hundred exceed in yield that of the average of the lands in the United States, and should there—as is often the case—come from one-half to one inch of rainfall just as the grain is filling, the result is a bumper crop from 200 to 300 per cent in excess of the normal yield of the United States. The farmer in Montana has an infinite advantage with respect to rainfall. As certainly as the seasons roll, the rains, except in exceptionally high lying mountain valleys, are over for the summer by July 15th, and the next ninety days may be considered as fair weather days in which the varied farm operations of haying, harvesting and fall plowing may be conducted without dread of falling weather to affect his results.

This is a universal financial advantage in respect to the farm laborer, teams, etc., as their ability to labor is measured by the days of the calendar, and plans do not have to be made to supplement the time lost in unfavorable weather. This, too, has much to do with the quality of the harvested product, be it hay or grain.

A very customary sight in the grain regions of Montana is to see grain sacked and corded up the same as cordwood and left in the field where the machine stood, there to remain until such time as the farmer can find time to haul it to market.

In no region in the United States is the proportion of the cost of granaries and hay barns so small in comparison to the value of other farm improvements as it is in Montana. This is a great saving to the farmer, for while it may be a comparatively small tax on the re-

sources of the average American wheat grower to house his wheat crop, averaging thirteen bushels per acre, the cost to the Montana farmer for providing storage rooms for wheat which will average from twenty-five to forty-five bushels per acre is very much greater.

The American of all folk is imbued with the idea of securing something for nothing. During the past year, more than a million and a half acres of government lands were homesteaded in the State of North Dakota. At this rate of entry it will be but a short time until free lands in North Dakota will all have been taken. In five of the oldest counties, Pembina, Grand Forks, Traill, Steele and Cass, there is an average of only 274 acres government lands open to entry. When these lands are occupied the irresistible flow of immigration will be on and into Montana, and, in addition to this population, who insist on free land as a condition to settlement, there will be hundreds and thousands of the younger members of old farming families of the older Eastern states who have made and saved money on the old farm, but who cannot afford the relatively dear farm lands of the older states; these, attracted by the marvelous conditions, with respect to climate, fertility of soil and fruit possibility, will come to the older portions of the state and secure by purchase, improved lands. These productive lands will be better farmed, with the result that still better returns will be secured, more costly and desirable buildings will be erected, and the state made richer by the natural increment to the taxable wealth.

Much preliminary time has been spent by the Commission in working under the Cary arid land grant of one million acres to the states reclaiming the same. By the terms of this act, the state is practically authorized to place these lands under irrigation, provided the cost of such operation does not exceed the value of the land.

There are vast areas of Cascade county eligible to such improvement.

The Cascade farmer will always be certain of a demand for his produce. The county lies admirably for transportation of the produce of the farm to market. Great Falls can be reached in a day's drive from any part of the county with a heavily loaded wagon drawn by a good team.

The monthly pay roll puts the farmer on to a cash basis, as he can always realize cash for his wares from the city dealer or consumer. For eight months out of the year the natural highways are unexcelled. Building material (except lumber) is abundant. Much of the county is underlaid with coal measures, carrying a fine vein of good bituminous coal, and a full supply, good in quality, abundant in quantity and cheap in price is the result.

The climate is agreeable and the general good health of the county is in large part attributable to the mild, dry atmosphere.

In no other county of the state has farm improvement been so constant and uninterrupted. It is assured a bright future. Great Falls has been the greatest wool market in the state.

CHOTEAU COUNTY.

Choteau is among the large counties of the state of large counties. It forms the central northern boundary line (lying nearly midway across the state for 170 miles), and its total area is 15,380 square miles. For years Fort Benton, its county seat, was the financial and business center of Montana; fur traders having here located soon after the tour of Lewis and Clarke through the state in 1803 and 1895.

Fort Benton is the head of navigation on the Missouri river, although no steamboat has ascended to this point since the completion of the Great Northern railway in 1887.

The county is almost entirely plains country, it being on the great northern plateau of the Missouri river. This stream in its great northern course reaches almost the center of the county, makes an abrupt turn to the south and east, then pursues an almost easterly course along perhaps half of the breadth of the county, forming for this distance its southern boundary. For almost the entire length of this stream within the boundaries of Choteau it has worn for itself so deep a channel, and the draws or coulees leading down from the high lying plateaus (which are thereby drained) are so steep and abrupt, that it is well nigh an engineering impossibility to divert the water from this river onto the neighboring plateaus. This might be accomplished by damming the stream to the height of the immediate banks and then conducting the water through canals onto the lower lying levels, but as stated the draws are so numerous and so many expensive flumes would be required to carry the water over these that the cost precludes such an attempt.

There are, however, some of the leading tributaries of the Missouri to be found in this county; the main ones are the Teton, the Marias and Milk rivers. These have their rise in the main range of the Rockies not far distant from the western boundaries of the county, and are very favorable streams for the exercise of engineering skill.

Choteau county stands to-day for the leading stock county of the state, and more cattle and sheep are to be found within its boundaries than in any of the other counties. That this is so is owing to a combination of circumstances; while there are great climatic changes in short periods of time within the territory named, yet, on the whole, the winters are not excessively cold.

Its general plane is nearer level than that of any other similar area in the state, and the flood waters originating largely from the winter snow, reinforced by the spring rains, do not pass off so rapidly, hence the surface of the plains is usually wet down to a good depth, with corresponding benefit to vegetation. In the early days Corinne, Utah, and Fort Benton were entrepots to Montana, the former being the nearest railway station on the Union Pacific railway and the latter the head of navigation on the Missouri. Freighters could give convincing testimony that the northern plains were everlastingly water-soaked and water-logged in the months of June and July; so much so, that trail teams were sometimes compelled to go into camp and await the

action of drying winds. These outfits usually carried a set of jack-screws to be used both to grease wagon axles and to afford means for prying the hopelessly mired wagons out of the mud. The soil is (much of it) called adobe soil, possessing the peculiarity of clinging when wet or damp, to any object with which it comes in contact. The writer has seen a light buggy, hopelessly wheel-locked by the vast accumulation of clay that adhered to the wheels, until the mass assumed such proportions as to become wedged between the wheels and the bed of the vehicle. This is largely owing to the absence of sand in the soil; it also tends to prevent the rapid evaporation of moisture. These peculiar moisture conditions, when considered with the fertility of the soil (it being especially rich in nitrogen, potash and phosphoric acid), explain very obviously the attraction to live stock found in the abundant plant growth in ordinary seasons.

These rich and nutritive grasses, sun cure and make quite as good stock food as the best of hay cured under artificial conditions. Cattle go onto these lush, natural meadows, covered with tender, succulent range grasses, early in the spring, after they have been on short commons for many weeks, many of them being perilously near that condition known to Eastern and Southern stock men as "on the lift" (namely, so poor and emaciated that when they lie down, they require assistance to regain their feet), their digestive apparatus no doubt impaired by the lack of the right kind of food, the hair starting from exposure to the inclement rain and snow storms of the late winter months, almost every bone in evidence. The young and tender green grass is at first relaxing in its effects, but they speedily regain their strength and flesh and often by the middle of July are in prime beef condition. This flesh grows firm and hard as the summer waxes and wanes, and by the time frosts come they are in prime condition for the Eastern markets and stand the long railway shipments much better than would be supposed.

There are physical characteristics of the country to be taken into account in the matter of selection of what would naturally be supposed to be the bleakest and most inclement region in Montana. It is a well known fact that well-fed cattle will never succumb to cold; it is the animal weakened by starvation which falls a victim to the blizzard.

These high-lying plains are wind swept as are but few regions of the continent. This wind is the key to the cattle and sheep situation. The snow which one year with another falls to a depth of eighteen inches, would be an insuperable bar to the winter range business, cattle will not paw away the snow to get at the herbage lying underneath (in this respect horses are much more independent than cattle), and unless the major portion of the range was cleaned of snow they could not get to feed. Then, too, this region is frequently visited by chinook winds, that will lick up snow twelve inches deep in a night and lay bare the plains; a most singular fact with the chinook wind is that but little moisture is left on the ground, it being literally borne away on the wings of the wind.

This county has within its boundaries, in addition to the three named important streams, perhaps 100 tributaries of the same. Many

of them flow into the Missouri, and it is especially the case that these streams cut a channel down through the alluvial soil and drift gravel in the same way that the main stream has done. These deep cut channels, together with the side streams and draws tributary to the smaller streams, make many so-called "cut banks" and "bad lands" formations. In these oftentimes the banks have as acute angles and as perpendicular walls as does a barn and these miniature canyons are a great protection from the wind storms, to cattle that drift therein to escape the severity of the storm.

The best agricultural lands are found along the valleys and the smaller streams, notably those of the Teton, Marias and Milk rivers.

Already large partnership ditches are being operated along the Teton and Milk rivers, and others are projected to be constructed in the near future. The area of lands apparently adapted to irrigation is greater than is usually supposed, and this fact coupled with the remarkable productiveness of the soil, once it is placed under irrigation and the proper system of cultivation, has the effect of doubling and often quadrupling the farm areas, as such acres produce double at times and fourfold the usual farm acre of the United States.

Then, too, the broken general character of the country, by draws and coulees, which are nothing but wet weather water channels, give the best of opportunity to reservoir the surplus spring floods and to hold them back until the moisture will give the best results.

Farmers and ranchmen are beginning to study closely the possibilities of thus storing water and to take advantage of the many favorable locations Choteau county gives for crop production.

There is a growing conviction in the minds of stockmen, especially to flock masters, that it is a prudent measure to provide forage for the stock, sufficient in amount to tide them over the occasional stormy periods, when from depth of snow or when it is crusted they are unable to rustle feed for themselves. This necessity is the ground work for extensive farm development, and already in many parts of the range country the stockman and the ranchman, formerly "at outs" with each other, are now working in harmony, the consideration being the financial relation existing between them.

So long as the vast bulk of the range country is practically above available water supply, by any present system, there seems to be no apparent ground for conflict over the occupancy of land.

So well organized are the cattlemen, and so perfect the system whereby the branded animal (no matter whether gathered by the owner or by another a thousand miles from the home range), is sold for the benefit of its owner, who receives the pay for the same through the stock association. This has done much to allay the friction between interested parties, and so long as there is more feed upon the range than can be annually consumed, just so long will peace and harmony prevail and vast sums accrue to owners by handling live stock under the open range system.

The country of the upper Missouri plateau has one great advantage over either the mountain region or that of the Great Plains country far to the east and south. Spring comes much earlier and it is possible to open up farm operations, oftentimes in February. This

is owing to the winds, that frequently sweep the fall plowed fields bare of snow as soon as it falls, or if such be not the case, they are subjected to the effects of the chinook. Fields thus worked and sown are green with growing grain many times before the Dakota fields can be touched, and the ground is covered with a rank growth prior to the May and June rains.

These come just as the growing grain needs moisture, and falling as it does on well advanced vegetation it does not waste from evaporation as it would where grain had but just sprouted. So marked are these effects that the average of the yield of the well-tilled unirrigated grain fields of Northern Montana is far in advance of these of the country at large. The use of water for irrigation has but fairly been started in Choteau county and there is certain to be a large development there of this interest.

Wheat, oats and barley succeed remarkably well, the leading hay crop as yet is blue joint, with timothy as a good second. Alfalfa, however, is destined to be the great forage crop. Under irrigation this is an enormous yielder, giving from four to seven tons per acre, and where the land is artificially watered, no man can afford to harvest but a single hay crop per annum.

It requires a magnificent yield of the annual hay crops, such as timothy, blue joint or red top to equal one and one-half tons, and when it is possible to treble or quadruple such yields by a forage crop which shows by chemical analysis to be far more stimulating to the soil than animal manure, it is folly to adhere to a system which has these for a basis. Then again, timothy is one of the most exhaustive crops upon land, and while the legumes (and clovers and peas) are adding abundantly of the most exhaustive chemical fertilizers—nitrogen—to the soil, the lands which are naturally very productive are steadily growing poorer under the depleting crop, timothy.

That certain poorly informed consumers of forage in the leading markets of Montana do not like to feed the clovers, and hence have affected their sale, should make no real difference to the farmer who is growing hay, for no matter what the price be that he receives, he cannot afford to sell off his hay except it be fed out upon the land on which it was produced; otherwise it is but a question of time, when the land becomes so impoverished as to be valueless for crop production. the injudicious cropping of the lands of the South Atlantic states, where it is estimated by good authority that 8 per cent of the total area of certain states have been abandoned from being so impoverished as to not be worth cultivation.

There is but little reason why lands should not be as valuable for all agricultural purposes at the end of a century of continuous cropping as when first redeemed from nature and placed under cultivation.

CUSTER COUNTY.

Custer county is the leading county in size in this state of large counties. Its eastern and southern boundaries, form relatively a half and a third of the eastern and southern boundaries of Montana, and its area is not far from 27,000 square miles. It is bisected into

two irregular parts by the Yellowstone river, and within the boundaries of this county more than twenty named water courses find their way into this river. Of these Powder and Tongue rivers are of great length, the others in large part originating within the county.

The county was named for the late Gen. Custer, who knew it well and whose last sad campaign was made within its boundaries. His remains lie under the monument erected on the Custer battle field.

Custer has not been recognized as a prominent agricultural county of the state, simply that its early history was identified with the open range live stock industry, and in the early days no attention whatever was paid to soil culture in connection with the live stock industry. This condition is rapidly changing and men are learning that it pays to effect live stock insurance by putting up hay for calves and weak cows through that part of the winter when snow may be too deep or too crusted to permit open grazing. In the early days of Montana, the only enclosures to be noted were round-up corrals or possibly a few acres found around the dooryard of the home ranch; otherwise the herds of cattle and horses, roamed the state over at their own sweet will.

Post and rail fencing was expensive, costing \$1.25 per rod, and was short lived. With the advent of the railways and sheep, barb wire was introduced, and this being followed by land leasing, it has grown to be the thing to fence extensive areas of public and private lands. Much of this is untilled, the object of fencing being to provide winter pasture for stock. The difference between open range and fenced pastures is very marked and may be noted for miles and miles, long past the point at which the restraining fences are discernible by the naked eye.

In a way the beginning of fencing has been the beginning of homes of the small ranchman and farmer. If pastures could thus be guarded, crops and meadows likewise could be protected from the all-devouring flocks and herds, and it was thus that farming has worked itself into the heart of the best grazing portions of the state. The old-time conflict between the big cattle outfits and the man of small means is practically ended. The owners of thousands of cattle and sheep learn that the care of their flocks tax them to the utmost, and that they can to good advantage contract with the farmer to grow hay at an agreed price per ton, to be fed out in winter, when feed is an object.

Reciprocity of interest is thus accomplishing that which promised to be an eternal difference productive of quarrels, dissensions and bloodshed.

The application of water in irrigation has shown that Custer county soil is responsive in cereal production, and that for root and forage crops it is remarkably well adapted. Alfalfa is destined to be the keystone to the new agricultural arch that is rapidly being erected. Custer farmers readily secure three and four crops of alfalfa, and he who has forty acres of this legume to the man and team is insured an abundance of work from the 15th of May until the close of the season, as the development period of alfalfa in these fertile lands under irrigation is from fourteen to twenty-one days, and about as rapidly as a cutting can be made, cured, stacked and the land irrigated, the field is again ready for the mower.

This section of the state offers great promise for sugar beet culture. The soil and climate are exactly adapted, and the season for sugar manufacture is ample in length.

Horticulture in the vicinity of Miles City is yielding good returns, and unquestionably it is only a question of time when the demand for fruit will be met from the home orchards and plantations.

An extensive United States military post is maintained at Fort Keogh, four miles from Miles City, while at Miles City is located the Reform School and the United States land office. This gives good opportunity for information relative to the selection of lands from the public domain.

There is much of opportunity in this county to warrant the attention and investigation of the home seeker.

DAWSON COUNTY.

Dawson county lies in the apex formed by the Missouri and Yellowstone rivers, a small part of the county lying south of the Yellowstone river and forming a part of the eastern boundary of Montana. It contains 13,194 square miles, with a population of 2,056. Much of the county consists of high, rolling plateaus, strictly pastoral lands and adapted to grazing. Perhaps twenty small streams empty into the Yellowstone from within the confines of Dawson, and the bottoms along those, together with the Yellowstone bottoms offer the only opportunity for practicing irrigation.

Remoteness from market is a bar to agricultural development beyond such as comes from a combination of summer ranging, and winter feeding of stock; this can be successfully prosecuted to the full capacity of the production of the soil; which is adapted to the successful growth of the cereals, grasses, clovers and fruits.

The altitude is about 2,000 feet above sea level, and is the lowest in Montana, rendering it possible to produce anything which is grown in the upper Missouri valley. This county will never be densely populated, except along the Missouri and Yellowstone bottoms, and the streams leading thereto. The interior of the county will always be one of the great grazing regions of Montana and the stock industry its leading one.

A steady change in methods is in progress, and the greater the herds, the larger will be the demand for forage for winter feeding. Montanans are rapidly learning that it is the height of folly to grow the raw product, i. e., the steer or mutton and to ship directly off the summer range, sending them down to the corn fields of the Western states to be metamorphosed into the prime, juicy cuts of beef and mutton. Such procedure is ruinous to the small Montana farmer, as it gives him no opportunity to market his feed, which is infinitely superior for the purpose to that grown in the humid states. It is not only bad for the farmer, but the loss from shrinkage in weights incident to the 1,500-mile car trip of the animal directly off grass, is very great and can practically all be saved when the animals are in prime condition from a diet of well cured hay and grain.

Then the saving in roughage. If the good, bright straw now burned by thousands of tons in Montana could be fed it would be a great saving to the farmers of the state, and better than all will be the beneficial effects to the soil of the added fertility incident to the winter feeding of 200,000 steers and 1,000,000 of sheep now annually sent out of the state to be fed elsewhere. When this becomes common procedure, tens of thousands of fertile acres in Dawson county, along the larger and smaller streams, will be reclaimed and made to produce bounteously of stock feeding material.

DEER LODGE COUNTY.

This county is extremely irregular in shape, is nearly 150 miles in length from north to south, and at its widest point is sixty miles and contains a trifle over 4,000 square miles. Mountain ranges have much to do with county boundary irregularities.

Travel is up and down the valleys of the water courses, and it is only upon emergency that the ranges, towering from 1,500 to 3,500 feet above water courses, are crossed.

In early days the valley of the Deer Lodge river and the willow thickets and copses bordering it and its tributaries were frequented in the winter season by white-tail deer in such numbers as to cause the Indians to term it the Deer Lodge. The adaptation of the country to the wants of the wild animals fit it likewise for domestic herds.

This county is a prominent sheep range, there being within its confines 100,000 sheep.

The establishment of the Lewis and Clark forest reserve cuts off nearly the northern half of the county for forest reserve, and as sheep and goats are not permitted to range thereon, this will have a tendency to curtail the development of the sheep industry. It is very hard to secure reliable data as to the cattle industry. These are on the range the major portion of the year, and not always where the inspector can secure a reliable tally; but there are large holdings of cattle in this valley. Originally, though lying comparatively high, it was a great grass country, but many irrigated farms have ceased to produce, simply that they are in the wake of the tailings from the great smelters located at Anaconda.

These tailings are pulverized waste ore, from which all of value has been chemically or mechanically removed, and the waste flows off down stream out of the way of the operators. So extensive has been the deposition of debris in this case, that this smelting company has acquired titles by purchase to thousands of acres of previously fertile land. It is understood the injury is caused by coating the land (oftentimes a deposit several feet in depth) with a silt so fine as to hermetically seal the land to the influences of air and moisture. Then, of course, plant food would be present in such material in very limited quantities; spite of this, vast quantities of the blue joint and timothy hay are harvested annually in the county, and it will always be a prominent pastoral section.

The city of Anaconda, the county seat, has a large and growing population. Here are located the smelters of the great Anaconda

Amalgamated Mining Co., with a capital of \$75,000,000, which give employment to thousands of men, and these in turn afford a fine market for farm produce. From mining sources within the county there are produced values of a quarter million dollars annually.

A future source of great wealth to this county will be found in her standing timber. Now that this has been reserved beyond the reach of the lumberman, it will be harvested economically, prudently and judiciously, and the state and county will be infinitely better off in the long run for such reservation.

In favorable locations along the lower lying valleys the hardier fruits and small fruits are succeeding well, and give promise of adding to the attractiveness of the country home.

FLATHEAD COUNTY.

This county was named from the Flathead tribe of Indians, the most enlightened and progressive of all the tribes. Flathead is the northwestern county of Montana. Its population in 1890 was 5,000, and its area about 7,000 square miles; hence there is no immediate danger of its people being crowded for room. The county is mountainous in parts, the main range of the Rockies forming its eastern boundary, paralleled in the southeastern part of the county by the Kootenai mountains; the Mission range forms the southwestern boundary; on the northwest is the Purcell range. In the south central part of the county is Flathead lake, the largest body of water in the Rocky mountain system. Its length is about fifty miles with a maximum width of twenty-five miles; it is very deep, and so large a body of water exercises a powerful influence upon vegetation, this is particularly true as to spring and fall frosts. No data of the United States geographical survey are available, but we have reason to believe that there is no other county in Montana or in the United States that has passing through its borders so large a volume of water.

The Yakt river crosses the extreme western part of the county, flowing into the Kootenai, which is a very large stream. Entering the same stream near Kalispell (the county seat, which is quite centrally located) are the Maple and White Fish, these being tributaries to the north fork of the Flathead river, which is joined by the south fork of the same in the near vicinity of Columbia falls, twelve miles north of Kalispell; while entering near the head of Flathead lake is the Big Fork or Swan river. Flathead lake is an expansion of the river of the same name, and to the Eastern tourist these streams are all very striking from their grandeur and magnitude. The waters of this county carry the color peculiar to Niagara on the rapids above and below the falls, and this deep sea green color, coupled with the depth, width and rapidity of current, make of them mighty water courses indeed.

The agricultural lands of the county lie mainly in the central part and on either side of the Flathead river; the valley proper is about fifty miles in length by twenty-five in width. One peculiarity of this valley is that much of the finest of the agricultural land is or was covered with very heavy pine, and as this is cleared away in the commercial use of the timber, which is of the best in quality, the

lands are rapidly brought under cultivation and produce amazing crops of the cereals, roots, grasses and fruits.

The climate of Flathead county is unlike that of any other part of Montana; surrounded as it is by lofty ranges of mountains, some of which are thrown in a northerly and southerly direction across the county, and lying (the level lands) at an altitude ranging from 2,300 to 2,800 feet above sea level, the conditions are very much more humid than are to be found elsewhere in the state. The snowfall is much deeper in winter and lies longer upon the ground. This county has never been used as a winter range country and as a consequence, settlement by small ranchers has been more active than upon the cattle and sheep ranges to the east.

Again, the rainfall is usually greater in the growing season than in the case of sections of the state lying higher and with less mountainous environment.



RAISED IN THE FLATHEAD.

Something, however, has been accomplished in the line of irrigation, and where tried the results have been most gratifying. It might be presumed by the uninformed that the location of this county so far to the northward would make it inclement. Such is not the case. The coldest weather experienced there in '98 and '99 was 18 degrees below zero, and this extreme lasted but four days.

Whether it be the ameliorating influences of mountain environment, the prevalence of the chinook winds, or the comparative nearness of the Pacific Ocean, it is a fact that winter climatic conditions

are very much milder generally in Montana than is the case in any of the country lying in the same parallels to the eastward. Proof of this is given to the horticulturist in the character of the fruit succeeding here. Plums, not those of the Chickasaw type found in the Mississippi valley, but the varieties common to California and New York, the gages, egg plums, damsons and prunes are doing remarkably well, whilst cherries, pears and peaches give abundant promise of successful fruiting.

Projects will in time be planned and performed which will place 1,500 square miles of the arable lands of this county under irrigation, and thus the productive capacity of the soil be increased at least $33\frac{1}{3}$ per cent. They will be costly, however, owing to the magnitude of the streams from which water must be taken, it will be decidedly more expensive in diverting the water from the streams in passing canyons, and over broken lands and these operations will require the hearty co-operation of the farmers and the capitalist as well.

The neighborhood of the vast mining districts of British Columbia, as well as those of the county, which are most promising, both in the precious metals and of coal of most superior quality, will create a favorable market for agricultural products. This county is at present traversed only by the lines of the Great Northern railway and while the Flathead farms are 700 miles distant from the mining regions of Butte, Anaconda and Helena, this line with commendable foresight is giving to its farmers a freight rate which permits them to enter these markets on the same footing with farmers not 100 miles distant.

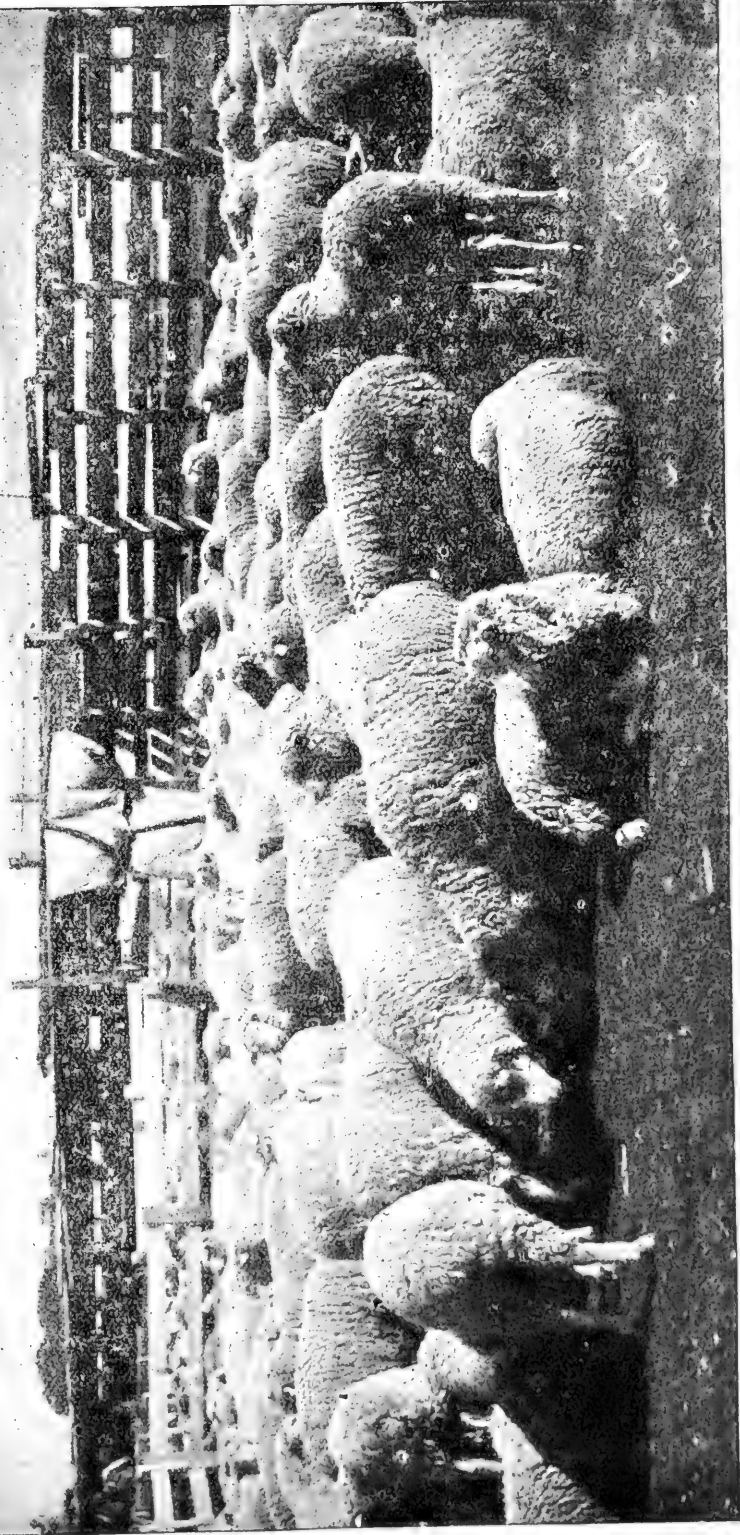
The Flathead and the Kootenai valleys have great agricultural futures ahead of them and are destined in the near future to become wonderful producers.

FERGUS COUNTY.

Fergus county occupies the geographical center of Montana and a large part of its area is known better by its local name, the Judith basin.

This is the banner sheep county of the state. For many years this was a leading cow county, but the dry season of 1890 and the encroachments of the sheep men caused the large cattle herds to be moved northward across the Missouri river, into the extensive plateau lying between the Missouri and Milk rivers, so that the cattle now on the range in this county represent the herds of the small rancher rather than those of the big cattle outfits. It has also been found profitable to fence extensive areas of this section so as to save the grass for winter pasturage. This custom of protecting the range by fencing is growing to be very common in all of the open range country in Montana and is a great aid to the range industry. Many stockmen turn cattle out on the open range early in the spring, as soon as calves are branded, and permit them to run at large until the beef round-up in the fall, at which time late calves are branded and cows and calves brought inside the fenced ranges for the winter.

An excellent idea of the utility of this plan may be gained by observing the difference in the feed or grass within the fences as compared



READY FOR SHEARING.

with the open or unfenced areas. So marked is this difference in the size and density of the plant growth that one can observe the difference for miles, the lands which have been open to range stock through the summer look brown and destitute of vegetation, while the fenced tracts show a luxuriant growth of vegetation, sun-cured to a rich golden color.

Both cattle and sheep men pursue the plan of fencing for winter pasture, though it is more difficult to restrain sheep within fence than cattle, and the loss to wool is not inconsiderable where sheep are exposed to barbed wire fencing. Fergus county is the only Montana county not traversed by a railway, and this has had its effect upon the agricultural development, as the distances over which farm products would have to be transported were prohibitive. This also has had its effect upon the extension of the stock industry of the county, as it is quite a common practice to drive sheep from fifty to one hundred miles to the railway shearing pens to save the wool haul.

Cattle and horses are also easily moved on foot, and so the production of the cereal and forage crop have been only such as can be handled in home consumption.

Again, while Fergus county has a larger area of practically level land than any other Montana county, it being a high level plateau, the supply of water is in no wise commensurate to the requirements, were all the arable lands to be brought under cultivation. The only available source of water supply, other than such as could be reservoired from the mountain gulches, being the Judith river and its tributaries. The former is a stream of considerable length, perhaps 100 miles, and it frequently happens that all the water is diverted, leaving the bed bare and dry, within the first 25 miles from its head.

Below the mouths of Spring and Warm Springs creeks there is a large volume of water supply by these streams and by seepage from these points to the mouth of the Missouri there is a large supply of available water and extensive areas of desirable farm lands, that can be easily irrigated.

GALLATIN COUNTY.

Gallatin county lies well to the southwestern corner of the state, there being only two counties, Madison and Beaverhead, between it and Idaho. It forms a portion of the southern boundary of the state and for a short distance a part of the northern boundary of the Yellowstone National Park. Originally one of the largest counties of the state, it has been divided and subdivided by legislative enactment until but a tithe of its former dimensions remain, but the one central thought has always permeated divisional legislation, that of preserving intact that matchless area of farm lands, the Gallatin valley. This is not a large tract; perhaps 1,200 square miles would comprise the valley proper and the surrounding bench land, while the remaining 1,095 square miles of its total area is composed of mountain ranges (rich in coal and timber), and more valuable agriculturally as constituting a continuous line of fencing 2,000 feet high around the east-



5,680 BUSHELS OF BARLEY, RAISED FROM 80 ACRES OF LAND, PRODUCED UNDER IRRIGATION.

ern, southern and western boundaries, while the horseshoe hills with an average altitude of 1,000 feet give valuable protection from the raw winds which sweep over all unprotected Western areas. But more important by far is the mountain environment in the matter of insuring an adequate supply of water from the winter snows, which are here conserved until the heat of mid-summer releases the moisture in time to be of greatest benefit to vegetation.

If a giant left hand were to be planted upon the map, the point of union with the wrist at the three forks of the Missouri, the fingers widely spread apart and the middle fingers pointing due south, the relation of the various main heads of the Missouri, would be quite well represented, the thumb standing for the Jefferson, the index finger for the Madison, and the middle finger for the true Gallatin, while the remaining two would stand for the East Gallatin and main tributary, Bridger creek. Imagine that the palm of the hand spanned across thirty miles of plow land and that the middle finger was 100 miles in length, the others being in due proportion and a fairly correct idea would be obtained of the relation of the water supply to the tillable lands of Gallatin county.

While there are older tilled areas in Montana than the Gallatin, there are none in which there is so much to show for agricultural factors in deciding its relative agricultural progress has been the very choice and desirable grazing lands and the absence of any of the precious minerals in the mountains in its close proximity. This has necessitated the attention of its settlers to farming and stock growing. Then, too, for many years a large cavalry post at Fort Ellis was maintained, and this in its day called for immense quantities of hay and grain. Later the extension of the main and branch lines of the Northern Pacific railway into the thriving cities of Helena and Butte brought within 100 miles of the valley two of the most desirable markets for agricultural produce within the state. The first grain grown in the Gallatin was in 1864 by Geo. J. Thomas; the following year John W. Nelson procured some seed wheat from the Bitter Root and from this seeding produced 250 bushels of soft wheat. Soon thereafter it was noted that oats succeeded equally well, and so actively has grain farming been prosecuted that the Gallatin valley has easily stood at the head as the source of supply for grain for years.

Coover & McAdam built a custom mill at Bozeman in 1865.

In 1867 Penwell & Co. built the Union mill.

In 1866 Judge A. Davis and others built a mill at Gallatin City.

In 1884 flour milling was commercially instituted by Nelson Story and in 1892 the Bozeman Milling Company was organized; these furnish market for 2,500 bushels of grain per day, and with the introduction of the latest improved milling machinery, the production of hard spring wheat has been greatly augmented.

In 1893 extended tests and analyses were made of the two-rowed barley produced in Gallatin county and its quality found to be such that a special bulletin was issued by the official organ of the brewers of Berlin. So much notoriety was achieved by this advertising that the crops of 1896 and 1897 were absorbed by German brewers at a price almost double that of the best barleys of the East.

The impetus thus given to grain production has called for the use of all desirable irrigable lands in the valley and the area on which spring-grown grains can be produced has been materially enlarged by relegating all winter grains, wheat and rye to the foot-hill farms, or high plateaus, which, while lying above the territory to which water can be profitably conveyed artificially, still receive sufficient moisture from the more abundant snow and rainfall of winter and early spring to mature exceedingly profitable grain crops. Upon these dry farm lands summer fallowing in alternate seasons is practiced to excellent advantage. The normal fall of the land from the mouth of the main canyons of Gallatin valley, Bridger, Bozeman, Middle creek, Cottonwood, Bear creek and the West Gallatin to the Three Forks of the Missouri is about seventy-five feet to the mile, and water consequently passes rapidly over the fields.

This has taught the farmers the importance of fitting the land in the best possible mechanical condition for the application of water. Lands are largely summer fallowed, i. e., summer plowed and it is the practice of the best farmers to cultivate these fallowed fields during the summer, some using the disk and others a weed extirminator; the result is that in spring the land is rapidly reduced to a mellow, friable condition, and much pains taken to bring the surface of the fields to a uniform plane or grade. Various implements are used—clod crushers, graders and levelers. Leaving dead furrows, back furrows or the previous year's ditches apparent on the surface of the grounds is never practiced; these interfere materially with future irrigation and detract in general from the appearance of the grain fields. In my experience of nearly a quarter of a century in the great grain farms of Wisconsin, Iowa, Minnesota and the Dakotas, it is my opinion that very much better farm methods are employed in the irrigated West than in the states named.

Evidently in prehistoric times the present arable lands of Gallatin county were under water, the dam confining the same being not far from the present head of the Missouri river, near the town of Three Forks. As the chasm in the rocky barrier was rent, to permit the escape of the waters forming this immense inland sea, the action of the waters was more positive in cutting to bed rock near the point of exit. As one progresses northward from Three Forks, the depth of the alluvial soil increases until the most fertile soils of the valley, and those of greatest depth, are encountered about midway between Three Forks and the Gallatin range. These lands are traversed by numerous streams, prominent among which are Bear, Cottonwood, Middle, Bozeman (or Sour Dough) and Rocky. Smaller streams are Bear canyon, Lime Kiln and Leverich; these streams all rise in the northern slopes of the Gallatin range, which has an average altitude of about 5,000 feet. The divide between the Gallatin and the Yellowstone is very sharp, and the snow deposited upon the north slope of the Gallatin range either falls in heavily-timbered regions, or else in sharply broken country, with the result that it does not melt so rapidly as if it were on high levels or on a northern slope.

Streams rising on these slopes seldom attain their maximum height of run off until about the 10th or the 15th of July, a time in

which irrigation is at its height. This results in an abundance of water for the first irrigation of grain, hay and clovers, and as the general average for irrigation periods in this valley is known to be about $1\frac{1}{2}$ times, it may readily be seen that the water supply of the major portion of the valley is more than ample in a season of normal moisture precipitation. Then, too, it is desirable at the time of the greatest irrigation activity that there be such a supply of water in the main streams as to equal the carrying capacity of the ditches taken out therefrom, as under these conditions it is possible for one to accomplish double what they would if working with an insufficient head of water.

That this has not always been to the best advantage of the soil, is shown by the rapid silting over of rocky swales or sloughs. Many of these old water channels, from two to five rods in width, traverse the country between the main streams and have been used by farmers as waste water channels. The beds of these are usually composed of small boulders, gravel and sand, and in many sections of the county these swales have been coated with a deposit of silt to such depth as to make them fine hay lands; this silt has been borne in solution from the higher lands and is occasioned by working too rapidly with a large volume of water, so that, usually, the farm lying next below is the one to receive the benefit of this increment. This must be avoided in the near future else very serious detriment will be sustained by the best grain lands in the county.

An unused source of idle capital exists in Gallatin county, in the surplus waters of the West Gallatin. There are large areas of untilled lands, mainly owned by the Northern Pacific railway, near the center of the county to which this water is readily transferable, and once this is under cultivation and irrigation, a notable improvement in crop production will be experienced.

The most reliable water rights in the county are those drawn from this stream, and that they are so, is from the unappropriated water therein. There are no grave engineering obstacles to be overcome in such transference, but the proposition is too large for the individual, or even the usual neighborhood corporation which has accomplished so far nearly all that has been done in this valley along the line of irrigation.

GRANITE COUNTY.

Granite county contains about 1,000,000 acres of land. To only a tenth part of this, however, has titles been acquired. The county is among the most mountainous in the state, there being but three valleys of considerable size, Flint, Willow and Hellgate. Hay crops are the leading farm products. Its mineral products are the leading sources of wealth. The output for 1899 was about \$3,000,000, mainly from the Granite Mountain mine and the Bimetallic, both located at Granite. These are silver properties and are paying under extremely adverse conditions. That such an amount of tangible wealth is added from the resources of a single county under existing conditions, is remarkable and should call the attention to the possibilities of the better

development of the farming region tributary to the mines. Much of the western part of the county lies toward the Pacific slope, with attendant mildness of climate.

Early settlers looked alone to the values of the low-lying valleys immediately bordering the streams as sites for houses and farms, for it is in such cases possible to conduct water out of the streams onto the bottom lands by individual effort at a nominal expense. These represent by no means the utmost possibilities of farming. Any tract of country lying as does Granite in the heart of the mountains has many available reservoir sites, where flood waters may be safely and economically stored far up above the natural level of the streams; again these sites will command extensive areas of open bench and park lands, usually the richest and most durable of all soils. These can be safely put to cultivation to the cereals and forage crops, as well as to orchards. These elevated sites are not frosty and will prove to be extremely valuable for farming purposes. A trip to Vermont or New Hampshire would show the possibilities of these upland plateaus if opened up and farmed.

Winter grain crops will be found to be very valuable to the farmer of the highlands, and one year with another a fine crop can be grown without irrigation. Rye and wheat succeed remarkably well, and winter wheat grown in Montana without irrigation is very different in milling character from the soft wheat of the humid states.

It is hard for a novice to understand that a mining claim, usually about 600 by 1,500 feet, is but a huge factory, save that its armies of laborers are employed in shafts, corridors, chambers and levels underground, instead of being at work on the surface, within walls of brick and stone; also that relatively, much more help must be employed than in the ordinary factory, that wages are from 50 to 100 per cent higher and the recipients of the daily wages are in much better condition to be liberal patronizers of the producer. These are cogent reasons why the outcome of the mineralized mountain state will in the future be relatively immense, as compared with that state whose home market is based on a poorly paid constituency.

JEFFERSON COUNTY.

Jefferson county receives its name from the Jefferson river on its southern boundary; this, while one of the main sources of the Missouri river, is the shortest principal river, probably, in the United States, as it is, all told, less than one hundred miles in length.

Jefferson is one of the mountainous counties, very broken and hilly, with but two principal valleys—the Big Prickly Pear and North Boulder. These streams rise about the central part of the county, the one flowing north to the Missouri river and the other south to the Jefferson.

The area of farm lands is consequently limited, there being of the million acres in this county only about 25,000 acres to which title has been secured. With the establishment of reservoirs, or a high line canal, tapping the Jefferson in Madison county, a large area of land could be brought under cultivation, lying in the vicinity of White-

hall on the north bank of the Jefferson river. This will eventually be done and a choice body of farm lands thus opened.

Grazing lands are extensive and many cattle herds of from 300 to 500 head are reared and ranged in the county. As a rule, the south hillsides are bare of timber and offer fine pasturage for cattle and horses. A peculiarity noticed in this state, especially the mountainous sections, is the agility manifested by live stock in traversing the steep mountain sides in search of food. One oftentimes sees live stock grazing in comfort on hillsides, apparently inaccessible to any creature that does not wear wings.

Study the face of the precipitous slopes and it will be observed that they are paralleled in all directions by trails made, no doubt originally by the wild herds, and now used by cattle and horses. It would be a physical impossibility to coax or drive a state's animal into many of these locations. It is a matter of education and brings into valuable use a large proportion of grazing lands that otherwise would be unavailable.

The farm lands of this county, though limited, are exceedingly productive. All cereals thrive and yield satisfactorily, while alfalfa, clover and timothy succeed well. All leading root crops are also profitably grown.

The leading industry of this county is mining, and always will be. The value of the mineral output in 1899 was \$1,500,000.

The county seat, Boulder, is the site of the Deaf and Dumb asylum, while near by is a famous, highly improved health resort, Boulder Hot Springs; on the southern side of the county are Pipe Stone Hot Springs. These possess high medicinal qualities, largely supported by guests from Butte. There are also valuable medicinal springs at Alhambra, near the north central part of the county, much frequented by citizens of Helena.

LEWIS AND CLARK COUNTY.

This county is historic ground. The city of Helena, the capital of the state and the county seat of the county, is located on the third largest and most productive placer camp of the state. "Last Chance," "Alder Gulch" of Madison county, and "Confederate Gulch" of Broadwater county, being relatively the first and second gold placer camps in importance.

Helena is the center of the live stock interests of the state, many of the owners of the large flocks and herds being residents here. It has railway connections with east and west, north and south lines; situated fourteen miles from the Missouri river, it has electric connections therewith, a dam costing more than a million of dollars supplying the generating power. This supplies power for street car lines, light and heating, as well as mechanical power, and is also the power used in the extensive smelting plant of the United States Refining & Smelting Co. of East Helena, six miles distant.

The county is named for the commanders of the United States government overland expedition, which passed from St. Louis to the Pacific ocean in 1803-1805. In passing westward they used the Mis-

souri river as their route, while on their return a part of the expedition crossed the Rocky mountains about midway of the county, over a pass known as "Lewis and Clark Pass."

This county is the financial center of the state, and Helena prior to the panic of '93 was universally known as the richest city of the United States.

It is still extremely wealthy, and is making rapid strides toward its former broad financial position.

Three hundred and fifty thousand acres of the million and a half acres constituting the area of Lewis and Clark has been proved up and become assessable land. Much of this is grazing land, and a large part is farmed by irrigation. There is a vast quantity of available water for irrigation, but to get the full use and benefit there will be great expense involved in conducting the water of the Madison river one hundred miles or more to the valley of the Big Prickly Pear. These lands are finely adapted to agriculture and will eventually be irrigated and tilled. Once the earnest attention of capitalists is drawn to the future agricultural possibilities of Montana under irrigation the state will receive a mighty impetus from the development of her arid lands. In no state in the Union is there such a present low value placed on farm lands. It is estimated on reliable authority that there is water in Montana streams adequate to the irrigation of 75,000 quarter section farms, and a water right in Southern California for 160 acres has a value of \$15,000. On this basis the water of Montana is worth one billion one hundred and twenty-five million dollars. Equally reliable data places the application of water to the lands of the state (12,000,000 acres) at a trifle less than \$100,000,000, or about \$7 per acre. In other words, at an expense of \$1,120 the Montanan secures a water right worth to the Californian \$15,000.

Nature has indeed been kind to the Montanan in placing within his reach a natural heritage of such inestimable value. But it may be said the Californian will use his land and water in the production of crops that will afford this heavy outlay. We answer this: The Gallatin county farmer has repeatedly harvested crops that have been sold for \$30 per acre gross, and we submit that a crop that will yield a gross income of \$4,800 per annum can afford to pay interest upon a fixed investment of \$15,000 and still be profitable to the owner.

The farm irrigated lands of California, Utah, Colorado and Wyoming have a fixed tangible value of about \$100 per acre, and the land owner of Montana has a reasonable right to consider that if his lands are equally productive and the supply of water as reliable, that once this is understood, that his lands will command quite as high a price as do other irrigable lands.

Lewis and Clark will take high rank as an agricultural county. The soil and climate are adapted to the productive yield of the ordinary fruit crops, cereals, root crops and the great labor centers of Helena, East Helena, the military fort at Fort Harrison and the mining camps will insure a good market.

Lewis and Clark mining output for '99 was a million and a half dollars, principally gold.

The Broadwater Natatorium is a remarkable structure. Hot water is conducted in underground pipes for several miles and is emptied into the largest artificial plunge in the world, more than 100x300 feet. This is inclosed in a very striking building of Moorish architecture and is an ideal bathing plant. The plunge and hotel in connection cost about a half million dollars, and are situated in a delightful spot.

Nearly half of the total area of the county is included in what is known as the Lewis and Clark forest reserve. This reserve will have but little effect upon the lands of this county, in the way of insuring protecting cover to the winter snows, but it will be of inestimable value to the farm lands of the adjoining counties of Teton and Cascade, and eventually it will be very valuable to Lewis and Clark in that strict government supervision will be exercised in harvesting the standing timber, and in guarding from the ravages of fire.

MADISON COUNTY.

The nucleus for permanent occupation of this county was made in days when Montana was not, and this present state was a part of Idaho.

The golden sands of Alder gulch, a little tributary of what was then known by the euphonious name of "Stinking Water," now as the "Ruby," was the attraction and it is said that there was a community of 10,000 souls strung out along a space of three to four miles in length, the gulch being a very narrow one. The city was housed in rude shacks and tents and eventually the towns of Nevada City and Virginia City were founded; the former has no longer even a post-office, the inhabitants still there, going to Virginia City, two miles up stream for their mail.

Virginia City is noted as being the first place in the state where the law and order party was able to make a stand against the era of bloodshed and robbery then so flagrantly common. It is estimated that \$100,000,000 in gold dust was taken out of Alder gulch, and that the revenue from the old placers has been in recent years over \$100,000 per annum. This is principally obtained from ground overlooked or considered too poor to warrant working at the then high prevailing rates for labor and supplies. In those halcyon days all supplies came into the country from Utah and men could not afford to leave their golden harvest to indulge in prosaic farming.

Year by year the farmer and truck grower, the cowboy and the shepherd have taken the place of the miner, until today the farm lands readily susceptible of irrigation have been taken up and made productive.

Of the 2,000,000 acres constituting her domain, more than ten per cent, about 350,000 acres, are owned by individuals. This indicates that there are extensive tracts of arable and grazing lands within her borders, and would represent 2,125 farms of 160 acres each.

Madison has a high altitude of from 4,000 to 6,000 feet, but nevertheless the scope of farm productions is extensive, embracing all the common cereals, root crops, the various forage plants, alfalfa, that

most wonderful of all the grasses is in all its glory here), and large areas are sown to alfalfa to be converted into beef and mutton. That alfalfa does so well on the wind-swept benches lying from fifteen to thirty feet above sub-water is that the tremendously deep-rooting system of this plant finds its way through all intervening strata of soil, gravel, sand, loam, clay, etc., to the permanent water table, from whence the moisture supply is pumped up to the crowns and stems, therefore the older the alfalfa meadow, the less water it requires from surface irrigation. Consequently, the man with a well-established alfalfa field will each year require to apply less and less water, and the surplus will be available for other lands and crops. It was in Madison county that the discovery was made that the native forage plants do not alone possess the property of laying up their generous store of succulence and nutriment in the sun-dried plant, but that the alfalfa plant, permitted to stand uncut until winter, has rare fattening qualities. This policy is not advised, but there may be conditions where it will be of value, notably where alfalfa is self-sown in sage brush land, so as to preclude harvesting by ordinary means. In the northern part of this county there is an extensive scope of open bench land lying between the south Boulder range and the Jefferson river that is an ideal region for the orchardist and truck gardener. The soil is a warm, sandy loam, the protection from the eastern sun is perfect and the physical formation of the country is such that the canyon breezes, working always from the higher to the lower levels after sundown and reversing the direction after sun up ward off the danger to vegetation from frosts. In this locality tomatoes and melons are ripened, while standard apples, grapes, plums, cherries and all the small fruits do grandly.

The county has a mineral production of three-fourths of a million dollars a year, and this is a wonderful stimulus to agriculture, as miners must eat, and their larders always contain the best that is to be had for money. The proximity to Butte, together with good railway systems and good wagon roads across the mountains, open up a vast trade with this great hive of human workers.

Madison has a great agricultural and horticultural future ahead of it, and opportunities are as abundant and promising here as in any other part of the state.

MEAGHER COUNTY.

Meagher county, divides with Fergus county, the honor of being the geographical central county of the state, and has long been recognized as one of the leading grazing counties. Its western boundary is formed by the Big Belt mountains, the leading outlying spur or range from the main range of the Rockies, which it parallels; its northern boundary is largely formed by the Little Belts; while the Elk mountains, an isolated smaller range, almost in the center of the county and the Crazy mountains, which lie to the southern line, give to the general plane of the country a broken surface, abounding in foot hills and small, attractive, fertile valleys leading therefrom which make ideal home sites. Meagher county was originally settled by

miners, there having been within its original boundaries one of the most famous of all the famous placer gulches of Montana, Confederate gulch, from which gold dust and nuggets were taken by the six-mule load, the winter work of four men. So successful were the settlers of this valley, first in mining, next in stock growing, that a recent census of the county showed a per capita wealth of every adult male of \$4,400. Much of this enormous aggregation of wealth is due to the fact that it is a physical impossibility for the farmers and ranchmen to produce grain for sale, as until within two years, much of the county (the valleys of Smith and the Musselshell rivers), was from 45 to 75 miles from the railway. As a consequence they have marketed their grain on foot, that most successful method, by feeding sheep and cattle.

The county seat, White Sulphur Springs, has an elevation of almost 5,000 feet and derives its name from hot springs located there, which are widely and favorably known for their curative properties.

White Sulphur Springs is a jewel spot upon nature's fair face. Thirteen warm springs, dotted over an area of perhaps two acres in extent, boil forth at varying temperature. Much has been said and written, and we believe most truthfully, of the notable cures that have been effected by these waters. A most singular and interesting fact is, that these sulphur springs were extensively patronized by the Indians for centuries before the advent of the white man, as well as since his possession of the land. The great feed grounds of the buffalo extended originally from the point of intersection of the main range with British Columbia, one-fourth of the way from the west to the east boundary, extending southeast from this point to a point a third of the way distant from the eastern boundary of the state to the western. Three-fifths of this vast state was at one time range for the buffalo, the elk, antelope and deer. Many Indian tribes resided in the mountain valleys in the western and northwestern parts of the state, cut off from communication with the east side by the mighty natural barriers of the main range of the Rockies and to get over these and into the general hunting ground, the various natural passes were used. One of the most common of these was that known as the Flathead pass, leading out of the northeastern corner of Gallatin valley, near its eastern part, over and into the valley of the Musselshell, which in turn flowed hundreds of miles through this natural game park into the Missouri. Not far from the headwaters of the Musselshell lie the White Sulphur springs, and the Indians of the tribes of Flatheads, Jockos, Nez Perces and others, oftentimes at war with each other, tiring of their almost exclusive fish and berry diet, would plan a summer excursion down into the game region, and tepees and contents, warriors, bucks, women, papooses, dogs and ponies would move in a long caravan down to the open plains country. Invariably they would plan both coming and going to stop some days or weeks at these wonderful springs to give their invalids a chance to be cured of the diseases to which they are so subject. The Indian (in blanket and moccasin) suffers greatly from exposure. The skin or canvas tepees are neither conducive to good health nor cleanliness, they are very liable to disease and the

need of a sanitarium for the afflicted was so great that by common usage the camping grounds around White Sulphur Springs were neutral ground.

Old-timers tell us that here, camped in close proximity, would be found in peaceful possession and enjoyment of the great medicine waters, tribes and parties which away from there would cut each others' throats without the least compunction. Two points are impressive in this connection; first, the value of the waters medicinally secured; second, the inherent right to enjoy undisturbed this valuable boon of the Great Spirit, the curative waters.

A valuable lesson is given to other corporations by this little, thriving mountain village, by its ownership of its system of water works, the only instance of the kind in the state where a town has constructed and owned its own plant.

The leading agricultural valleys, in which more than a half-million acres of land are now under cultivation, are Smith river and the Musselshell. One peculiarity of Smith valley is that the stream has two names, from its head, some fifteen miles south of White Sulphur Springs, to the point of egress from the Canyon of the Little Belt mountains, a distance of perhaps fifty miles, it is known as Smith river, below this point to its mouth, opposite Cascade on the Missouri river, it is called Deep creek, a seeming perversion of ordinary geographical rules of nomenclature, as creeks are supposed to form rivers and not vice versa. This stream is a leading tributary to the Missouri. From the south side substantially all the waters of Smith river are appropriated and used between its head and the mouth of the first canyon, some twenty-five miles north of White Sulphur Springs, it being no infrequent occurrence in seasons more than normally dry for the bed of the stream to be dry. No doubt a great aid to a better water supply could be experienced were the side gulches leading from the mountains to the rivers reservoired, thus holding in reserve the surplus waters which now pass off in spring floods: doubtless there too are many locations along this stream where it would be found practical to cross section the bed of the stream from rim rock to bed rock with a trench in which a dam could be constructed of stone and cement, which would bring to the surface and permit to be used, the large underground flow which passes off and out of the county in the deep strata of gravel and boulders which fill this section from the upper surface of the bed of the stream to the lower levels on bed rock.

This has never been undertaken in Montana to our knowledge, and, while it might not prove to be practical, yet there is no better field for such an experiment than is to be found in this valley.

This valley is among one of the highest in the state, and there is some question as to the success of certain of the cereals which thrive so remarkably well in the lower lying valleys of the state. The principal crops grown are timothy and alfalfa for forage plants, the latter being the leading crop of the county, while the culture of alfalfa is just beginning with most gratifying results, and the promise of giving at least two No. 1 crops annually. Red top and blue joint also do well; oats is the leading crop in the cereals, there being no local market for wheat and barley; potatoes do well, except at rare intervals.

The hardier apples and crabs are successfully grown and in no part of the state do the small fruits succeed better. The recent construction of the Montana railroad from the Northern Pacific railway, at the mouth of Sixteen-Mile creek, to the near vicinity of the famous silver and lead mining camp of Castle, has given a new impetus to agriculture, and it is confidently expected that in the near future this remarkable mining camp will be alive with its old-time vigor.

Perhaps eighteen miles east of Castle, the river passes away from the environment of the Little Belt mountains, which form its northern watershed into a broad, open, rolling country (very favorable to stock 'grazing) on to the valley proper, which is capable of irrigation, where it broadens and thus renders it possible to farm large tracts of land, now used solely for grazing. These two valleys form a natural route for a railway, and with such a potent factor in the development of any country, rapid strides will be made in farm prosperity.

MISSOULA COUNTY.

This is a border county of Montana; its western boundary, the Bitter Root mountains, separating Montana from Idaho. It is one of the well watered counties of the state; flowing through it from east to west is the Missoula river, formed near its eastern boundary by the union of the Big Blackfoot and the Hellgate rivers, which unite later with the Bitter Root coming in from the south.

The valley of the Missoula proper, extends perhaps 200 miles across the county, and this, with the valley of the Bitter Root, is the ideal fruit section of the Rocky mountain region.

The mean altitude of Missoula county is 2,300 feet, and paralleled as it is by the Bitter Root range on the west and the main chain of the Rockies to the east, the conditions are most favorable for climatic conditions, exactly adapted to fruit culture. The soil is quite large granitic, and while lacking the strength of, the heavy clay soils found east of the mountains; it is free of alkali, and seems to be exactly adapted to the growth of trees and fruit. Wheat, oats and barley are leading crops, also the grasses and clovers, while there is no section of the state in which root crops succeed better. Spring arrives from two to four weeks earlier than in the eastern and central parts of Montana, and the killing frosts are delayed for about an equal time.

A considerable portion of the county is occupied by the reserve for the Flathead Indians. This in time will be thrown open to settlement and will render available one of the richest bodies of agricultural land in the West.

Irrigation is quite extensively practiced. The average supply of water in the Bitter Root river for the past three years has been 8,784 cubic feet per second, equal to 350,000 miner's inches. This is unemployed water, and if judiciously applied to the lands would, under diversified farming, afford a supply for 700,000 acres of land.

The lumber interests of Missoula county are extensive, and the saw mill plant of the Big Blackfoot Lumbering Co., on the Blackfoot, at Bonner, on the Northern Pacific Railway, is one of the most complete and extensive in the United States.

There are also considerable mining interests in the county, and these are always valuable markets for agricultural products. Until the outbreak of the Spanish war, a regiment of United States regulars was stationed at Fort Missoula. These posts are valuable markets for farm produce and great promoters to business interests. Missoula, the county seat, is a divisional point of the Northern Pacific railway; it has an excellent public school system, is a most thriving residence city, and is the home of the State University. It is also the present head center for the small fruit trade of Montana, the growers of small fruits in the valley of the Bitter Root, of which strawberries and blackberries are as yet the leading products, find here energetic dealers and middle men who find good markets for these goods, at most remunerative prices to the fruit men. This industry is destined to be the leading one of this section, and lands suitable to the culture of fruit are in active demand.

These plantations will call for the use of large quantities of water for irrigation. The United States government survey has maintained a gaging station in the Bitter Root, the Blackfoot and the Missoula; the work is supervised by Prof. Fred D. Smith of the State University.

There are many public and private ditches in use in this county and many more are projected.

PARK COUNTY.

Park county, originally a part of Gallatin county, from which it is separated by the Gallatin range of mountains, is named from its being the entrance to the Yellowstone National Park. This is one of the promising counties of the state, offering a vast range of possibilities to the settler. The Yellowstone with a northern course, the Shields river with a southern trend, the latter a tributary of the former, gives to the county a valley nearly 100 miles in length, which is well watered; the above named rivers and their tributaries giving opportunity for irrigation, advantage of which has been taken by the farmers who have taken the water from all the smaller streams and applied it to the fertile lands.

Park county was the dead line for the predatory bands of Sioux Indians, who, for years prior to 1876, raided all the county to the eastward. West of the Gallatin range of mountains, the country had been settled from the south and west and it was these settlers in turn who opened up the lower Yellowstone valley and drove the Indians back into the Dakotas. Following the Indians, came the cattle and horsemen, and for years this was one of the great open ranges. These, in turn, are giving way to the farmers, who have discovered in the irrigable valleys mighty possibilities in cereal production. The Shields river valley is especially adapted to barley; it is productive, also, in

hard fife wheat. Higher bench lands are ideal alfalfa areas and the foot hills to the Crazy and Gallatin range will eventually be vast winter wheat and rye fields.

The future of fruit in this county is also very bright. Many experiment orchards have been set and are now in good bearing.

A considerable revenue is received from the travel to the National Park. Passengers for the park leave the main line of the Northern Pacific at Livingston and proceed by a branch line to Cinnabar, from whence the trip is made by stage. This travel, already large, is rapidly increasing, and makes a good market for farm produce.

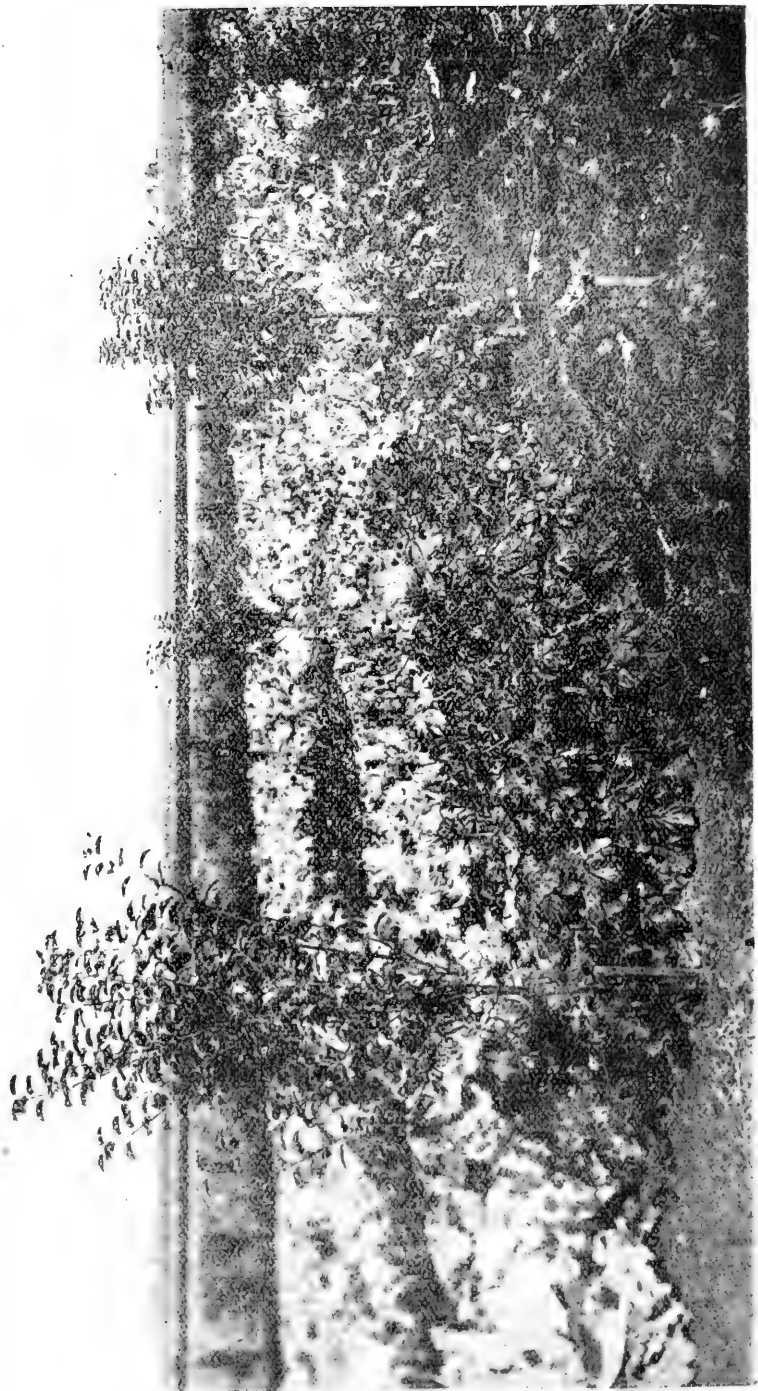
Park county is very rich in precious minerals; there is great activity in opening up and preparing to conduct extensive mining operations. The output of 1899 was about \$150,000. This will be vastly increased in the near future.

Rapid progress in development is occurring in this county. The members of the Board of Trade of Livingston are an active, energetic corps of promoters of all legitimate enterprises, and Park county has a brilliant future ahead of it.

RAVALLI COUNTY.

Prior to 1893, the entire portion of Montana lying west of the main range (except the counties of Deer Lodge and Silver Bow) was known as Missoula county. From this stretch of country on the north was carved Flathead county; and on the south Ravalli county, leaving the present county between the two. Ravalli is under the average size of Montana counties, containing 4,012 square miles, but is large in agricultural and horticultural possibilities. Geographically it is well located, upon the west, the Bitter Root mountains, the loftiest among the high timbered ranges of the Rocky mountain system, together with the Rocky mountains proper in the east, the general course being nearly north and south, shut out and shelter the valley of the Bitter Root from the east and west winds, which are the ones most to be avoided in the mountainous regions. The Bitter Root, a beautiful, typical mountain stream, carries an abundance of water through the irrigation season, and flows almost due north midway between these ranges, giving an average width of perhaps twenty miles between the foot hills of either range. The prevailing winds are up or down stream, and with its naturally well sheltered position, and the equalizing influences of the air currents from the higher mountain plateaus to the lower valley levels, an ideal climate results for agricultural possibilities.

Ravalli county, or the Bitter Root valley proper, is rich in historic memories. At old Fort Owen, whose adobe walls are still plainly visible, in the near vicinity of Stevensville, are to be seen the first farmed areas in Montana. In 1896 there died on his farm near Stevensville Mr. Thomas Harris, who raised the first wheat and oats crops ever grown in Montana; this was in 1854. In the same neighborhood is also to be seen the first buildings of St. Mary's Mission, located here as being most accessible to the headquarters of the Flathead Indians, whose first reservation was contiguous to Stevensville.



A TWO YEAR ORCHARD, UNDER IRRIGATION.

This has since been removed to St. Ignatius Mission some sixty miles north upon the present Indian reservation.

Undoubtedly the great christianizing influence of the fathers of this mission has had much to do with the molding of the character of the Flatheads, and in making of them the best friends the whites have ever had among the Indians. Nearly forty years ago the Bass brothers of Stevensville began to work with fruit culture. Except for the phenomenally favorable local conditions for tree growth the experiment must have come to naught, as the first trees were brought from Salt Lake City by pack train, a distance of nearly 500 miles. The distance not being so much of an obstacle as was the length of time en route, and the necessity for transporting the tender trees in unprotected bundles. From this unfavorable start, orcharding has been persistently followed up in this valley until it is to-day the scene of the greatest commercial orchard activity in the United States. Here are located orchards of 500 acres and upward, and the valley in the near future is destined to be one vast orchard. The soil of the benchlands on either side of the Bitter Root is of granitic origin; apparently light and worthless, carrying many boulders and gravel in the disintegrated granite, but for the present at least the conditions are ideal for apple, cherry and plum culture. Remarkable success is also being experienced in peach and pear growing and small fruits thrive in a remarkable manner.

Three million pounds of fruit were shipped out of this valley in '98, and this is but the beginning, as this fruit was largely the first crop of the numerous young orchards which are just entering into bearing. This valley is fortunate in having interested the well known manager of the Anaconda Copper Co., Marcus Daly. He has acquired large areas of farm and ranch lands in the vicinity of Hamilton, the county seat of Ravalli county, and is a most enthusiastic orchardist, setting orchards at the rate of 50,000 trees per annum. His efforts will be seen not perhaps so much in the matter of cultivation as in the business foresight requisite to the successful marketing of such vast quantities of fruit. With his other extensive business connections, in merchandizing and lumbering, he will open up the way to many Eastern markets which have been heretofore held and occupied by the fruit of Washington and Oregon.

Ravalli county has been the scene of great activity in irrigation; the many orchard and farm plants calling for an assured supply.

SILVER BOW COUNTY.

This county derives its name from a small stream of the same name and was so called by the early settlers, who, from the summits of the big butte, which gives the city its name, saw spread out before them on the fair landscape, a beautiful trout stream wimpling on toward the seas through grassy intervals. The natural course of the stream suggested the shape of a bow (not the Indian bow), fashioned from a straight bit of wood or bone, but the more fanciful weapon of the archer, whose ends curve gracefully upward. The word silver

was peculiarly appropriate as its waters shone silvery in the rich green setting of the lush meadows. Unfortunately for the sentimentalist, the march of progress, as exemplified in copper mining, has changed all this. The beautiful pellucid stream has been robbed of its purity, every drop of its sparkling water has been taken from its bed and by devious and uncertain ways has been led up, into and through mighty concentrators, where it is made to play its part in dissolving obdurate stone and mineral, whence it finds its way back to its original bed as a turbid, thick, muddy, sediment-bearing torrent, scarcely worthy of the name water. Its natural bed is covered in places, ten, twenty and thirty feet deep, with disintegrated ore, rock and soil. So saturated is the water with sediment that it does not purify itself until passing Lake Pend d'Oreille, 300 miles to the westward.

Silver Bow county produces more mineral values than any other county in the United States. The output for 1899 was \$55,000,000. Of this, gold was \$1,500,000; silver, \$13,000,000; copper, \$40,500,000.

That the residents of Butte, the capital of the county, and the site of the greatest mining activity in the world, are proud of their title, "The greatest mining camp on earth," is easily understood when it is remembered that it has a record of a production of \$500,000,000 since its establishment.

Butte has 65,000 busy inhabitants, and is a fitting complement to the productive agricultural acres of Montana. Agriculture is almost unknown within the confines of the county. A small amount of hay is harvested, principally blue joint, and timothy (the former a native product), and a few dairy cows are pastured. It is interesting to know that the mines do not trespass to any considerable extent upon the agricultural lands. As this enormous amount of wealth has been dug out of an area scarcely two miles square, it is difficult to discover any possibility of agriculture of this county in the immediate vicinity of these mighty smelters, as the smoke belched from their massive chimneys carries with it such a volume of destructive gaseous matter that vegetation exposed to its fumes cannot survive. This is true of trees and plants. One of the legumes (sweet clover) seems to resist the bad influences. This clover also stands well in alkali permeated soil. This peculiarity would make it a valuable plant, did it possess value originally.

Butte is the clearing house for Montana farm products, and draws heavily, not only on Montana, but on the neighboring states as well. The fact that gardening in all its simpler forms is practically unknown and that all the staples of life require to be produced elsewhere, offers rare opportunities to those who are more favorably situated for such truck crop production.

That Butte City and Silver Bow county indicate permanency, is to be seen in the constantly increasing output of ore and the remarkable increase in population. It has practically doubled itself in three years and has every promise of being a continued producer.

The valley of the Big Hole, or Wisdom river, in the southern part of the county, is a fine grazing country and offers superior advantages to stock raisers.

The main portion of the county is mountainous and will always find its greater values in the business of mining.

SWEET GRASS COUNTY.

This is one of the last legislative creations and is a grand county from the standpoint of the farmer and herdsman. It is bisected almost equally on east and west lines by the Yellowstone river, which flows a little south of east in its general course. Prominent tributaries to the Yellowstone from the north are Big Timber and Sweet Grass creeks, while, from the south, the Boulder and Stillwater enter. There is in addition a dozen or more smaller creeks entering the Yellowstone, while there are numerous tributaries to the above four larger streams. Then on the north side of the county many small streams find their way northward to the Musselshell river. The prevalence of these streams means much to the section, as to the initiated it always means an easy way to secure precious water for irrigation. Once free of the near vicinity of the mountains along these streams, we are reasonably safe in expecting to find a fairly generous margin of bottom land fringing the streams and consequently easy prospects for conducting the water out of the streams and on to the land.

Sweet Grass is happily named, as it has long been a favored range, not only for cattle owners and horsemen, but for the shepherd as well. A half million of its two million acres have been appropriated and settled, and it is fast coming to the front as a fruit, agricultural and stock-growing country.

The first lands to be reclaimed within the state, under the provision of the Carey Arid Land Act, whereby Montana was given a million acres of land, conditioned on putting water thereon, are located in Sweet Grass county, and it is expected that ere long the principal part of this vast body of land will be brought under irrigation, and that settlement will speedily inure. The northwestern part of the county is broken by the Crazy mountains, but the presence of mountains always adds value to the land in the near proximity, as mountains usually insure an abundant supply of water in the irrigating season from the many streams heading therein; and fed by the snow banks and drifts that lie for months in their high altitude, untouched by the rays of the sun, long after the snow has disappeared from the low lands and the foot hills. Then, too, mountains usually mean timber and this has always been available; without money and without price to the Montana settler, supplying him with material for fencing, houses, barns, etc., as well as fuel. Free timber is a great boon to the settler in the mountain regions.

In no other part of the state does alfalfa do so well as in Sweet Grass. Three and four crops are cut annually.

A peculiar formation of country is found along the Boulder. The stream is named, no doubt, from the great abundance of boulders that are strewn not only on the surface, but form more than half of the soil or strata from the grass roots to bed rock. Much of this is so stony as to be hard to break up. The discovery has been made that by gathering the stones from the surface, then disking well in early spring while the surface is soft from spring rains and seeding on this scarified native sod, that alfalfa will do splendidly well.

The only help it needs in its new environment is an abundance of water. Were one to see a cross section of this land in which the finest alfalfa grows, it would surprise him that anything could possibly live, much less thrive in such an environment, as from thirty to fifty feet in depth the cross section shows boulders varying in size from a hen's egg to a bushel basket, sand, gravel, clay and very little loam, the whole cemented together into an actual conglomerate, which, when quarried out, appears to be bound together into an apparently indissoluble mass. How the roots of any plant can thrust themselves down ten, twenty and even thirty feet into such an unkind, unpromising environment passes the comprehension of man. Strange as it may seem, it appears to be a habitat in which alfalfa is at home.

Fruits (hardy in nature), such as standard apples, crabs, pears, cherries and plums, are doing well where judiciously planted and intelligently cultivated, while small fruits succeed beyond expectation.

Game and fish are abundant. There will be a marked influx of settlers into this part of the state in the near future.

It is expected that 5,000,000 pounds of wool, worth \$1,000,000, will be marketed in Big Timber in 1900.

TETON COUNTY.

Teton is a border county. British possessions form more than one hundred miles of its northern boundary; its western boundary is a part of the Rocky mountain range, and considerably more than half of its area covered by the Lewis and Clark and Flathead forest reservations and by the Blackfoot Indian reservation. These reserves do not affect, to any appreciable extent, the agricultural lands of the county, as these are mainly in the southeastern part.

The Great Northern railway traverses the county from east to west, while the Great Falls and Canada railway crosses the eastern part of the county from north to south.

It by no means follows that because Teton lies so far to the north that it is inhospitably cold. The three counties that span eastern Montana, east of the range, the north tier of counties, are practically the only counties where open winter stock grazing is practiced. The winds prevail here in winter and the newly-fallen snow is swept into coulees and draws, leaving the well-grassed plateaus exposed, so that stock can feed the major part of the winter. These counties are susceptible to chinook winds, which also afford relief to the winter months. There is a large settlement of Minnesota farmers in the southeastern part of the state near Choteau, and these are in love with the producing capacity of the land under irrigation. Barley as fine in quality as the Gallatin barley is grown there, and wheat, oats and root crops are unexcelled both as to quality and quantity.

Small fruits do well, and in some locations the hardy apples and crabs are succeeding well.

Water for irrigation is quite abundant in the southeastern part of the county and is easily diverted from the streams to the farm lands; the surface of the county is favorable for irrigation, as it is

not so broken and cut by coulees as in country in the nearer vicinity of the larger streams.

The natural market of this part of the state is Great Falls. This lively town of 15,000 souls makes a heavy demand upon the farmers for food for its army of workers, busy in the great smelters.

Teton county has 5,000,000 acres of land within its borders and only three per cent of this has been claimed. It is true that the forest and Indian reserves occupy, perhaps, 2,500,000 acres, but there is still remaining to the settler a vast number of good homesteads. Unquestionably, it will be found that much of the western part of the county, along the foot hills with northern exposures will be available for winter grain lands, susceptible of production without irrigation.

The prospective Oriental trade, for which the Great Northern is making extensive preparations in cutting down its grades and providing a fleet of ocean carriers, will supply a good grain market to all the country tributary to its line.

It will not be long until the great Blackfoot reservation will be reduced in size by opening it up to settlement, and the southeastern part to be thrown open to settlers. These Indians will eventually be self-supporting; they are acquiring extensive bands of cattle, horses and sheep, and have done considerable in the way of farming.

VALLEY COUNTY.

This county is the northeast county of the state. Its southern boundary across two-thirds of the country is the Lower Missouri river, whose principal tributaries are from the north. Lower Milk river with its half-dozen tributaries, form an agricultural valley of itself), Por-



IN THE MILK RIVER VALLEY, RAISED UNDER IRRIGATION.

cupine creek, Poplar river, Big and Little Muddy rivers and numerous smaller confluents, with their fertile bottom lands offer many desirable home locations where crops can be grown under irrigation.

It is doubtful if the waters from the Missouri river can ever be taken from its deeply cut channel onto lands in successful irrigation work; and but little has been done as yet to promote agriculture in Valley county. Perhaps a fourth of the county is composed of the Fort Peck Indian Reservation, lying along the north side of the Missouri river and extending back therefrom about fifty miles. Within the reservation is much area susceptible of irrigation, and the Indians under efficient management are doing some advanced farming. Other most desirable farming areas are to be found along the Milk river and its tributaries, Assiniboine, Woody Island, Cottonwood, White, Frenchman's, Little Rocky and Porcupine creeks.

This county has but little fall compared with other sections of Montana. Milk and its tributaries are shallow banked streams, and water is very easily taken out onto the adjacent territory.

There is no more productive lands than are to be here found; there are abundant beds of lignite coal, offering a cheap and reasonably satisfactory fuel supply; splendid yields of barley, wheat and oats are being grown wherever sown, and in forage plants the product is marvelous.

YELLOWSTONE COUNTY.

This county was named for the river of the same name, which forms its southern boundary; Musselshell forms the northern boundary. The county lies nearly midway of the state, east and west; the Crow Reservation and Carbon county being between it and Wyoming. The county seat is Billings, named after Mr. Frederick S. Billings, former president of the Northern Pacific railway. Mr. Billings made large investments in lands in Yellowstone county about the time of the projection of the Northern Pacific railway through the state.

During his life he was a firm believer in the agricultural possibilities of this region, which opinion has been maintained by his representatives, who have handled the Billings estate always with the idea that the future for agriculture of the contiguous territory was bound to be most promising. While removed far enough from the mountains to have but little waste land it is sufficiently near to possess that degree of fall which permits water being taken from the Yellowstone river for purposes of irrigation at a reasonable expense.

In Yellowstone county are to be found the oldest alfalfa fields in the state, there being one forty-acre field on which alfalfa has been harvested for fourteen consecutive seasons, there having been added to the original field sufficient to embrace a tract of 300 acres. It is an ideal stock country, but the stockmen have not been permitted undisturbed possession thereof. Wherever water could be transferred to the bench lands they have been fenced, ditched, and either sown to alfalfa or else continued in the product of the native blue joint hay, which, perhaps, all things considered, is the ideal horse forage plant of the West.

Farmers of this county have been most successful in reaching the markets of Butte, Helena, and the Yellowstone National Park with hay products. Time nor opportunity have not been afforded the Experiment Station to investigate the effects of continued cultivation of

the soil to blue joint. It is not expected, however, that it will prove to be very exhaustive to land. As a rule it does not maintain under continued cultivation and harvesting, the ability to produce the normally heavy hay crops that are usually harvested from blue joint fields when first put under irrigation and harvesting. This is owing, no doubt, in part to the grass not being permitted to re-seed itself, as quite frequently occurs in its wild state.

The custom, however, in Yellowstone has been to maintain the land in blue joint so long as from three-fourths to one ton per acre could be cut, then to break up and sow to grain, following this by seeding to alfalfa. In the vicinity of Billings are to be found large sheep feeding interests. Many bands of sheep are run during the summer upon high lands lying between the two rivers along the base of the mountains to the west and south and during the winter these bands are moved to winter ranges, where the grass has been permitted to grow undisturbed through the summer, with the expectation of it furnishing ample winter food for the bands, supplementing this, in case of heavy snow, with a sufficient supply of alfalfa to tide the sheep over the short periods in which it is impossible for them to find their own food. From these bands are usually purchased from 100,000 to 250,000 lambs, which are fed exclusively on alfalfa hay, for a period of from thirty-five to forty days, when they are found to be in fine condition for the Eastern market. It is needless to say that this practice is far more beneficial than is that of shipping the hay out of the country, a process which will be quite as disastrous in the long run as that of exclusive grain growing.

Yellowstone county is also becoming a favored point for steer feeding in the same general way. It has been proved that young stock fed upon prime alfalfa hay in the mild winters of Montana form quite as good beef and mutton as do the live stock fed in the Mississippi valley, carried through on corn, eastern hay and corn stalk fields. The lack of grain in the Montana ration being more than compensated for by the very superior quality of Montana hay and the mildness of the winter through the feeding period.

Very extensive irrigation projects have been successfully developed within the boundaries of this county. Here, too, will be found some of the first work of the Montana arid land commission.

The Northern Pacific Railway Co. have also formulated plans which will look to the reclamation of a tract of land, perhaps 30,000 acres, lying within the borders of this county.

The altitude of Yellowstone is a mean between the highest to the lowest lying valleys under cultivation in the state.

Much attention has been given to the production of Indian corn, which is here, in favorable seasons, a very profitable crop. As high as ninety bushels per acre of ear corn, the finest quality of dent, have been produced, and well authenticated records of 1,200 bushels of Irish potatoes have been grown upon a single acre. Watermelons, field pumpkins, squash and tobacco are successfully raised, while most encouraging results are being obtained from fruit culture. Both standard and crab apples, plums, pears and small fruits and grapes are succeeding admirably.



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