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THE IRRIGATION AGE

PUBLISHED IN THE INTEREST OF IRRIGATION FARMERS,
DEALERS IN AND MANUFACTURERS OF IRRIGATION AND
GENERAL FARM MACHINERY.

VOL. XXIII.

CHICAGO NOVEMBER, 1907.

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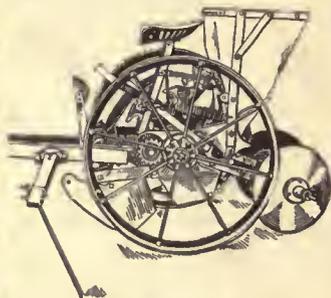
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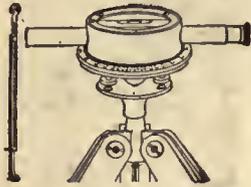
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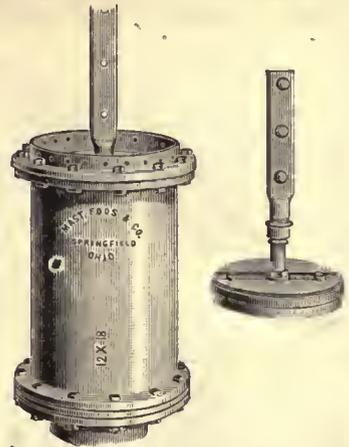
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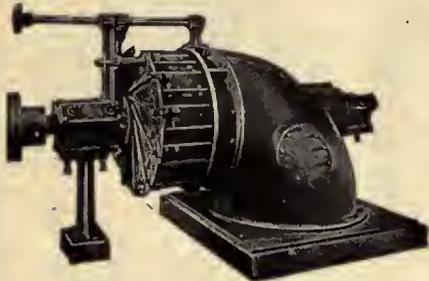
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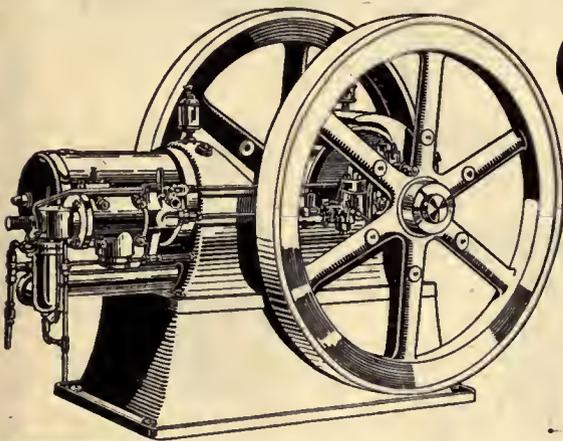


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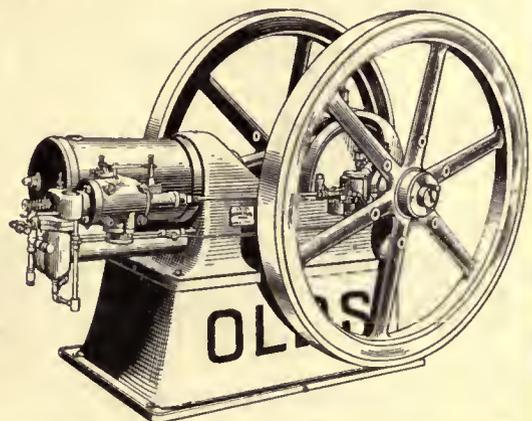
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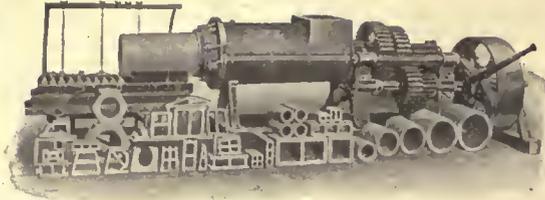
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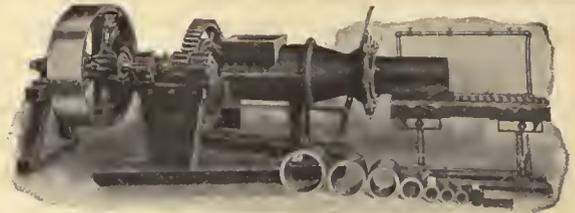
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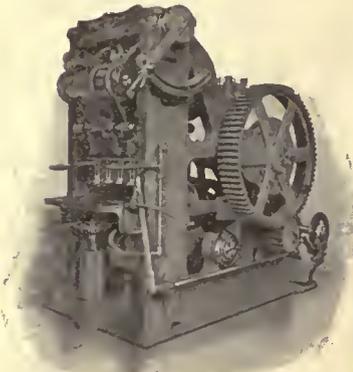




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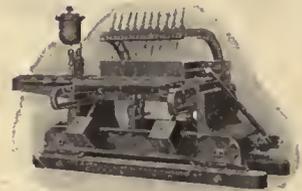
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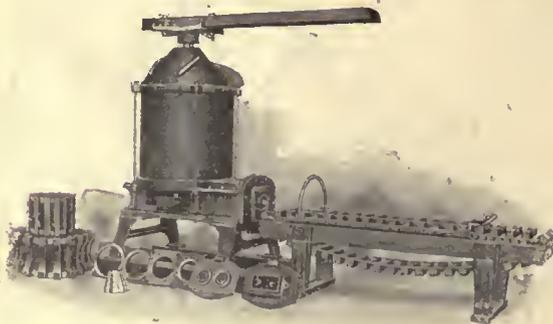
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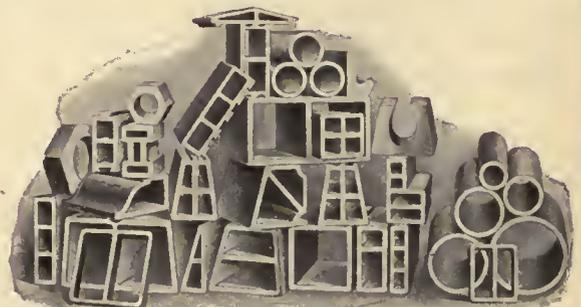
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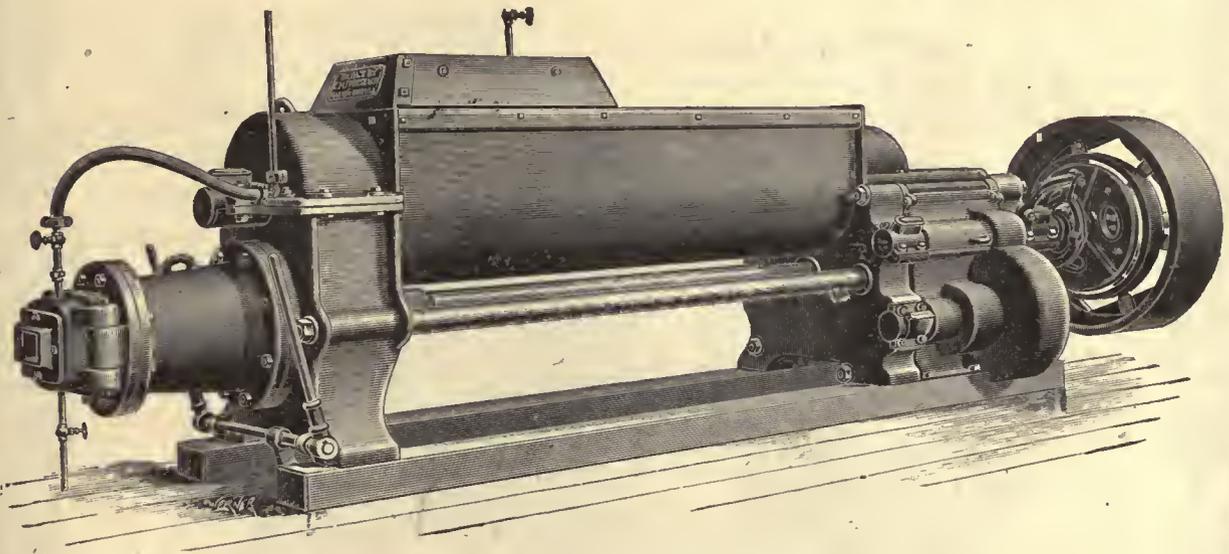
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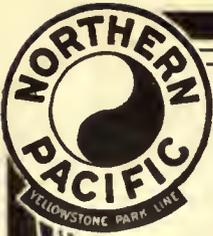


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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, NOVEMBER, 1907.

No. 1

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION

THE IRRIGATION ERA

ARID AMERICA

THE DRAINAGE JOURNAL

MID-WEST

THE FARM HERALD

IRRIGATION AGE COMPANY,

PUBLISHERS,

112 Dearborn Street,

CHICAGO

Entered at the Postoffice at Chicago, Ill., as Second-Class Matter.

D. H. ANDERSON, Editor

W. A. ANDERSON .. G. L. SHUMWAY

Associate Editors

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

Will Not
Affect
Colorado.

Probably no state in the Union is more immune from the fluctuations of Wall street stocks than is Colorado. This is largely due to her agricultural wealth and a prosperous and successful season has given the commonwealth a stability which it would be difficult to undermine. It is true, as Secretary Garfield pointed out in his interview with President Roosevelt on the subject of the recent Wall street flurry, that "Western bankers have gradually been divorcing themselves from Wall street influences until they are now practically independent of them." When one looks further into the matter it is easy to comprehend why this divorce has been made possible. The west concerns itself with wealth that is substantial—with the products of the soil and the raising of live stock. Climatic conditions remaining normal, there is little that can have a disturbing effect upon the accumulated wealth of agriculture. When a corner on any of the products of the soil is secured it is easily broken and no panic results, for there can be no overcapitalization, no watering of stocks. The West's prosperity is invulnerable, and while the eastern financial disturbance cannot help but have a disheartening effect on western enterprise, there is no fear of failure, no danger of panic. Just an example or two of Colorado's wealth will show how unassailable it is. Greeley, the heart of the potato region, will receive \$2,000,000 from its crop, while at Monte Vista, the largest of San Luis valley shipping points, it is estimated that the potatoes sent from there will net \$750,000.

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Official organ of the American Irrigation Federation.
Office of the Secretary, 309 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 22 years old and is the pioneer publication of its class in the world.

Our
Twenty-third
Year.

With this issue the IRRIGATION AGE begins the twenty-third year of its successful existence. Ever since its inception the paper has been the exponent of progressive and modern ideas in irrigation, and we feel that we can claim some of the credit for the successful carrying out of many prospective plans. We have been fearless in statements made and have always endeavored to conscientiously and thoroughly examine into every project which we undertook to comment upon. We have at times criticized severely, but have acted always upon the dictates of our best judgment.

The AGE is now entering upon a new era in its career. We appreciate, as stated in our October issue, that we do not reach anywhere near the number of people that we should and it is to be our aim the coming year to get in better touch with the western agriculturist and by getting into closer relation with the middle western and eastern people to enlarge the rapidly swelling ranks of these western agriculturists. To the advertiser we are thus enlarging a field with which he has connection through this paper alone.

Our policy in the future will continue to be what it has been in the past. It is our intention to make the AGE the best periodical that effort and resources can produce and to this end are using our best endeavor. Criticism is invited. We appreciate that we are not infallible and any suggestion or ideas which our readers have to make will be most cheerfully welcomed. We ask your coöperation in making the AGE the brightest, cleanest and most progressive publication possible.

Tin Can Clubs.

We are reproducing in this issue a letter from Mr. H. A. Green of Monterey, Cal., which is published preliminary to a series of articles, to be prepared by that gentleman on his "Tin Can Club." Mr. Green is desirous of organizing "Tin Can Clubs" throughout the United States, and his booklet, "Everybody Grow Trees," will be mailed free to all those who make application for it. In this work, Mr. Green says, "Our generation is leaving a calamitous heritage for those who are to take our places in the management of affairs, in shape of millions of dollars worth of bonds of various kinds to be redeemed. We are also denuding the country of its timber, and individually making no attempt to replace it with another growth. There is a practical and inexpensive way of squaring ourselves and lifting this burden, and that being so, it is our duty to act without delay." He says, "I assert and believe, that the tin cans thrown away as useless can be made to earn more than enough to pay off any state, county or municipal bonds now issued, and besides make our beloved country more beautiful and prosperous." Mr. Green further explains that by the planting of seeds in tin cans, and the organization of Tin Can Clubs in all the cities of the country a great interest may be developed and the propagation of trees which will prove invaluable to future generations. We hope, through the assistance of Mr. Green, to be able to place this matter so clearly before our readers that Tin Can Clubs may be organized in every town in the west, and that children may be taught the value and the beauty and the benefit to future generations of work of this character.

The action of Mayor R. W. Speer and **Municipal Aid** the finance committee of the board of supervisors of Denver to recommend an appropriation of \$10,000 from the city treasury in 1908 for the proposed improvement of the High Line canal in the suburbs of that city, is truly a step in the right direction. The men in charge of the prospective improvement have organized and already a large amount of money has been raised by private enterprise. The plan is to purchase the old High Line canal and then when the preliminary is finished to organize a stock company and pay back the subscribers. The High Line canal is now attempting with inadequate facilities to irrigate some 20,000 acres of land north and south of Denver and on the east side of the Platte river, from which it gets its water supply. The city's appropriation will undoubtedly be included in next year's budget, providing the citizens raise the remainder of the \$25,000 needed for the enterprise, this being the only condition imposed by the mayor and the finance board. An unique parade was organized in Denver last month to boost the plan and raise enthusiasm. Headed by a band and

a tallyho a score of men proceeded through the streets carrying a banner bearing the words:

"See what the water wagon and A. B. McKinley will do for Denver."

The inscriptions on some of the other banners follow:

"Twenty-five thousand dollar irrigation parade. Money for Denver's suburbs."

"Denver lost to Greeley the Antero reservoir, but Denver will win the Platte watershed championship series."

"Twenty-five thousand dollars necessary for success. Don't be stingy. Subscribe \$10. Irrigation means more trees, good roads, valuable lands."

"Irrigation means for Denver happy homes, more people, more business."

Carpenter in Canada.

The province of British Columbia has practiced irrigation on a small scale for many years, but only recently has the development been so much as to cause any particular stir or reveal difficulties in the laws which had not been applicable to the present situation. In the last few years the rapid extension, the great value of irrigated land, valuable principally for fruit, have led to much feeling and realization that the present laws were not applicable to the situation which is developing. The Lieutenant Governor and Executive Council has appointed an Irrigation Commission to examine and report into the whole matter in all its relations and have appointed on that commission the Minister of Public Works of British Columbia, T. J. Fulton, K. C., and Prof. L. G. Carpenter, professor of engineering of the Colorado Agricultural College and formerly state engineer of Colorado and consulting engineer for the state in the Kansas-Colorado case. The commission has been examining the irrigation systems of British Columbia and those under present consideration. It is expected that from the recommendations there will be presented to the next British Columbia legislature a comprehensive revision of water laws as a government measure.

Hall's Hints.

With this issue we are beginning the publication of short, practical hints on irrigation by Mr. John G. Hall, a well known irrigator of Greeley, Colo. The subject treated in this issue is that of dividing water, and our readers who wish further information along this line are requested to write Mr. Hall, enclosing stamped envelope for reply. He will gladly answer all inquiries. Address, John G. Hall, R. F. D. No. 2, Greeley, Colo.

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

THE IRRIGATION AGE is in receipt of a letter dated October 10th from Mr. John Donahue, president of the Colonial Security and Trust Company of Denver, Colo., in which he states that he is enclosing an article concerning the matter of "dry farming" in that state. But as will be seen by a perusal of "dry farming by one of the farmers," he quotes from an editorial which appeared in our September number, and suggests that we lay ourselves open to a charge of total ignorance of the facts. This editorial was prepared for publication by a member of our staff, during the absence of the writer, and was perhaps slightly overdrawn. Mr. Donahue's letter, however, brings to mind the fact that the subject of "dry farming" is rather a big one and the title of this particular line of industry is in a sense misleading. The editor of this journal has been in close touch with Mr. H. W. Campbell, who has done more to develop what is known as scientific farming in the semi-arid region of the west than any other man. Mr. Campbell and the writer have gone over this subject many, many times, and that gentleman has reiterated in our conversations his belief that the term "dry farming" as used by land sellers throughout Colorado and elsewhere is misleading, and will eventually bring to distress and possibly want settlers who have gone into that country under a misapprehension. This same opinion is shared by the editor of the IRRIGATION AGE, who has hesitated to express his views, fearing that reputable land sellers would be injured by the exposure of those who were inducing eastern people to purchase land which they claim will produce good crops by "dry farming." We do not question the statement made by Mr. Donahue as to the success on particular tracts of land, nor do we doubt his statement that splendid results may be obtained in horticulture and general agriculture through a practice of this system. It is only fair, however, to state that Mr. Donahue is evidently following the Campbell system of scientific farming and has thoughtlessly permitted the term "dry farming" to be used in connection with his work. The gentleman is evidently an enthusiast along these lines and is no doubt successful. He states that he is president of a corporation that is conducting the most extensive "dry farming" operation of any single corporation on the eastern Colorado plains and that it is his duty to travel over this vast area for the purpose of observing what others are doing and how they are doing it. It is evident that Mr. Donahue has given the subject very careful thought and is securing information and data which will be very serviceable to him in his experiments along these lines. We are rather inclined to doubt, however, his ability to furnish many names and addresses of men who have, as he says, some of the finest orchards in all America, upon the arid plains of eastern Colorado. But to return to the main point. Many people who have the best interests of the west at

heart have felt for some time past that the literature which is being sent out from land companies concerning this so-called "dry farming" is partially misleading. The writer expressed this view some time ago to Mr. Fisher Harris, president of the Dry Farming Congress, and stated to him that unless caution is used in attracting settlers under the claims of "dry farming" enthusiasts a condition will soon develop in eastern Colorado similar to that which was encountered in western Kansas in her early history. A man need not go very far back in the history of Kansas to learn that misrepresentation by unscrupulous land sellers caused almost irreparable damage and injured that state so badly that only within the last few years has she recovered from the stigma brought upon her wholly by the avariciousness of unscrupulous, heartless land sellers. It may be well for Mr. Donahue to know that we will assist in every way, any method which will help develop Colorado and the West generally. We have attempted during many years past to explain that fact and the editor of this paper is moreover a great admirer of Colorado, and his object in entering into this matter so fully is to warn the people of Colorado first, and secondly, prospective settlers, that "dry farming" is not "boy's play" and should not be attempted by the man brought up in the east, who has no clear conception of what is necessary to make a success under these conditions. Mr. Donahue may depend upon the support of this journal at all times in assisting to colonize the "scores of millions" of acres mentioned by him; the colonization of this land must, however, be worked out in a clear way and full information must be placed before the prospective purchasers. We will also be glad to publish any matter which Mr. Donahue may see fit to furnish us. This is a broad subject and we will gladly exploit its features in the columns of the IRRIGATION AGE.

We are calling attention to the advertisement in this issue of The Bitter Root District Irrigation Company. This company is placing its lands in the Bitter Root valley on the market, and will no doubt find an easy sale, as they are as fertile and productive lands as any of the well known valleys of the fruit region, and when irrigated are capable of producing an astonishing revenue. The Bitter Root valley is known among the high-class fruit regions of the West. The superlative quality and the unprecedented quantity of the fruit grown there has long been known. This is especially true concerning the Bitter Root Valley apples. There are instances on record where a single acre planted to one variety of apples has netted its owner over \$500.

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Professor Carpenter. In a recent letter from Prof. L. G. Carpenter of Colorado, he informs us that the reason he could not be present at the Irrigation Congress which convened at Sacramento, Cal., was that he had been in some of the remote parts of British Columbia, and in order to get back to his work in Colorado, could not get around in time for the congress.

Professor Carpenter was missed in the deliberations of the congress and it is hoped that he may not become so closely identified with Canadian interests as to keep him over the line for any considerable period of time. He states that distances are great in British Columbia, and that possibilities there in an agricultural and irrigation way are remarkable.

"The Hog Man's Klondike." The San Luis valley is indeed "the hog man's Klondike," as a circular recently issued by the Denver & Rio Grand railway chooses to call it. Each season is witnessing a large increase in the fattening of hogs in the valley and there will continue to be an increase for several years to come. The cause of this is of course the ease, rapidity and fattening capacity of barley and the field pea. Last season there were about 40,000 hogs fed in the valley; this year there will be at least 75,000, while an estimate of 100,000 would not be far out of the way. The production of an acre of barley costs just about one-half of what an acre of corn does and will fatten one-third more hogs. The cost of production of an acre of peas does not exceed \$1.50, only about a fifth of what it costs to cultivate an acre of corn, and a fourth more hogs can be fattened on the produce from the same amount of ground. Pea-fed hogs are becoming famous throughout the country for the excellent quality of the bacon. It was not more than two months ago that representatives of one of the largest packing houses in the United States looked over the San Luis valley to see if it would pay them to undertake to turn out pea-fed hams and bacon. It would require, they stated, an annual purchase of 100,000 hogs to make it a paying investment distributed over a period of nine months. At the present time the selling of hogs does not cover more than five months and should it become essential to carry them through nine months it would require extra labor and extra expense in the harvesting of the pea vines for hay as the fields do not last more than the five months. Even at that, hog raising in the valley would be immensely profitable. But it will never reach its full capacity until there are better transportation facilities. Hogs cannot at the present time be raised a great distance from the railroad as the shrinkage in transporting them eats up all the profits and the greater part of the valley is untouched by a railroad at the present time. When the contemplated railroad extensions are made then may we look to see

the San Luis valley attain its greatest efficiency in hog raising, and also take its place as the leading hog raising district in the United States.

Seriously Handicapped. The development boom in the far West is giving the Reclamation Service a good deal of concern at the present time.

With every part of the intermountain country enjoying a remarkable building boom, the government finds itself seriously handicapped by its inability to secure reasonable bids for constructing its big irrigation works. The large contractors are all loaded up with railroad work which will occupy their attention for many months to come, while smaller contractors have all they can possibly do to take care of the local demands of cities and towns.

Many of the contracts of the government have been advertised several times without securing reasonable bids. The government is confronted with the proposition of doing the work by force account or of postponing it until there is an improvement in conditions. The present time is most unpropitious for the government to undertake doing the work itself. There is an unusual scarcity of labor. Wages are from 40 to 60 per cent higher than two years ago, while efficiency has been decreased rather than improved by the unlimited demand for laborers. Owing to the remoteness of much of the government work from cities and towns, labor is not attracted thereto, and as a rule the government gets only the leavings or the most undesirable class of laborers. The steady and skillful workers are all busy.

The costs of all kinds of material has increased enormously. Take cement, for instance, which enters so large in the construction of dams and headworks, and for which the government is asking for hundreds of thousands of barrels, it has been compelled to accept bids at prices nearly double those paid two years ago. Even at the present high price only a few manufacturers are competing, and today the cement required for Idaho, Montana, Wyoming and the Dakotas is shipped from Chicago.

Lumber has nearly doubled in price, and horses and mules now cost fully twice what they did three years ago.

As an illustration of the material increase in the cost of construction the following examples are cited; In 1904 and 1905 the average cost of earthwork excavation was about 13 cents per yard, and the contractor executed the contract and furnished the required bond. When he came to secure the necessary machinery, animals and labor, he found the work would cost so much more than his bid that he threw up his bid and forfeited his bond. On readvertisement the contract was again let at 24 cents per yard, and the contractor is said to be losing money at this price.

The Scientific Fifteenth Irrigation Congress

By Edgar L. Larkin, Director of Lowe Observatory, California.

The great congress held in Sacramento was of a strong scientific cast. To me it seemed like a regular session of the American Association for the Advancement of Science. Or like the World's Congress of Arts and Sciences in the World's Fair at St. Louis. The scientific papers presented were of an order so high that they would be accepted and placed on the programme of any great national society or academy of exact science. And the facts placed before this representative convention were startling indeed, and should be heeded by every American citizen, and this without delay. It has long been known to geologists that the coal supply of the world is limited. That it must soon fail and that other sources of heat energy will have to be sought in the near future. Quite near—within one hundred years. The alarm bell is now ringing in the anthracite regions of Pennsylvania. Deeper and deeper sink the shafts and the layers and beds of the precious coal grow thinner with descent. I saw in a paper recently that the cost of mining had recently increased from 40 to 50 per cent. Double the number of men are now required to mine the same amount of coal owing to thin layers and great depth. From various lines of arguments, by different speakers, it was shown that one century more will wipe out the world's stock of coal, at present rates of consumption. Geologists are of the same opinion, unless new and unexpected discoveries of coal bearing strata are made soon. From all estimates I have been able to find, the store of petroleum will also vanish in about a hundred years, at present rates of use. Spouters are waning and pumps are increasing. Natural gas is greatly reduced in pressure and it is not probable that it will hold out during fifty years. But oil and gas are being wasted at a frightful rate. Human beings on a speck of a world 93,000,000 miles from the sun, are deliberately throwing away their supply of carbon—the life of the earth. At the World's Fair in St. Louis, they had in the palace of minerals, heaps of coal, iron and other materials required to build a warship. The piles contained the one one-thousandth part of each. But this quantity was startling to behold. Totally wasted, for fighting is absolutely useless and worse—a high crime. But the coal wasted in constructing these mighty engines of malignant death is as nothing compared to that required to run the deadly navies of the world. Mountains of coal are poured into their hateful furnaces. Here is the statement of science to the fighters: Stop, or freeze to death. Will they listen to reason in the future? History shows that they have not in the past. And at the exposition a cry for the great fertilizer, nitrogen, rose in clear notes above the din. It was shown by the ablest electricians how to take this life for plants out of the air. Why show these machines? Because it is well known to geologists that the world's supply of nitrates is rapidly running low. But to secure nitrogen from the atmosphere by the aid of electricity is costly. Listen to the wail for carbon; hear it in the distance now. With inconceivable sorrow, our children of the second generation hence will look back upon us and heap reproach upon our heads for wasting the earth's store of life-giving carbon.

MAN HATH NO PERMANENT CITY.

It is known to scientific men that man cannot long exist on this planet without vast supplies of heat. Face this fact. All natural stores of carbon will soon be exhausted. This is settled. Each year polar ice draws a little nearer to the equator. In time it will encroach on the temperate zones, and crowd humanity along toward the torrid zones. But there is not land enough in this belt to supply food plants. Stay at home in the temperate zones and millions will freeze; migrate to the torrid and millions more will starve. These are facts to face. Man must secure heat in some way or disappear from his home—the earth. Byron's concept of the last man committing suicide on the equator is no fable. There are three ways of securing heat when coal, oil and gas come to an end. First, store heat directly from the sun during days to use at night. Second, secure heat from electricity; and third, cover all that part of the earth's surface not required for food plants with forests. Enough energy from the sun falls on the deck of every steamship, when the sky is clear, to run the engines. But the greatest electricians have not invented a method of conserving this energy into the form of heat. The problem may never be solved of running a ship by day from solar energy or of storing it to run the boat at night. If this cannot be done, then electricity and carbon in trees remain.

A STUPENDOUS WORLD PROBLEM.

The chief forester of the United States stated that at the present criminal waste of forest they would be destroyed within thirty years! An incredible thing is going on. This great nation is asleep. Private soulless corporations are seizing all the forests in the United States and binding the whole country hand and foot in slavery. One man owns enough rich forest lands to make a state. He should not own an acre. The trees belong to the people. Something has to be done. Let the people awaken to this great danger. Lumber will soon be of such enormous price that no poor man can hope to own a house.

The trees of the world must be quadrupled and that before many years, if man is to have carbon. Our descendants will justly hold us in derision if we let all forests get into the clutches of conscienceless corporations. This is not sensational, but a rigid fact. Steamers can be run with wood for fuel and all buildings heated with it likewise. But see the enormous quantity needed. Every desert and semi-desert on earth must be irrigated, and all irrigation schemes, ancient and modern, will be as child's play compared to these colossal works.

To ye fighters, stop your murderous work, put your energy and capital into irrigation, raise trees wherever a tree can grow or die. It is known to every anthropologist that Nature has set the decree of death on humanity, if war will not end. And let the race die if it is to fight forever. Good riddance.

ELECTRICITY FROM GRAVITY.

I listened for a week to hundreds of papers in the World's Congress of Mechanical and Civil Engineers at

the Fair. They told how this planet could be dressed up, swamps drained, rough places made smooth, roads built and canals dug, with rivers diverted to arid areas. The next week was devoted to the World's Congress of Electrical Engineers. A number of the civil engineers were in the audience one day, and an electrician said, with enthusiasm: "You gentlemen fix up this planet, turn it over to us and we will wire it." Now there is a vast amount of wisdom in this. The habitable earth can be turned into an electrical machine. Everybody may then have all the electricity needed at very low cost. This, of course, under government control, after every corporation has been annihilated.

To have this earth an electrical paradise of light, life, health and happiness, two things must be done: Plant trees on every waste acre on earth and store the mountain waters. This is what mountains are for—to accumulate ice, snow and rain. Canyons were made by good dame Nature for one purpose only—to be filled with water: Build great dams across every canyon and "store the floods." As I look into the depths of great canyons, now as I write, one 1,600 feet deep and the other 670, on each side of the observatory, I see Nature's plan. For if gigantic dams of granite were erected at their mouths, billions of gallons of water could be stored in the rainy season for use in the dry. There! I looked out of my south window. Behold! 900 square miles of an area cut out of paradise lies below in ever living green. Thirty years ago the same expanse was one of dreary sand and the cactus plant. Now Pasadena rises in beauty amid groves of countless orange, lemon, peach, pear, plum, prune, almond, walnut, eucalyptus, pepper, magnolia and camphor trees all bathed in the light of the sun of California. And heliotropes, carnations, roses, sweet violets, the great flaming poinsettias and blooming hydrangeas by literal millions. And beyond, the great Los Angeles. Not one of these could exist without irrigation. Forests, stored water and irrigation are the watchwords of humanity now. But water flowing from mountains to thirsty plains below can be used over and over again to turn the armatures of giant dynamos. These pour out floods of electricity for more than 4,000 different methods of use at present. You can do anything human with electricity. It is now under better control than steam. Touch a key here and light bursts into view; and there, heat appears giving blessed warmth, health and life: The very water that calls fruit, flowers and grains into being develops electricity in its descent. Look at this: Water in the mountains contains human needs in every minute detail. Light, heat, work of every kind whatever, and Life itself. Running water works all night while the sun forsakes half of the earth continually. Loud and long will be the wailing and awful the gnashing of teeth when men suddenly awake from their present inconceivable lethargy and discover that carbon has disappeared. With feverish haste they will plant forests all over the globe. Why not plant trees now? Why not store every drop of water and set it to work generating electricity and also food plants? Again: Do this or die. Let every wheel on earth be turned by means of electricity and all work, heating and cooking likewise. It is doubtful if the earth's land surface can supply wood and food enough. If the race doubles or quadruples, then every inch of land and every stream must be utilized. Here is an appalling question: Will men, when polar winds and frigid

weather set in, and when the pinching and gnawing of hunger begins, fight? Will humanity die on the battlefield? Will reason entirely vanish in the throes of starvation and cold? Will they clutch each other's throats with the ferocity of tigers over the fragments of food? The overwhelming carbon question must be faced. Listen, and that within one hundred years.

Lowe Observatory, Echo Mountain, Cal., September 27, 1907.

DIVIDING WATER.—PAST AND PRESENT METHODS.

BY JOHN G. HALL,
GREELEY, COLORADO.

In 1882, when the writer first landed in this irrigated country, the method of dividing water on the main canal was done wholly by guess work. No consideration was given to the velocity obtained by a stream running in the lateral, and after a few years this careless method was found very unsatisfactory, and a new one was introduced. The new way, known as the Clark system, where each water right in the lateral was given a four-inch space on the measuring wier; to illustrate, if a lateral was drawing only one right, all space on the wier would be closed up by perpendicular boards except a space four inches wide; two rights eight inches wide; three rights twelve inches wide; and so on.

The variation of amount per right was regulated by the depth of the stream. For a 40-inch right the issue would be ten inches deep. The right of forty-eight inches, twelve inches deep, and so on; always multiplying the depth by the number of inches in width. This system existed for many years. Finally, like the first, it became old and out of date, and the meter system was introduced, and is in use at the present time. This system is a rating of each particular lateral, this rating being taken by an engineer, who secures the velocity of the water at different heights on the wier, the wier remaining the same in width at all times. The table of the rating of each particular lateral is carried by the ditch rider and a given height in inches on the wier will deliver to the users the given amount in inches. This appears to be wholly satisfactory to the users and does away with many disputes, quarrels and lawsuits, and this particular invention has come into almost general use during the past twenty-five years in the territory around Greeley, Colorado.

In case I have not made this matter clear to the readers of the IRRIGATION AGE. I will be glad to correspond with them and to explain the different methods and the improvements in detail. I will attempt to take up some other features of practical irrigation in the December issue of the AGE.

NOTE.—Our readers who are desirous of securing information from Mr. Hall will kindly enclose stamped envelope for reply. We have made an arrangement so that he will answer all questions pertaining to different systems of irrigation free of charge for readers of the IRRIGATION AGE.

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

THE SUNNY SAN LUIS VALLEY.

A Descriptive Outline of a Valley That Is at the Same Time One of the Most Beautiful and Fertile Regions in the United States—The Towns, Streams and Mountain Ranges which Make Up Its Grandeur—By W. A. Anderson.

Situated in the southern part of the Commonwealth of Colorado, about the middle of the state from east to west, and extending south into the state of New Mexico is the "Sunny San Luis Valley," which has become famous during the past three or four years as a stock raising center. Entrance is had to the valley by the Denver & Rio Grande railway from Pueblo and the east and by the same line from New Mexico and the

forming its boundaries on the other three sides. The character of the soil bears out the theory, varying from a heavy adobe (which is only in a limited area) through a dark heavy alluvium to a lighter sandy or gravelly loam. This soil varies from a depth of eighteen inches to three feet throughout the valley and under all is a heavy adobe. The soil is undoubtedly the sediment and silt deposited by the numerous



Sheep Passing Through Monte Vista, Colorado, on Way to Pea Fields for Winter Fattening.

south. This is the only railroad which touches any portion of this fertile section. In coming from Pueblo the route leads through La Veta pass, one of the grandest and greatest passes in the Rocky Mountains. There is no doubt but that the valley is one of the most picturesque as well as one of the most fertile in the United States. To the north, east and west are mountain ranges, tributary to the Rocky Mountain system. The region was at one time Mexican land and towns, ranges and streams still bear the names given them by these nature-loving people. The land became the property of the United States by the cession following the War of 1812, but descendants of many of the first settlers who wrested the land from the Indians are still residing in the valley. There are many of them who are prosperous, thrifty farmers, but the majority

glaciers, rivers and creeks which fed the old lake.

The mountain range to the north is the Cochatopa, to the west is the San Juan, which forms the Continental divide, and to the east is the Sangre de Cristo. The latter is Spanish or Mexican for "Blood of Christ." When the peaks of the range are snow covered the sun setting behind the Continental divide across the valley paints them a dark red—blood red. It is truly an awe-inspiring sight and it is easy to comprehend why a reverent, God-fearing people came to christen the range "Sangre de Cristo." In the Continental divide to the west the Rio Grande del Norte (the great river of the north) has its source. It is difficult to believe that this is the stream which the geography of our school days taught us is the largest river in North America next to the Mississippi river, and which ulti-



An Irrigation Ditch Near Monte Vista, Colorado.

seem to inherit the indolent traits of their Indian and Spanish forbears. They are a clannish people as a rule, either because of ostracism by their white neighbors or by preference. Their homes are of adobe and are grouped together, generally on the outskirts of the towns.

The geological theory of the formation of the valley is that it was at one time a great lake which gained freedom for itself by washing out its southern bank, thus leaving its bed with the mountain ranges

mately becomes the dividing line between the United States and old Mexico. At this time of the year it is an easy-going stream with no great depth at any one point, but in the spring of the year, when the snow is melting on the mountains it becomes a raging torrent which makes it necessary for settlers along its banks to keep careful watch that stock and buildings are not swept away. Three other streams, the Conejos, Alamosa and La Jara rivers, were strong enough to force their way across the lake bed and finally join

the Rio Grande river near the southern end of the valley. There are numerous other streams, such as Rock, La Garita, Carnero, Saguache, Cottonwood, Medano and Sand creeks, which flow into the valley from the surrounding mountains, but the waters either sink or spread out over the surface, soon after entering the valley from the foothills, thus forming great natural hay fields.

The altitude of the valley varies from 7,600 to 8,000 feet, about the same height as is the City of

The valley is about 100 miles long—that is, from north to south—and varies in width from thirty to forty miles, and slopes gently toward the center. The Rio Grande river enters the valley on the northwest side and flows southeast for about forty-five miles, turning almost due south twelve miles southeast of Alamosa. Portions of four counties are included in its scope. They are Saguache (pronounced Siwatch), Rio Grande, Costilla and Conejos. Saguache is the most northerly and the largest. The northern, eastern



Bird's Eye View of Alamosa, Colorado.

Mexico. The altitude naturally is a great inducement to health seekers, and together with the purity of the water supply, derived for the greater part from artesian wells, is bound to make the San Luis valley one of the most popular health resorts in the world. Monte Vista, the largest town in the region, makes the proud boast that never in the twenty-four years of its history has a case of typhoid fever had its inception in the village.

A word about the history of the valley is not out of place. Zebulon Pike, after whom Pike's Peak is named, was the first United States citizen to penetrate the valley. His visit was in 1806, when the section was then a part of the Spanish domain. On his return to Washington he reported that this section of the state was "an earthly paradise," but notwithstanding his enthusiastic praise of the region there is no record of attempted settlement until 1846, when certain thrifty Mexicans came and settled along the Rio Grande river, using their home ranches as the base camps for the great grazing herds of cattle and sheep on the plains and the foothill slopes. These first settlers were driven off by Indian depredations and it was not until 1855, when the United States government established garrisons at Fort Garland, that they had the temerity to return. Then white cattle men, learning of the richness of the pasture land, came in. Gradually they began to dig irrigating ditches and cultivate and were surprised to find that the region which they had first considered too high and cold for the successful pursuit of agriculture, gave promise of being one of the most fertile they had ever seen. The real development of the valley, however, covers a period of less than thirty years. It was then that the construction of irrigation canals was begun, taking water from the Rio Grande and the other rivers.

and western borders of it are in the mountains and are devoted to summer feeding of sheep. Lower down, just below the foothills, are large cattle ranches. In the eastern portion is the Luis Maria Baca grant, No. 4, one of the concessions made by the Mexican government to certain of its citizens before the region was ceded to the United States. To the southeast is Costilla county, whose south boundary is the New Mexico boundary line. The southeast portion of Costilla is taken up by the Sangre de Cristo grant, which is probably five times as large as the Baca grant. Rio Grande county is south of Saguache and west of Costilla counties and is of smaller area than any of the other three. Conejos county is in the southwest portion of the valley and extends to the New Mexico border.



General View of Del Norte, Colorado.

Of the towns in the valley Monte Vista, in Rio Grande county, is the largest and most prosperous. It has a population of 2,250, which at the present rate of development will doubtless be doubled within the next five years. The town was formerly called Henry, in honor of T. C. Henry, the man who conceived the idea of irrigating the valley by taking water from the Rio Grande river. The company he organized originally had its headquarters at Del Norte, but when the people of Del Norte refused to grant concessions in the way of lands a town was established fifteen miles southeast and the company moved its offices there. This was in 1884. Shortly afterward the name was changed to Monte Vista, the Spanish for Mountain View, and those who have visited the town agree that it was well named. Del Norte, the county seat of Rio Grande county, is the oldest town in the valley. It was for many years the terminal of a branch of the Denver & Rio Grande railroad, which now extends some forty miles beyond into the mountains to Crede, a mining camp. The town has a population of 1,200. Just in the center of the town is a magnetic spring,

Denver, to Monte Vista, Del Norte and Creede, to Salida, to Durango and to Santa Fe. The population of the town is over 1,700, made up largely of the employes of the railroad shops located there.

Other towns in Conejos county are Romeo, Conejos and Antonito. The latter is a junction point of the railroad, one branch going south to Santa Fe, N. M., and the other west to Durango and the San Juan mining region. Near Romeo the land is being given over to sheep raising.

Straight north of Alamosa, on the narrow gauge line to Salida, are the settlements of Mosca and Hooper. This section of the valley enjoyed a great boom about twelve years ago, but careless methods of farming brought alkali to the surface and caused the abandonment of many farms. In the last few years more careful farming methods have been practiced and fields which have lain idle for years are again being made productive. Center, near the southern boundary of Saguache county, is the "Center" of a great grain raising belt. Its chief drawback is its distance from a railroad. It was laid out in 1897 by the Grain Belt



Street Scene, La Jara, Colorado.

whose health-giving properties are wonderful, being especially good for persons affected with stomach troubles. Agriculture in the valley has reached its highest point around Del Norte, it being within little less than a mile of the center of the town that the record-breaking yield of potatoes, 847 bushels to a measured acre, was established.

La Jara (The Willow), in Conejos county, is the center of a fertile region. The name was originally given to a postoffice located on a ranch six miles west of the present town, which was then known as "The Tank." In 1883 the railroad established a station at the tank and the postoffice was moved, taking the name. The town suffered under the none too scrupulous advertising of certain promoters and in 1900 the boom fell flat. Since that time it has been "picking up," however, and as it is in the center of a very fertile region it has a future before it. Its present population is about 600, but it does annually now about \$1,000,000 worth of business.

Alamosa, also in Conejos county, is the geographical center of the valley. It is the headquarters of the Fourth division of the Denver & Rio Grande railroad from which five radiating lines go out—to Pueblo and

Railway Company, which projected and surveyed a line west from Hooper to Center (then called Centerview), a distance of twelve miles. The proposed railroad went the way of many others and never materialized, but the town has prospered and should a railroad ever be put through there is little doubt but that it would become one of the largest in the valley. Center is fourteen miles northeast of Monte Vista. Saguache, the county seat of the county of that name, is the northernmost town in the valley. Like Center, however, it is handicapped by lack of proper railroad facilities and can never reach its full capacity until it gets railroad connection with other towns.

I have attempted in this article to give in a general way a descriptive outline of the valley and its principal centers. There is much more that might be said of the scenic beauties, the business possibilities and opportunities and the healthful advantages of the region. But it is not my purpose to do this, and I have prepared this outline in order to familiarize the readers of the IRRIGATION AGE with the valley as a whole. In the December number I will write of the agricultural advantages which have made the valley famous.

DRY FARMING BY ONE OF THE FARMERS.

J. L. DONAHUE,

PRESIDENT THE COLONIAL SECURITIES & TRUST CO., DENVER, COLO.

Your editorial on "Dry Farming" in your September issue sets out to discuss the subject in an apparently fair-minded manner. But before the writer was well into his theme he proceeded to make some statements that on a basis of fact pure and simple are not only open to criticism but are not true. When you declare "In the first place there can be no such com-



Peach Orchard on the Dry Farm of E. R. Parsons, at Parker, Colorado, Twenty-miles from Denver. This Orchard Has Never Been Irrigated. Note How Clean the Ground Is.

forts as can be obtained by irrigated agriculture, such as fruit trees and vegetables, and there is no assurance that even a drouth-resisting crop will mature," you lay yourself open to the charge of total ignorance of the facts.

The writer is the president of a corporation that is conducting the most extensive dry farming operations of any single corporation or individual on the Eastern Colorado plains. His duties require that he travel over the vast area, still largely undeveloped, for the purpose of observing what others are doing and how they are doing it. He can and will supply you the names and addresses of men who have today some of the finest orchards in all America upon the semi-arid plains of Eastern Colorado. There is Mr. E. R. Parsons, of Parker, who grows the finest of cherries, peaches and apples every year. A view of one of his orchards accompanies this article. Mr. George Lambert, of Sedalia, Douglas county, Colorado, is another. The Stark Brothers' orchard at Littleton, in Arapahoe county, is another. Mr. Cope's orchard and beautiful extensive grove of deciduous trees out on the plains at Cope, twenty miles from a railroad, is another. Mr. J. B. Robertson's orchard at Cheyenne Wells, where the limbs hang laden to the ground with apples of the most choice varieties at this very hour, is still another. And if you want to give me the space I will furnish the names and addresses of one hundred more who have fine producing orchards that never had a drop of water applied by artificial irrigation. Every one of these men and scores of dozens of others produce all varieties of garden truck grown anywhere in the north temperate zone. Mr. F. B. Goodale, of Peoria (a way station on the Kansas Pacific fifty miles from Denver), is producing the finest cauliflowers ever grown on earth without irrigation, and is shipping them to Kansas City and Omaha markets by the carload at

two dollars per dozen f. o. b. Peoria. This man raised cauliflower for the past fifteen years on the fertile garden lands of Long Island, and after very searching investigation and study of conditions, chose the semi-arid plains of Colorado as the ideal place to produce high class cauliflower, and that without irrigation.

The local fairs just over at Hugo, Limon, Castle Rock, Bennett, Elbert and Akron would convince the most skeptical whether or no fruits and vegetables not only *can be* but *are* grown abundantly without irrigation all over the plains of Eastern Colorado.

You are quite correct when you assert that "Dry farming means one endless round of work for the agriculturalist." The only type of farmer that we of the West advise to leave their farms in the humid regions of the East or the Middle West to take up dry farming on the great plains of the West, are such men as those who are willing to earn their bread by the sweat of their brow; who have been trained in the school of skillful farming and who long ago learned the lesson that good crops and certain harvests are always the result of "endless work" and tireless vigilance. Let no man leave his home in the Middle West to enter upon the pleasant but serious task of dry farming in the West unless he has already learned the art of agriculture and has means sufficient to purchase the equipment essential for successful farming anywhere in America.

One word on drouth-resisting crops and seasons of drouth. The writer regrets that lack of space in your valued paper which can only be at his disposal with your courteous consent, will not permit exhaustive discussion of so vital a question as Dry Farming. However, our word will have to be accepted in this instance for the fact that proso, emmer, Kherson oats, bald barley, peas, Kaffir corn, millets of several varieties, durum (macaroni) wheat, dwarf milo, maize, bromegrass and native blue stem can be depended upon to produce high average yields in the driest years that



Apple Orchard Developed Under "Dry-Farming." This Is Also On the Parsons Ranch. This Orchard Is On High Ground and Lacks the Advantage of "Run Off" Water from Higher Levels.

have ever been recorded in the West since the establishment of the government climatological service.

The season just closed has been one of the driest in Eastern Colorado in nearly a quarter of a century. Almost every month since January first at every station, where government gauges are located on the Eastern Colorado prairies the record is considerably below the normal (normal is only about an average of fifteen inches). The government report in this morning's press in Denver (October 8th) for the Den-

ver district reads as follows: "The total since January 1st is 10.93 inches, or 1.37 below the normal." This has been about the condition every day since January 1st. Only about a dozen times during the year was the precipitation up to normal even, and then not during the vital part of the *growing season*. No one appreciates more keenly than the writer the great value of artificial irrigation in the reclaiming of the lands of the semi-arid West. He believes that the Reclamation Act was one of the most important statutes ever enacted by Congress, and that it is the most glowing star in the crown of Mr. Roosevelt's well earned renown. But let it never be forgotten that there are scores of millions of acres of the richest soil in all our land of superlative wealth that can never be reclaimed by artificial irrigation for many very obvious reasons.

It is because of this fact that we who live in the West and who believe in her promising future have set resolutely to work to reclaim these vast stretches of barren acres by the methods now commonly known as "Dry Farming." It would be a real delight for us who are doing the work, attempting to solve the problems at close range, to tell you our views of what "Dry Farming" is doing, what its limitations are, and what it is absolutely certain to bring to pass as the years pass into history.

ALCOHOL VS. GASOLINE.

"The Comparative Values of Alcohol and Gasoline for Light and Power," is the name of Bulletin No. 93, which is just being issued by the Agricultural Engineering section of the Experiment Station at Ames.

In the spring of 1906 the National Congress passed an act which became a law January 1, 1907, permitting the withdrawal from bond, tax free, domestic alcohol when it was denatured or rendered unfit for human consumption by the addition of certain materials repugnant to the taste and smell. The passage of this law has aroused much speculation into the possibilities of this new fuel. The Experiment Station compared gasoline and alcohol with four objects in view, -viz: (1) the heat value of the fuels; (2) their economy in the production of light; (3) their economy in the production of power; and (4) the relative safety of gasoline and alcohol for general use. The conclusions reached in these experiments will prove interesting to every reader.

This bulletin may be obtained by asking for Bulletin No. 93. Apply to Director Chas. F. Curtiss, Iowa Experiment Station, Ames, Iowa.

DIVISION OF THE WORK OF IRRIGATION AND DRAINAGE INVESTIGATIONS.

In view of the fact that Dr. Elwood Mead has been called to Australia to assume direction under Government auspices of irrigation work in that country, the Secretary of Agriculture has divided the work of Irrigation and Drainage Investigations of the Office of Experiment Stations, which Dr. Mead has managed with such marked ability since its establishment in 1898, into two sections. Dr. Samuel Fortier, irrigation engineer in charge of the Pacific district of the Irrigation and Drainage Investigations, and stationed at the University of California, Berkeley, Cal., has

been made Chief of Irrigation Investigations. Mr. C. G. Elliott, for several years past engineer in charge of the drainage investigations of the office, has been made Chief of Drainage Investigations. Both of these officers will report directly to Dr. A. C. True, Director of the Office of Experiment Stations.

Samuel Fortier, B. S. A., M. E., D. Sc., is a graduate of McGill University. His practical training began with employment on a survey of the route of the Denver & Rio Grande railroad, and has included experience as assistant engineer of the Denver Water Company, chief engineer of the Ogden Water Works, chief engineer and superintendent of the Bear River Canal system, in planning of irrigation dams and reservoirs in Utah and Montana, and the Modesto and Turlock irrigation system in California, the measurement of stream flow, and the Irrigation and Drainage Investigations of the office of Experiment Stations, with which he has been connected in one capacity or another almost from their organization. As director of the Montana Experiment Station he demonstrated administrative capacity in a somewhat different field and was brought into close relations with the farming interests. Here as in earlier experience at the Utah Experiment Station and later at the California Experiment Station he gained an intimate knowledge of the strictly agricultural side of irrigation and the problems which are pressing for solution in this field. His, therefore, has been a well-rounded experience in practical engineering and construction work, investigation in irrigated agriculture, and administrative duties. The results of Professor Fortier's work in the different lines named have been embodied in numerous papers in engineering journals, in reports and bulletins of the Utah, Montana, and California experiment stations, and in the publications on irrigation and drainage of the Office of Experiment Stations.

C. G. Elliott, C. E., who has been placed in charge of the drainage work, received his training in civil engineering at the University of Illinois, and has been in active engineering work since 1878. He was for many years editor of the *Drainage Journal*, published at Indianapolis, Ind., the leading journal of its class in the United States. He is also the author of numerous reports and technical papers on drainage, and of two books, "Practical Farm Drainage" (1882 and 1903), and "Engineering for Land Drainage" (1903), which are generally recognized as authorities on the subject of drainage. Mr. Elliott has been in charge of the drainage investigations of the Office of Experiment Stations since 1902, and the results of his work in this capacity have appeared in the form of numerous technical and popular bulletins on farm drainage, reclamation of swamp and overflowed lands, and related subjects, published by the Office of Experiment Stations.

In the irrigation division the three main lines of work will be, as heretofore, (1) dissemination of practical information, (2) scientific and technical investigations, and (3) reporting on irrigation conditions in certain districts.

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The Home

BULBS AS HOUSE PLANTS.

Queries occasionally come to the Colorado Agricultural College concerning the proper handling of bulbs for home decoration during the winter. Such information should be of some general interest, as nothing adds more to the cheerfulness in the home than plants, and a few bulbs afford a pleasing and all too uncommon variety. No class of plants are of easier growth if a few fundamental principles are adhered to.

The first is, perhaps, a choice of kinds. The beginner will do well, no doubt, to experiment first with a few kinds, as a few well-grown specimens are much more satisfactory than many which give indifferent results. In this class may be placed the narcissi of various kinds, hyacinths and freezias.

Narcissi come in many forms, as the polyanthus, jonquils and daffodils. The two common forms of hyacinths are Dutch and Roman, while freezias are of but one kind.

Soil for bulbs should be made light with sand and loam, but aside from texture there is little else required. Any soil in which the common house plants thrive will answer.

Four or five-inch pots do nicely for bulbs, but the shallower pans look neater. One hyacinth bulb is all that should be grown in the smaller sizes, while from three to five narcissi, according to size, may be used. Some drainage material, as a few pebbles or bits of broken pots, should be placed in the bottom, then the pot is filled two-thirds full of soil, which should be pressed down firm, but not packed; then the bulbs are placed so that they may have half an inch of soil over them, and the surface of the soil should be at least half an inch below the top. A thorough watering is now given and the pots are put in a damp, moist place, where the temperature will remain at not far from 50 degrees. This may be in a cellar, or even in a room, though suitable protection must be afforded to prevent drying out. A common practice is to bury the pots out of doors where sufficient protection is given to maintain the required temperature. This treatment is necessary in order to secure a good development of roots before the top begins to grow. This will, usually, take about four weeks, but their condition may be ascertained by an examination at any time. Pick up one of the pots, invert it and tap the rim gently on a table's edge and the contents will usually fall out readily without disturbing either roots or soil. When the soil is fairly well filled with roots it is time to place the pots in the window.

Freezias are, perhaps, the most satisfactory for several reasons. They are very easy to grow, the bulbs are cheap and but few flowers surpass them in fragrance or in beauty. They are planted the same as the others, but as the bulbs are small, a larger number should be planted in a pot, perhaps six will be about right for a four-inch pot, a row around the outside with one or two in the center.

Unlike the other bulbs, freezias should be placed in the window at once. Keep in the sunshine as much as possible and water carefully. The plants are apt to take a spindling growth any way, so a little care will be well repaid. As the flower stalks begin to form they may need staking, but a small stake may be used which will not be too conspicuous.

After the flowers are exhausted, the plants should be well ripened by gradually withholding water, then the pots may be placed in the cellar until the next fall. The larger bulbs may be used for forcing a second time. This is not true, however, of the other kinds mentioned, as they are worthless for forcing a second time.

W. PADDOCK.

Pure Food.

Pure food legislation seems to be a popular theme nowadays, and while it is true that many articles running in the magazines with reference to the way we eat, where we eat,

and how we eat, often make us tired, yet when it comes to food to eat it becomes a serious matter and concerns all of us. It seems that almost everything we buy prepared for food has been tampered with, and adulterated, and some of the most deadly poisons are often used in such cases as preservatives. Everywhere people are demanding a halt. Too much credit cannot be given to the Fort Collins, Colo., Chamber of Commerce, for acting upon the suggestions of Dr. George H. Glover, dean of the veterinary department of the State Agricultural College, and his co-workers, and recommending to the city council the enactment of a pure food ordinance. While it has only been a few months since this ordinance was put into effect, yet today Fort Collins can boast of pure food laws that are enforced as in no other city in the state and very few in America. This pure food law is practically self-supporting, although Dr. Glover, to whom credit is more especially due for this good work, is receiving nothing for his services. He has had two and three assistants busy for two months inspecting milch cows and the dairies. These assistants have not only profited by the experience, but practically all the money that has been received for inspection has gone to them. Of the \$75 a month which is paid to the inspector, \$65 is paid to three assistants—two that are doing all the inspection of slaughter houses, and Dr. Kingman, for the milk and cream analysis.

Everything with respect to pure food legislation is gradually working out satisfactorily. One reform after another is being brought about without a jar or friction. The only complaint that has amounted to anything has been from the owners of cows in the city, who have objected to the \$2 license fee. It is not presumed that everything will work smoothly at the beginning. Mistakes will necessarily be made. Dr. Glover will ask the city council to amend the ordinance with respect to the license fee paid by the owners of one cow where they simply supply milk to one or two neighbors. This will be changed to a registration fee of fifty cents.

L. M. T.

Life on the Isthmus Isn't So Bad.

Some aspects of life on the Isthmus were portrayed in an entertaining manner by Mr. M. J. Stickel, the popular secretary of the Young Men's Christian Association, at Cristobal, in a letter to the home organization soon after his arrival at Panama. He wrote:

"I have been here five days, and I think I am prepared to write a book on 'Panama: Past, Present and Future.'"

"I have been the entire length of the canal zone twice, and have viewed every phase of making dirt as well as mud fly. At Culebra the air is vibrant with the noise of steamshovels, dirt trains and machine shops. This is varied by the shock of frequent blasts of dynamite as great masses of rock and clay are blown off the side of the hill to satisfy the rapacious shovels.

"I must say this, however: Never in all my life have I been so disappointed in a place—pleasantly so, however. The climate thus far is most delightful. It is hot in the sun at midday, but most pleasant in the shade. I have slept under a blanket every night.

"The one constant source of surprise is that things are not foreign, nor scarcely tropical. One has to conjure with his senses to realize that he is not in Galveston or Atlanta, or even St. Louis. Everything is American.

"This is a land of contradictions and perversions. Wagons turn out to the left side of the road; waiters serve you on the left side of your plate; the sun rises in the Pacific, and has his going down in the Atlantic; the Pacific end of the canal is east of the Atlantic end; breakfast is called 'coffee,' luncheon is called 'breakfast,' although dinner, strange to say, is actually called 'dinner.' You can't buy anything, except stamps, with money save from Chinamen or natives; if you purchase ten cents' worth of stamps and hand in a \$2 bill you will be given \$3.80 in change. The gold employees are all white, and the silver ones are all yellow or black; and so on.

"It is a fine place for women and children. The average health among them is very much above that in the states, and the man who has his family here is very fortunate in every way, except, perhaps, in regard to children who are ready to go to high school."—From "The Lighter Side of Life at Panama," by Gertrude Beeks, in *The Circle* for October.

RURAL WATER SYSTEMS.

"Rural Water Systems," devoted to the subject of the Deming Hydraulic Ram, is the title of a neat little booklet issued by The Deming Company, makers of pumping machinery, Salem, Ohio.

This booklet is so attractively gotten up that we consider it worthy of illustration here. Its twelve pages illustrate the usefulness of the Hydraulic Ram in the country home, and, although the main points are covered, it may easily be read through in ten minutes.

It is explained that conditions of installation differ, and that it is therefore desirable to consider each by itself, and to offer suggestions bearing on that particular case. This method is bound to result more satisfactorily to the prospective purchaser than would a general set of rules applied to every case, regardless of conditions.

FRUIT VARIETIES.

THE KING DAVID APPLE.

HISTORY FURNISHED BY THE PROPAGATORS.

In this department this month it seems proper that we should give a brief history of the King David Apple, since we are offering the young trees to readers of the IRRIGATION AGE. The illustration shown on this page is a photograph of one year old trees. They are, however, larger than the trees which will be sent to our readers in our subscription offer. The trees which will be sent you will go by mail, and,



The Deming Company's Booklet.

We would advise any of our readers who are interested in this to write The Deming Company for information, which they will doubtless be glad to furnish on request.

An Inverted Saying.

If we could only see others as we see ourselves what splendid men and women would inhabit the world.—*The Circle.*

A Dream.

Wishing to learn what his nephew would say, Uncle Charles asked little Fred, "What would you do if you stood at the root of a tree with your foot on the head of a live rattlesnake, a tiger was crouching on a branch above ready to spring, and you saw a wild Indian running at you with uplifted tomahawk?"

"I should wake right up," was the unexpected reply.—*The Circle.*

consequently, will have to be trimmed down to a length of two feet or so. The trees in this picture are from five to seven feet in height.

One year trees, particularly apples, are rapidly growing in popularity. The set-back caused by transplanting is less, they live better and grow more rapidly. On an average there is no difference in the time when a one year tree comes into bearing and the time a two-year old tree comes into bearing. Peach trees, older than one year, are never sold by reputable nurseries. They are practically worthless.

As stated in this department last month, it is our desire to give a short history of some popular variety of fruit each month. Any readers or nurserymen who will favor us with short histories of any variety of fruit will do us a great favor.

In 1893 a promising looking seedling was found in a fence row in Washington County, Ark., Fall 1894, as a 2½

(Continued on page 23.)

CORRESPONDENCE

FROM BOSTON.

The following letter from a gentleman in Boston, supports the argument of Mr. Wright in his article "Americans for America," which was published in our October issue, namely that there are plenty of good Americans in the central and eastern states still ready to follow Horace Greely's advise and "go west," when definite information on any particular locality is furnished them.

413 Massachusetts Ave.,
Boston, Mass., October 29, 1907.

Dear Sirs:

During the past year or so I have become very much interested in irrigation as it pertains to the reclamation of arid lands which would otherwise be non-productive, and I have read considerable regarding this subject. I have had my eye on the far west for a number of years, and as an ambitious, energetic, progressive spirited young man (allow me to say so) I expect some day to cast my lot in some part of the far western country. Fruit growing is what now seems to be the specialty I desire to engage in.

The above will be sufficient as an introduction to you, and now I want to say that I read your article in the IRRIGATION AGE, current issue, and concur with you from my viewpoint that some means should be devised whereby desirable people from the eastern and middle states could secure homes on some of the fine lands that are now being brought under the great irrigation enterprises. One point you mention strikes an identical chord in my own estimation of what American citizens who have the ability and desire, but perhaps not the capital, should do before the chance rolls by—that is, strive to obtain a tract of this irrigable land, which they may subsequently look upon as their own home—an

actual home, not a flat, as in the city, or a rented place as in the country. A home for all time, for they and theirs.

I have dwelled upon this very feature in many conversations with men I happen to meet here and speak of regarding country life, western development, the trammled life of the great cities, etc. Here we are, we American citizens, sticking to the cities and large towns, "hangers-on" on the property which is the natural outcome of the prosperity of the agricultural communities throughout the land, and here we are looking at thousands of immigrants from the other side who come in, take up the lands waiting to be developed, and on which they soon become self-supporting and more, while the "self-important" American "hangs on" to a rented flat or some other form of abode in the city and never owns a home of his own.

There are several other features I desired to touch upon in conjunction with your article, but they have slipped from my mind for the time being. There is another feature which is important in getting people upon the thousands of acres of new lands which are awaiting settlers, and this is easier terms and conditions to the new settler during the earlier years of development. I believe this is referred to by a gentleman who wrote an excellent article that was also published in the same issue I speak of. I forget his name, but he was at the Sacramento Irrigation Congress. He, too, has struck a vital issue and an excellent point, for if the requirements, all in all, were made the easiest to the new settler during the first few years, and gradually increased as he became better entrenched, this leniency would tide over many strong, willing and energetic man and family, who could not possibly succeed under other circumstances, where their financial means was very small. While this may seem a little too charitable to many, I don't consider it would be so, for in the end it would mean more people, more new wealth brought forth from the soil, and all that natural increase in values to the communities and the individuals interested that is so essential to the large, broad, permanent growth of a new country.

I cannot at this writing go further into this subject as I feel and should like to, but I trust in the foregoing words you will grasp some of my views regarding the subject so ably and timely discussed in your communication referred to.

Yours very truly,

C. L. LEAVITT.

[We desire to draw attention especially to that part of this letter which says, "American citizens . . . sticking to the cities and large towns . . . looking at thousands of immigrants from the other side who come in, take up the lands waiting to be developed, and . . . soon become self-supporting and more." Why should Americans stand back? No matter why, they do simply because their knowledge of opportunities in the west is too general, they are not attracted nor helped to any given point. Much greater pains are taken by the government, and, perhaps, westerners themselves to attract to and locate on homesteads, foreign immigrants. It is taken for granted that Americans know where and when and how to go west. They don't. Is a man, with a family, working for a comfortable salary going to pick up and take a leap in the dark by going west without knowing to what point he should go, nor just what he will do when he arrives? Certainly not. He wants some information first.

For the benefit of this correspondent, we will say that in many new localities, in the west the newcomer can secure plenty of employment for his support, until his lands are bringing sufficient income. This is not universally true, nor would it be as nearly so as it now is should as many new settlers come west as we would like to have. But a great deal will have been accomplished when exact information and estimates are furnished the prospective colonists from the eastern states as to just what they can do with a given capital, and what part of the west is best suited to their respective desires.—The Editor.]



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TIN CAN CLUBS.

We reproduce herewith a letter from Mr. H. A. Greene, Monterey, Cal., which will explain itself. We hope to induce our readers to form Tin Can Clubs.

Monterey, Cal., October 7, 1907.

D. H. Anderson, Esq.,
Chicago, Ill.

My Dear Sir:

I am pleased to report to you that the movement to popularize tree growing on the lines spoken of to you at Sacramento has been a great success.

You mentioned to me that you would publish an article in your paper about it, so I am sending you a lot of pictures to illustrate it, and will give a few ideas not spoken of in the booklet.

The use of the tin can is valuable for kitchen gardening, especially in mild climates, for by its use tomatoes, cucumbers and melons, for instance, can be had two months in advance of their appearance in market.

Throw cans into fire to melt solder. Replace bottoms and bind together with string or wire.

In some sunny place locate a large box and fill with fresh manure. Bury the cans with seed planted in them down into the manure. When safe from frosts plant out, removing the tin without disturbing roots.

Change manure when it gets cold and, of course, keep soil moist. Cover 'forcing box' with cotton cloth or sacking.

I am urging everybody, whether living in one room or otherwise, to plant a nut or tree seed of some kind in a can and keep it watered. The chances are that the plant will interest the person and a fondness for it be cultivated; with the probability that a permanent resting place will be found for the trees.

One of the largest nurseries in California is now planting their tree seeds in tin cans.

Should you desire I will send some tan oak acorns to you for distribution. The tan oak is most suitable for street and road planting.

I am going to get out a better booklet on the tin can 'hunch.' I have a lot of trees to send to clubs for prizes, such as redwoods, palms, etc., all in cans.

For the moment I do not think of further information, but you will doubtless get up a good paper on the subject.

It really looks as though many thousands of trees will be planted through this movement and it will surely create an interest in the subject of forestry among the people.

I am invited to speak on this subject in many places, but will have to decline, except in high schools.

I have just forced Abyssinian banana seeds (my own growing) to sprout in twenty-one days by covering them with new manure. This is a good hunch for getting palm seed to 'come' quickly.

If I could induce the State Foresters to send out tree growing club organizers it would result in thousands of such clubs being formed. I claim that cans may be used by government foresters advantageously.

In home gardening I consider the can better than an earthen pot. I plant all my rose cuttings in cans, generally with solder melted out of them, which in tree cuttings is not necessary, since when ready to be planted finally the cans are crumbling from rust.

Let me know if you will give this subject space in your magazine, if not kindly return the photographs.

I think you can do a great good by pushing this scheme of mine along.

Respectfully yours,

H. A. GREENE.

An Orthodox Explanation.

A mother was giving her little girl a bath, when she said, "I wonder where this dust on the water came from?"

Small Girl: Perhaps I leak somewhere, mama. You know, I'm made of dust.—*The Circle.*

FROM OUR EXCHANGES

Denver Field and Farm—The people of the Riverside irrigation district down in Weld and Morgan counties last week voted an issue of \$717,500 bonds with which to purchase a controlling interest in the Riverside reservoir and extend the Riverside ditch to the Wildcat country. The reservoir when completed will contain over 3,000,000,000 cubic feet of water. This election means the beginning of work on the ditch within thirty days and insures water for the strip of territory above the old ditches on the north side of the Platte river from Masters to a point ten miles below Fort Morgan. About sixty miles of ditch will be constructed and over 40,000 acres of new land will be brought under irrigation.

El Paso Evening News—Between irrigation and dry farming, the agricultural problem in what has long been known as the arid west seem about to be solved.

Throughout many sections of the region it has been found that an abundance of water exists under the ground for irrigation purposes; and by its use lands are being watered and splendid crops are raised. Then the dry farming method produces numerous crops on lands which had hitherto been considered worthless for anything except grazing purposes.

Both of these systems are well adapted to the country surrounding El Paso, and with the construction of the Engle dam for irrigation purposes and the inauguration of dry farming the desert should soon be transformed into green fields and blossoming orchards.

It is highly probable that work on the dam will be commenced before the end of the present year, and this will mean the watering of the great area of valley lands which, with sufficient moisture, will produce immense yields of all kinds of crops; while in sections where irrigation is not practicable the dry farming method will make fertile lands of what is now barren plains.

Irrigator (Ore.) Irrigator—The great irrigation system which B. F. Yoakum of New York and associates are putting in below Hildalgo, Texas, will be completed in time for this season's crop. It will be one of the largest irrigation systems in the world when finished and will have cost more than \$2,000,000. More than \$1,000,000 has been expended upon the enterprise. The land to be reclaimed lies in the valley of the Rio Grande and was purchased for something like \$5 an acre less than five years ago. Not an acre could be bought now for less than \$50 and when water is placed upon it the value will be increased to \$200. The irrigating system will cover about 100,000 acres.

Wyoming Tribune (Cheyenne)—In compliance with a request from Senator Warren the general land office at Washington has issued to the Wyoming Storage and Water Supply Company of Sheridan, Wyo., a reservoir site which includes within its area Lake De Smet in Johnson county. The company proposes to use the waters of the lake to irrigate lands in the Piney Creek and Clear Creek valleys, making it possible to secure a sufficient area of irrigable lands to warrant the construction of a sugar beet plant near Sheridan. The grading and construction work will be commenced at once under the direction of Hon. Edward Gillette, state treasurer of Wyoming, and an experienced engineer. Lake De Smet is the key to a great tract of fine farming lands and the attention of the reclamation service has been several times called to the proposition, but for various reasons such as the fact that Wyoming already has two big government systems no action has been taken. The permit issued by the general land office can be considered conclusive evidence that the reclamation service has definitely given over this project in order that it may be more speedily developed by private parties. The association with Mr. Gillette with the enterprise is considered a strong recommendation for its success, as he has been active in the development of Sheridan county lands for a number of years and has for several years been devoting much of his efforts to getting capital into the county to establish a beet sugar factory. The taking up of the De Smet proposition is regarded as another step and a long one to this end.

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STATE OF CALIFORNIA—SECOND PAPER.

Water Supply for Irrigation and Power—San Joaquin Valley—Tulare Lake—Climate.

This magazine made a general reference last month to the importance of the San Joaquin valley. It was shown that in time its very fertile irrigable lands may sustain a population of 5,000,000 or more.

It was not stated that fine rivers flow down from the heights of the Sierra Nevada mountains capable of supplying, when fully husbanded, an abundance of water, not only to reclaim all the lands, but a stupendous aggregate of power for manufacturing and farm use. These rivers come from the regions of eternal snow, are constant, and the total fall or head possible in the distance of say ten miles is in some instances 6,000 feet, about thirty-nine times that of Niagara Falls!

The San Joaquin and Kings rivers alone may be made to supply over 400,000 horse power! The mountain streams of the state probably represent—this is an estimate—a million horse power when fully appropriated, as it may be. This water can be used for mechanical purposes before it reaches the level of the farm lands. Hence, it would not interfere with agricultural interests, but would, in fact, benefit them immensely. For water powers would require storage works, thus conserving the supply for the later season where limited. Again, an abundance of power would enable farmers to raise water to levels difficult to reach by ordinary flowage. This would increase the tillable area and the productive power. Then, to have factories in the midst of the farming sections, placing the industrial consumer beside agricultural producer, is clearly a most fortunate advantage. Besides, this power can be used for a complete system of electric transportation, thus almost perfecting the conditions of convenience and prosperity.

After the San Joaquin river leaves the mountains it bends northward to near the center of the valley and becomes the middle drainage channel of the lower end. The Sacramento river is the central flowage channel of the upper valley. The surface of the land declines gradually from the foothills toward these rivers.

THE GREAT YOSEMITE VALLEY.

The world-famous Yosemite valley has been under the control of the state of California until the past year, when it passed to the jurisdiction of the United States and became one of the national parks. Under the direction of the military authorities new roads are being constructed; the game, which was being exterminated by hunters, will be restored and protected, and this picture of scenic magnificence maintained in a manner worthy of its greatness. With electric railway connection established between the railroads and the park entrance, the time and trouble heretofore required to visit Yosemite will be a matter of the past.

Near the south end of the San Joaquin valley, in Kings county, is a phenomenon found in few places in the world. Years ago Tulare lake existed there, a shallow basin of water about fifteen miles in diameter. A small steamer plied upon its surface. A little stream from the mountain prevented it from drying up. But this inflow later on was diverted for irrigation uses, and gradually the lake's waters evaporated. Enterprising land men have been engaged in selling off its bed for

farming purposes. Thousands of bushels of wheat have been harvested from the floor of that lake.

The promoters knew that the lake might at any time receive some flowage, but not much was expected. So they diked around some of the smaller farms, inclosed them in high banks of earth, to keep the water out. But last season was one of those which spoil all ordinary calculations. The rainfall had not been equaled for many years—it broke the records. The little stream had a big surplus of water, and the Kings river rose high and helped out with backwater. Tulare became a lake again. The farms had to go. The loss was serious, to the promoters mainly. But there is not a doubt but that lake will again dry up, the inflow will be prevented by canals and dikes, and its bed will bloom with wheat fields, orchards, gardens, even towns!

CALIFORNIA CLIMATE AND HEALTH.

In all ordinary seasons the summers in San Joaquin valley are dry and very warm. The mercury gets up to 110 and 120 at midday. But it is not a sultry heat, rather a semi-mountain, dry atmosphere. Just this sort of weather is needed to perfect the great crops of fruit realized there.

It is not a wilting heat. Prostrations are scarcely known. The nights are nearly always cool, and tired people can rest well. This valley used to be called malarial. So were the prairies of Illinois and Kansas. But the conditions have changed, and this region is healthful summer and winter.

The winters are not cold, about like October in Iowa. Rains are common in winter, but no snow of consequence falls. Oranges and lemons ripen on the trees during December and January. The mercury seldom falls to 30—the freezing point. To an eastern man the winters seem mild. In December fogs visit parts of the valley.

All along the coast there is some fog in winter and spring, and the air is frequently moist and raw, blowing in almost constantly from the sea. This damp climate is not favorable to catarrh, tonsillitis and bronchial affections, nor to consumption. Persons so afflicted—say with catarrh—should seek the dry, inland towns, with high altitudes of 2,500 to 3,500 feet.

Many other ailments—one may say most other complaints—are benefited by California climate. Those who suffer from cold in rainy, freezing regions will find comfort and relief in the sunshine of the Golden State. For old people with thin blood it is a refuge. Children and flowers bloom all the time in California!

Hundreds of thousands visit this favored region every year, and the number increases constantly. Many go for a visit, throngs spend the winter, large numbers make it their permanent home. By the census of 1900 the state's population was 1,485,053. At the end of 1905 the governor estimated the population at 1,750,000, an increase in five years of 264,947, or at the rate of almost 53,000 a year. That is growing some. The census of 1910 will doubtless report 2,000,000 or more.

San Francisco is being rapidly rebuilt. It is reported that the expenditures for new structures and restorations for 1906, following the fire, were not less than \$40,000,000. The bank clearings have in the same period exceeded all previous records for the city. The schools report 75 per cent of the attendance of 1905-6, just before the catastrophe. There are close to 600,000 people in the cities and towns around the bay now, and the number will be close to 1,000,000 when the sun goes down on 1910.

KING DAVID APPLE F-R-E-E

Are you a lover of fruit? Are you a fruit grower? Do you not take great pleasure in testing out new varieties? If so you will be interested in our **FREE GIFT** of a one year old tree of the splendid **KING DAVID** apple. We have secured a limited supply of these trees from a great nursery and since we publish a paper devoted partly to fruit culture we think it a most appropriate present to give to readers of our journal.

How To Secure a Tree

If you plant one of these trees you would not part with it when it comes into bearing for \$25, no, not for more than that. Even to home owners who are not fruit growers, a bearing King David apple tree will be a source of pleasure, a supply of fine, beautiful eating apples, and of profit for a lifetime. We will mail a one year tree to you and guarantee good healthy trees for the price of one year's subscription to the **IRRIGATION AGE**.

The Offer

Irrigation Age—one year with one King David Apple tree..... **\$1.00**

Special

You may make the above offer to your neighbors, same prices, including tree, and we will send you one additional tree for each neighbor's subscription you secure and send in. This offer will enable you to secure several trees.

The King David apple originated in Arkansas 13 years ago. In quality it is absolutely **BEST**. Color, beautiful as can be imagined, a deep, dark, solid red. A large apple, late variety, excellent keeper; tree, a vigorous, spreading grower. All in all, King David promises as near perfection as it is reasonable to expect. Is there any reason why you should not have this splendid apple tree growing on your place? Is it not a rare gift? Write us today, and secure a tree.

Fill out coupon plainly, enclose in envelope with money order or crisp dollar bill and mail at once. Make a separate list for neighbors.

THE IRRIGATION AGE,
112 Dearborn Street

Chicago, Ill. _____ 1907

Enclosed find \$ _____ with which please credit me.

Send your paper _____ years and as per your offer send me _____ King David Apple trees this (Fall) (Spring).

R. F. D. _____

THE WASTE IN IRRIGATION.

The quantity of water which plants use forms but a small part of that which is diverted from streams for irrigation purposes. Large volumes are lost by absorption and seepage in the earthen channels of canal systems. Similar losses occur in the laterals which supply our farms and a large part of the remainder is wasted in irrigating crops. An irrigator is chiefly concerned in lessening the waste of water in his supply ditch and on his farm. In localities where water is scarce, the supply ditch should be made water-tight. This may be done by lining the channel with cement concrete, cement plaster, asphalt, heavy crude oil or clay puddle. Flumes or pipes may also be used as a substitute for an earthen ditch.

One of the most common sources of loss of water is poor preparation of the surface. When the soil is irrigated by flooding from field laterals an uneven surface causes needless waste of water, extra labor in spreading it over the surface and smaller yields. The water flows into the low places, which receive too much and may become water-logged while the high places are left without water and the crop thereon is dwarfed. The surface between field laterals should be so evenly graded that water will flow in a thin sheet over the entire surface, the excess being caught up by the lower lateral.

Another common cause of waste is the lack of attendance. Water is often turned on a part of a field are permitted to run without attention for hours and even days. On some farms the irrigators look after the water for ten hours and turn it loose for the remainder

of the day. Under this practice the low places receive too much, the high places little or none, and a large part flows off the field to the injury of the roads and adjoining farms.

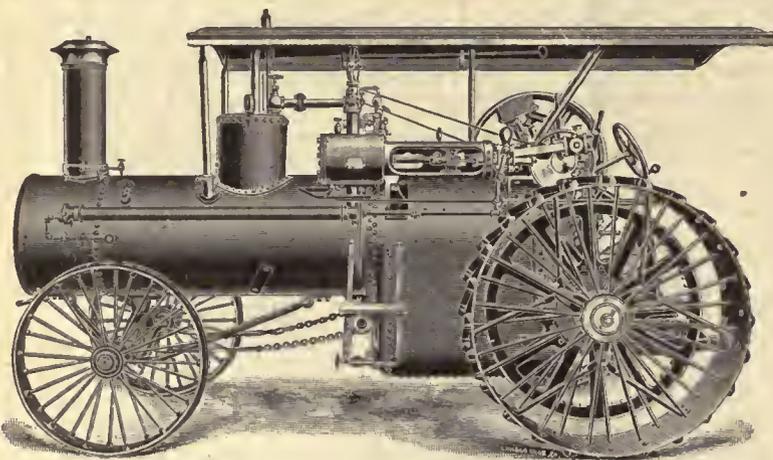
Too shallow and too frequent irrigation is another source of waste. Wetting the surface and neglecting to cultivate it afterwards may result in the loss by evaporation of three-fourths of the water applied in this way. For most plants, and for all deep-rooted plants in particular, the ground should be so prepared that water will readily percolate to a considerable depth beneath the surface and enough water should be applied to moisten the subsoil. As we have said again and again in farming by irrigation, thorough and frequent cultivation is of first importance. It not only prevents the escape of large quantities of soil moisture into the air in the form of vapor but it greatly improves the condition of the soil.—*Denver Field and Farm.*

A Bargain.

He: Miss Hunt, I love you, but now I dare not dream of calling you mine. Yesterday I was worth ten thousand dollars, but today, by a turn of Fortune's wheel, I have but a few paltry hundreds to call my own. I would not ask you to accept me in my reduced state. Farewell forever.

She (eagerly): Good gracious! Reduced from \$10,000 to \$100! What a bargain! Of course, I'll take you. You might have known I couldn't resist.—*The Circle.*

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation



"RUMELY"

Threshing Machinery

Single and Double Cylinder Coal
and Straw-Burner Traction
Engines.

Rumely "Ideal" Separators, Wind
and Attached Stackers.

Ruth Self Feeders.

Grain-Handling Attachments.

CLOVER AND ALFALFA
HULLERS

PLOWING ENGINES

M. RUMELY CO.

Manufacturers

LAPORTE :: :: INDIANA

(Concluded from page 17.)

foot switch, was transplanted in a two-year orchard of Gano, Ingram, Ben Davis, etc. In 1898 the seedling bore its first fruit, about a peck of very fine apples; it bore full each succeeding year up to 1901, when it produced 1½ barrels, in 1902, 2½ barrels. We then secured the sole right of introduction and cut the tree almost to pieces for propagating wood, as we have every year since, but in spite of this it has continued to bear annually, although all other sorts in the same orchard have missed several crops since 1898.

When we first saw King David on September 20th, all Jonathan, in that neighborhood had fallen; King David were not picked until October 25th and were then still hanging firmly on one of the finest trees we have ever seen, much larger, thriffter than the surrounding trees planted two years earlier.

In King David we have found an apple that promises as near perfection as it is reasonable to expect—quality absolutely best, surpassing Jonathan, Grimes or Spitzenburg; color beautiful as can be imagined—a dark, deep, solid red, a blending of the shades of Jonathan and Ark. Black of which is probably a cross. We cannot see how either tree or fruit could be improved; a strong, vigorous spreading grower, larger, heavy, dark green foliage, a remarkably young and heavy bearer; hangs a month later than Jonathan, a far better keeper; this alone, if there were no other points of superiority, would entitle it to first place. Awarded the blue ribbon by the Illinois Horticultural Society. Everyone who has seen the fruit has expressed the greatest admiration for its beautiful color, its high quality; we firmly believe it will prove the most popular and profitable apple ever introduced. In Stark Experimental Orchards, Phelps County, Mo., has more than fulfilled expectations as a splendid grower, young bearer; one year trees planted spring 1904, bore some beautiful specimens in 1906.

The following are a few opinions expressed by well known authorities, on the King David apple:

"I think you have found a valuable acquisition to our already long list of valuable varieties."—Hon. G. B. Brackett, U. S. Pomologist, W. D. C.

"Will make its mark in due time. As good as Grimes, which means the very best. Am having specimens modeled

at Department of Agriculture. They were all delighted with it there."—H. E. Van Deman, Ex-U. S., Pomologist, W. D. C. Later—95. "I have tested the fruit to my entire satisfaction. It is one of the most beautiful red apples I ever saw, fully equaling Jonathan in this respect, and surpassing it in quality. I never ate a better apple." Later—"One of the best winter apples offered to the public. Will probably succeed over a

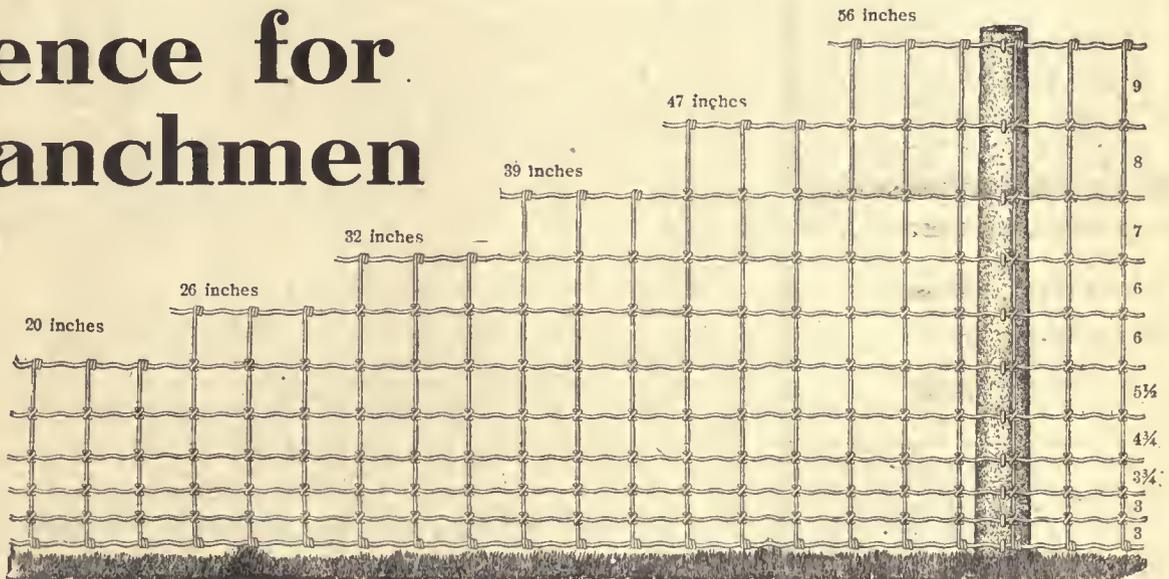


A Field of King David Apple Trees in the Nursery.

large part of the apple growing region. Medium size, brilliant red, very attractive, extra fine flavor."—H. E. Van Deman, in *Rural New Yorker*.

"A year last spring you sent me ten one year trees of King David, which are now bearing some of the largest, finest apples I ever saw; I want more."—Jno. Bennett, San Diego County, California.

Fence for Ranchmen



You will not long content yourself with barbed wire fence after we prove to you that a hog-tight woven wire fence costs nothing—that is, it more than pays for itself the first year and is clear profit every year thereafter.

Our catalog will show you where you lose money—hard cash—every season you neglect to fence your field hog-tight.

Let us make you a proposition on a hog-tight woven wire fence for your ranch. If you will give us the number of rods required we will make you a proposition on the whole business, delivered, freight paid at your nearest railroad station.

Our Square Deal Fence is the highest type of fence on the market today. The one-piece stay feature alone puts it into a separate class from cut stay fences.

OUR LOCK IS PRACTICALLY IMMOVABLE and indestructible. Our wavy line strand wire furnishes a flexibility which enables Square Deal Fence to withstand and recover completely from excessive strains which would cause permanent injury to a less elastic fence.

Get our catalog with full description and prices.

Keystone Steel & Wire Co., 600 Rush St., Peoria, Ill.



Cows' Relief is a specific Remedy for all troubles of bag and teats. It enables dairymen, farmers and other cow owners to keep their cows in a healthy and profitable condition.

Cows' Relief is one of the most perfectly penetrating and disinfecting compounds in existence. It goes directly to the seat of the trouble, relieves the congestion and breaks up the bunches that prevent a natural flow of milk.

Twelve to twenty-four hours' time is all that is required to relieve any case of Caked Bag, if applied freely at the beginning of the trouble.

FOR HEIFERS WITH FIRST CALF

Cows' Relief works in a most pleasing, prompt and successful manner. It relieves the soreness and swelling in the bag and is worth its weight in gold to every dairyman. It keeps the teats soft and flexible, and renders the animal quiet and docile.

H. C. Rice, Farmington, Conn., says: "Please send me two boxes of Cows' Relief. Enclosed find check for same. Please send at once. I wouldn't be without it in my stable."

L. F. Cuthbert, Hammond, N. Y., says: "I have used your Cows' Relief and find it a very valuable remedy for Caked Bag."

We have scores of testimonials like the above. Ask your dealer for Cows' Relief and insist on having the genuine. If he cannot supply you write direct to us, enclosing \$1 for large package prepaid, (enough for four or five ordinary cases). Your money back if you are not satisfied. Positive guarantee on every package. Or send your name and one neighbor's who keeps cows, stating how many you each have, and we will send our book concerning "Cow Troubles," also Goldline Cow Watch Charm FREE while they last.

OUR HUSBANDS MFG. CO.,
710 Chapel St., Lyndon, Vt.

You can increase the value of your property

and at the same time save money by digging your irrigating ditches with a **Vulcan Steam Shovel**. It's a mighty small piece of work where a Vulcan Shovel will not save the price of itself. We don't ask you to take our word for it, but we do ask you to let us send you the proof.

Vulcan Steam Shovels are built in 10 standard sizes from 22 to 110 tons in weight, and $\frac{3}{4}$ to 5 cubic yard dipper.

When writing, give full description of your work.

.. The ..

Vulcan Iron Works Co.
130 Vulcan Place
Toledo, Ohio

THE ADAPTATION OF VARIETIES TO SOILS.

The Yellow Newtown Pippin apple, which is well-known to most apple growers, well illustrates the adaptation of varieties to soils. This variety originated on Long Island and was grown in a few restricted localities in the vicinity of New York, and in a small way at Albemarle in Virginia. In the first year of Queen Victoria's reign, Her Majesty was presented with a few barrels of this variety, which were grown at Albemarle. So pleased was she with the apples that she had the tax removed from this one variety. As might be expected, this notice by the queen brought the variety into prominence, and since that time it has been much in demand for the export trade. This demand led to increased plantings, when it was soon found that this variety succeeded in only a few restricted localities. Recently it has been determined that this varietal peculiarity is entirely due to soil. Wherever soil is found which corresponds in its physical make-up with those where the variety has succeeded, and the climatic conditions are favorable, the Yellow Newtown will succeed.

It is simply an extreme case of the adaptation of a variety to a particular soil. No doubt some other factors, which are not now understood, enter into the adaptation, but the general principle holds good.

The intending planter of fruit of any description will do well to study very thoroughly the plantations in his neighborhood which are located on similar sites and soils. W. PADDOCK.

THE ADVERTISING COLUMNS.

I wonder if the average reader of the IRRIGATION AGE thinks the advertising columns of the paper are interesting? I wonder if he looks them over carefully each month and gets anyways near the information out of them that he does from the reading matter proper? I wonder if he considers the advertising a part of the paper, speaking of it in the light of something for which he has paid \$1.00 to receive it each month for one year; or does he consider it something separate from that part of the paper which he thinks he is paying for.

There are two ways of bringing the manufacturer and the consumer together—of presenting you, the consumer, with information and prices regarding goods which you may be in need of. One way is to advertise in the columns of the papers which you read. Another way is to write you a personal letter. Did you ever hear any one say that if you buy an article that is widely advertised you will pay more for it, because *somebody has got to pay for that advertising?* There is no truth in that statement. Here is the proof. Counting four persons to a family, the circulation of the IRRIGATION AGE being 33,000 copies each month, it is read by 132,000 people, we will say. Now then, it costs \$50 to put a page advertisement in one issue of this paper. Therefore, by *advertising* it costs \$50 to reach these 132,000 readers. Suppose now, that instead of advertising, the manufacturer should write each one of these readers a *personal letter*. The postage for these letters would cost him \$1,320. Does this

CLASSIFIED DEPARTMENT

Classified rate 5c per word, seven average words to a line, including address.

PECOS VALLEY OF TEXAS.
Thousand acres under best irrigation system in Pecos Valley, cut in any size tracts, \$45.00 per acre with water-rights. Write Barton-Duggan, Denton, Texas, for particulars.

WANTED—At once, a competent civil engineer, with practical experience in irrigation work. Write, stating qualifications and salary. Steady employment. Central Okanagan Land and Orchard Co., Ltd., Kelowna, B. C.

demonstrate to you conclusively whether it is cheaper to advertise an article in the paper you read or to write you a personal letter?

Advertising brings things you need within your reach. It reduces the cost of distributing these articles all over the country. It, therefore, directly benefits you. Advertising is a part of the paper. It is one of the most profitable parts to you. Whether you have or whether you have not appreciated the advertising columns, you certainly should, in our estimation. You'll keep finding new things, new machinery, better and cheaper than what you are getting along with now. You are *entitled* to a diversified line of advertising in this paper for the information you can get out of it. The advertising department should be your buying guide. It is furnished you as part of the value you are to get for the price of the subscription. I would not take a paper that had no advertisements, and furthermore I would keep carefully informed on things I used in my work or in my home or what my family used, by reading and answering and buying through advertisements which I read in my papers.

Advertisers are always glad to answer your inquiries and to send you complete information and prices with reference to the goods or whatever it may be that they have for sale. Why not be well informed? Why not learn all there is to know from the advertising columns of the paper you are paying for? The advertisements are merely an index. You are entitled to the catalogues and information that the advertiser will send you immediately upon receipt of your inquiry.

In this issue of our paper are shown advertisements of land companies from various parts of the west. Anyone who is interested at all in new sections of the country should read these land companies' advertisements and get their booklets and maps. Anyone who is interested in irrigation or agricultural machinery, or in household goods, or in spray machinery, or gasoline engines are doing *themselves* a favor and are getting the most benefit out of this paper for which they are paying \$1.00 per year, *only* when they read these advertisements and investigate what they have to say or sell.



Available for 1908

With 24 years' experience as a farmer by irrigation methods, I offer my services to some company who has need of a practical man for opening up and developing new farms in irrigated districts. Full knowledge of how to lay out the land for irrigation, division of water, how and when to apply it.

References. Address JNO. G. HALL, R. R. 2, box 48, Greeley, Colo.

A LIBERAL OFFER

Send \$1.00 for Irrigation Age one year and a King David Apple Tree; or send \$2.50 for Irrigation Age, the book, Primer of Irrigation, and the Apple Tree.

A PARTY OF THREE CIVIL ENGINEERS

Experienced in Surveying

Mapping lands, laying out of railroads and construction work, is open for engagement on a per diem basis or contract work. Have complete equipment in instruments and tools, automobile and camping outfit for themselves and helpers.

Particulars on inquiry addressed to

ENGINEERS

Room 414, Flatiron Building, New York City

**Farmers
Stockmen
Merchants**

South Dakota, North Dakota and Montana offer excellent opportunities for diversified farming, stock raising, mercantile and professional work.

The rainfall and climate and long growing seasons are favorable to raising all grains grown in the middle western states.

Wheat, corn, oats, barley, rye, flax, alfalfa, speltz and potatoes are the principal crops of South Dakota and North Dakota. Montana raises the same crops except corn.

Cattle, sheep, hogs and horses are profitably raised in all three states.

There are good opportunities also for stores of all kinds—for trades and professions—in the towns on the new lines of the

Chicago

**Milwaukee & St. Paul
Railway**

Land in South Dakota and North Dakota along these new lines may be bought at \$10 to \$25 per acre. In Montana bench land may be bought at \$5 to \$10 per acre. Irrigated land in Montana sells at \$50 to \$150 per acre.

The Pacific Coast extension of this Railway has been completed for a distance of over one hundred miles west of the Missouri River and regular train service has been established.

Send for new publication, free on request, descriptive of the country adjacent to the new trans-continental line.

F. A. MILLER
General Passenger Agent
Chicago

GEO. B. HAYNES
Immigration Agent
95 Adams St., Chicago

Oxford Hotel

—DENVER, COLORADO—

At the OXFORD HOTEL, Denver, Colorado, you will find all the leading men interested in irrigation and all of its branches.

Denver is the logical irrigation center of the United States. You will find nearly everyone engaged in or interested in irrigation projects stopping at the OXFORD

Located half a block from the Union Depot: **FIRE PROOF, MODERN, EUROPEAN PLAN and POPULAR PRICES.**

—THE—
HAMILTON-BROOKS CO.
PROPRIETORS

A Life Income

If you only knew how to create for yourself a permanent income for life, would you not set aside a few dollars each year for the next five or six years?

Then maybe you would like to know how?

Take the culture of nut trees, for instance, and start with a very small investment—say only \$30 or \$40 a year. This amount will purchase and set out an acre of the paper-shell variety of pecan trees—twenty to the acre. The care and cultivation of these trees will cost very little and the trees will not interfere with other farming operations on the same land. In from six to ten years from the setting out, each tree should yield at least twenty pounds of nuts, that is four hundred pounds to the acre, and at only fifteen cents per pound (the best varieties are now selling at fifty and seventy-five cents), this means a net income for life of \$60 on each acre.

Doesn't This Interest You?

But, perhaps you will ask, can the pecan be grown successfully in my locality? We can tell you if you will state where you live. There are some sections of this country in which the pecan does not thrive; but there is hardly any portion of the United States where some one of the many varieties of nut trees cannot be grown successfully.

If you care to know more about nut growing for profit, let us send you FREE a three month's subscription to the

American Fruit and Nut Journal,

which is authority on the culture of all varieties of fruits and nuts.

Or, send us fifty cents for a year's subscription to the Journal and we will give you (ABSOLUTELY FREE) a year's subscription to your choice of any fifty cent publication in America.

Think It Over

But don't delay too long, for both of the offers are limited and there may not be enough free subscriptions to go around among the late comers.

ROPER-HINTON CO., Inc, Publishers
PETERSBURG, VIRGINIA

Mention this Journal.

Eastern Colorado Lands



Are steadily advancing in price. Nowhere can lands be found so near a city the size of Denver, providing a ready market for all produce, at the price these farm lands are now offered to the

Homeseeker and Investor

Abundant crops can be raised in this territory by "Dry Farming," many farmers realizing enough from the first year's crop to offset all expenses, including the full price of their farms. This is the

Opportunity of a Lifetime

for very soon Eastern Colorado will be thickly settled and land held at a price too high for those in search of a home in the West.

Go out and see this country for yourself. See the opportunity that awaits you. Take advantage of the

Low Homeseekers' Rates

in many cases less than one fare for the round trip

VIA

Union Pacific

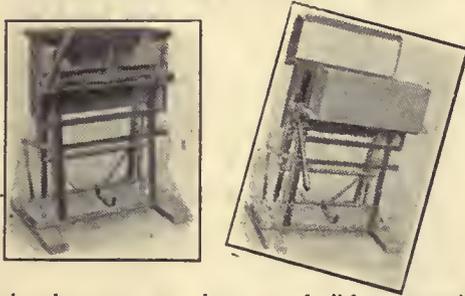
Tickets on sale first and third Tuesdays of October, November and December, 1907

For full information inquire of

E. L. LOMAX, G. P. A.
OMAHA, NEB.

Dry Cement Buildings

ABSOLUTELY MOISTURE AND FROST PROOF



This is what you get when you build your buildings from blocks made on **THE SIMPLEX MACHINE.**

It makes a two piece or hollow wall, any thickness desired for cottage, church or factory building.

All blocks made with face down, and length to 24 inches. Will also make hollow blocks if so desired. **THE SIMPLEX** can be operated by one man or more.

It is light, strong and the most rapid machine on the market. **THE PRICE IS RIGHT.** Send for Catalogue D.

SIMPLEX MANUFACTURING CO.
124 W. Cortland Street, JACKSON MICH.

Galvanized Steel Irrigation Flumes AND WATER TROUGHS



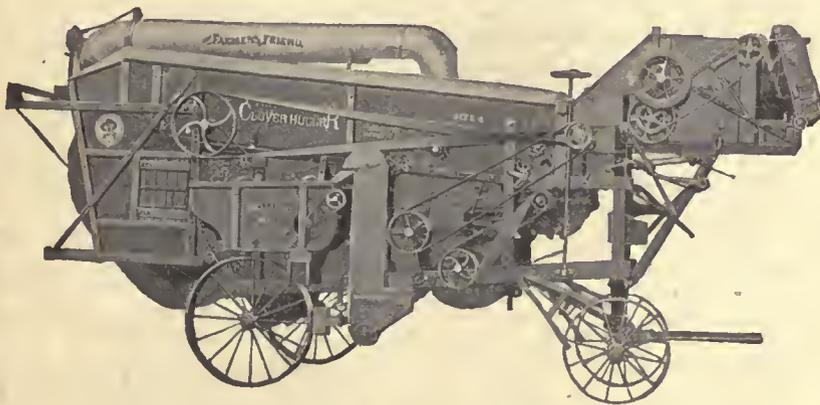
Galvanized steel is rapidly taking the place of wood for fluming purposes and with The Maginnis Patent splice fluming is made easy. Any boy can put the Maginnis Steel Flume together or take it apart. Steel flumes and troughs "Ship Knock down" Third Class freight. Let me figure on your flume. All flumes guaranteed.

Write for Testimonials and Particulars to

P. Maginnis, Mfr.
Kimball, Nebraska

The A. & T. Matchless Clover Huller

Is Unrivalled in Alfalfa and Clover



Leads by a full length, gives full value for investment. Is profitable for owners.

New Century Separators.

Portable Engines.

Traction Engines, burning wood, coal, straw or oil.

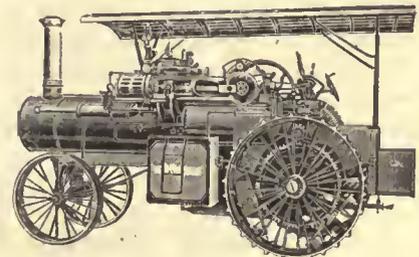
Double and Single.

Portable Saw Mills.

Illustrated Catalogues Free on Application.

Pacific Coast Branch - 150-156 Union Avenue, Portland, Oregon

The Aultman & Taylor Machinery Co. 475 North Main Street
MANSFIELD, OHIO, U. S. A.



Irrigated Fruit Lands

in the

Bitter Root Valley of Montana

References as to the Financial Standing and Integrity of the Owners of This Land

CHICAGO, ILLINOIS		HAMILTON, MONTANA	STEVENSVILLE, MONTANA
FIRST NATIONAL BANK	NATIONAL BANK OF THE REPUBLIC	RAVALLI COUNTY BANK	BITTER ROOT VALLEY BANK
METROPOLITAN TRUST AND SAVINGS BANK	CONTINENTAL NATIONAL BANK	CITIZEN'S STATE BANK	
BENJ. NEWHALL, of J. Newhall & Sons	ROYAL TRUST COMPANY	MISSOULA, MONTANA	
IRA M. COBE, Pres. Calumet Electric R. R.	JOHN W. MCKINNON, Pres. Knickerbocker Ice Co., of Baltimore	FIRST NATIONAL BANK	WEST. MONT. NATIONAL BANK
		MISSOULA TRUST AND SECURITY BANK	

THE BITTER ROOT DISTRICT IRRIGATION CO. lands are practically the last of the distinctly high-class fruit lands purchasable at a price which will permit a man in moderate circumstances to secure a fruit farm, as the most valuable lands for fruit culture are fast disappearing from the market. Fruit lands are readily selling at \$300 and upward per acre for undeveloped irrigated lands, and as Eastern orchards are rapidly deteriorating, owing principally to intemperate seasons, \$500 to \$700 and upwards per acre are prices at which well developed irrigated orchards find ready sale today. Crop records of the Bitter Root Valley show as high a yield, net, per acre, as any land in the U. S.

CONVINCING BOOKLET.
PROFUSELY ILLUSTRATED
SENT ON REQUEST



THE APPLE WITHOUT A
WORM. YOU CAN EAT IT
FEARLESSLY IN THE DARK

OUR LANDS ARE NOW OFFERED AT \$100 PER ACRE, one-quarter down and the balance in equal annual installments. Building supplies are cheap and you are entitled, as a land holder, to cut free of expense a yearly total of 10,000 feet of lumber from the National Forest Reserve, which immediately adjoins our lands. Ten acres of this land, properly cultivated, will more than amply provide for the everyday needs of a family from the very start, and as the fruit trees come into bearing large profits are assured.

We GUARANTEE to refund within 90 days of purchase the entire amount paid for lands which, after investigation, do not entirely please the buyer.

READ WHAT THE U. S. GOVERNMENT says about the Bitter Root Valley. Report from the Department of Agriculture. Bulletin No. 172.

"Throughout the valley diversified farming is practiced. All kinds of cereals do well. Red clover and timothy seem to be preferred in places to alfalfa. The soil is peculiarly well adapted to vegetables, and both soil and climate are admirably suited to fruit raising. The apple, plum, cherry, and in fact all the hardier varieties of deciduous fruit trees, appear to have found in the Bitter Root Valley ideal conditions for their growth. Sheltered from the west winds by the Bitter Root Mountains and from the east winds by the main range of the Rockies, the valley possesses a much more moderate climate than many fruit producing regions which lie far to the south of Montana."

Land Values

IT is difficult for those not informed to understand why lands in some of the Pacific slope valleys are so much more valuable than, for example, Illinois farm lands. The reason is that the valley lands grow a much higher priced product than corn, wheat, or oats. The yield from an acre of high grade Western fruit land will bring in money from ten to twenty times more than an acre of grain. This is the secret of the higher values. Apples grown in the Bitter Root Valley are never sold in barrels, but are packed in boxes and sold as fancy fruit. The area of lands capable of producing fruit of the quality grown in the Bitter Root Valley is limited to a few valleys in the Northwest. Hence the high price that such land commands.

THE MONTANA AGRICULTURAL STATION
BOZEMAN, MONTANA

DEPARTMENT OF HORTICULTURE
R. W. FISHER, HORTICULTURIST

BOZEMAN, MONT. Sept. 17, 1907.
BITTER ROOT DISTRICT IRRIGATION COMPANY,
100 Washington St., Chicago.

GENTLEMEN:—

I have just this morning returned from the Bitter Root Valley. The fruit this fall is an eye opener, even to people who are acquainted with conditions in the valley. I have seen some of the best apples the past week that I have ever seen anywhere, not excepting the Hood River.

In regard to the ten-acre tracts of land which are sold for \$1,000, I have figured out what I think is a liberal estimate for the expenditures during the first year on this land. Expenditures are as follows:

First payment \$250.00, house \$250.00, taxes \$5.00, interest on first deferred payment \$45.00, trees \$125.00, water maintenance \$12.50, fence \$50.00, horse \$100.00, cow \$30.00, seeds \$40.00, plow and cultivator \$35.00, strawberry plants \$35.00, single wagon \$75.00, making a total of \$1,052.50, which would be necessary to spend to get ten acres on a paying basis.

The income following for the first year could be made by one who has some knowledge of growing vegetables or by one who is willing and capable of taking advice or profiting by experience of others:

Two acres of potatoes \$200.00, two acres cabbages \$400.00, one acre miscellaneous vegetables \$200.00, one acre onions \$150.00, making a total income for the first year of \$950.00. In addition to this, in the fall of 1909 he could get a profit from one acre of strawberries which would be in the neighborhood of \$300.00.

Starting with \$1,000.00 an energetic man will not make a failure on ten acres of land in the Bitter Root Valley. Even if he had less than this amount a person could make a living and get a place started by doing work for neighbors or in the lumber camps. I could point out a number of farmers in the Bitter Root Valley who have gone in there during the past four or five years without any capital whatever and have made not only a living but have been putting money in the bank. Of course, a great deal depends upon the man, but I believe any one will be perfectly safe in starting in with a ten acre tract, even though his capital is limited to \$1,000.00.

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(Signed) R. W. FISHER.

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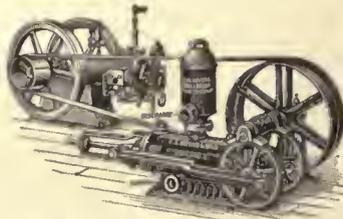
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WITHOUT AN EQUAL ON THE GLOBE

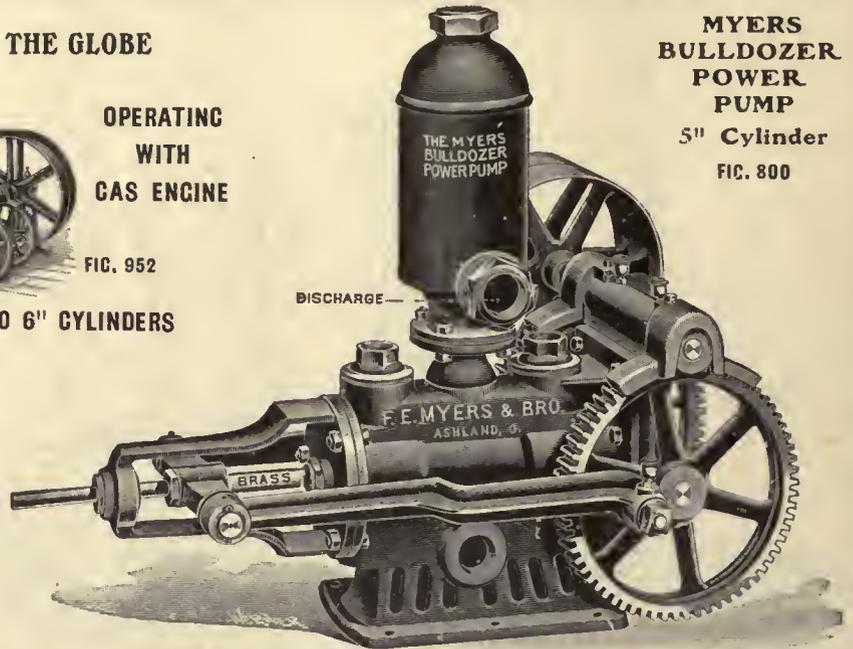


OPERATING WITH GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

MYERS BULLDOZER POWER PUMP
5" Cylinder
FIG. 800



MYERS BACK CEARED WORKING HEAD

TAPPED FOR 3" PIPE

5, 7 1/2 AND 10" STROKE

FOR BELT, WIND OR HAND POWER

FIG. 1113



BULLDOZER WORKING HEAD

BULLDOZER PUMP 6" BRASS LINED CYLINDER

FIG. 1079

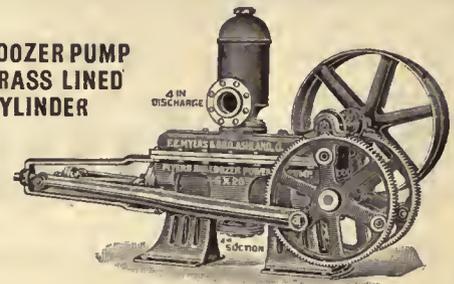
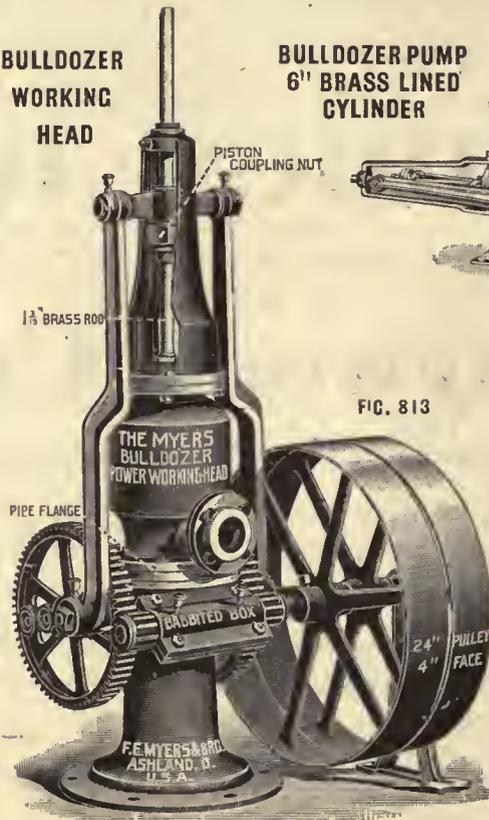


FIG. 813



MYERS BULLDOZER WORKING HEADS

NO. 359

5", 7 1/2", 10" STROKE
DISCHARGE 2 1/2" OR 3"
SUCTION 2" TO 4"

NO. 364

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SUCTION 8" OR LESS

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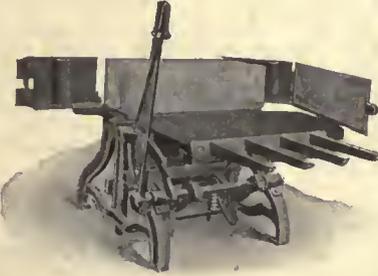
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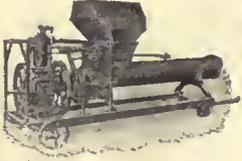
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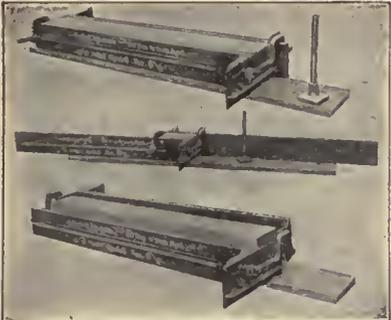


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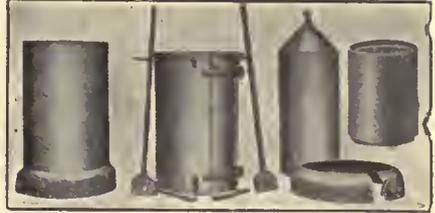
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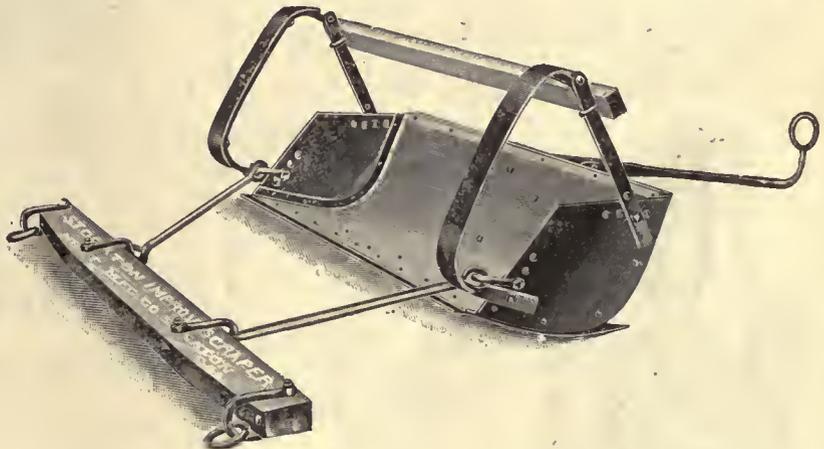
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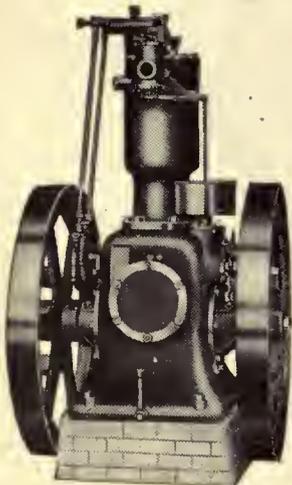
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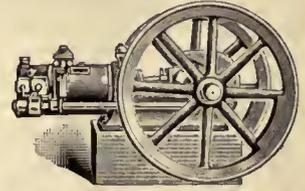
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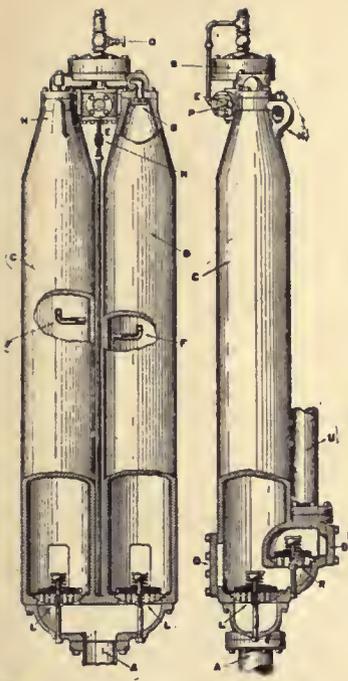
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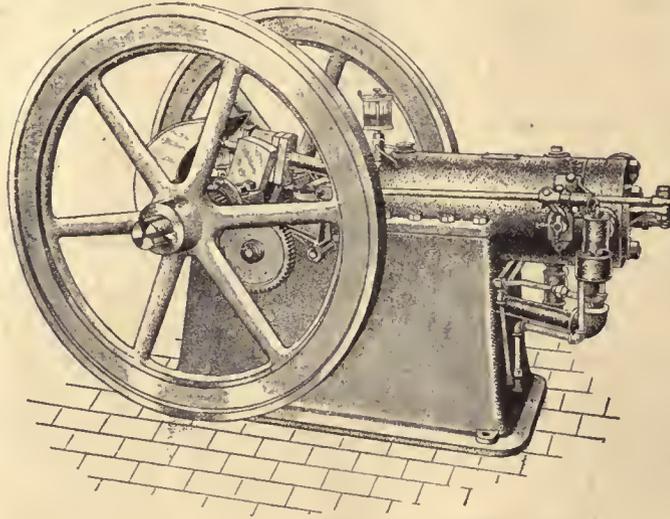
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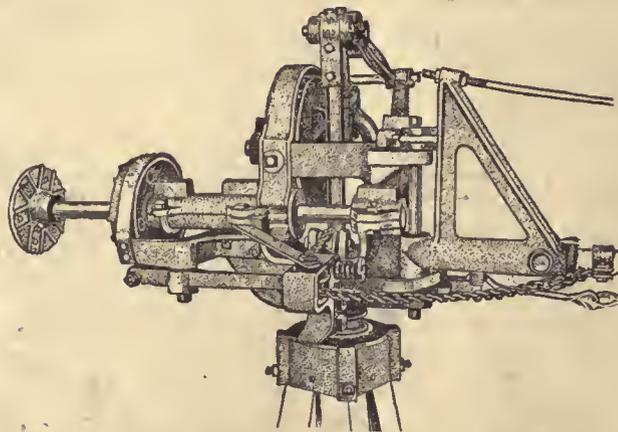
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THE IRRIGATION AGE

PUBLISHED IN THE INTEREST OF IRRIGATION FARMERS,
DEALERS IN AND MANUFACTURERS OF IRRIGATION AND
GENERAL FARM MACHINERY.

VOL. XXIII.

CHICAGO DECEMBER, 1907.

No. 2

Perfect Irrigation Ditches are Austin Drainage Excavator Ditches

¶ An irrigation ditch must be perfect in grade and sectional profile. It is not dug to carry away waste water but to carry water as a commodity from places where it is plentiful to places where it is scarce. Salvage, not waste, is the governing motive, hence it is that irrigation ditches are dug so perfectly and often lined at great expense with stone or concrete.

The Austin Drainage Excavator

is a machine for digging perfect ditches, and it is the only machine that digs ditches with bottoms true to grade and sides to perfect slope by a single operation and in one process. The original soil is not disturbed or loosened an inch below the required profile. It is therefore left as impervious to leakage as it ever was and in the best possible condition to serve as a foundation for lining if a lining is desired. The spoil banks are deposited far enough to the sides to leave wide berms. ¶ The Austin Drainage Excavator specializes as a dry-land machine, although it can be operated with equal facility as a floating dredge. As a dry land machine, the only water it needs is boiler water, hence it is an arid-region machine and as much at home on the deserts of the West as it is in the overflow lands of the East, where it has dug hundreds of miles of drainage ditches. It digs a ditch with sloping sides and smooth bottom in one operation, moving along the work under its own motive power—no slopes to trim, no berms to clean; no horses or mules to provide with forage and water, no army of teamsters and scraper holders and shovelers to pay and feed and keep from striking. The illustration here shows a drainage ditch. Did you ever see an irrigation



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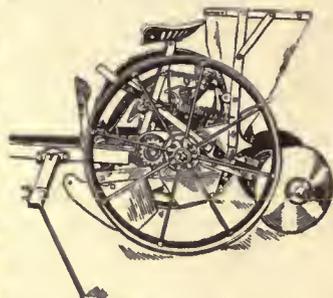
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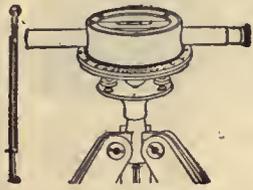


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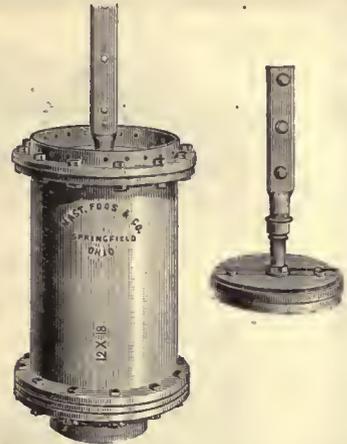
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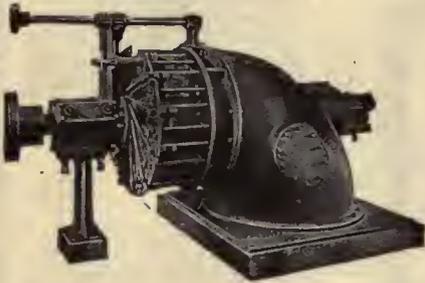
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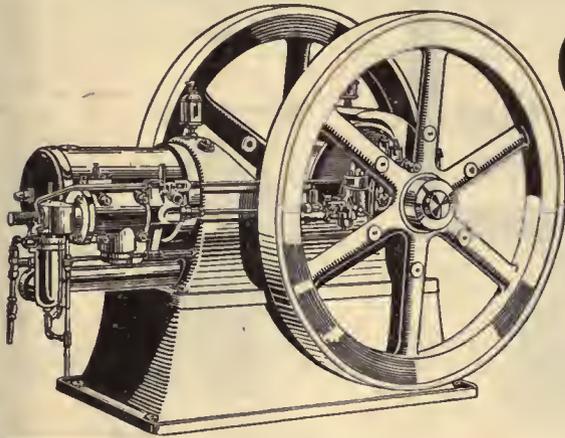


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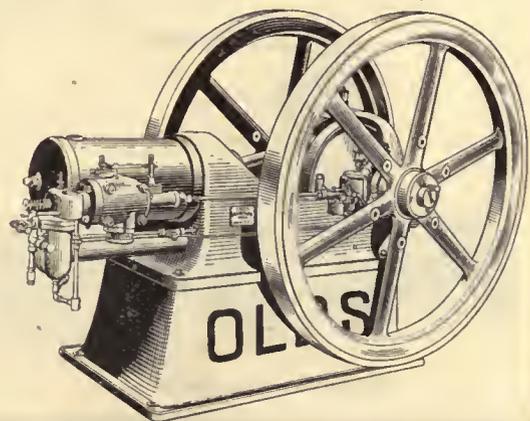
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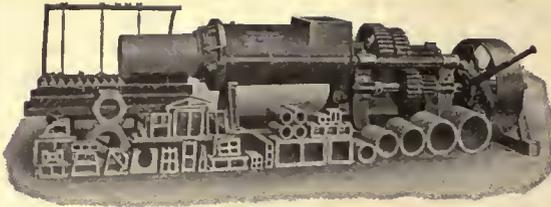
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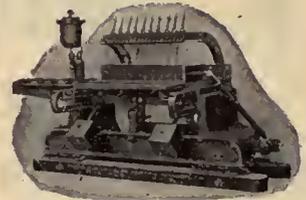
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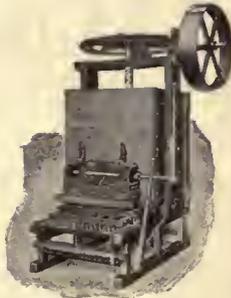
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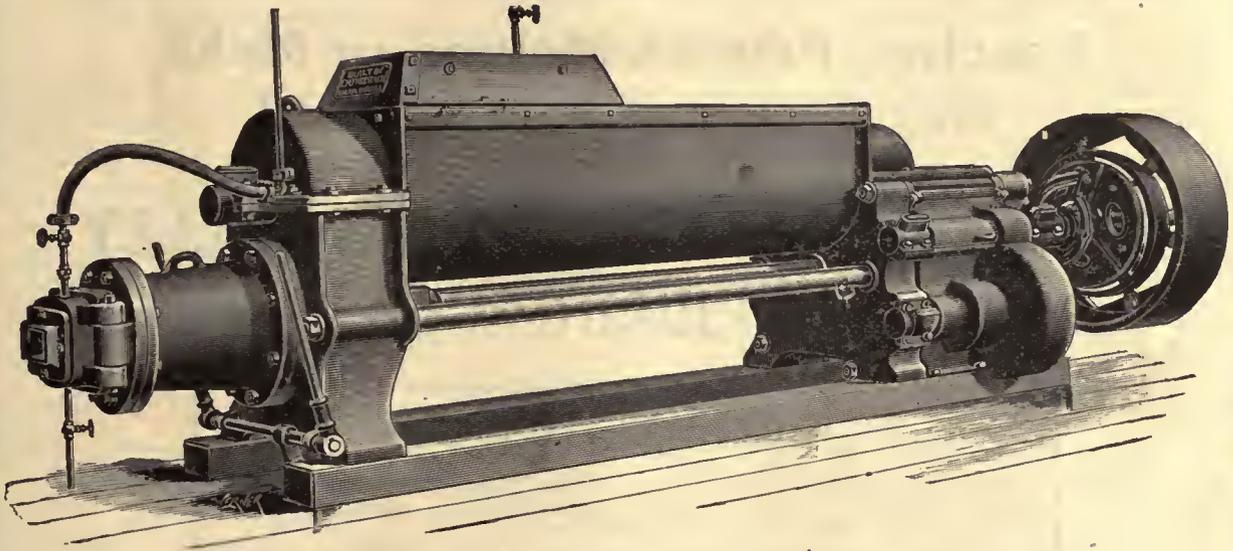
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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, DECEMBER, 1907.

No. 2

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered at the Postoffice at Chicago, Ill., as Second-Class Matter.

D. H. ANDERSON, Editor

W. A. ANDERSON .. G. L. SHUMWAY
Associate Editors

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

Court Decisions. THE IRRIGATION AGE will publish for the first time in this issue, a compilation of Superior Court decisions on Irrigation Litigation, and this department will be continued regularly in this journal from now on. Work of this character entails considerable research and this department has been contemplated for some time past; it is our impression that the information furnished will be of great value to our readers.

New Invention. W. H. Dougherty, of Pocatello, Idaho, is the inventor of a water wheel for irrigation, and has recently received papers issuing to him a patent on same.

The wheel is designed for the lifting of water and consists of a frame carrying two fan wheels on each side, geared to an endless belt of buckets operating on a square shaft. The paddles of the fan wheels are concave, affording the greatest possible resistance to the stream. On the model recently shown by Mr. Dougherty, there are twenty buckets. Two are always submerged at the same time, and two are in a position of discharging water, so that really the wheel has but seven loaded buckets to raise at one time.

Mr. Dougherty estimates that he can construct a larger wheel at a cost of about \$300, with a capacity in a two-mile current of 1,000 gallons of water per minute. The device is compact and very simple, and will, no doubt, come into general use where wheels of that character may be used.

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Official organ Federation of Tree Growing Clubs of America.

Official organ of the American Irrigation Federation. Office of the Secretary, 309 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 22 years old and is the pioneer publication of its class in the world.

Mead in Australia. In a recent letter from one of the leading firms in an agricultural line at Melbourne, Australia, that of Langwill Brothers & Davies, they call attention to the fact that the people of that country are all pleased that they have secured the services of Mr. Elwood Mead, who recently left this country to look after the irrigation affairs of Australia. They also state that he has a big job in front of him, but feel that they have secured a good man, to our National loss, and advise that when a government has the services of a good man they should retain him.

It will be interesting to watch the development of irrigation in Australia under the guidance of Mr. Mead, and we hope some time soon to receive information from him concerning his work in that country.

Van Dyke of California. We are publishing elsewhere in this issue an article by Mr. T. S. Van Dyke, of Daggett, California, a well-known writer on irrigation. Mr. Van Dyke takes up the subject discussed by Professor Fortier in our October issue on the matter of colonizing our fast developing irrigation areas in the west. The article by Mr. Van Dyke will prove highly interesting to those interested in the subject of colonization, and his description of farming on his home place in California may give valuable information to those who are similarly situated.

Mr. Van Dyke is generally recognized as one of the best posted men along irrigation lines in the United

States and we hope to have other articles from him for publication in future issues of this journal.

Tree Growing Clubs. Our November issue contains a letter by Mr. H. A. Greene, of Monterey, California. An editorial mention was also

made of his plan for growing trees from the seed, whereby the school children of this country may be educated along lines which will teach them the value of this character of work, and it is the intention of the promoters of this movement to carry on the work in such a manner that the study of this subject will be a pleasure rather than a burden to those who take it up.

It was the intention of Mr. Greene to designate the organization "The Tin Can Club of America," but in a recent letter received from the gentleman he informs us that after consulting some of the prominent men of the west it has been decided to change the name to "Federation of Tree-Growing Clubs of America." The idea being to form clubs in all sections of the country and wherever possible furnish free seed to the members of said clubs.

Mr. Greene informs us that he recently received a letter from the school children of Milpitas, Santa Clara County, California, which was very gratifying. He states that he had sent out to some of the schools, circulars bearing upon the tree-growing movement. These children have, he says, become enthusiastic "Tin Can-nisters" as a body, and that it leads the promoters to believe that when such results are obtained through a simple suggestion it illustrates how, with proper encouragement, all of our school children may become interested in this great movement.

A gentleman in Los Angeles last week was right, when in introducing Mr. Greene, he said: "In my judgment Mr. Greene has given out a suggestion that will result in more good to the country than all the millions of Carnegie will ever do."

Mr. Greene speaks of a shrub, one variety of blueberry, which makes a very quick-growing and beautiful hedge. The seeds or sprouts from this plant will be furnished different clubs as they are organized. It is the intention of the movers along this line to furnish the clubs with as much material as is possible free of cost. The different clubs throughout the country as they are organized will be asked to send information concerning plants and trees in their vicinity, with a description of the soil and climatic conditions under which specific varieties develop most rapidly. This will teach members of other clubs who are living where conditions are similar, what varieties may be best propagated in their territory, and stimulate enthusiasm along this line of study, which will be of inestimable value in an educational way to all who participate.

THE IRRIGATION AGE has been made the official organ of Federation of Tree-Growing Clubs of America and will publish regularly articles which will attract not only the children but serious-minded people as well. It will aim to encourage the support of all newspapers throughout the United States in this undertaking and print such matter as will be of benefit to the members of the newly organized clubs throughout the United States. A list of the clubs, with the membership of each, will be published in the columns of THE IRRIGATION AGE. We would suggest to publishers who receive this journal that the organization of a club in their town would be of great value to every citizen, and the result would be manifest in a year or two in greatly beautifying their streets, lawns and gardens.

Each club as it is organized should apply for membership to H. A. Greene, president of Federation of Tree-Growing Clubs of America, Monterey, California. Its officials should also communicate with THE IRRIGATION AGE and send a list of its members. First, however, they should communicate with Mr. Greene at Monterey and secure literature and suggestions about forming the organization. The Board of Control of the Monterey Tree-Growing Club will manage affairs, and much valuable information may be secured by addressing that club or Mr. Greene personally. It is hoped that the day is not far distant when there will be a headquarters of the Federation in Chicago or some other central city, officered by able men of distinction.

One hundred thousand clubs should be in operation in five years, and possibly many times that number. Mr. Greene will furnish articles which will appear in the columns of THE IRRIGATION AGE regularly, so that those who are interested in the subject may keep well posted concerning the movement. We hope to induce readers and club members to furnish us a lot of other matter for publication. Copies of THE IRRIGATION AGE containing matter of this character will be sent to leading men who are in position to aid the cause.

As an illustration of the interest which some of the counties in California are taking Solano County has offered \$1.00 for each black walnut tree planted on public highways. If counties would pay only ten cents to children to plant walnuts, oak or other good trees, the children could, by the "can method," make many a dollar. In fact, it is the impression of the writer that children would gladly plant seeds and after the tree had reached sufficient size for transplanting they would willingly transplant them for 5 cents apiece, and this sum could be readily paid by a fund raised among the citizens of each hamlet or town for that purpose. We also believe that in time counties and cities will make appropriations to meet a demand of this character, and if this work goes on as its promoters hope it may, ten

years will see a great interest developed in Tree Growing throughout the United States.

We are publishing elsewhere in this issue a photograph of Hon. A. H. Greene, President of the Federation of Tree-Growing Clubs of America.

**Echo of
Irrigation
Congress.**

Among the many letters received during the past two months concerning the Irrigation Congress held at Sacramento, California, early in September of this year, we find numerous complaints concerning the manner in which the program for that congress was framed up. One man who is prominent politically in a western state, writes as follows: "The meager press reports received during the congress indicate that it was in a manner a sort of a "Government Bureau Love Feast," and that he is still searching through the proceedings of the congress for any considerable amount of live discussion on important and vital questions concerning the irrigationist. He states further that he has no doubt but that the papers presented by the gentlemen connected with the Reclamation and Forestry service were excellent, but that if the Irrigation Congress is to be representative of western sentiment, and is to be helpful with discussion and suggestions in regard to those matters which vitally interest the home seeker and irrigationist there will have to be a radical change in the program and in the lines of discussion in the future, as it seems that a considerable amount of the discussion was on subjects but distantly related to irrigation.

The gentleman who expressed these views was not in attendance at the congress and is only able to discuss it on information secured from press reports, and it may be readily understood that if a man observes this sort of a condition from meager reports which were sent out, he could have had much greater reason to complain, perhaps, had he been in attendance. It is a fact that one who was not in attendance at the congress, should not be critical, and it is our impression that it is not the disposition of this gentleman to be so understood.

It is the opinion of the editor of IRRIGATION AGE that leading thinkers have become somewhat disgusted with the methods of conducting the irrigation congresses, and the fact that Reclamation Service officials and representatives of other bureaus take entirely too prominent a part in the deliberations of that body. This is particularly true of the Reclamation Service, which has seen fit to bring men from remote points who are connected directly or indirectly with that bureau, place them upon prominent committees and through their manœuvring dictate the policy of the congress. It may be readily understood that the Reclamation Service is looked upon by the western newspapers

as the means of salvation for the west and the work performed by this service will no doubt stand forever as a monument to the good judgment of many of the able men connected with the service and many men outside of the service who were active in developing sentiment leading to the passage of the reclamation law.

It was not the intention, however, of the men who saved the Irrigation Congress when an attempt was made to combine it with the Trans-Mississippi Congress, that this body should be conducted by the heads of bureaus or individuals with "axes to grind." The idea of the gentleman who made a fight for the life of the congress at Colorado Springs was that it would be a good meeting place for those who cared to consider methods of irrigation, a place for the discussion of work being carried on by the government and if necessary a rostrum from which criticisms of the Reclamation Service or other co-related departments could be expressed and answered by government representatives in attendance. It certainly was not expected, if the writer understands the situation correctly, that the congress should be taken over and managed entirely according to plans laid down by representatives of the different bureaus in Washington, D. C.

Perhaps one of the most alarming features in connection with government dictation in the conduct of this congress is the fact that the newspapers in the city and state in which the congress is to be held are naturally inclined to look upon the Reclamation and Forestry Service, as expressed in foregoing lines, "Saviors of the West." They are prone to accept statements from the different representatives of the Bureau as facts, without further investigation. A fairly good illustration of how the newspapers may change the policy of deliberations of this sort is that of the men from Southern California, who arrived in Sacramento a little too zealous, perhaps, with the intention of questioning what they believed to be injustice shown their section of the country by representatives of the Reclamation Service. These gentlemen were, no doubt, somewhat hasty in explaining their plan and were designated by the reclamation people and others as "kickers," and were so emphatically belittled by the press of California, particularly the northern part, that when the time came for exploiting their grievance, they were given scant recognition. Perhaps, also, these gentlemen were not well equipped with data to support their claims. It is possible that in this case they went off "half-cocked," and should have arrived better supplied with specific data to support their contentions. That, however, does not do away with the gravity of a situation which will permit government officials to belittle their claims in the public press prior to the time of their delivery before that body, which, as stated above, was meant to be conducted along the line of a critical body, if necessary, whereby the private citizen has as good a right to

express his views as well as the well-paid government official.

It may be well to state for the benefit of the gentlemen connected with the Reclamation Service that a movement is on foot to investigate some of the methods under which they controlled the Sacramento Congress, and sooner or later these gentlemen will be made to know that the National Irrigation Congress is a body supported and made possible by the delegates who are not officials of the government, and that these gentlemen who represent the Reclamation Service and other bureaus will not be permitted to exploit the congress according to their own desires.

The congress which is to be held at Albuquerque next year may possibly be organized along different lines. At any rate that is the opinion of THE IRRIGATION AGE.

Another feature in connection with the Irrigation Congress which is worthy of notice is the fact that the railway companies worked in harmony with the government officials to shape the policy of that body. Several officials of western railways were in attendance and used their efforts to retard progress along certain lines. This is a strange attitude on the part of the railways when it is considered that the heads of the companies maintain that the Reclamation Service is working at cross purposes with them. Those who are acquainted with inside facts know this to be untrue, and yet it is difficult to understand why the representative of the Great Northern Railway should attempt to frame the policy of a national irrigation congress. It is also difficult for the average delegate to understand how the reclamation officials get together and shape policies when the administration under which these officials secured their positions is evidently opposed to certain plans of the railways.

This subject will be taken up later in discussing the congress to be held at Albuquerque and letters will be published from delegates expressing their individual views concerning the conduct of the Sacramento meeting.

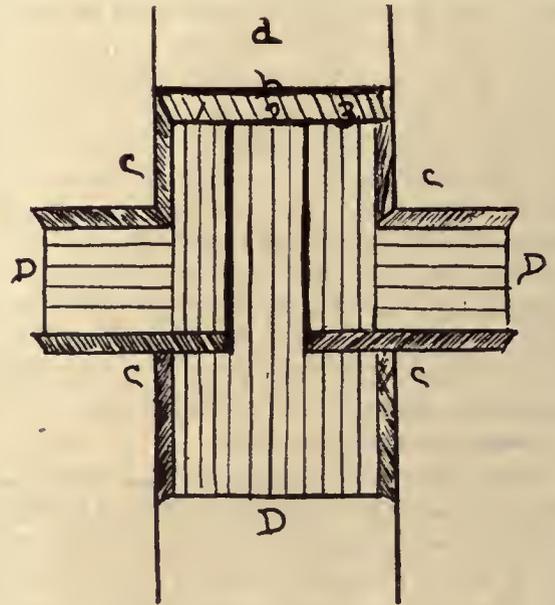
HOW WATER IS DIVIDED ON A PRO RATA BASIS AMONG USERS.

BY JOHN G. HALL.

For the benefit of those interested in irrigation and unfamiliar with the methods used, I will endeavor to explain briefly how water is measured by ditch riders for irrigation purposes. A man must be kept at the head-gates of all canals of any size, and more especially on streams that are liable to fluctuate; to regulate amount of water going into canal, to prevent breakage of canal banks, also to be in touch with river commissiener, who is dividing the water in the stream among various ditches taking water from same.

Now that we have defined the duties of the head gate keeper, we will next discuss the duties of the ditch

riders. It is almost impossible to handle a canal without a telephone line from the head gate of the canal to the lower end. The ditch rider-in-chief should ride the lower division, having his assistants on divisions above. When riders are stationed on their respective divisions, the rider-in-chief ascertains from the head gate keeper by telephone the amount of water coming in at head. Given heights over weir at head of canal will give stipulated amounts per water right after a certain percentage is deducted for seepage and evaporation. This is done in the morning before riders start on their divisions. To illustrate: If the rider-in-chief finds that he has water sufficient to give fifty inches per right for the day each division rider is so instructed by telephone. Tomorrow it may be increased or diminished as the supply warrants. Each large lateral has a lateral superintendent, who informs canal rider on his division of the needs of those under his lateral. For instance, if ten water rights are called for by lateral superintendent under a certain lateral for the day and the canal is giving fifty inches per right this would



Dividing Box.
with weir.

- a—Three rights flowing over weir in dividing box.
- b—Weir where dividing boards apportion water to three users, each receiving one-third of space on weir.
- c—Earth banks.
- d—Private laterals.

make five hundred inches for that lateral for that twenty-four hours, and so on the whole length of the canal. After the lateral superintendent has his issue for the day at the head of his lateral he proceeds down his lateral, sub-dividing the water according to the rights of each user by giving him his percentage of the width of the weir where his water is taken out, which should always be in a dividing box constructed for that purpose. There should be a dividing board in said dividing box that can be shifted to cut out any percentage of the water at that point. Generally there are several of these dividing boxes in a lateral of any size. All divisions having been made, the water is now in the hands of the irrigator.

PLANTING OF TREES.

H. A. GREENE TELLS ABOUT HIS PLAN OF ORGANIZING THE FEDERATION OF TREE-GROWING CLUBS.

We have been made aware of the certain extermination of our stovewood and lumber supply in the near future, and in order to save the situation the people generally must become tree-growers.

Whether stove-wood is to be \$5 or \$20 a cord in ten years will depend upon the people themselves.

The knowledge derived from an experience in growing trees may prove useful to any one, and is sure to be of much value to a child.

It has taken a few men many years to deplete our wood supply, now it will require many people a few years to restore it.

Organized efforts alone will succeed, and at the same time afford pleasant pastime, cause a distribution of valuable varieties of trees and benefit all participants both socially and financially.



HON. H. A. GREENE, MONTEREY, CAL.,
President Federation of Tree Growing Clubs of America.

CLUBS.

Tree-growing clubs should take the place of literary, musical, dancing and similar clubs, yet the members may indulge in such pleasures under the name of an association having "useful effort" as a motto, with the same freedom.

A movement on the line suggested above, and to be further explained, has already taken root in many parts of the United States, and doubtless every state will ultimately hold conventions with delegates from each authorized club.

Later, it is probable that a national tree-growing organization will be formed.

OUR CHILDREN.

One object of the club will be to enlist the services of school children in every district, since they are almost necessary to bring about quick results.

AN OFFICIAL ORGAN.

It is the intention of the promoters of this great plan (to replant the country with trees) to support an official magazine in each state.

Such a publication would contain the name and address of every club in the state and advertise the announcements desired to be made public by them. [Since this was written THE IRRIGATION AGE, Chicago, Ill., has been made official organ.—Ed.]

EXAMPLE TREE-GROWING CLUB.

For the purpose of giving a clearer idea to the public as to the duties and probable workings of a tree-growing club, a report of an imaginary meeting of one will be given here. For obvious reasons the date is two years hence:

Recently an enthusiastic meeting of the San Jose Tree-Growing Club was held at its club house.

The secretary reported the receipts of a number of valuable trees from many sections, which were exchanged for our native trees, distributed by request.

The Committee on Reforestation reported that the school teachers had handed in the names and addresses of the pupils having trees on hand ready for replanting in permanent places on Arbor Day, to the number of about nine thousand, and it was found that members of the club had several thousand more of such trees.

It had been arranged with Mr. Jones to plant on Desolation Hill 10,000 trees suitable for lumber, and with Mr. Smith, of Poverty Flat, to plant on his land 10,000 oaks and other specified kinds of trees. The price of the trees named planted and guaranteed to grow, was ten cents each.

The Amusement Committee reported having arranged for a special train to take the members, friends and all school children to the grounds where the trees are to be planted on Arbor Day.

The Committee reported that a brass band has been engaged for the day. The Finance Committee reported the collection of \$532 from taxpayers who had failed to start tree-growing during the year.

The Treasurer reported a balance on hand of over \$1,000, largely from donations received from public-spirited citizens.

A letter was read from the County Board of Supervisors asking the club to plant trees on Windy Road at the regular price of ten cents each.

The time for planting these trees will be determined at the next meeting. A number of letters were read from citizens and improvement clubs asking the club to plant trees along certain streets. It was decided to notify these people that the club would furnish suitable trees for five cents each for such a purpose.

After appointing a committee to arrange for a ball and banquet and hearing addresses by our State Forester and other distinguished guests, the meeting adjourned.

HOW TO RAISE TREES.

Procure tin cans, preferably the size of a tomato can. It will be found that many of them have been

opened, leaving the top bent back, in which case bend to form a bottom and take out the other end with a can-opener.

Cans with tops removed require holes punched in bottoms, say with a hatchet. Fill the cans with sandy loam and place them in a protected place near a water supply and bury them to the top.

Now plant your seedlings, cuttings or seeds. In every case, when planting or replanting, flood with water, since it is necessary to expel the air beneath and settle the soil about the plant.

Keep continuously damp, for a drying-out may end your crop irretrievably. Many kinds of trees may be set out in permanent resting places after one year, while others should be kept in the "nursery" a year longer.

Before transplanting trees examine to find if your cans are sufficiently rusted to permit the roots to have freedom. If rusted holes appear in places, nothing is necessary to be done, but if intact place a little salt around them, outside of the can, and it will eat into the metal in a few days. Do not use too much salt.

SEEDLINGS.

In planting seedlings (meaning the baby trees which you have taken up), remove the little branches, only leaving the main stem. Put a little soil in a can and hold the plant in the can while pouring in earth. When the can is full, gently pull the plant upwards until the upper roots are in sight, then pour water into the can. It will be found that the soil has settled considerably, so again fill the can. The roots should be just below the surface, barely covered.

NUTS.

With acorns, nuts, etc., fill up the can and settle the soil with water, then press your seed into it lightly. Put in more soil to the top of the can, then water again. The nut should just be covered out of sight.

Directions for smaller seed is very much the same as with the nut sorts—let them be under a quarter of an inch.

CUTTINGS.

Take your cuttings in dead of winter when the sap is down. Make a clean cut with a sharp knife below the "joint" or bud, and at the upper or smaller end, above the bud, then place it in a can, buried two inches. Try to have all your cans filled to about a quarter of an inch of the top when earth is settled.

FORCING.

Considerable time may be gained in cold weather by what is called "forcing." To make hard seed sprout quickly, before planting in cans, press the seed into a layer of wet earth in a large box, then cover over with a layer of a foot or more of fresh horse manure and renew it every few days.

With palm seed, after sprouted and planted in can, keep buried in warm manure to the top of the can instead of out in the ground for a time.

PLANTING TIME.

Only plant out your trees in permanent place in the wet season, unless they are to be watered when the dry weather comes. When watering them then wet thoroughly below the roots or not at all.

OAKS.

Everyone should plant acorns, if nothing else, and by the can process they grow much quicker than is generally supposed, and will not die in transplanting.

TREES FOR DISTRIBUTION.

The Monterey Tree-Growing Club has on hand many hundreds of Monterey pine and redwood trees growing in cans, which will be prime for transplanting next winter (1908). These trees are offered in exchange for other desirable kinds of trees to other Tree-Growing Clubs. The Monterey Club will receive orders now for Monterey pines, to be delivered next winter, in any quantity, for \$5 per hundred, the money to go to the school children who are growing them.

THE MONTEREY PINE.

This tree will thrive on shallow ground and stand drought.

TAN-BARK OAK.

Possibly the best native California tree for street and road planting is the chestnut oak, our best tan-bark tree (*quercus densiflora*).

The Monterey Club will have quantities of these trees to offer, also madronas.

THE PARENT CLUB.

The Monterey Tree-Growing Club contemplate building a log club house on their beautiful tract of land, within the city limits of Monterey.

For the time being the Monterey Tree-Growing Club will represent the National Tree-Growers' Association, giving charters to clubs and generally supervise the movement.

ORGANIZE.

If there is not already a Tree-Growing Club organized in your town, get busy, for you cannot afford to be classed as an unprogressive community, selfish and unwilling to do service for your heirs.

IRRIGATED FARMS IN THE LITTLE EMPIRE OF THE WESTERN SLOPE.

Profitable farm lands are scattered all along the line of the Denver & Rio Grande Railroad, "Scenic Line of the World."

In the valleys of the Grand, Gunnison, North Fork and Roaring Fork Rivers, and in the San Luis and Uncompahgre Valleys of Colorado, and the Farmington District of New Mexico—farming, stock raising and fruit growing are carried on in a way that is a revelation to the farmer in the East.

For those who desire to make new homes, there is no other region that offers more and better advantages than western Colorado, a land of blue skies and sunshine, with a temperate and even climate, where the erstwhile desert needs but to be tilled and watered in order to verily "Blossom as a Rose." Several illustrated publications, giving valuable information in regard to the agricultural, horticultural and live stock interests of this great western section, have been prepared by the Denver & Rio Grande Railroad, and can be obtained by addressing S. K. Hooper, G. P. & T. A., Denver, Colo.

FORTIER'S WARNING.

BY T. S. VAN DYKE, DAGGETT, CAL.

I have seen nothing from the Irrigation Congress for years as important as the note of warning Mr. Fortier sounded at the last meeting in Sacramento concerning the possible failure of some of the national irrigation enterprises, and lately printed in THE IRRIGATION AGE. Since Imperial came into being it has been fashionable in some quarters to discredit government experts. But no one can deny their frank honesty about telling the truth as they see it. While we all deprecate anything that can "hurt the town" and despise "the knocker," we should also welcome the truth. There is no knocker worse than the man who is proclaiming eternally from the housetop that all that is, is great, good and glorious and leaving to implication the assumption that there is not a shadow on the rainbow.

Every one who knows the history of irrigation enterprises knows that the greater part have at first been financial failures, and that in many cases the builders were not the only sufferers. On the contrary, the builders have often suffered because the settlers made the failure or a partial failure. There is no reason why the same causes may not operate so as to leave settlers unable to meet their payments to the government on the water right. In such case we may expect a merry howl from all that part of the Union that knows nothing of irrigation. And it will not take many failures to have the whole thing slow down to a serious dullness if not a temporary stoppage. Mr. Fortier told the exact truth in that address. It was lately published in THE IRRIGATION AGE, but should be in everything devoted to the subject and well heeded at Washington.

I wrote something on this subject in THE IRRIGATION AGE some fifteen years ago, but could not go into it fully, and cannot now, for it is a long subject. The plain fact is that the lands in which nothing of value can be raised without irrigation are no place for the poor pioneer with little or no capital but a pair of horses, a wagon and a lot of small children, with a sick wife, perhaps. Thousands of such made a success on the prairies of Illinois and Minnesota, because there is pasture and wild hay at hand at the start and the upturned sod will raise corn, beans, potatoes and enough other things to give a living in a very few weeks for one who is contented with a cheap living while waiting for the sod to decay. With that kind of farming it is not possible to make many bad mistakes which cannot be quickly rectified. No question arises about the proper laying out of the land unless it is a question of drainage on swampy land; of alkali he need have no fear, and of the effect of extremely dry air on certain crops he need know nothing.

Under certain conditions of rare intelligence, industry and economy such persons have mastered the desert. But it has generally been only after a long and painful struggle, while the number of those with a respectable "wad" who have dropped it in the sands of the desert and wondered where it went is amazing when compared with the success that is attainable by following the proper course. All desert land is not wonderfully rich, as is so often implied by those who do not state it directly. On the contrary, some of it is

so deficient in humus or vegetable mold that it is wonderfully poor. I can show plenty of it on my ranch that will not raise corn two feet high, and most of it won't be over a foot. But it raises marvelous alfalfa after the alkali is taken out. It is a remarkable proof of the theory that alfalfa takes its nitrogen direct from the air; for that same soil raises exactly the same alfalfa as land that will grow corn eight or ten feet high. The reader will appreciate better what I have to say about this if he will bear in mind that I have nothing to sell, nothing to recommend and no time to answer letters even with cash enclosed.

No matter how much you think you know about soil making you know nothing until you meet soil very deficient in humus. I actually have to take a screw-driver to harvest a radish; the third day after irrigation and carrots require a pick, or even a crowbar. This is no joke either. It took me four years to find out how to raise them as well as many other things—that is, in large quantity, cheap. I can do it now in immense quantities, but if I had depended on raising my living, or even half of it out of the soil the first three years I should have had to quit.

With plenty of water any fool can raise a cucumber. I am considerable of a fool, but I cannot do it. This is the sixth year I have experimented with different varieties and can eat the whole crop at one meal every year and hanker for more. I think the total yield of string beans for the same period would just about equal the weight of the seed, while it is much the same with tomatoes and about all the good varieties of sweet corn, as well as field corn. Hubbard squashes, pumpkins and common squashes, except summer squashes, are about the same. This is the effect of dry air checking pollination, as can be plainly seen in corn, where the tassel will rub into powder, although it looks all right. The cornstalk will grow all right and the silk come out on the ear, but the cob will run out from ten to twenty kernels on an average. I have seen fully developed cobs with silk fully grown with never a kernel to show. This is something the poor settler rarely hears about until he comes in contact with parts of the desert.

Such a settler may be dumfounded to find he cannot raise a potato on which he confidently relied for part of his living. I cannot do it yet. The seed will not start quickly enough in spring to make the tubers before the extreme heat comes to stop the growth of the plant, and in the fall it is too slow to make before frost comes. It wants seed a year old, and it is very hard to keep seed potatoes that long. My latest conclusion is that the way to do is to plant late enough in spring to keep from making any tubers at all. With very little water the small plants then lie dormant all summer and go off with a rush when cool weather comes in September. But it has taken six years to learn this, and it might not work at all in many places.

All these troubles make it necessary for the settler to have some money, yet they are nothing to some others. The first great difficulty is generally in bad laying out of the land. You may be led into this in many ways, but the most common is anxiety to have something green as soon as possible. Even where one has money enough to buy hay he wants to see something growing and his desire for a garden and fruit trees is still greater. Is there anything worse than to see a

piece of land earning only fifty dollars an acre when it could just as well be earning a hundred? Indeed, there is my friend, and that is to see it earning the hundred, but taking two or three times the water and work it ought to take. In the first case you can often plow up and work over a piece without losing too much. But in the second case you find it paying too well to destroy. I have about thirty acres in just this fix which have already ruined my chances for saintship and make me mad every time I irrigate them. Another tract laid out properly shows that the first is taking more than double the work and double the water to the acre that the other is. As I irrigate both myself, I can not be mistaken about it. The ground had been laid out by others and by a competent engineer, it was said, and I was in such a hurry to get in a crop that I did not take time to run a level over it myself. It was all wrong, from start to finish; ditches in wrong places for good irrigation, and ground just uneven enough to cause alfalfa leaves to dam it in spots, leaving islands half dry unless an immense head of water is forced over them. The other tract I laid out myself, and any child that can hold a watch can irrigate it with either a big head of water or a small one.

But bad laying out may do much worse than this and the neglect of proper drainage ditches or other disposal of waste water may keep the settler bankrupt for some time. And this is only one of your troubles. The fact that some people go on dry land and make money at once, and that nearly all eventually do far better than they would in any rainy country does not at all alter the fact that you are liable to meet a hard row of stumps and should be prepared for them. I have room to mention only one more, and that is alkali.

Perhaps you think you know all about it, or that an analysis will settle the question. A positive analysis or one showing what is considered a dangerous amount of alkali is all right, and unless the drainage is perfect, or can be made so, you had better let it alone. But a negative analysis, showing no dangerous amount of alkali, is very unreliable for many reasons, too long to state now.

It was reserved for me at the age of sixty and after twenty-five years of experience and observation in southern California, and after seeing all its alkali lands, as well as much of those in other states and Mexico, to collide with the genuine article in its most fascinating form. Nearly fifteen years ago a ditch was built at Daggett, on the Mojave River, controlling thousands of acres of elegant looking mesa land, which were true desert and subject to entry as such. Some fifty entries were made under the law and nine parties, supplied with teams, seed and provisions by the company, went to work. In two years all was abandoned, the school house burned for fire wood by hobos, and the half finished hotel dragged away piecemeal at night by more enterprising citizens. Three years later the Salvation Army tried it and sent out an Englishman, born and raised in the best irrigating section of India. Six months amused him sufficiently and again the whole was abandoned. None of them could raise enough to feed a pair of horses and the general verdict was that the land was "no good."

I had seen enough in other places to feel certain that the fertility of the soil was but a trifling factor in raising alfalfa, if indeed it were a factor at all after the

first few months, and that any soil fine enough to start the seed would raise it provided the drainage was perfect and there was water enough to irrigate it heavily when big. The drainage was perfect—all open soil for ninety feet with no cut-off from hard pan or fine layers. A series of severe dry years proved the permanency of the water supply and though it was nothing near what had been calculated for underflow, it was still large enough for a fine proposition. The owners being weary I gathered in the fragments of the wreck and I came out to start things right. Two different parties had failed on the piece I opened up on, but as it was the nearest to town and had the ditches in the best order I began on that. I was warned by everyone far and near that I would fail and if it had not been for having my reputation at stake I guess I would have done so. But I was sure perfect drainage would raise good alfalfa and that was all any one need want. Pride did the rest.

For over two years the sympathy of half the town was worse than the jeers and "I told you so" of the other half. Arriving in cold weather I first tried barley for hay and got in five acres in fine shape as the soil took water wonderfully and held moisture splendidly with no excess. The crop in April just about kept the splinters of the wagon bed out of my anatomy as I rode home on it. Then it was time to plant alfalfa and thirty pounds of seed to the acre went in on a tract wet twenty feet deep deeply plowed, harrowed, combed and groomed in the most approved style. Result about one plant to a square rod. It was plain that the dry air dried out the top soil before the seed could start and that the soil was so coarse that this could not be remedied by rolling. I got the best chain drill on the market, drilled the seed into dry, unplowed ground so as to get a perfect covering with the dry dirt falling back on it instead of wet clods, and then irrigated heavily so as to seal it over. Result in four days a stand like hair on the proverbial dog.

The second pair of leaves came on quickly and everything looked lovely when all of a sudden it looked less lovely. Some of it began to look sick, some turning yellow, some bluish, some quietly doing nothing. On one tract of nine acres it was all yellow and stood still at about an inch high for over a year. I staked out numbers of plants and watched them daily. Some gave up the ghost after six or eight months but most of them kept alive. On another large tract most of the plants died. Where they lived they did not turn yellow at all but turned bluish in sheets, revived at once with water, to turn bluish again in three or four days. But it was fourteen months before any of it was large enough to turn a horse on with a clear conscience.

Some of the town folks said "How the devil do you expect anything to grow in that ground? There's no substance in it." One man who had been done up in farming on another part of the same desert thought that if I would "plant buckwheat first to suck the pizen out of it" that it might grow something. But no one mentioned alkali and out of a dozen experts who had examined the land years before not one had mentioned alkali. None showed on the surface with any amount of water and the plants that died lacked the rusty hue of alkali killing. In a few spots of low, tight soil a trifle of alkali showed, but no more than in the best parts of California and Arizona. A cubic foot of soil selected in such places over an area of fifty feet square-

and a foot deep did not leach out enough boiled down to make a spot on a black stove griddle. That same ground afterward killed everything planted in it. It was just like being fooled in getting samples out of a gold mine.

Just about one year after the plants came up some of them began gradually to turn green in the yellow patch. In the other patch none had turned yellow and few of them had stood absolutely still like the nine acres of yellow ones had. But the growth had amounted to nothing of value. All tracts had been diligently watered in all sorts of ways, some with flooding by standing water, some by flooding with thin sheets of running water—in lands as they are called—and some by small furrows. All sorts of quantities and variations in the periods of irrigating were tried with no difference in the results. On the nine acres of yellow stuff not a sign of alkali could be brought to the surface by any amount of water or any method of applying it. On ten other acres a trifle showed in a very few spots but none at all where the plants turned bluish and wilted a few days after having plenty of water. On about ten acres of swale having a tight, fine soil the ground turned nearly black in many places, killed seed in the ground and killed the plants after coming up. But it took nearly a year of heavy irrigation to make it show, while it would kill quickly enough without showing.

It was plain enough that it was alkali everywhere and that most of the soil was so coarse in texture that capillary attraction could not bring it clear to the surface against the constant heat of the sun and the extreme dryness of the air. The vapor became so fine that it dropped the salts an inch or two below the surface. This has since been plain enough on ground where alkali can readily be made to show in winter when the sun is lowest and the air cold, especially if the air is made damp by a storm. On the same ground it is impossible to make any show in summer.

This alkali comes from the rainfall being so light that it has never been able to wash out the potash, soda, and salt formed by the decomposition of the rocks forming the soil. During a wet spell one winter a railroad cut showed plenty of it nearly ten feet below surface.

The under drainage being perfect, leaching was an easy matter, but owing to bad laying out I could not get the water on deep enough. So some of it took a year and some two years; while some spots a trifle too high are not leached yet. I found putting it under a pressure of ten inches for four days and nights would discharge it completely. I have five acres of melon and garden land leached that way with deep basins four years ago and not a sign of the return of alkali has yet appeared. I am putting out all new ground in basins of one-third of an acre each, and perfect levels on the bottom. It amounts to terracing three inches in a hundred feet. The levees are about twelve feet on the bottom and fifteen to eighteen inches high so that all machinery can run right over them, yet the alfalfa grow all over them. This is expensive but I now leach the whole piece while the seed is sprouting, and from now on it will take half the water and half the work the other land takes and give a much more uniform stand.

Now if the reader will remember what I said about having nothing to sell I will tell something that sounds

pretty large. From the leached portions of that ground I have for two years taken twelve tons of hay a year per acre, worth thirteen dollars in carload lots and costing for all labor about three dollars including the baling which we do ourselves direct from the field. I get winter pasture equal to two tons more with considerable waste at cutting which could be cleaned up by stock with no injury to the ground because it is so hard. I have taken four solid tons from six forty-ninths of an acre at one cutting. And if I had three weeks more of the extreme heat, as they have on the Colorado Desert, I could cut sixteen tons of hay and have the pasture besides.

I have not yet told all, but enough to show what might betide a man direct from the east with only a little money. Mr. Fortier is exactly right. The first settlers in a new region should be under some sort of guardianship. They should be almost compelled to put their money first into proper laying out of the land, including proper drainage ditches and let fine houses, flowers, fruit trees and all fancy or slow stuff go until later. They should form clubs and buy the best machinery for land grading and ditching, and especially for throwing levees over which mowers and hay rakes can run with ease. Every one should lay aside prejudice against "book farming" and read every book there is on irrigation. The occupants of every hundred acres or so should own a level in common, a good one too, and have some of their number learn to use it. Any boy or girl that can add and subtract can soon learn to run it. And any old stiff with eyes good enough to see the light through a telescope when the leveler is not behind it can soon learn to place the rod within a few inches of the right spot. Not a ditch of any kind should be run without it no matter what the eye says. And not a foot of land should be planted until graded with it to the proper slope or level no matter how fine an eye you have. A skilled irrigator should be overseer from the start, and the company instead of being liberal with water because there are few to use it should be very stingy,—for experience has shown on many a tract that the settler thinks he is getting something for nothing and uses too much water. Thousands of acres have been damaged that way in the great San Joaquin Valley of California. These are but a few samples of principles that should be applied to insure quick and high success. At places like the land under the Roosevelt dam in Salt River Valley the settler will be in the midst of good examples. But time has shown that the average settler will not travel far to learn anything but will insist on working out his own experience just as if no one had ever tried the problem. It won't take many of that class under an isolated project to leave Uncle Sam wondering when he is going to get back that money that every one said was so sure after the water once reached the ground.

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Pea Fed Lambs and Hogs—Profitable Industry In San Luis Valley, Colorado.

W. A. ANDERSON.

The "re-discovery" of the San Luis valley in an agricultural way is directly attributable to the field-pea. The discovery of the value of the field pea as a stock food was rather an accident than an experiment and can be credited to Mr. James A. Kelly, one of the pioneer agriculturists of the valley, and Mr. F. Sylvester.

It is not a new crop, having been raised rather extensively in parts of Europe and is today cultivated in the northern portion of the United States and in Canada. It is rich in humus and nitrogen and these ingredients have worked against its successful culture in more humid and warmer portions of the country. If damp the vines decay easily and in warmer climates are subject to many mold diseases. The vines being long and of tough fibre are rather difficult to harvest and it does not pay to stack it for purposes of feed where other hay can be so much more easily obtained. All three of these objections are overcome in the San Luis valley. The weather is cool because of the altitude and being an arid country the defects from dampness do not bother. And the method of feeding—turning sheep and hogs into ripened, unharvested fields—does away with the labor of harvesting.

But I began to tell of the original application of the field pea. A few years ago it was discovered that the constant raising of grain year in and year out was diminishing the fertility of the soil and the farmers cast about for some crop which would replenish the nitrogen and humus taken from the ground by the grain. It was necessary that the crop be leguminous or nitrogen gathering. Field peas were found to best supply the deficiencies and a year or two demonstrated that they not only restored the productiveness of the soil but increased it. The problem of how to dispose of the new crop then arose, as there was no market for it, even though it made as fine a hay as alfalfa when it was cut in the blossom, or even when it was allowed to mature. This was because of the difficulty of harvesting it. About eleven years ago Messrs Kelly and Sylvester attempted to solve the market problem by feeding the pea hay to lambs in corrals, using wheat, oats or barley as a grain feed. As far as fattening lambs was concerned the experiment was a success, but notwithstanding the increase of the fertility of the soil the direct financial returns were not great because of the high cost of the grain feed. Then by accident really Mr. Sylvester discovered that lambs he had turned into an unharvested pea field after the grain had matured gave better returns than those he was feeding in the corrals, the matured crop supplying both the grain and the hay. Further experiment along the same line confirmed the success of it until today, seven years after the discovery of the fattening qualities of the field pea, the lamb industry has become the largest and one of the most profitable in the valley. All at once, apparently, were found the conditions for successful rotation of crops, the problem of disposing of the crop used in the rotation, and the successful elements of a new industry.

Following close upon the feeding of pea grain and hay to lambs came the hog industry. It was discovered that the field pea made an excellent fattener for hogs as well as for lambs, and it was not more than three or four years ago that the feeding of hogs became general. Hogs bring better prices than do lambs and are more easily cared for, but there are not so many of them raised because of the inability to obtain them as easily. Either the farmer must breed them himself or else have them shipped in from some distant point. The question of summer feeding is the one that now stands in the way of the rapid development of the industry, and it is the general belief that before many years this will be successfully solved. When it is and the farmer of the San Luis valley has facilities for the cheap breeding of hogs the industry will doubtless surpass in quantity the feeding of lambs. Hogs have the advantage over sheep in many ways: they do not require so much attention; they clean up the ground better, often being



A Field of Peas in Bloom.

turned into a pea field after the sheep have gotten all they can from it; and fatten more readily, for the reason that they are content to lie down after feeding and do not run about as do sheep, thereby saving some loss from shrinkage. Therefore, because of the difference in the dispositions of the animals, the pork value of an acre of field peas is about 75 per cent greater than the lamb value. And it is the hog that is giving the valley most of the publicity it is receiving throughout the country. Pea-fed bacon has become so prominent that just recently one of the largest packing firms in the world sent representatives through the valley to estimate the paying probabilities of a brand of pea-fed bacon and hams. About the only difficulty in the way was the fact that the company must necessarily have the supply of 100,000 hogs distributed over a period of nine months, while at the present time it does not

cover more than five or six. To fulfill the demands of the packing firm it would be necessary to harvest the pea hay, thereby entailing more labor and expense to the farmer and breeder. Pea-fed bacon has a streak of firm, red lean where the corn-fed bacon is all fat and is more tender and better flavored. You may think that this statement is one of a valley booster or enthusiast, as I did, until I learned that in the fall of 1906 a butcher in Albuquerque, N. M., finding he had a surplus of San Luis Valley hogs, slaughtered a carload and sent the pork to Los Angeles, where it was displayed and sold as "Colorado Pea-Fed Pork." It was so immeasurably superior in quality, flavor and texture to any pork ever obtained on the coast that the demand for more was immediate. Within a month several large livestock dealers on the Pacific coast had men in the San Luis Valley buying pork. Trainload after trainload were shipped alive the whole distance of more than a thousand miles. It was found that the valley hog, with his strong constitution, due to the high altitude, pure air and healthful food, was far better able to stand the journey than his corn-fed cousin. In less than the whole season the Los Angeles market alone took 110 cars of live hogs from the valley.

Prof. H. M. Cottrell, head of the department of animal husbandry in the State Agricultural College of Colorado, made a trip through the valley in the fall of 1906. On the completion of his tour he had the following to say:

"With conditions so favorable, there should be raised and marketed every year in the valley a million hogs and this could be done and large numbers of calves and lambs be also fed.

"If the actual results that can be obtained in the valley in making gains cheaply with highest quality of meat were generally known to stock feeders in the corn belt, it would be but a short time until the valley would be settled to its full capacity with experienced stockmen.

"I secured estimates from a number of conservative men who are feeding and as near as they could judge from the weights of their stock when put on feed and when marketed, they are securing from 90 to 160 pounds of gain on lambs from an acre of feed and about 100 pounds of pork per acre of feed from the hogs that clean up after the lambs. Where hogs are fed alone the estimates are 400 to 500 pounds of pork per acre of feed.

"Most of the peas are raised in the valley for not to exceed \$1.50 per acre for all expenses up to the time the stock is turned in and the only expense incurred in feeding is to water, salt and herd the animals—they gather the crop.

"The San Luis valley has about the same tillable area as Denmark. Denmark sells annually to England alone bacon worth \$18,000,000 and besides keeps two million head of cattle. The field peas and barley of the San Luis valley produce the choicest quality of bacon and the valley has the advantage over Denmark of being under irrigation."

Professor Cottrell has great faith in the fattening capacity of peas for calves and is urging the adoption of such measures. Of this he says:

"I believe that baby beef can be produced very profitably in the valley, putting calves on full feed at weaning time and marketing them fat in May and June of the following season. I would recommend that

several cars be put on feed this season and accurate accounts of the feeding operations be kept."

At Romeo, on the line of the Denver & Rio Grande railway, the state agricultural college is establishing a model hog farm and it can be conservatively predicted that within a few years the San Luis valley pea-fed hog will have almost a world-wide reputation. I believe that



"Mortgage Raisers."

before long hog raising will be the prevailing industry in the valley. There are several reasons for this. One is the cheapness of the raising and the consequent low cost of labor. Another is that no hog cholera can be prevalent in this altitude and that with proper care there will be no plague of any kind. There has been



Lambs in Pea Field.

some trouble among a few farmers, but it has been mostly attributable to filth and lack of proper care. It is related of one of the wealthy farmers that his hogs were dying, the epidemic, whatever it was, seeming to be especially fatal to young pigs. He called upon an old friend, an inmate of the Soldiers' and Sailors' Home near Monte Vista, and asked him to suggest some means

of stopping the trouble. The ex-soldier remarked that he could end the epidemic at once if given a free hand, and the farmer told him to go ahead. Late one afternoon when the owner was returning from town he noticed a huge bonfire where his pig pens had stood. On his arrival he found that the old soldier had built new pens and shelters in a different portion of the field and that all the old shelters, feed troughs and pens were rapidly going up in smoke. Needless to say, the epidemic that had so devastated the herd was immediately stopped. Pea-fed hogs bring a better price than corn-fed swine, the price for live stock last season bringing an average of thirty cents more per cwt. at Monte Vista than did the corn-fed article at Chicago.

Last year 350,000 lambs were fattened in the San Luis valley, while some 40,000 hogs were shipped, practically the whole output going to the Pacific coast. This may seem to be a great distance to ship live stock and the loss from shrinkage would appear to a reader who deals in live stock to be great. But it is a remarkable fact that the shrinkage in pea-fed stock is less than half what it is on other stock. Sheep, of course, are easier to transport to the railroad than are hogs, which must be hauled by wagon, and so the hog industry must be limited to within a radius of a few miles from shipping points. Sheep can be driven a reasonable distance without much shrinkage. This season (1907-1908) there will be about 300,000 lambs fattened in the valley and a conservative estimate places the number of hogs at between 80,000 and 100,000. These figures do not signify that the farmers generally are turning from lambs to hogs. The chief reasons for the decrease in the number of lambs are the high prices asked by the breeders who summer pasture the animals and the fact that the farmers were unable to obtain loans from banks to purchase because of the stringency of the money market. Most of the hogs were bred in the valley, so that the recent flurry does not affect the holders of this kind of stock.

You may ask what this field pea is. It is a small, round pea, very similar to the common garden pea. The vines grow long, often measuring seven feet, and when in the prime of their growth standing higher than a person's head. The ease of producing them is really remarkable and rather tends to make the farmer indolent and shiftless. They are drilled thinly into the ground in the spring of the year and then kept moist by irrigation until blossoming time, after which they require no other attention. The total cost of production of an acre—that is, seeding and irrigating—never exceeds \$3.00, and I believe \$1.50 is a fair average. Generally, the farmer drills in with his peas some kind of grain, preferably oats or barley. This is done for the purpose of keeping the vines off the ground when they are young and giving them an opportunity of reaching their full growth. I have heard enthusiastic real estate dealers tell prospective land buyers that the wild sunflower, which is the most common noxious weeds in the valley, was planted for this same purpose of keeping pea vines from the ground and that it made as excellent a food as did the pea itself. I do not vouch for the veracity of the statement, but I have seen sheep eating the sunflowers in preference to the pea vines.

Often a farmer will be found who does not take the trouble of plowing up his grain field, but simply drills his peas into it. Apparently this method raises as good a crop as a plowed field.

THE PAYETTE VALLEY IN IDAHO,

With Data Concerning Its Development, the Causes and Future Prospects.

[SPECIAL CORRESPONDENCE.]

The achievements of the people of the Payette Valley during the past seven or eight years are now historic facts, many of which exemplify the adage that "truth is stranger than fiction."

The purchase of the largest irrigation canal in the valley in 1900 by a handful of farmers, without capital, and dependent upon their crops for a living, and the subsequent building of a larger canal by their own labor, marked the beginning of a transition from frontier hardships and disadvantages so often found in a newly settled district, to the most favored condition as it appears today in the state of Idaho.

The old Payette Valley Irrigation and Water Company's canal which cost the original owners more than \$400,000 was purchased from the New York bond holders, then in control, and under the leadership of C. E. Brainard, of Payette, who is now, by the way, the largest land owner in the valley, was reorganized into a Farmers Co-operative Irrigation Company, under which title it is still to be operated by the Farmers of the valley. The fact, that these same farmers have, during the past seven years, spent more than \$75,000 for improvements and enlargement of this canal, aside from the regular operating expenses of about an equal amount, and that they now own this valuable property with a bonded indebtedness of less than \$100,000, rivals the story of the seven prosperous years in Egypt in the time of Joseph.

The other principal canal on the south side of the Payette river, known as the Noble Ditch, was completed about seven years ago, under the leadership of B. F. Barch and other prominent farmers, assisted in a financial way by W. A. Goughanour, the present mayor of Payette, and others thus adding another \$100,000 asset to the farms in the vicinity of New Plymouth with an indebtedness at the present time of less than \$10,000.

These canals on the south side of the Payette, with the lower Payette Ditch on the north side, including its two extensions reaching nearly to Weiser, are the veins through which the life of the valley pulsates.

The marvelous development in so short a time of the sagebrush deserts between Payette and New Plymouth, and the even higher state of cultivation attained in the older settled district north of Payette, along the Snake river, is the wonder and admiration of all beholders. The business men of Portland, who recently spent an hour in making a short side trip on the Payette Valley railroad to the new townsite of Fruitland, six miles out from Payette, expressed themselves as having witnessed a revelation and the financial standing of every merchant in the valley was at once greatly enhanced by presenting evidences of the present and future resources of the valley before so strong a body of men. It would indeed be a difficult task for the most celebrated landscape painter to portray on canvas a picture that would, in any sense, compare with that now being sketched by the farmers and fruit growers of the Payette Valley. One of the journalists of Portland, in addressing the Commercial Club of Payette, after returning from the excursion up the valley, re-

marked that as compared with one of the valleys in his own state where "God had done much and man mighty little" here "man had done great things even if God had done little," but when we consider that the children of Israel were kept in the desert forty years before reaching the promised land, we are impressed with the idea that God did much for the Payette Valley in so arranging an abundant and never failing water supply with so fertile a valley and a healthful and mild climate, that man has been able to change the desert into a veritable "promised land" in so short a time.

Some of the sagebrush lands, which sold five years ago at from \$35.00 to \$45.00 per acre, are today selling at from \$150.00 to \$200.00 per acre, and just beyond these settlements and within three miles of New Plymouth, the present terminus of the Payette Valley rail-

In addition to this nearly 600 cars of sugar beets were produced in the valley, worth about \$100,000. This year the acreage in sugar beets has been more than doubled and the average tonnage over the entire valley will probably exceed fifteen tons per acre. These beets are contracted in advance and sold to the Western Idaho Sugar Company at the nearest beet dump, for \$4.50 per ton, and some of the growers last year cleared from \$60.00 to \$75.00 per acre above all expenses, when the land was specially prepared for this crop.

These fruits never fail to obtain first place wherever exhibited. At Ogden, Utah, at the National Irrigation Congress, it was the Payette Valley fruit which won the \$500 silver cup for Idaho and at the last congress, held at Boise last year, where there were magnificent exhibits from Colorado, Utah and Oregon, as well



Fruitland Fruit Pickers and Orchard—8 years old.
Payette Valley, Idaho.

Corn Field Near Payette.
Alfalfa Hay, Payette Valley—9 tons per acre.

road, there are several thousand acres of similar land still untouched, at from \$40.00 to \$50.00 per acre, including water rights, and these are being improved as rapidly as men can be found to make contracts and take care of the crops. The New Plymouth Land & Colonization Company of Payette has this year improved several hundred acres and has planted 150 acres with sugar beets and 30 acres with peas for the Idaho Canning Company of Payette, the principal cannery of the state, the balance of the land being mostly in grain and alfalfa.

Last year 328 cars of fruit and melons were shipped from Payette; 150 cars of apples; 120 cars of prunes; 6 cars of pears; two cars of peaches and 50 cars of melons, representing a cash revenue of nearly \$200,000.00.

as from all other parts of Idaho, the Payette Valley growers were awarded the four silver cups for first prize on apples, pears, peaches and prunes.

Only the surface has, however, thus far been touched and the development of the next five years will without doubt surpass all records of the past.

OIL AND GAS.

Arrangements are now being made for the putting down of several wells for oil and gas in the vicinity of Payette and the strong surface indications and general character of the surrounding country are sufficiently convincing to experts to warrant them in expending a large amount of money in making the test.

Work will be pushed as rapidly as possible, leases are now being secured and in order to comply with

the terms of these leases actual development must be started very soon and continued to a depth of 2,500 feet if necessary.

PAYETTE.

The growth and prosperity of Payette since the last census in 1900 is phenomenal. At that time its

tomatoes and peas. The creamery, which is largely owned by the farmers, is operated under lease and is making an excellent record.

Co-operative fruit packing houses have been established during the past two years and now furnish equal shipping facilities to the small as well as the larger shipper.



A Handsome Payette Valley Home.
Fishing Grounds near Payette, Idaho.

A Comfortable Home near Fruitland.
Farm Adjoining, near New Plymouth, Idaho.

population was only 650 while today it would fall little, if any, short of 3,000. The city now owns and is rapidly extending a water works system. Electric

The Oregon Short Line has just completed at Payette one of the finest depots in the state, a modern and commodious structure built of cement, stone and



A Typical Farm Scene in Payette Valley, Idaho.

light is furnished by a local company. Extensive lumber mills are in operation. Two large flour mills are operated by water power from the Payette river. The largest and best equipped cannery has been built with local capital and puts up a first class pack of fruits,

pressed brick. The company is just now laying out a most elaborate and extensive park adjoining the depot and tracks for a distance of three blocks.

The citizens of Payette and vicinity have recently subscribed over \$15,000.00 for a Y. M. C. A. building,

which will be erected during the year. The farmers of the surrounding country have taken an active interest in support of this movement and an attractive feature of the new building will be a rest room for ladies as well as the public lobby for men, especially adapted to the needs of the community.

The greatly increased acreage of sugar beets this

eastern cities. Many of the growers have received from \$200.00 to \$300.00 per acre for their canteloupes and the acreage is increasing yearly with the increased demand as the quality of the Payette Valley canteloupes are compared with those from other localities.

Fruits of all kinds are even more profitable, Jonathan, Rome, Beauty, and Winesap apples and Italian



Another Group of Scenes in the Payette Valley, Idaho.

year in the Payette Valley practically insures the building of a million dollar factory on the one hundred acre tract now owned by the Western Idaho Sugar Company, near the city, so that the future growth and prosperity of Payette and the Payette Valley is already assured.

prunes being the best commercial fruit so far produced in the valley.

THE PAYETTE VALLEY AS SEEN BY A DRUMMER.

"All aboard for New Plymouth!" The salesman



Scene near New Plymouth, Idaho.

PAYETTE CANTELOUPES.

The Earl Fruit Company of Chicago has this year contracted for a very large acreage of canteloupes, in fancy packs, to be shipped from Payette to the larger

for a large hardware firm, who had just swung off from the long O. S. L. train as it pulled into Payette, Idaho, turned in surprise and, after a word with the conductor, climbed into the Payette Valley coach standing on the sidetrack, from which he had heard the familiar words.

A few years before, this drummer, after a long, hot, dusty trip for twelve miles through the sagebrush, past a farm here and there, arrived at New Plymouth and found the two stores, which the place then boasted, had

cool breeze from the Payette river blew through the open window, while the train rolled along up the valley. As far as he could see, waved fields of green alfalfa, dotted here and there with ten, twenty and forty-acre



Photo of C. E. Brainard and View of His Beautiful Payette Home.

been made by a competitive salesman a few days before and in disgust crossed it off his list.

Contrasting in his mind with these unpleasant reminiscences, he gratefully leaned back in the comfortable coach and taking off his hat pleasantly smiled as the

tracts smooth as a floor and cultivated until they looked like a Chinese garden. There are the beet fields from which, the year before, an average of eighteen tons of sugar beets, analyzing from 15 per cent to 20 per cent sugar, netting the farmers from \$30.00 to over \$75.00

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per acre, had been raised. Past orchards loaded with blossoms, skirting the irrigating canals and then striking boldly across a field, through rows of trees, over irrigating ditches and under telephone wires, glides the New Plymouth train, making the round trip twice a day. While in this reverie the train slowed down and grasping his grip he found himself in New Plymouth for the second time. Following along the hard sand walk shaded by elm trees he left the station and sauntered into town, past a new brick bank building just completed and by several stores to the hotel, where, after partaking of a meal more appetizing than he had tasted since he left home, and contented with himself and the world, he unpacked his samples and stepped in to interview the hardware manager. The store was full of people and three clerks were busy supplying their wants. Glancing around he was astonished, for here was a stock of from fifteen to twenty thousand dollars displayed in an engaging manner, which would be a credit in a town of five thousand people. After booking a generous order he wandered up the street to another substantial brick building, occupied by a drug store, past several grocery and dry goods stores, a handsome two-story brick with offices upstairs, and around to the postoffice, from which mail is distributed twice a day by free delivery.

That evening as he sat in the hotel at Payette his thoughts still lingered on his trip up the valley. Truth is sometimes stranger than fiction. In a few years a desolate waste of sagebrush changed to an immense garden dotted with comfortable homes, all connected by telephones, and in another year to be lighted by electricity from a million-dollar plant now being built a few miles below the city on the Snake river. Efficient schools and churches in the rural districts, with high schools at both Payette and New Plymouth; abundant water for irrigating; pure well water for domestic use; no chance of a failure in crops; a good market guaranteed; what state in the union offers more comforts and opportunities than Idaho? and what valley more than the Payette? The drummer sighed and was sorely tempted to give up his roving life and be a farmer.

Supreme Court Decisions

Irrigation Cases

RIPARIAN RIGHTS.—

In a suit to settle conflicting claims to the use of the waters of a stream, the parties entered into an agreement which fixed their water rights, and provided that nothing therein should be taken to waive the right of a riparian owner to a designated quantity of water. *Held*, that a lower riparian proprietor could not urge that the agreement positively gave to such riparian owner the right, and could not require the court to enter a decree giving such right.

People's Ditch Co. v. Fresno Canal & Irrigation Co. Supreme Court of California, 92 Pacific 77.

MISTAKE IN AGREEMENT.—

Where the agreement of the parties in a suit to settle conflicting claims to the use of the waters of a stream entered into to obtain a judgment settling their rights does not express the intention of the parties, the remedy is by an action to correct the agreement, and not by praying for the entering of a decree in the suit in accordance with such intention.

People's Ditch Co. v. Fresno Canal & Irrigation Co. Supreme Court of California, 92 Pacific 77.



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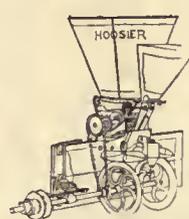
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POLLUTION OF STREAM.—

Where the pollution of a stream is not the necessary result of the operation by one of oil wells on his premises, but is due to a wrongful act in conveying the waste oil and water into the stream, a riparian owner injured thereby may maintain an action therefor.

Teel v. Rio Brava Oil Co. Court of Civil Appeals of Texas, 104 Southwestern 420.

WATER RIGHTS—PETITION.—

Where a petition for the condemnation of water rights disclosed that petitioner's purpose was to make a perpetual use of the water sought to be appropriated, the petition was not fatally defective for failure to allege in terms the extent of the time that the water was intended to be used, as provided by Ballinger's Ann. Codes & St. § 4143.

State ex rel. Liberty Lake Irr. Co. v. Superior Court for Spokane County. Supreme Court of Washington, 91 Pacific 968.

CONFLICT WITH FEDERAL STATUTE.—

Ballinger's Ann. Codes & St. § 4156, providing that a portion of the water of non-navigable streams and bodies of water shall be reserved to that part of the public using or needing the water on abutting property, was not inconsistent with Act Cong. March 3, 1877, c. 107, 19 Stat. 377 (1 Rev. St. Supp. U. S. 137 [U. S. Comp. St. 1901, p. 1548]), reserving such water to the appropriation and use of the public.

State ex rel. Liberty Lake Irr. Co. v. Superior Court for Spokane County. Supreme Court of Washington, 91 Pacific 968.

NECESSITY OF CONDEMNATION.—

Where an irrigation company sought to condemn a way for a ditch and the riparian or littoral rights of relators to the waters of a non-navigable arm of a lake, it was no defense that the water company appropriated and was capable of using a large supply of water through another source.

State ex rel. Liberty Lake Irr. Co. v. Superior Court for Spokane County. Supreme Court of Washington, 91 Pacific 968.

DISTRIBUTION OF WATER.—

Where there are conflicting claims for priority in the use of water rights for irrigation purposes, the court, in an application for injunction, may make equitable distribution of the supply of water according to the priority of the claimants and the quantity each has by his labor and diligence acquired the right to divert.

Gates v. Settlers' Milling, Canal & Reservoir Co. Supreme Court of Oklahoma, 91 Pacific 856.

PRIORITY OF RIGHT TO DIVERT WATER.—

Where the question of priority of right to divert water from a running stream for the purposes of irrigation, and the question as to whether either of the claimants had used reasonable diligence in prosecuting his work and in making application to beneficial uses of the water, are controverted questions of fact, dependent upon the weight of contradictory testimony and the credibility of witnesses, this court will not disturb the finding of the trial court, if there is competent evidence reasonably tending to support the finding and judgment.

Gates v. Settlers' Milling, Canal & Reservoir Co. Supreme Court of Oklahoma, 91 Pacific 856.

IRRIGATION.—PRIOR RIGHT.—

The right to the use of water from a public stream for irrigation purposes depends upon the construction of appropriate ditches, the conducting of water through such ditches to the place of intended application, and the application of such water to beneficial uses, all within a reasonable time; and he has the best right who is first in time.

Gates v. Settlers' Milling, Canal & Reservoir Co. Supreme Court of Oklahoma, 91 Pacific 856.

RESTRICTING USE OF ARTESIAN WELLS.—

A landowner has no right to extract subterranean water in excess of a reasonable and beneficial use on the land from which it is extracted; and so is not deprived of property without due process by Act March 6, 1907 (St. 1907, p. 122, c. 101), declaring an artesian well not provided with appliances for preventing the flow of water therefrom to be a

nuisance, and one who maintains it or permits water to unnecessarily flow from such well, or to go to waste, to be guilty of misdemeanor, defining an artesian well to be an artificial opening in the ground through which water naturally flows from subterranean sources to the surface of the ground, and defining waste to be permitting the flow from an artesian well to run into a bay, pond, or channel, unless used thereafter for the beneficial purposes of irrigation or domestic use, or onto land, unless it be used for irrigating it or for domestic use, or the propagation of fish.

Ex parte Elam. Court of Appeal, 2d District California, 91 Pacific 811.

APPROPRIATION OF WATER.—

Where plaintiffs claimed that S. had appropriated the water of a spring and had deeded the same to them and sought an injunction perpetually enjoining defendant from interfering therewith, plaintiffs' right to the water was limited to the amount beneficially appropriated, so that the jury having found that S. appropriated 20 gallons a day, plaintiffs were only entitled to that amount and could not restrain defendant's use of the excess.

Berry v. Equitable Gold Mining Co. Supreme Court of Nevada, 91 Pacific 537.

PERCOLATIONS—RIGHTS OF ADJOINING LAND-OWNERS.—

Percolating waters may be developed by a tunnel and conducted away from land, as against owners of adjoining lands, where the waters would otherwise in their natural flow sink into the ground and be lost.

Cohen v. La Canada Land & Water Co. Supreme Court of California, 91 Pacific 584.

DIVISION OF WATER.—

Plaintiffs and defendant owned adjoining land. A creek rose from a spring on defendant's land and flowed through the same and through about three-fourths of the length of plaintiffs' land when it was absorbed. Defendant had never diverted more than one miners' inch of the water, and his land contained only three acres and a fraction that was irrigable and adapted to cultivation by means of such water, while plaintiffs' land contained about 2,000 acres, fifty of which was adapted to cultivation and susceptible of irrigation from the creek. *Held*, that a decree vesting in defendant sufficient water to supply his pipe and dividing the balance of the flow so that defendant should have the entire flow for one day out of every twenty-one days, and that plaintiffs should have the balance, was a proper division.

Gutierrez v. Wege. Supreme Court of California, 91 Pacific Reporter 395.

OVERFLOW—DAMAGES.—

A complaint alleging that defendant owned and operated a canal through which water was conducted for irrigation purposes, and, in connection therewith, at a place near plaintiff's land, a headgate, that the water washed out the headgate and portions of the bank and overflowed plaintiff's land, and that the damage thus caused was due to defendant's gross and willful negligence in failing to properly construct the canal and headgate, and in failing to properly maintain the headgate and to control the water in the canal, was sufficiently specific as to the manner in which defendant was guilty of the negligence charged.

Dennis v. Crocker-Huffman Land & Water Co. Court of Appeal, Third District, California, 91 Pacific Reporter 425.

IRRIGATION—APPROPRIATION OF WATER.—

Ballinger's Ann. Codes & St. Sec. 4156, declares that the right given to condemn the use of water shall not extend further than to the riparian rights of persons to the natural flow of water through lands on or abutting on streams or lakes as the same exists at common law, and is not intended to allow the taking of water from any person that is used by the person himself for irrigation or that is needed for that purpose. *Held*, that the word "needed" as so used meant water necessary to irrigate the land of a littoral or riparian owner which he has under irrigation at the time his rights are sought to be condemned, or which he intends to and will place under irrigation within a reasonable time, and that, as to such water, no condemnation could be had.

State ex rel. Liberty Lake Irr. Co. v. Superior Court for Spokane County. Supreme Court of Washington, 91 Pacific 968.

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The Illinois Blackberry.

This variety was discovered growing wild near Alton, Ill., more than twenty years ago, by Mr. E. A. Riehl, director of the Alton (Ill.) Experiment Station. The history of the fruit as given by Mr. Riehl to the present nursery people who are selling the plants, is as follows:

He noticed a clump of blackberries growing in a fence corner along a road, which were ripe at an earlier date than those grown at the Experiment Station, and were larger and much better. Mr. Riehl watched the behavior of this clump of berries for several seasons and then took up two plants for a trial under cultivation. They bore so well, were so large and of such excellent quality that he replaced a patch of Kittatinny, where the latter had died from rust. Later the Kittatinny variety had nearly all perished from rust and as fast as they died out they were replaced by the Illinois until the whole patch was of this variety. The Illinois was found to be so superior to all others that none excepting it were grown further than to test new sorts as they were introduced, and up to the present time Mr. Riehl has never found an equal to the Illinois in all of its desirable points. It ripens shortly after the variety known as Early Harvest, but matures its whole crop more quickly. Later in his experience Mr. Riehl reports that it has never been winter injured.

The Worden Grape.

If you have failed to plant Worden Grape you will make a mistake. It resembles the Concord in many respects and when first introduced was claimed to be nothing more than the Concord. It is, however, much earlier in ripening, and larger in size of bearing. The fact that it ripens earlier is a strong point over the Concord. Its one weakness is that it will not ship to good advantage, being tender in skin, but for home use there is none of greater value. Worden is ripe and gone before Concord comes in. The clusters are very large and handsome.

Pineapple Strawberry.

A novelty in this fruit is the Pineapple Flavored Strawberry. It was introduced by Charles A. Green. The fruit is large and beautiful and its individuality in flavor should please any lover of the strawberry.

The Home

When Honor Walks Abroad.

One evening at dusk, as Mayor Jones and I were going home, a negro tramp, unkempt and sinister, asked him for the price of a lodging. He had no change, but he handed the tramp a five-dollar bill, telling him to get it changed and he could have his alms. We waited; the mayor talked of other things; I, with far less faith than he, in some dubious expectation. But after a while the tramp came back, and into the mayor's hand poured out the change in silver. The mayor, humanly complaining of the heavy silver which the Treasury Department sends to us in the West so that New York may have all the crisp dollar bills, dropped the money in his pocket.

"Ain't you going to count it?" asked the tramp.

"Did you count it?" asked the mayor.

"Yes."

"Was it all right?"

"Yes."

"Well, then, there's no need for my counting it, is there? Did you take out what you wanted?"

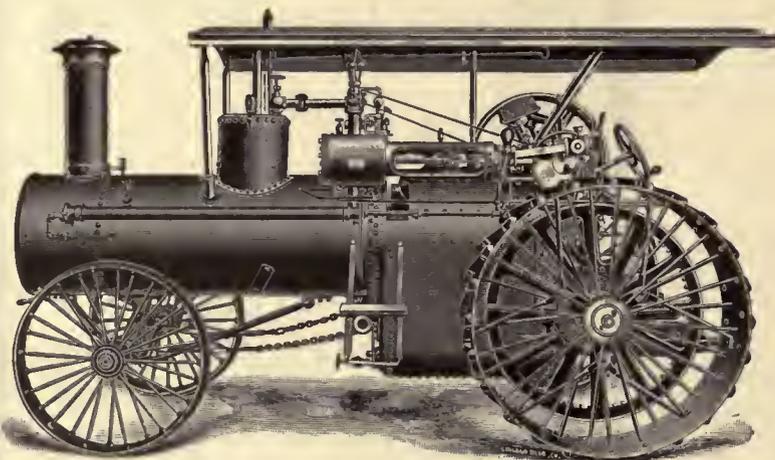
"No."

"Here then."

The mayor gave the tramp a coin and we went on.

There was no possible ostentation about this; Mayor Jones had no need, in the dark, to do anything to impress me, his friend. I should not, indeed, stoop even to explain so much. But how much good did such confidence do that wandering outcast? How much good did it do me or others with whom he might come in contact? By the same law, possibly, my own lack of faith in the tramp would have led him to treat me differently.

When one understands this higher law as Mayor Jones



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understood it, every act of one's life, no matter how trifling or insignificant it may seem, becomes really of monumental importance, and the hasty word, the unkind glance, the very spirit, no matter how deeply hidden, in which a thing is said or done, are seen to have an effect which may reach further than imagination can go, an effect not only on one's own life and character, but also on the lives and characters of all those about one.—From "The Golden Rule in Real Life," by Brand Whitlock, in THE CIRCLE for December.

Christmas Cakes of Other Lands.

German Liebkuchen.—Mix one quart of honey and two pounds of granulated sugar, heat slowly, and boil for fifteen minutes, then stir until cold. Spread twelve ounces of flour on a shallow pan, place in a moderate oven, and stir frequently until it is an even light-brown color. In another pan place twelve ounces of blanched and dried almonds and roast until golden brown; cool and chop fine. To the flour add the nuts, two ounces each of finely chopped citron and candied orange-peel, one teaspoonful of cinnamon, one-quarter teaspoonful of cloves, ground cardamomseed, and white pepper, and a half teaspoonful of salt. Work in the honey and one-half of an ounce of potash dissolved in rose-water. When thoroughly mixed, cover and set the paste away for twenty-four hours. Roll out a scant half-inch thick, cut in pieces three by four inches, lay on waxed or greased pans, and let chill for three hours, then bake in a medium oven. Glaze with water-icing, and sprinkle quickly with finely chopped roasted almonds.

English Yule Dollies.—Cream together a half cupful of butter and one cupful of sugar. Add gradually two well-beaten eggs, one tablespoonful of cream, one teaspoonful of vanilla, a pinch of salt, and three cupfuls of flour with which have been sifted two teaspoonfuls of baking-powder. Stand for an hour in a very cold place. Have ready a tin cutter in the shape of a doll about five inches long. Take a portion of the dough on the board at a time, roll out half an inch thick, and cut into dolls. Brush each over with milk, and dredge lightly with powdered sugar. Use currants for eyes, and bake on greased pans in a moderate oven. When cold,

decorate the skirt of each doll with ruffles of frosting. Wrap separately in sheets of waxed paper. In packing place the doll in a long shallow box, pack firmly with tissue-paper, and before closing add a tiny Christmas card and a sprig of holly, tying the box with scarlet ribbon.—From the *Cooking Circle* in THE CIRCLE for December.

"Twas the Night Before Christmas."

Then you went to sleep at last, to dream. First, Santy got the bobs stuck in the chimney and your father had to go up on the roof and poke them down with a clothes-pole. When you finally pulled them out and wiped the soot off, they turned into a woolly cow, which began to eat the tidy on your mother's rocking-chair, and then—. It was sort of gray and spooky when you woke up, and mighty cold. It was a minute or so before you realized that it was Christmas at last.

"Ma," you called, "is it time to get up yet?" and your mother just mumbled something that didn't sound like anything at all. You waited pretty nearly an hour, it seemed, and then you simply couldn't wait any longer. "Is it time yet?" Finally your mother gave up. "All right, I s'pose you'll die if I don't let you get up right away. Bring your clothes in here and I'll button you up."

Clothes! Was there ever such another nuisance? Your arms and legs simply wouldn't go into the right holes in spite of all you did. You would have given anything if you had only been a wild Indian and could just wrap a blanket around you and skim down and see—

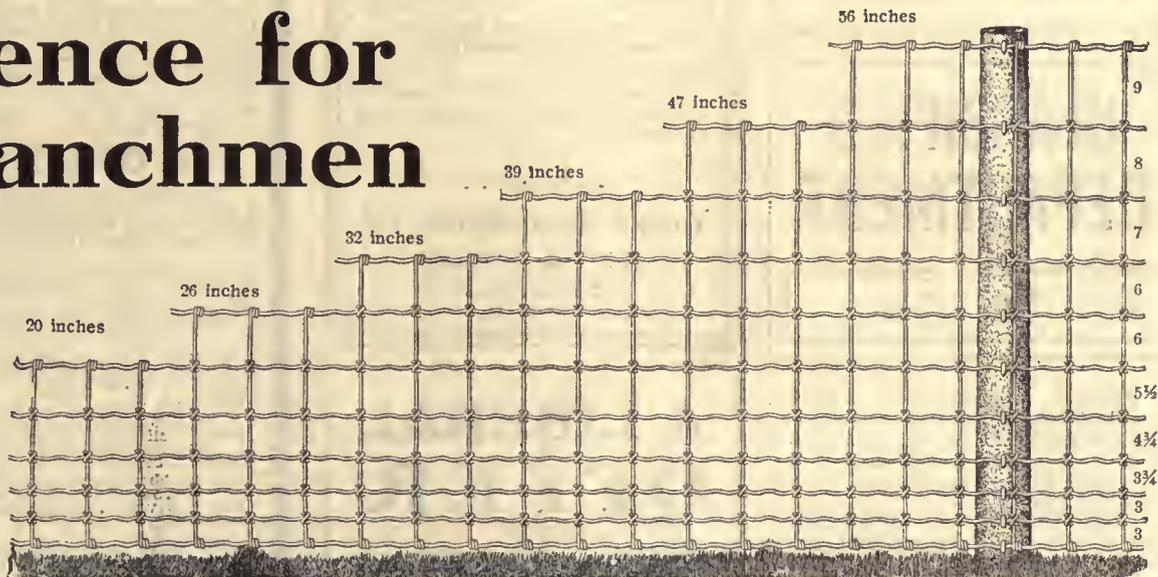
"Oh, ma!" you run back to the stairs to scream; "he did. He brought 'em!"

"Well, wasn't that nice in him," she said. "Now don't go and break them the first thing." As if you could.

After a while your father came downstairs, rubbing his eyes and yawning, and when he saw the bobs he had to grin. "By jingo!" he said, "but they're dandies. S'pose they would hold me?"

"O' course they would," you contended. "Look a' those runners. That's pure steel. Say, I don't want any breakfast—"

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We have scores of testimonials like the above. Ask your dealer for Cows' Relief and insist on having the genuine. If he cannot supply you write direct to us, enclosing \$1 for large package prepaid, (enough for four or five ordinary cases). Your money back if you are not satisfied. Positive guarantee on every package. Or send your name and one neighbor's who keeps cows, stating how many you each have, and we will send our book concerning "Cow Troubles," also Goldine Cow Watch Charm FREE while they last.

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A NEW INVENTION

Rapid Acting, Force Suction
Possesses Superior Mechanical
Movements



The illustrations presented herewith show two views of our patented Quick Return Pump Attachment and Pump, the most successful device for pumping water for farm purposes, stock raising, irrigating, etc. on the market. Superior to any make of this style of pump for raising and forcing large quantities of water to great heights or distances with small power.

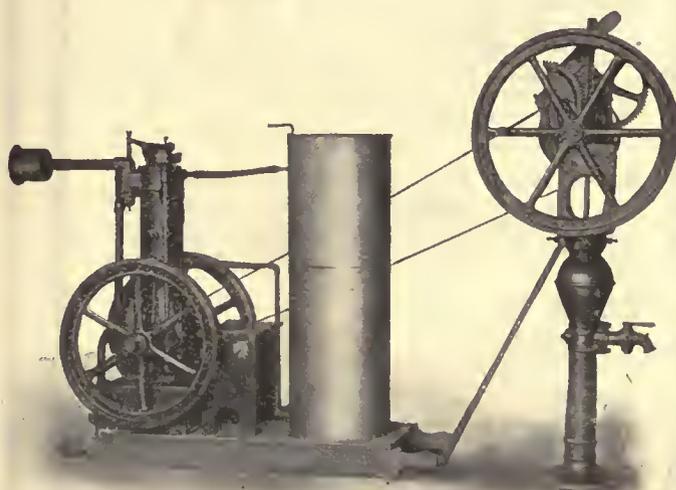
It has a double acting lever, operating a non frictional, roller bearing lifting arm. The greatest advantage in this pump is the quick return of the plunger which so vastly increases it's efficiency. It is easily operated by hand for household and domestic farm purposes. It is especially adapted to attachment to wind-mills where the largest possible pumping efficiency for a limited wind power is necessary. Gasoline, gas or steam power can also be attached.

It is used for individual irrigating plants, house water works systems and ranch stock watering. It is also adapted to pumping quarries and mines of ordinary depth.

Manufacturing rights or territory is offered For Sale.

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 310 Boyce Bldg., Chicago



Oxford Hotel

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At the OXFORD HOTEL, Denver, Colorado, you will find all the leading men interested in irrigation and all of its branches.

Denver is the logical irrigation center of the United States. You will find nearly everyone engaged in or interested in irrigation projects stopping at the OXFORD

Located half a block from the Union Depot: **FIRE PROOF, MODERN, EUROPEAN PLAN and POPULAR PRICES.**

—THE—
HAMILTON-BROOKS CO.
PROPRIETORS

A Life Income

If you only knew how to create for yourself a permanent income for life, would you not set aside a few dollars each year for the next five or six years?

Then maybe you would like to know how?

Take the culture of nut trees, for instance, and start with a very small investment—say only \$30 or \$40 a year. This amount will purchase and set out an acre of the paper-shell variety of pecan trees—twenty to the acre. The care and cultivation of these trees will cost very little and the trees will not interfere with other farming operations on the same land. In from six to ten years from the setting out, each tree should yield at least twenty pounds of nuts, that is four hundred pounds to the acre, and at only fifteen cents per pound (the best varieties are now selling at fifty and seventy-five cents), this means a net income for life of \$60 on each acre.

Doesn't This Interest You?

But, perhaps you will ask, can the pecan be grown successfully in my locality? We can tell you if you will state where you live. There are some sections of this country in which the pecan does not thrive; but there is hardly any portion of the United States where some one of the many varieties of nut trees cannot be grown successfully.

If you care to know more about nut growing for profit, let us send you FREE a three month's subscription to the

American Fruit and Nut Journal,

which is authority on the culture of all varieties of fruits and nuts.

Or, send us fifty cents for a year's subscription to the Journal and we will give you (ABSOLUTELY FREE) a year's subscription to your choice of any fifty cent publication in America.

Think It Over

But don't delay too long, for both of the offers are limited and there may not be enough free subscriptions to go around among the late comers.

ROPER-HINTON CO., Inc., Publishers
PETERSBURG, VIRGINIA

Mention this Journal.

Eastern Colorado Lands



Are steadily advancing in price. Nowhere can lands be found so near a city the size of Denver, providing a ready market for all produce, at the price these farm lands are now offered to the

Homeseeker and Investor

Abundant crops can be raised in this territory by "Dry Farming," many farmers realizing enough from the first year's crop to offset all expenses, including the full price of their farms. This is the

Opportunity of a Lifetime

for very soon Eastern Colorado will be thickly settled and land held at a price too high for those in search of a home in the West.

Go out and see this country for yourself. See the opportunity that awaits you. Take advantage of the

Low Homeseekers' Rates

in many cases less than one fare for the round trip

VIA

Union Pacific

Tickets on sale first and third Tuesdays of October, November and December, 1907

For full information inquire of

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ABSOLUTELY MOISTURE AND FROST PROOF



This is what you get when you build your buildings from blocks made on **THE SIMPLEX MACHINE.**

It makes a two piece or hollow wall, any thickness desired for cottage, church or factory building.

All blocks made with face down, and length to 24 inches. Will also make hollow blocks if so desired. **THE SIMPLEX** can be operated by one man or more.

It is light, strong and the most rapid machine on the market. **THE PRICE IS RIGHT.** Send for Catalogue D.

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124 W. Cortland Street, JACKSON MICH.

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Galvanized steel is rapidly taking the place of wood for fluming purposes and with The Maginnis Patent splice fluming is made easy. Any boy can put the Maginnis Steel Flume together or take it apart. Steel flumes and troughs "Ship Knock down" Third Class freight. Let me figure on your flume. All flumes guaranteed.

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Kimball, Nebraska

FAVORITE CEMENT BRICK MACHINE With Mechanical Tamper

Normandin Concrete Block Machine—unexcelled

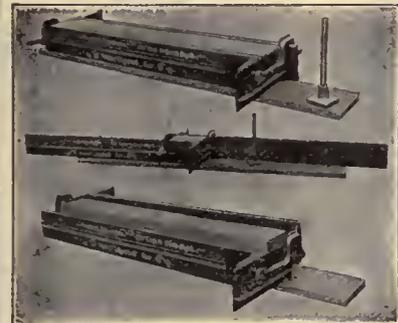
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HIGH GRADE
CONCRETE MACHINERY

Very Strong

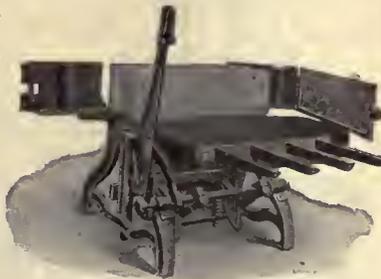
This is it.

The Modern Method of Construction for Residences and Public Buildings is with Concrete Blocks and Brick

We have the largest line of Concrete Machinery in the world. Ask for information regarding our DRAIN TILE MOLDS, our SOLID CONCRETE PRODUCT MOLD for retaining walls, our CONCRETE BLOCK AND BRICK MACHINES, ALSO CEMENT POST MACHINES.



Practical Sill, Cap, Block and Step Mold



Normandin Concrete Block Machine

Our SYSTEMATIC MIXER has no equal. Our machines adopted twice by the United States Government. 3 Gold Medals St. Louis and Portland. Write for Catalog R.



Wolverine Cement Drain Tile Molds



Systematic Concrete Mixer

BIG PROFITS OUR MACHINES DO IT ALL INVESTIGATE

CHALLENGE COMPETITION



BUILD OF BLOCK AND BRICK EVERLASTING

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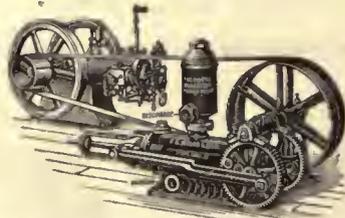
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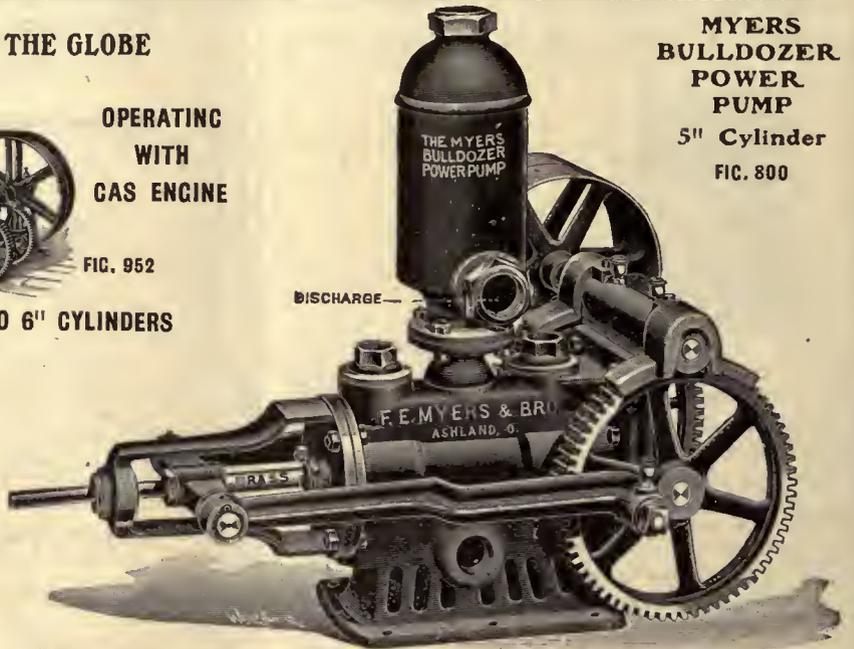


OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

MYERS
BULLDOZER
POWER
PUMP
5" Cylinder
FIG. 800



MYERS
BACK GEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

5, 7½ AND 10"
STROKE

FOR BELT,
WIND OR HAND
POWER

FIG. 1113

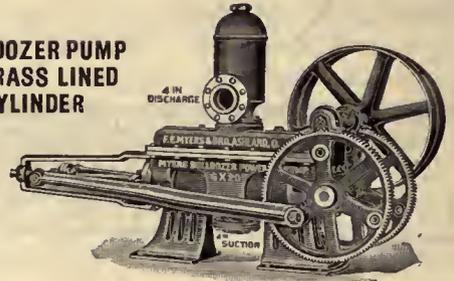


2½" DISCHARGE

BULLDOZER
WORKING
HEAD

BULLDOZER PUMP
6" BRASS LINED
CYLINDER

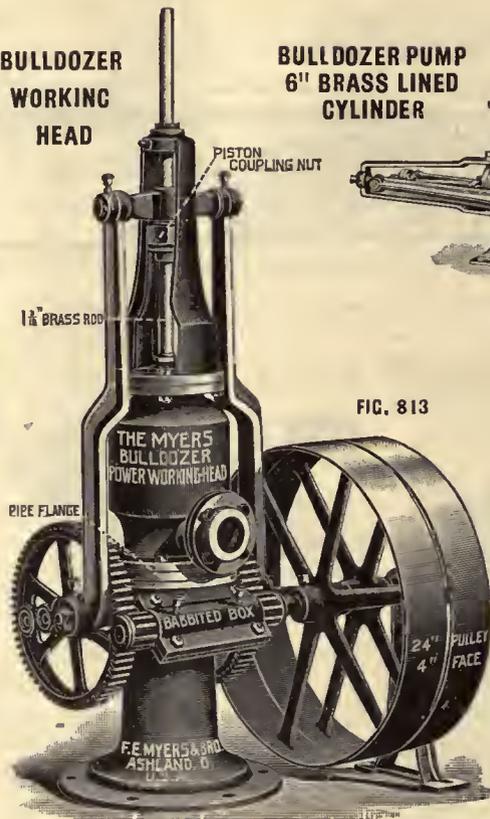
FIG. 1079



PISTON COUPLING NUT

1½" BRASS ROD

FIG. 813



PIPE FLANGE

THE MYERS
BULLDOZER
POWER WORKING-HEAD

BAGGIED BOX

F. E. MYERS & BRO.
ASHLAND, O.

MYERS BULLDOZER
WORKING HEADS

NO. 359

5", 7½", 10" STROKE
DISCHARGE 2½" OR 3"
SUCTION 2" TO 4"

NO. 364

12", 16", 20" STROKE
REGULARLY FITTED 4"
DISCHARGE
SUCTION 8" OR LESS

Write for descriptive Circulars and Prices. We want you to acknowledge this Ad. so that we can acquaint you in detail with the superior features of Myers Power Pumps. This is the proper season. The right time to write is right now.

F. E. MYERS & BRO., ASHLAND, OHIO, U. S. A.
PROPRIETORS OF
ASHLAND PUMP AND HAY TOOL WORKS

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Gas Engines without Batteries.

No other machine can do it successfully for lack of original patents owned by us. No twist motion in our drive. No belt or switch necessary. No batteries whatever, for make and break or jump-spark. Water and dust-proof. Fully guaranteed.

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with
full in-
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Age one year and
The Primer of Irrigation

CEMENT PIPE TOOLS

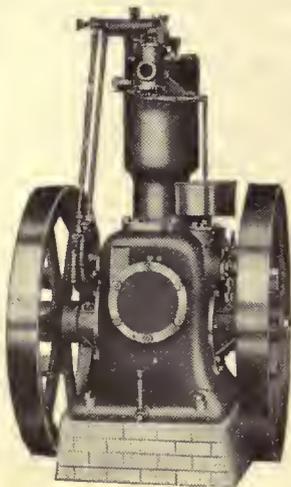


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Motor Co.**

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Distillate or
Alcohol.

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in use.
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Proof.

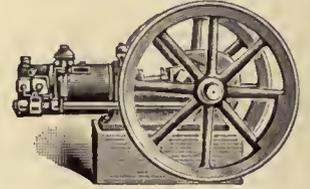
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needs and send for
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Is not this a good record?

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Bristol Aqueduct Co.

Bristol, N. H., 4-1-07

Otto Gas Engine Works, Phila., Pa.



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"I want to see a Phonograph in every American Home."

The Phonograph is Mr. Edison's pet and hobby. Though he has patented hundreds of other wonderful inventions, he regards the phonograph as his greatest achievement. Mr. Edison knows of the wonderful pleasure his instrument has provided and is providing to thousands of homes.

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Thomas A Edison

Latest Style Edison Standard
WITH OUR **PARLOR GRAND** Equipment

Lots of Fun

With an Edison Phonograph

This wonderful instrument has been termed, and rightly, too, the "king of entertainers." There is absolutely no one older or younger who is not amused and delighted by this greatest invention of the "WIZARD OF THE TWENTIETH CENTURY." As Mr. Edison has well said, no American home should be without a phonograph.

The latest perfected product of the great Edison factory, also our own splendid **Parlor Grand** equipment—new features—exclusive points of superiority!

See It—Hear It! Get this remarkable instrument in your own home—then you will see how far superior this is to the ordinary talking machine—far superior even to the fine Edison Machines you have heard heretofore.

FREE TRIAL

While This Offer Lasts every responsible person can get on *free trial* a genuine Edison Phonograph outfit, including 12 genuine Edison gold-moulded records, direct from us to your home: *positively not a cent in advance—no deposit—no bother with C. O. D.—no formality of any kind. We allow forty-eight (48) hours' free trial at your home;* and in rural districts up to a week if necessary for convenience of patrons.

Try the instrument in your home, play the stirring waltzes, the two-steps, concert pieces, minstrel dialogs, old-fashioned hymns and other religious

Every Father, every Mother, every reader of this paper who is interested in home amusements should read this grand offer. I know what the Edison Phonograph means in the home and nobody CAN know until after a trial in your own home.

THE EDITOR.

music, beautiful vocal solos, operatic airs and other beautiful Edison gold-moulded records. Play all these, and if then you do not care to keep this wonderful Edison outfit, send the instrument back at our expense—and we will charge you nothing for the trial.

\$2 a Month

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the finest Edison Outfit—which is recognized as the best phonograph outfit in the world. We illustrate here the regular outfit, but the special circular we will send you illustrates also our new special standard outfit with our special Parlor Grand equipment and the large hand decorated Parlor Grand Floral Horn. We will send you this magnificent circular free with our Edison catalog.

Better write at once.

SIGN Your Name and Address

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Edison Phonograph Distributor

Edison Building,
Suite 3229
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TRADE MARK
Thomas A Edison



Look at this happy home scene depicted here. At this very moment there are thousands of homes in the United States where you might find just such scenes as this.

The baby, as you see, is filled with delight at the deep human sounds which come from the big horn of the phonograph. Grandpa is as much pleased as the baby. Every member of the family is happy. Don't you want to bring just such scenes into your own home?



Think of the many delightful programs you could make up. Let us suppose you want to have a dance. Place the phonograph in one end of the room, take up the carpets or rugs and begin. You don't have to wait for any fiddler and you don't have to pay him \$3 for his work either.

Here is an illustration of what you may do when your friends call. One likes a comic song. Out comes a record filled by one of the best known minstrels of the day. Everybody applauds, and while the hand clapping is going on you slip in a Sousa march and watch the listeners straighten up. The applause becomes deafening and you are the hero or the heroine of the whole neighborhood. Thus can the concerts go on night after night.

And on Sunday you may have sacred music of the very best quality.

And don't forget that you may secure records of every member of the family. These will keep for years and years, and after the dear ones have departed their voices will be with you still.

Let Grandpa talk into the horn and then listen to its exact words as they come from the phonograph a moment later.

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Without any obligation on my part send at once to me free, prepaid Edison catalog and full explanation of the free trial easy payment offer.

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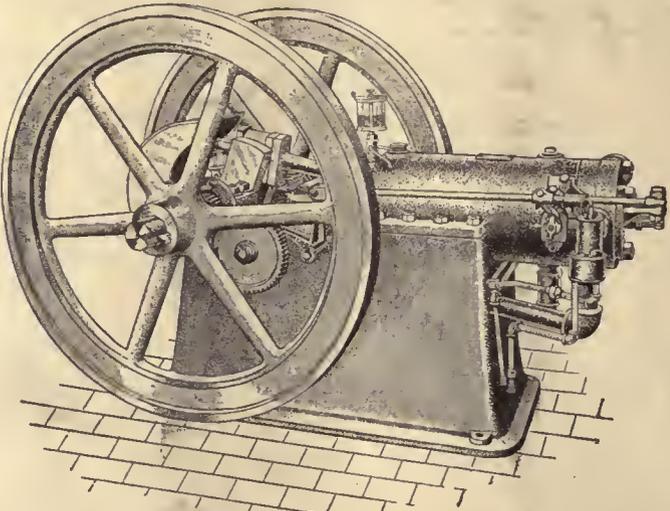
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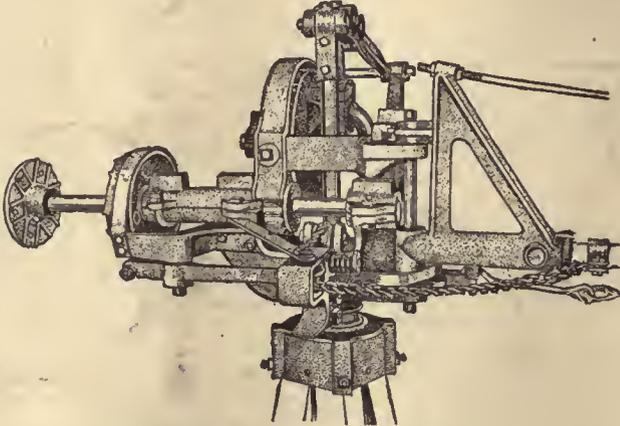
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GENERAL FARM MACHINERY.

VOL. XXIII.

CHICAGO, JANUARY, 1908.

No. 3

A DITCHING MACHINE BASED ON A PRINCIPLE



The operation of the AUSTIN DRAINAGE EXCAVATOR is based on the principle that a perfect ditch is one whose bottom is smooth and true to grade and whose sides are sloped to the proper angle.

If you will look at the accompanying picture you will notice a U-shaped frame reaching down into the ditch, with its two arms extended over the spoil banks. This is the guide frame along which the two scraper huckets travel. They cannot depart an inch in their line of travel from this frame and so must cut a ditch just the shape of the frame. The contractor adjusts the frame to fit the engineer's profile, that is he makes a template to the engineer's drawing, and thereafter every foot of ditch dug is dug to this template. This means that the sides and bottom of the finished ditch are left as firm as nature made them, that every foot of dirt excavated is pay dirt; that no slope trimming or cleaning of berms are required.

The AUSTIN DRAINAGE EXCAVATOR will build levees and embankments as well as dig ditches. Send for our form letters and catalogue S, telling how.

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Morris Machine Works BALDWINVILLE, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need

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Pumping water by hand is hard work—useless, too, when you can get a Deming Ram to do it for you. Pumping engines and windmills get out of order—continually require attention. The Deming Ram needs practically none.

Farm help is costly and hard to get. That makes it all the more an object to you to cut down the work you have to *hire*, and do it with machinery that looks after itself and that does not loaf when your back is turned. The Deming Ram is always ready, always willing and does not get tired.

Do you have a spring or a flowing well? Write us the situation. We will tell you whether you can use a Ram, how much water it would deliver, and just what it would cost you to install it.

Let us submit an estimate; after that, the buying is "up to you." We ask now only your inquiry—may we have that?



Made in Seven Sizes

THE DEMING COMPANY,

Salem, Ohio

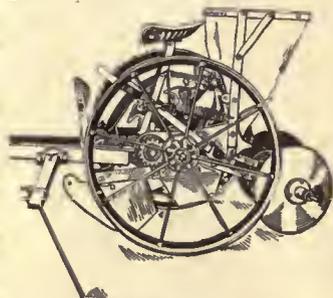
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Booklet on
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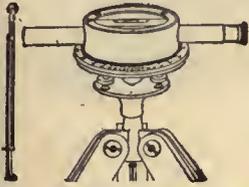


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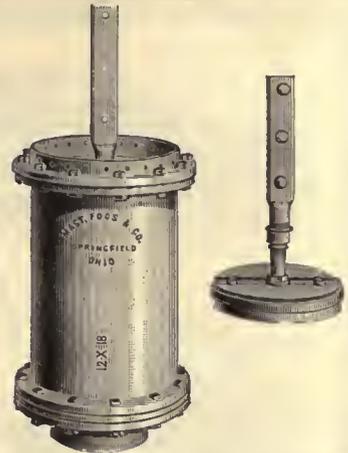
BUCKEYE IRRIGATION CYLINDER

PORCELAIN LINED
For Spiral or Iron Pipe

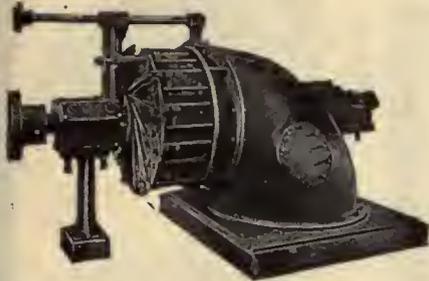
These cylinders are of the highest quality, are fitted with our patented removable poppet valves and brass seats, and are built to meet every requirement. Diameter 4 to 12 inches.

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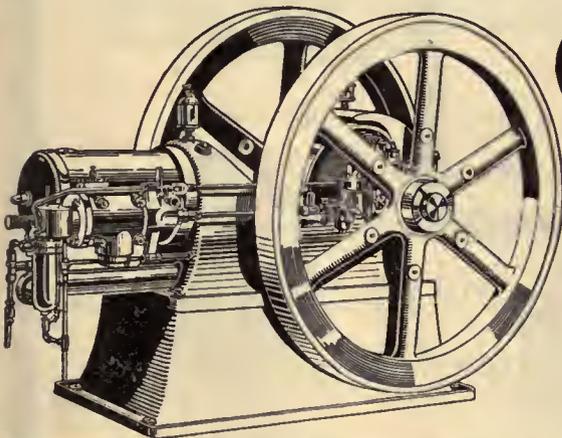


When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

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This company has been making engines—and nothing else—for thirty years. We are engine specialists. It stands to reason that a big, successful concern like this, that makes one thing, must make that one thing well.

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This liberal proposition is the crowning reason on top of a lot of good common sense ones, why you should buy an Olds Engine and none other.

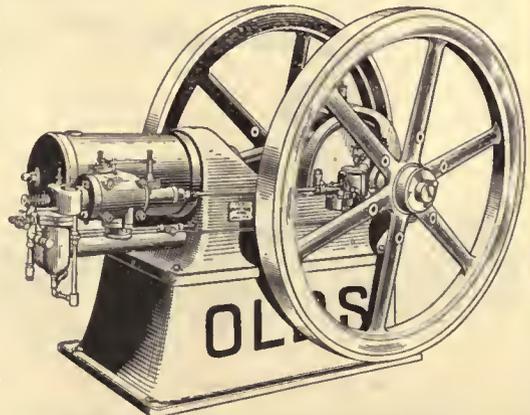
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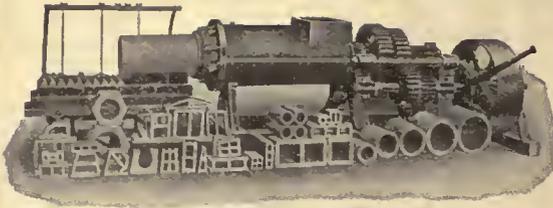
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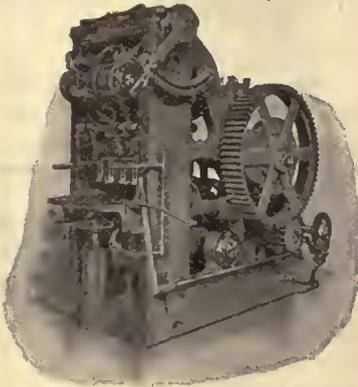




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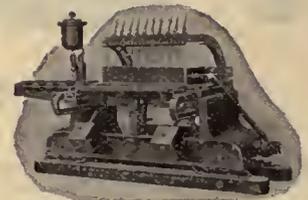
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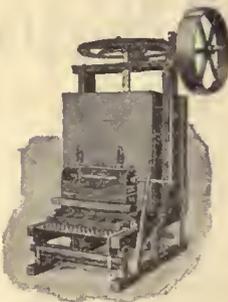
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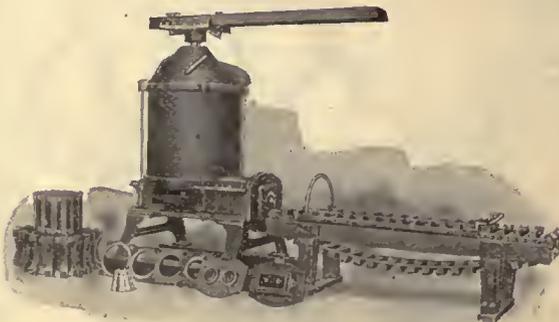
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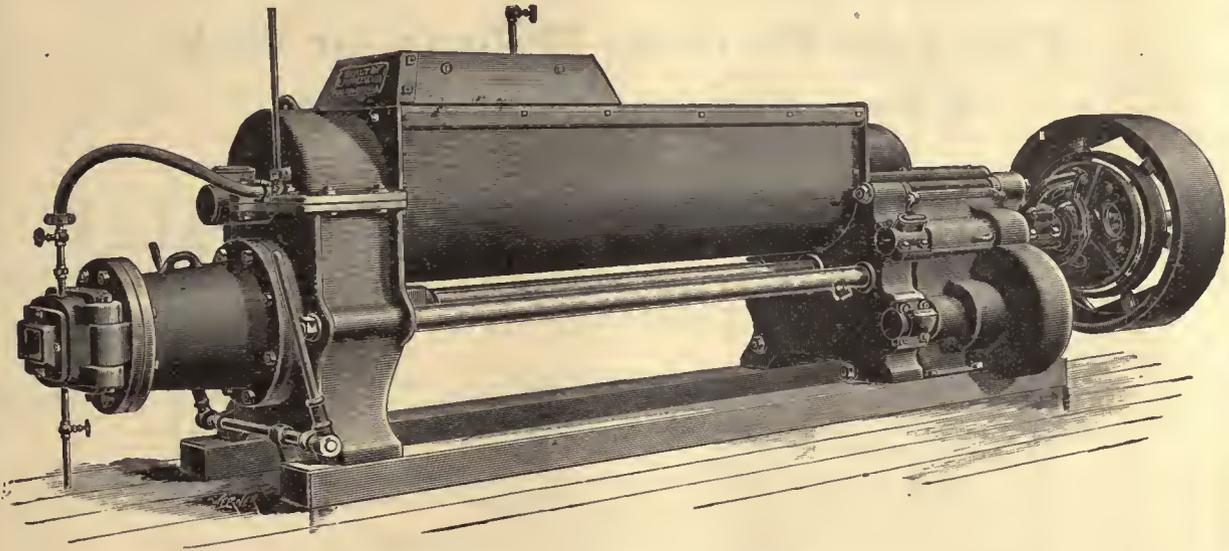
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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, JANUARY, 1908.

No. 3

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, - - - CHICAGO

Entered at the Postoffice at Chicago, Ill., as Second-Class Matter.

D. H. ANDERSON, Editor
W. A. ANDERSON .. G. L. SHUMWAY
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ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

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Official organ Federation of Tree Growing Clubs of America.

Official organ of the American Irrigation Federation.
Office of the Secretary, 309 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 22 years old and is the pioneer publication of its class in the world.

Organize. Organize a Tree Growers' Club in your home town and write *THE IRRIGATION AGE* for seeds and other information.

Tree Clubs. In another column will be found further mention of the Federation of the Tree Growing Clubs of America, which our readers are requested to carefully scan, and a special invitation is extended to those who contemplate organizing clubs in their home towns. They are requested to communicate with the secretary of the Federation, D. H. Anderson, at 112 Dearborn street, Chicago, Ill.

Tribute to a Man. We are publishing in this issue an article by Mr. Chas. A. Green, a well known nurseryman and editor of *Green's Fruit Grower*, Rochester, N. Y., which pays a very high tribute to a man who has done much to benefit the present and future generations, and of whom Mr. Green very gracefully speaks in connection with his propagation of a new species of currant, known as the Diploma Currant, which has attracted wide attention. The gentleman referred to is Mr. Jacob Moore of Rochester, N. Y., and we would respectfully call the attention of our readers to the article by Mr. Green, so that they may understand what this man has accomplished.

Sixteenth Congress Proceedings. We note with regret that the committee in Sacramento who had the Sixteenth National Irrigation Congress in charge has not yet gotten out for delivery the report of the proceedings of that body. This delay is difficult to understand in view of the record established by that committee in other lines. The Sacramento people should wake up, as the publication of this volume, if attractively prepared, will do much to advertise that city and all California.

The American Irrigation Federation. It may be interesting to our many readers who are members of the American Irrigation Federation to know that this organization has been growing rapidly during the past six months. Very little has been said about it in the columns of this journal, but Mr. Shumway has been putting in some very effective work in the west during the past few months and the report of new members is exceedingly gratifying. It is the intention of the officials of the American Irrigation Federation to work in conjunction with the Federation of Tree Growing Clubs of America, and each member of the Irrigation Federation will be asked to organize tree growing clubs in their home towns. All of those wishing information concerning either of these organizations may secure printed matter, fully descriptive of same, by addressing D. H. Anderson, secretary of the Federation of Tree Growing Clubs of America, 112 Dearborn street, Chicago, Illinois.

Mead. Mr. Elwood Mead, who will practically have control of the various Government irrigation schemes throughout Australia, as chairman of the Water Supply Commission, arrived at Melbourne, Australia, early in November. Mr. Mead has not yet taken up his duties, but great things are expected of him as he has had large experience in irrigation work in the United States and Canada. As soon as Mr. Mead's work in that country is well under way we hope to be able to publish some information concerning it.

California Reclamation Solution. An article in this issue of THE IRRIGATION AGE by a well known engineer, entitled "A Practical Solution of the California Reclamation Problem," is well worthy of perusal by those interested in this important subject. This article treats of the deplorable conditions existing in the Sacramento and San Joaquin valleys, where over one million five hundred thousand acres of the richest agricultural land on the face of the globe has been rendered almost or altogether worthless from the fact that it is either under water all or part of the year, or is in constant danger of periodic overflow.

Fairbanks. While THE IRRIGATION AGE is not, in any sense, in politics, it seems only proper to say a kindly word about a gentleman who may possibly be a candidate for the highest honor in the gift of the American people, the Presidency of the United States. The gentleman referred to is Mr. Chas. Warren Fairbanks, of Indiana, a man with whom the editor of this journal is acquainted, and with whom he has come in contact at various conventions and meetings throughout the western country.

Mr. Fairbanks, all criticisms in eastern papers to the contrary, is a strong man in the West, and would make an able President. He is in full touch with western conditions; in fact, it is a question if any other man who may be put up would have as good an insight to the needs of the west as Mr. Fairbanks. He has shown this knowledge in his various speeches before irrigation congresses and other conventions throughout that country, and THE IRRIGATION AGE wishes to be understood as saying these few kindly words concerning him to counteract in a small way the effect of the many misleading statements concerning him which have been published from time to time during the past few years. It would be difficult to find a man more kindly disposed towards the west than Mr. Fairbanks, and our weak tribute to him is offered with the hope that some of the effect of many unfair statements may be corrected.

Buys Ties From Hawaii.

A striking instance of the scarcity of timber suitable for railroad ties in the United States is seen in the recent purchase of the Atchison, Topeka & Santa Fe Railway Company of 2,800,000 ties of ohia wood from a lumber company operating in the Hawaiian Islands. It has been difficult for some time for the railroads of this country to obtain wooden ties satisfactory both in quantity and quality, and many of them have been looking about for an opportunity to purchase tie timber in other countries.

During a recent trip of this kind by a representative of the Atchison, Topeka & Santa Fe Railway Company arrangements were made for the purchase of these ties, not only in the Hawaiian Islands, but also in Japan. It is stated that ties from Japan will be made from a certain species of oak which compares in lasting qualities very favorably with the white oak of this country, which has been considered the most satisfactory wood for tie purposes. About a year ago, before the representative of the railroad had started on his trip, the United States Forest Service made a few tests on the ohia wood. The results indicated that, in point of strength, ohia wood will rank with the oaks. It was thought from these tests that the wood was worthy of further investigation, and the large order placed by the railroad indicates that their agent is confident that Hawaiian wood will prove to be a satisfactory material for railroad ties under the conditions existing in this country.

Shumway's Notes. Our readers will note, with pleasure, the return of Mr. Shumway by the appearance of his editorial notes in this, the January issue. Mr. Shumway has been traveling extensively in the West during the past several months, building up the organization known as the American Irrigation Federation, of which he is the executive chairman, and he will have considerable to say about his work along that line in future issues of this publication.

In connection with the notes which are prepared by Mr. Shumway, the editor of THE IRRIGATION AGE wishes to announce a slight change in the policy of this journal concerning the work of the Forestry Bureau of the Department of Agriculture. We have seen fit during the past several years to criticize severely the head of the Forestry Bureau, Mr. Gifford Pinchot, and felt justified in the expose of conditions concerning the connection of that Bureau with other Bureaus in Washington, such as that of the Reclamation of Arid Lands. We have never had anything personal against Mr. Pin-

chot, the main object in criticising him being what we estimate as the arrogant position assumed by him in carrying out the policies of the Bureau of which he is the head. It was seen fit also to mention Mr. Pinchot and make some criticisms concerning him on account of his connection with George H. Maxwell. No one who understands the situation has ever questioned the integrity or sincerity of Mr. Pinchot. He, like all other mortals, however, is liable to make mistakes, and yet in justice to him we wish to say that a careful investigation made by the writer into his work during the past seven or eight months, leads us to say that we have not yet found a single individual who can place a charge against Mr. Pinchot concerning his honesty or good intent, and, while we shall feel at liberty to criticise him in the future as in the past in case conditions arise which would make it seem advisable, we will, hereafter, require substantial evidence concerning any wrong doing by Mr. Pinchot before any adverse criticism concerning him is allowed to appear in the editorial columns of this journal.

This does not apply however, to matter which will reach us from time to time from such men as Mr. Shumway. We do not presume to outline, in advance, the policy of articles written by contributors, but will at all times be glad to publish any criticisms which may be made by our readers or others, allowing, of course, the same privilege to those whom our correspondents see fit to criticise.

It is only reasonable to suppose that Mr. Shumway and others similarly situated have a clearer insight to local conditions than would be possible to the editor of this journal, and we will always be glad to furnish space in which their grievances may be properly aired.

THE IRRIGATION AGE will do all in its power to promote the interests of Mr. Pinchot's bureau in the future, and we trust that he will take advantage of our offer to exploit his views or reply to adverse criticisms which may, from time to time, appear in the columns of this paper concerning his department.

International Harvester Company. Everybody's Magazine has been publishing a series of articles entitled "The Reaper Kings," which make very interesting reading. The January number will contain the first of a series on the formation of the combination known as the International Harvester Company. This series of articles should be read by the public generally, as they give the inside history of the combination known as the International Harvester Company.

EDITORIAL NOTES.

BY G. L. SHUMWAY.

It is with much regret we notice that Secretary Garfield recommends such an unworthy measure as the land leasing bill. We had hoped that the public land convention, and further mingling and communion with the master minds of the West, would have convinced him of the impracticability of such a bill, as well as the futility of trying to impose it upon people who so utterly loathe its principles. I fear the dominant spirit of the "Tennis Cabinet" has overruled the Garfield good judgment.

One of the features of the new measures makes it absolutely impossible. The advisory board of a Grazing District is to be composed of four men appointed by the Governor from the District, and one man appointed by the Secretary of Agriculture. If a difference of opinion arises in which the local four oppose the Washington One, the Secretary of Agriculture shall decide. Thus the four become mere figureheads and the Secretary of Agriculture the autocrat.

Another provision is objectionable. The bill does not provide the fundamental principle of a home. It provides national landlordism and citizen tenantry. To illustrate what this will do, one has but to look at the condition prevailing on leased lands of any description where the tenure is abbreviated even to twenty years. The occupant never is inspired with the true home-building instinct, and his improvements are always of a temporary nature, with an eye single to getting as much as possible out of the holdings during possession, even though they are thereby impoverished and damaged for years.

It would seem that the metropolitan press of the country at least would cease publishing the ready made editorials and "tainted news" sent out by the bureaucrats. "Bub" Pinchot's new role is "The Savior of the American Forests." We knew that his rating in his own estimation was very high, but hardly thought it had reached the altitude of The Savior.

The National Forestry Association has extended me the courtesy of an invitation to become a member, and urges me to help protect the forests. My natural instincts inspire me to want to cut a tree if I need it to build, or to burn. My forefathers built their cabins in the primeval forests of New England, and I have myself hewn from the native woods the logs and lumber used in the construction of my homestead habitation. That is my idea of what trees are for.

To fence the home building world away from the forests is a crime. To forbid them the uses of national forests, which are theirs by right, and compel them to buy of the lumber trust is still a crime.

The federal plan should be to plant trees for future generations. State Forestry Bureaus are doing far greater service along this line than the National Government. I note also that shrewd business men are adding commercialism to the forestry spirit. One prominent railroad has in the last year planted more trees than the Government has in the entire incumbency of the present Chief Forester, which is about ten years.

"Nature faking" is in many forms, but the one most persistently insisted upon emanates from the "Tennis Cabinet"—the theory—nay, the positive assertion—that forests on the mountains regulate the flow of water and benefits irrigation. New England and the slopes of the Appalachians bear witness that since brush and young trees have grown upon abandoned farms, streams that have run unceasingly for many decades have ceased. Many of the brooks of Maine, once the home of the trout, are entirely dry. The waters which might form such streams now pass through millions of subterranean channels, fibers of roots, into pulp and leaves. A single large cottonwood tree will dry a well or spring.

Congressman Mondell, of Wyoming, proposes the sale of public grazing lands and isolated sections in the railroad grants. That would help solve some mooted questions, as well as add materially to the fund available for reclamation. I would, however, suggest that the sale be made of a provisional nature for a specific purpose, and that occupancy and individual use be the essence of the title. That the land revert to the Government before it can be transferred to or used by, another, and that a limit be placed on the acreage owned by any one person.

We of the West rather sympathize with the East in your troublous panic, but admonish you who have grown justly leary of "Industrials" that security and profit lie in two classes of investment. Municipal bonds, which include District Irrigation Bonds, and investment in farms—especially irrigated farms—which command high rental values. District Irrigation Bonds are a new class of security, which, because drawing usually 6 per cent, are first mortgages, with interest and principal payable through taxation on groups of the richest and most productive farms in the country; and the security covers all villages, lots, or other lands within the prescribed limits of the District. Dig your money out of your old sock and buy an irrigated farm or an irrigation bond.

OPTIMISTIC CLUB OF AMERICA.

A Novel Organization for Purpose of Dispensing Cheerful Philosophy.

President Roosevelt, Secretary Cortelyou and the Governor of Every State in the Union Invited as Honorary Members.

This novel organization was recently organized with headquarters at Salt Lake City, Utah, with Charles A. Quigley, the vice-president and general manager of the Studebaker Bros. Co. of Utah, as its president, and the desire of the organization is to create a local club in every hamlet, village, town and city in the United States.

Colonel Charles Arthur Carlisle of the Studebaker Bros. Mfg. Company of South Bend, Indiana, has gotten back of the Optimistic Club of America and is pushing it forward to success in every direction.

The philosophy of the club, subject to modification and additions, is as follows:

"God reigns; the union still lives and the sun still shines, even though the clouds obscure it."

"There are more people dying each day for the lack of a kind word, a pat on the back and a little encouragement, than there are from disease."

"A smile is potential, magnetic, and dispels trouble."

"The man who never makes any mistakes never makes anything else."

"Hard luck stories are like over-due notes."

"Go bury thy sorrows, the world hath its share. Just smile."

"Before money was invented some people were happy."

"Shake hands as though you meant it, and smile."

"Nobody can compute the value of a smile; a frown has cost a kingdom."

"Nobody can really harm you but yourself."

"You are under a real obligation to every man on earth."

"You can't put influence in a glass case."

"When in doubt, take Optimism."

"In darkness, in light, in sorrow, in blight, be an Optimist ever, and things will come all right."

"Optimism is the first-born of hope, the mother of confidence, the executioner of adversity and the undertaker of pessimism."

"A frown is a renegade smile that is afraid to look itself in the face."

"On the faces of the happy aged it is a well known fact that wrinkles are only the foot-prints of smiles."

"On the vehicle of modern progress the creak of the wheel is the pessimist protest; a little Optimistic lubricant will silence both the creak and the croak."

"The Optimist wins."

"The greatest smiler is the greatest healer."

"Smile and the world delights with you; croak, and you croak alone."

"A smile is God's own medicine."

"A grin is a counterfeited smile, and does not pass current because the heart stamp of genuineness is not upon it."

"Optimism and pessimism have fought many bloody battles; if Optimism had not been a victor up to date, hope would have died years ago."

"In the realm of the birds, the lark is the Optimist, the crow is the Pessimist. Why be a crow?"

"Clearing house certificates and tight financial conditions have afforded more people, who never had a dollar, an excuse for their hard luck stories than anything that has happened since the Civil War."

"Let Optimism and the Optimist destroy the last hope of the pessimist and perfect confidence will again prevail with peace and plenty for all."

"Fall into line and the sunshine of the home and the glory of trade will reflect the delight of a gracious personality."

Organize a club, improve upon the philosophy quoted above if you can; print and spread your work, and let the motto of your club be:

"Not until every man and woman has been successfully enlisted will we haul down the unconquerable flag of determination."

Water Rights in the San Luis Valley

W. A. Anderson

The greater part of the cultivated area of the San Luis valley constitutes what is known as Water District No. 20 of the state of Colorado. On May 13, 1889, a petition for the adjudication of the water rights in the district was filed by Oscar Wilkins, H. C. Dorris, E. B. Hayt and James T. Maddox. Judge A. W. McIntire was appointed as referee and for two years testimony was taken to prove appropriators' rights to water. The decree in the matter was handed down on November 17, 1891, by the district court of Costilla county. Considerable dissatisfaction was found with the apportionment, and petitions by the Farmers' Union Ditch Company and the Prairie Ditch Company, filed on October 10 and 23, respectively, served to reopen the case. Judge McIntire, former referee, was again appointed to serve, and upon the findings of fact in the testimony upon which the previous decree was based, a new decree, dated May 1, 1896, was entered setting aside the former judgment and making new appropriations. From the findings of this second decree the Rio Grande Land & Canal Company and the Empire Land & Canal Company took appeal to the state supreme court, and on April 4, 1900, the remittitur from the supreme court

valley. According to the priority numbers there are nearly 6,500 cubic feet of water being taken from the river every second. Of course these figures are theoretical, and there may be more and there may be less flowing into the canals. There are several private ditches also which have appropriation numbers which have never diverted water. Up to 1900 there had been filed one hundred and forty-six water rights to take water from the Rio Grande river in Water District No. 20. Of the total the following named amounts are entitled to a flow of more than ten cubic feet per second:

Sylva	26.2
Rio Grande Ditch No. 1.....	12.8
McDonald Ditch.....	16.4
Horner & Ydren.....	11.6
Centennial	82.4
Fish	18.6
Anderson	17.2
Empire	666.5
San Luis Valley.....	14.6
Independent No. 2.....	30.4
Rio Grande & Piedra Valley.....	75.7



The Rio Grande River, San Luis Valley, Colorado.

was filed and the district court of Costilla county entered a decree setting aside and modifying the decree of May 1, 1896, in so far as the Rio Grande and Empire canals were concerned and allowing it to stand as it related to other ditches.

The law governing water rights in the state of Colorado is that as a ditch on a certain date diverted a certain amount of water it was given a priority right to that amount. As each ditch of later construction took water it was also given an appropriation priority number, and the date and amount were recorded. Or when a company enlarged the capacity of its ditch the amount was registered and given a priority number. In practice when water is plentiful there is no restriction as to the amount of water a ditch may take from the streams, but when the rivers are low it is the duty of the water commissioner to restrain the owners of ditches from taking more than the ditch is entitled to and shutting off the water when ditches of later construction are taking water to which the earlier built canals are entitled.

The Rio Grande river supplies the larger part of the water used for irrigation purposes in the San Luis

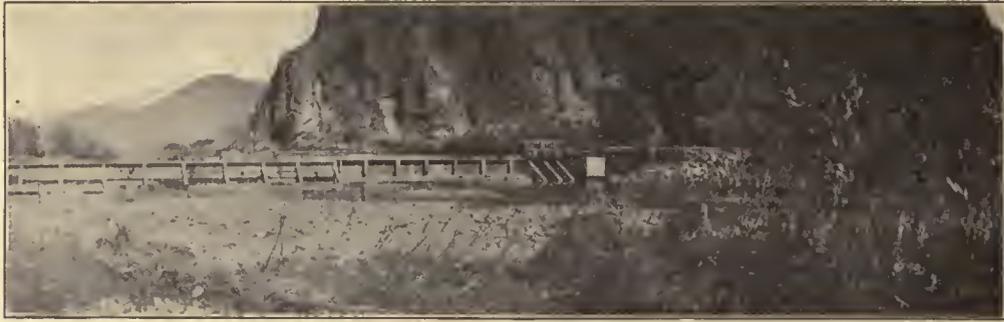
Rio Grande & Lariat.....	54.4
Excelsior	75.1
Independent Ditch.....	11.2
Rio Grande Ditch.....	26.4
Rio Grande Canal.....	905.6
Rio Grande & San Luis Ditch.....	14.6
Monte Vista Canal.....	257.8
Hickory Jackson.....	20.6
San Luis Valley Canal.....	92.9
Rio Grande Ditch No. 4.....	12.
Costilla Ditch.....	103.3
Prairie Ditch.....	105.1
Star Ditch Enlargement Co.'s.....	10.
Billings Ditch.....	25.6
Farmers' Union.....	138.8

From these figures it will be seen that the Rio Grande canal is the largest in the valley. A word about the history of irrigation in the valley would not be out of place here. In 1883 T. C. Henry conceived the idea of building a large canal north of the Rio Grande river and one or two south. Accordingly he received a loan from the Travellers' Insurance Company of Hartford, Conn., of about \$700,000. Work was be-

gun on the Rio Grande canal the same year and a little later the Monte Vista canal was started. The company organized by Mr. Henry was also the owner of the Empire canal, now the property of another corporation, watering land to the south of the Rio Grande river. Considerable land was also taken up and by 1884 the work had so far progressed on the Rio Grande canal that a crop was planted on what is now the North Farm, about four and a half miles northeast of where the town of Monte Vista is located. In the fall of 1885 the Travellers' Insurance Company took over the rights and property of Mr. Henry's company and since that

where it empties into the stream about a mile south-east of the town of Saguache. There are eighteen main laterals leaving the main canal, all flowing east. Altogether there are over five hundred miles of laterals, carrying water sufficient to irrigate 125,000 acres. There are at the present time between 60,000 and 75,000 acres being supplied. The water appropriations, with dates, numbers and amounts of the Rio Grande canal are given below:

176	Aug. 31, 1879 (Hermanthal).....	2.8
178	Nov. 30, 1879 (Scotch).....	11.2
179	Dec. 30, 1879 (Schuch & Schmidt)...	2.



Diverting Dam, Rio Grande Canal, Colorado.

time has been in active ownership. The organization of the Rio Grande Land & Canal Company, the Monte Vista Canal Company, and the Colorado Valley Land Company was shortly after affected and it is through these three organizations that the active management of the business is conducted. Judge F. C. Goudy of Denver is manager and Mr. John MacArthur has charge of the local office at Monte Vista as superintendent. The company maintains the Meadow Ranch of 16,000 acres some twenty-five miles northeast of Monte Vista, where about 1,400 cattle are annually raised, and the North Farm, which contains about 2,000 acres. Both

197	Dec 31, 1880 (Biedel).....	20.
198	Jan 1, 1881 (Enterprise).....	13.4
220	April 15, 1882 (Schuch & Schmidt)..	1.6
235	July 1, 1882 (Dunning Mill).....	6.
216A	Sept. 2, 1881.....	318.4
276A	June 10, 1885.....	22.8
288A	June 10, 1886.....	22.7
312A	June 10, 1887.....	26.
317	March 1, 1888 (Schuch & Schmidt)	.8
338½A	June 10, 1888.....	33.6
344	March 30, 1889.....	24.4
358A	June 10, 1889.....	16.6



The Monte Vista Canal, San Luis Valley, Colorado.

these ranches are under the Rio Grande canal. The South Farm of 1,000 acres, under the Monte Vista canal, was a few years ago sold to the Getts brothers, who are operating it at the present time. Mr. W. W. Reilly is the engineer for both canals and it has been under his direction that much of the construction work has been done.

The Rio Grande canal has its rise on the north side of the river about one mile above the village of Del Norte. The headgate was constructed in 1901, and consists of twelve four-foot openings and was built to replace the old structure. The course of the canal is northeasterly for thirty-eight miles to Saguache creek,

363A	June 10, 1890.....	43.
363B	July 24, 1890.....	52.
365	Nov. 17, 1891.....	293.7
Additional since 1900, about.....		60.

The Rio Grande canal is locally known as the Travellers' ditch. Water rights in both the Rio Grande and Monte Vista canals cost the farmers seven and a half dollars for twenty-five inches; nine dollars for fifty inches; eleven and a half dollars for seventy-five inches, and thirteen and a half dollars for a hundred inches a season.

The Monte Vista canal was formerly known as the Citizens' ditch. It takes water from the Rio Grande

river about half way between Del Norte and Monte Vista. Its direction is southeasterly for twenty-two miles to where it empties into the Alamosa river about six and a half miles northwest of La Jara. The canal formerly extended across the Alamosa river some twelve or thirteen miles southeast to the Conejos river, but it was discontinued a few years ago at the Alamosa river as the district below was covered by Conejos rights and the revenue derived from the sale of water was insufficient to maintain the ditch. The Monte Vista canal gets its water by two appropriations, the first, No. 224, dated May 31, 1882, being for 132.2 feet, and the other,

tain their unreasonable position. In the meantime all the San Luis irrigation projects involving the use of public lands for reservoirs or canal purposes are held up in the land office.

The Travellers' Insurance Company had started the construction of a large reservoir near the headwaters of the Rio Grande river with a capacity of 42,000 acre-feet. Work on it was necessarily stopped the fact that Secretary Garfield again put into effect the order restricting the impounding of water, which had been suspended by Secretary Hitehoeck. There are, however, several other reservoirs now under construc-



Headgate of Monte Vista Canal, San Luis Valley, Colorado.

No. 358, dated May 24, 1889, being for 125.6 feet, a total of 257.8 feet.

Reservoir building in the valley has been hindered and in some cases effectually stopped by the department of the interior. The reason is that some years ago the federal government concluded a treaty with the government of Mexico by which we guaranteed them a flow of 63,000 acre-feet annually from the Rio Grande river

tion. The recent great increase in the value of irrigated farm lands in the valley has led to the projection of several reservoir plans, designed to save water from the winter and spring flows of the rivers for use later in the summer. The first two of these to approach completion are located west of La Jara on the Alamosa and La Jara rivers. The Terrace reservoir on Alamosa river will have, when completed, a capacity of nearly 30,000



Headgate of Rio Grande Canal, San Luis Valley, Colorado.

at the international boundary. Partly in order to secure this delivery according to the treaty, and partly to promote irrigation in Texas and New Mexico in accordance with the reclamation law, the service has undertaken the construction of the big reservoirs in New Mexico, and refuses to permit the development of further storage and irrigation projects in the San Luis valley, holding that Colorado development subordinate not only to the international rights of Mexico, but also to the rights of users of water from the new reclamation projects, even though the San Luis appropriations were prior to those for the Elephant Dam—Engel project. Thus far no final decision in the matter has been reached, and in view of the recent decision in the Colorado-Kansas case it seems hardly possible that the officials of the interior department will be able to main-

acre-feet. The impounding dam of this reservoir will be the highest dirt fill in the world, being 211 feet high and 1,055 feet on the base. The La Jara reservoir, with a concrete and masonry dam, has a capacity of 17,000 acre-feet. These two reservoirs will provide for a township and a half of land. The distributing ditches have already been constructed, and about 2,000 acres of ground was irrigated and in crop in the season of 1907.

Other reservoirs which will probably be placed under construction within the next year or two are the Elk Creek and Magote, taking water out of the Conejos river, and having a combined capacity of 43,000 acre-feet.

(Concluded on page 84.)

A Practical Solution of the California Reclamation Problem

In the San Francisco *Chronicle* of Sunday, August 11, 1907, there appeared an article entitled "Reclaiming California's Netherlands." "Planning to Add Over 1,500,000 Fertile Acres to Wealth of State." "When Drained This Land Is Said To Be Worth from \$300 to \$500 Per Acre."

This article treats particularly of the deplorable condition existing today in the Sacramento and San Joaquin valleys, where over one million five hundred thousand acres of the richest agriculture land on the face of the globe has been rendered almost or altogether worthless, from the fact that it is either under water all or part of the year, or is in constant danger of periodic overflow.

Naturally the problem of successfully reclaiming these lands and rendering them permanently immune from flood damage has for years been regarded as the most important question before the people of California and its legislative bodies.

It is estimated that fully \$20,000,000 have already been expended in dredging, erecting levees and pumping out diked areas; but it is admitted that this vast expenditure has accomplished no lasting good, as the beds of these rivers are continually filling up with debris from the old hydraulic mining operations and the levee of today has to be built higher and higher, with no surety that next year's floods will not sweep it away and devastate the land it is intended to protect.

The people of California have at last awakened to a realization of the fact that spasmodic levee and dike building by local reclamation districts is worse than useless; that the only practical, permanently successful way to reclaim this wonderfully fertile empire is to take it all in under one comprehensive plan and place it once for all beyond the possibility of flood damage.

How can this be done? Various plans have been proposed by engineers, many of whom are of national reputation. It is generally conceded that as an essential to successful reclamation the channels of the Sacramento and San Joaquin Rivers and their main tributaries *must be restored to their original levels*. As this can only be done by dredging, the cost of this class of work by any of the proven devices heretofore in use has always acted as an insuperable bar. Then, again, successful dredging would have to be on such a gigantic scale that the disposal of the dirt dredged from the river channels at once becomes a serious problem. There has always been a tendency to rely on the paternal aid of the Federal Government, backed up by State appropriations; but the necessities of the situation involve the expenditures of such immense sums that a proposition to segregate such a large slice from the Rivers and Harbors Budget could not help exciting the antagonism of the three hundred odd congressmen whose special bailiwicks would be left out in the cold.

State help in amounts large enough to do any real permanent good could hardly be expected for a similar reason.

Therefore, it seems plain that the burden of the cost of reclamation must be borne by those whose prop-

erty will be directly benefited thereby, viz., the owners of the fifteen hundred thousand acres of land in the Sacramento and San Joaquin valleys which such reclamation would forever make safe against possible flood damage.

But as it would be an impossible task to get several thousand owners to unanimously agree to the adoption of any one plan irrespective of its real merits, it would seem that the State itself must take the initiative and by legislative enactment form one grand reclamation district embracing the fifteen hundred thousand acres which it is intended to benefit; authorizing the trustees who will have charge of the reclamation work to issue 4 per cent bonds against the entire drainage district for the cost of the work done as it progresses; bonds to mature in 50 years, but to be subject to being retired at end of any five-year period on due notice being given; the State of California to guarantee payment of interest on the bonds and to collect the taxes on the lands from which the interest and the principal are to be paid.

Such act should provide for the temporary condemnation of a strip of land one thousand feet wide on each side of the river to be dredged outside of incorporated towns and cities, to which the debris taken from the bed of the stream shall be transferred, and where such debris does not contain a sufficient quality of vegetable loam to insure fertility, a top dressing of tulle mud shall be laid on the new made ground, which will then be turned back to the original owner in prime condition to be put under cultivation.

Competent engineers estimate that to restore these streams to their original levels, as they existed fifty years ago, two hundred and fifty linear miles of channel would have to be dredged and from each mile an average of 3,000,000 cubic yards of debris must be elevated and spread over the thousand foot strip on each side of the channel. This will raise the banks of the river eight to nine feet above present height and will cut down the level of the stream itself twenty-four feet, a net gain of about thirty-two or thirty-three feet, which will abundantly take care of any future floods.

To be effective, the work of dredging the entire two hundred and fifty miles of river channel must be done within a comparatively short period, say five years, in order to put the reclaimed land in shape to be cropped, and so earn a sure income that will not only pay the tax levy, but also produce an additional revenue to the owners. During the five years of unproductiveness the State should advance the interest on the bond issue.

The first question to be considered is the measure of damages to which property owners would be entitled for the temporary condemnation of the thousand foot strip of land alongside the river. As they would only be deprived of the use of this land for a short period—in no case exceeding five years—and as it would be returned to them infinitely more valuable than when it was given up, it would seem that in the great majority of cases the obligation would be on the side of the property owner and in any case would be limited to the actual value of improvements destroyed.

But the most important question to be considered—

FEDERATION OF TREE-GROWING CLUBS.

DETAILS CONCERNING THE MOVEMENT.

We are glad to inform our readers that the movement to form tree growing clubs throughout the United States is meeting with splendid success. Recent letters from Mr. H. A. Greene of California brings the good news that clubs are being organized all over that state. Work is already under way for the formation of a parent club in Illinois, and it is hoped that within the next few months a club will be organized in each county of this state, and develop from that to similar organizations in every school in each county. When it is considered that there are one hundred and one counties in the state of Illinois, and that by the organization of a club in each county at some central point others may become interested and that in time there is likely to be from ten to twenty or even fifty clubs in each county, it can readily be understood what a tremendous movement this may become, where all the members of the various clubs are propagating trees from the seed and transplanting them in the gardens, along the public highways, and on farms

ester of the date of organization, the names of its officers, also to make an annual report to him of what has been accomplished during the year. Copies of the reports must be forwarded to Hon. H. A. Greene, Monterey, Cal., president, and D. H. Anderson, 112 Dearborn street, Chicago, secretary of the Federation of Tree Growing Clubs of America, who will cause a certificate of membership to be issued showing that the club has its official place among the immortals.

When the members of the club, or the club's nursery, have a surplus of any kinds of trees on hand, the secretary is expected to forward its list to THE IRRIGATION AGE, the official organ of the Federation, and by such a course exchanges of trees will be made between clubs.

SUGGESTIONS.

No more acceptable Christmas or birthday gift could be thought of than a growing tree, especially where propagated by the donor.

School teachers should particularly be induced to become active club members.

Besides growing trees, members should strive to



Getting a New Start in Life on the Flathead Reservation, Great Northern Railway.

throughout their respective counties. To one who has never given any thought to this subject a careful consideration of it will, at first, appeal, but gradually settle into a firm belief in the wonderful future of this organization.

The shibboleth of the Tree Growing Clubs of America is, "One great, strong, unselfish soul in every community would actually redeem the world," and the motto of the clubs is "Useful Effort." It is the ambition of the promoters of the Tree Growing movement to have a club organized in every community in the Union.

The objects of such clubs are: First, to aid in conserving our natural resources; to make our world more beautiful, and to plant useful trees to restore the timber supply. Second, to interest the school children in raising trees, and give them an opportunity to earn money by it through their individual effort. Third, to teach by example and precept unselfishness by earnest effort to accomplish extensive planting and redistribution of valuable trees.

It shall be the duty of each club, as suggested by the Hon. H. A. Greene, president of the Federation of Tree Growing Clubs of America (whose headquarters are at Monterey, California), to notify the State For-

have owners of land contract with the club to plant trees thereon.

Trees grown by club members and the school children would not be ready to plant out until they are two or three years old.

For example: Mr. Brown desires to plant ten acres of land in trees and will pay ten, fifteen or twenty-five cents each, planted and growing. Should Mr. Brown want them planted six feet apart it would take 15,000 trees. Now, the club must cause a sufficient number of trees to be started of the kinds wanted, by members and school children. When the trees have attained the age agreed upon a picnic is arranged. The larger boys will be divided into two squads, one wearing brown, and the other blue, overalls. One squad will dig holes and the other plant the trees. The girls and smaller boys will distribute the trees from wagons alongside the holes. Should it be deemed advisable, a watering squad might be formed to soak each tree. Teachers aided by men and women would direct operations. The club would naturally supply a good "feed" for the noon hour.

The County Supervisor would be induced to plant the public highways with trees, which would be accomplished in the same manner as above described.

If any of our readers who contemplate organizing a club will kindly notify THE IRRIGATION AGE an effort will be made to secure acorns of the California species and some other rare seeds for experimental purposes in this and other central states. Address D. H. Anderson, secretary, 112 Dearborn street, Chicago, Illinois, for additional data.

It is well to offer a suggestion concerning the planting of tree seeds:

A box no larger than 18 by 20 inches and 4 inches deep filled with sandy loam, should be used. Smooth uniformly, leaving no hollows or holes. No more than 1,000 seeds should be sown in each box. Sprinkle over seed soil to depth of little more than diameter of seed. Cover with fine sand if earth is not quite loose, unplastic. Unless a fine sprinkler is handy cover the surface with a piece of sacking and soak thoroughly. Afterwards keep moist. Naturally, you will place the box in a warm place and protect from frost and interference. When plants are about two inches high remove them into tin cans and care for them until they are ready to transplant, say three feet tall. It is suggested that all trees should be thoroughly soaked with water after transplanting. A layer of wood ashes between the



H. A. Greene, President Federation of Tree Growing Clubs, Directing Planting of Tan-bark Oak Acorns in Tin Cans at His Home in Monterey, Cal.

buried cans will tend to keep off worms. Use sulphur on tops if attacked by insects, and pick off worms if found. Further specified information will be gladly furnished by the Monterey Tree Growing Club of Monterey, California.

The splendid movement is growing organizations of these clubs throughout the country, and it is expected that a strong club will be organized at Elgin, Illinois, within the next thirty days, which will be the nucleus of the Tree Growing Clubs of this state. The matter will be presented at a meeting of the Teachers' Federation which is to be held at Elgin, about January 15, and will be explained to them thoroughly so that they may go to their homes and organize clubs and have the work started the coming Spring.

A GREAT IRRIGATION PROJECT IN THE SALINAS VALLEY, CALIFORNIA, AWAITING GOVERNMENT AID.

(Special Correspondence.)

In the Salinas valley of Monterey county, California, under the balmy sky of one of the fairest sections of the new France beside the Pacific, lies one of the inviting fields offered the Government for irrigation enterprise.

The project comprises 150,000 acres lying between a point a few miles southeast of San Ardo and sweeping down into the broader valley lying below the city of Salinas. Through this strip of beautiful country flows the Salinas River. It has a number of small tributaries.

Nearly every foot of this land is rich and will produce all the crops that make the tiller's heart rejoice. In the Salinas and its tributaries enough water flows in the winter months to give the 150,000 acres a bountiful supply.

All that is necessary is to impound water in the flood season and canal it to the acres of the valley during the dry spell where the land now lies idle, except at such places where private enterprise may have developed an irrigation supply by steam pumping or windmill.

The enterprising people of the Salinas valley have had surveys made that show feasible reservoir sites, where a sufficient supply of water can be stored at a cost of about \$15.00 an acre. The people have begun the project. They await some action by the Reclamation Service toward taking it up and completing it.

The climate of the Salinas valley is one of the most perfect in California.

Dr. D. Brumwell of King City, in the valley of the Salinas, in his report on the mortality of the state, says: "The death rate of Salinas valley, per capita, is 33 1-3 per cent less than that of the rest of the state. Malaria and kindred diseases are unknown in the valley. In fact, the climatic conditions are ideal for both health and industry."

The citizens of the valley, who at their own expense have obtained an engineer's report, deserve praise for their enterprise and it should bear fruit. The Government can hardly delay long in taking up their project.

The rainfall in this rich valley ranges only from 8 to 12 inches, and sometimes it is less than 8 inches. This is why irrigation is so vital. Fine grain crops are raised by "dry" farming.

When the rainfall is good the land shows its capacity. Where watered artificially the results are abundant. Of alfalfa, of which there are five cuttings a year, seven tons an acre are taken off. Barley does better than twenty-five sacks, and wheat produces fifteen sacks. Sugar beets produce from twelve to twenty tons.

There is a variety of soil in the valley ranging from decomposed granite to heavy, rich adobe and including both light and heavy sandy loams. All is irrigable with the possible exception of a few small patches of clear sand near the river.

Small fruits and orchards where planted are doing finely. Salinas apples are famous.

At Salinas the valley is about ten miles wide, but

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narrows gradually toward Soledad to about five miles, while at San Ardo it is about one mile wide.

From the mountain surrounding the valley flow the Arroyo Seco, the San Lorenzo, San Antonio and Nacimiento rivers. On the one first mentioned the engineer found five available reservoir sites. One excellent one was found on the San Lorenzo and one on the San Antonio. On the Nacimiento are several, but owing to the narrowness of the canyon their impounding capacity has not been worked out.

There is a good dam site at Wunpost on the Salinas River, to raise the water for diversion into canals through which it could be taken to lands only a mile and a half below. From this point to Salinas and beyond there is abundance of fall to permit of carrying the water alongside of the foothills and supplying all the lands between them and the river, including the mesa lands in the vicinity of King City. A forty-foot ditch carrying water seven feet deep would carry 1,000 cubic feet per second, which would supply all the land on the east side of the Salinas River below the foothills.

There is a fine underflow for windmill and pumping irrigation.

The cost of installing a Government project would be greatly lessened by the fact that valuable material is close at hand. Here are two analysis that have been made: Analysis of clay found on the Arroyo Seco, made by Smith Emery Company, San Francisco:

Silica (SiO)	55.07 per cent
Alumina (Al ₂ O ₃)	17.54 per cent
Iron oxide (Fe ₂ O ₃)	6.06 per cent
Lime (CaO)	7.12 per cent
Magnesia (MgO)	2.77 per cent
Loss on ignition	9.84 per cent
Undetermined	1.60 per cent
	100.00 per cent

This deposit is very near one of the dam site surveys.

Analysis of lime rock found on the Arroyo Seco, made by Prof. A. S. Eakle, Assistant State Mineralogist, State University, California:

Silicon dioxide (SiO ₂)	0.38
Alumina red oxide of iron 3 (Al ₂ O ₃ Fe ₂ O ₃)	0.44
Calcium oxide (CaO)	54.76
Magnesium oxide (MgO)	0.62
Carbon dioxide (CO ₂)	43.70
	99.90

This only lacks about 2 per cent of being pure lime carbonate.

Extensive markets are close. There are good railroad connections now and it is expected that the Western Pacific, Gould's transcontinental road, will pass through the valley within the next two years.

JUDGE CYRUS HAPPY.

Writes About the Spokane Country.

Judge Cyrus Happy, of Spokane, honorary vice-president of the National Irrigation Congress, and recognized as the father of irrigation in the Spokane country, has this to say of farming by irrigation:

"If any one had predicted ten years ago the marvelous results in the way of products and profits now being realized in Washington from irrigated lands he would have been considered crazy. Nowhere in the United States are the lands yielding such returns to the owners as they are in the Pacific northwest, from irrigated orchards, where the growing of the apple, pear and cherry crop is being reduced to a science. In the Yakima and Wenatchee valleys, where sufficient time has elapsed to grow orchards to the state of bearing crops of fruit, the profits being realized from these orchards, and the prices being paid for such lands, are almost incredible.

"Spokane is favorably situated as respects irrigation, and the growing of the best varieties of winter apples, pears and cherries. In two or three years the young orchards now growing on irrigated lands in Spokane territory will begin profitable bearing. Then the advantages of irrigation to accrue to Spokane will become most apparent so far as dollars and cents go,



Scene Along Great Northern Railway.

but the best crop any country can produce is good citizens. Anarchy never grows upon a farm, little or big. The irrigated district combines the most scientific cultivation of the soil, while eliminating all the most objectionable features of the farm. The home is near the school house, church, stores and neighbors, and in the case of Spokane's irrigated districts, will be close to good transportation facilities.

"Under such favorable conditions, and in view of the fact that the public lands are so soon to become exhausted, there can be no doubt that the City of Spokane will be surrounded by a density of population engaged in cultivating the soil, which will greatly add to the growth, wealth and attractiveness of Spokane.

"The question is sometimes asked whether there is danger of oversupply of fruit which will be raised in the near future on irrigated lands. Here is what W. N. White, a prominent apple buyer of New York, recently said on the subject after a stay of two months in eastern Washington:

"The Spokane country is certainly making a good record as an apple producer. The winter apples from this district are entitled to first place in the high grades of the world's supply. The fruit is large and of beautiful appearance. Such attractive fruit always finds a ready market. In answer to the question as to whether or not there is any danger of over-supply, let me say that the demand is constantly increasing—in-

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creasing in a greater measure, perhaps, than the supply. Anybody who can put two and two together and find that it makes four may easily figure out that there is no occasion to begin to back up on the increase of your acreage. Keep on improving the quality—the size and the attractive appearance of your apples, and you will never lack for eager market demand for them. Notwithstanding the vast territory you have in Washington that may be profitably devoted to apple production, you haven't enough to create the danger of over-supply.'

"As we look at it now, whatever development takes place within 150 miles of Spokane in the way of irrigation and fruit growing, will inure greatly to the advantage of Spokane; but this city's-greatest benefit will accrue from the irrigation of those irrigable lands like those in the Spokane valley and other outlying districts within an hour's ride by trolley cars from the city. These districts will not only be densely populated, but doubtless will become as beautiful and attractive to the tourist and pleasure seeker as are the orange groves in California and Florida. With the great abundance of cheap water power which the Spokane river

A LONGING.

I'm weary of the city with its artificial ways,
The rows of mammoth buildings with their princely fall displays.
I'm sad with sight of children prematurely world-wise,
grave,
And I'm hurt to see how people of all ages have to slave
To keep alive the spark of life that ever begs to live,
Because it might enjoy some day the treasures God did give
In great profusion on the earth to brighten mankind's eye—
But here instead of reveling in His works they toil and die!

I'm weary of the city, and I'll journey far away.
I'm weary of the city, and no longer will I stay
Amongst its heavy hearted, and its toil, and noise, and strain—
Yes, I'll leave the busy city and Ill seek a western plain,
Where the brown and dried-up grasses bend beneath the autumn's breeze.



An Irrigated Farm in the State of Washington.

will provide, it does not require any stretch of imagination to see these beautiful suburban orchard communities lighted up all night with arc lights, and abundantly provided with electric railway service. It seems to me that these favored communities will contain ideal homes and conditions for the development of citizenship that is healthy in body, mind and morals."

And the spirit of the prairie tingles through me when
my knees
Press against my skittish bronco as he cleaves the bracing air—
So I'll hark me to the prairies, life is fresh and joyous there!

N. C. HARRIS.

Arizona Blade—Ed Crane, manager of the University Experiment Station at Yuma, according to the *Enterprise*, reports wonderful success in growing a test crop of onions. They are of the White Bermuda variety. A strip thirty feet wide across the field was recently harvested and weighed. The test showed that the acre of onions would produce 25,000 pounds, which wholesales in Yuma at from 2½ cents to 3½ cents a pound. This means an income of from \$625 to \$500 per acre. It was on land adjoining this tract that last June and July were produced 13,521 pounds of tomatoes on a half acre, the crop selling for \$624.60. On the same seven acre tract there was last year a one acre patch of Rockyford cantaloupes, which from July 5th to September 7th produced \$144.60 worth of fruit.

Send \$2.50 for *The Irrigation Age*, one year, and
the *Primer of Irrigation*, a 260-page finely illustrated
work for new beginners in irrigation.

Reclamation Service News

The Secretary of the Interior has awarded contracts for furnishing cement for use in connection with Government irrigation projects as follows:

Kansas Portland Cement Company, Independence, Kan., 5,000 barrels for use on the Payette-Boise project, Idaho, at \$1 per barrel f. o. b. cars at Independence;

The Marquette Cement Company, of La Salle, Ill., 12,000 barrels for South Dakota, Nebraska and Montana projects, at 88 cents per barrel f. o. b. cars at La Salle.

The Secretary of the Interior, as a result of his recent inspection of conditions on the ground in the Truckee-Carson irrigation project, Nevada, has issued an order largely in the interest of the settlers, tending to simplify matters and save uncertainty and annoyance especially as regards the way in which payments are to be made.

In future the payments of the charges, instead of being required to be made at the Land Office at Carson City, Nev., can be made to the Special Fiscal Agent, of the Reclamation Service located at Fallon. The local land office for this project is at Carson City, Nev., a distance of nearly seventy-five miles by rail and involving a day's time for the round trip from Fallon. Most of the irrigators find it impossible to make the round trip from their homes in one day. It is therefore a source of considerable expense and inconvenience to the irrigator to require him to make payment at the land office.

The Secretary has also decided to increase the charge to \$30 per acre, to take effect on and after January 1, 1908. He has given the present settlers and those who settle before this date the preference of a lower rate, but the success of the project justifies an increased payment on the part of those who longer delay.

On and after that date all applications for homestead entry on the land open for settlement in this project must be accompanied by an application for water right and by the first payment on the charge of \$3 per acre of irrigable land. The charge for operation and maintenance of 40 cents per acre of irrigable land is in addition to this. The payment of this first installment of \$3.40 per acre is made a condition of acceptance of the entry. Applications for water rights for land in private ownership filed on or after January 1, 1908, must likewise be accompanied by the first installment of \$3.40 per acre of irrigable land.

For all land filed upon in any year on or before June 15, and for application for water rights for land in private ownership filed on or before the same date, the charges will be collected for that irrigation season. When the filing is made after June 15 in any year, the amount paid on account of operation and maintenance will be a credit on account of the installment for the next year.

In regard to raising the charge to \$30 per acre—the estimate was made for the land first reclaimed and were prepared at a time when materials and labor were much cheaper than at present. Since that time the cost of construction has become greater, with the result that the greater part of the necessary cost for storage to protect the water supply for the new lands must be in addition to the first estimate. It has therefore been necessary to have a new estimate of the cost of construction. This goes into effect on all applications for water rights made subsequent to the date announced.

The increase in the charge for construction is necessary and wise, not only because of this new estimate of the construction cost, but also because it is a just and reasonable matter to require future settlers to pay a greater charge than those who have heretofore settled upon the land. The early settlers found a barren and nearly unoccupied country with few neighbors or roads. They were more than twenty miles from a railroad and there was only a small town with little market for their

products and meager accommodations for furnishing supplies.

A railroad has now been extended onto the heart of the project, the towns have greatly increased in population and furnish much better opportunities for purchasing necessary supplies and for disposing of produce. Many farms are now occupied and the means of travel are much better than in the beginning. New settlers are finding more favorable financial and social conditions than the first settlers, the conditions of life are easier and profitable occupations abound.

The requirement that all applications for homestead entry on and after January 1, 1908, and for water rights on private lands must be accompanied by the first payment of the charges, \$3.40 per acre of irrigable land, has been demonstrated by experience to be a necessity in order to prevent speculative filings and to secure bona fide settlers. The holders of private lands are likewise subject to the increased charge and the requirements of first payment, in justice to those who have made prompt application for a water right, and also to prevent the holding of such lands unirrigated for an indefinite period for speculative purposes.

It has been shown that when a homesteader is required to make a payment in advance, his interest in the land is sufficient to overcome the discouragements of the first few years, and he is far more likely to become a successful farmer. For the best interests of the project in securing the cultivation of the land and to prevent as far as practicable the making of speculative entries, the requirement of a first payment at the time of entry has been found to be essential. This has been demonstrated by the experience of all private enterprise and by successful operations under the Carey Act.

The requirement that for all lands filed upon in any year on or before June 15, and for water right applications for land in private ownership so filed, the charges for operation and maintenance shall be payable for that irrigating season, is in the interest of farmers, as the farmer who enters land on or before June 15 will have sufficient time in which to prepare the land and raise at least one crop during that season. For applications filed later in the year there is no reduction in payment, but there is a credit allowed on the charge for operation and maintenance for the next year.

The Secretary of the Interior has canceled the award of sale of timber around Lakes Clealum, Kacheese and Kachelus, Washington, recently made to the Cascade Lumber Company, of North Yakima, Wash., and the timber is to be readvertised either by lump sum bids for the timber around each lake or by scaling, as may be decided upon hereafter.

On April 7 bids were advertised for sale of timber around these lakes, and also around Bumping lake, involving about 63,000,000 feet of timber, 2,000 telephone poles, and 20,000 railroad ties. The bids were to be submitted by schedule of which there were four, one for each lake. The bids were received, but one of the companies inserted a stipulation intended to further explain the intent of the specifications, and various questions were raised.

In view of these questions the Secretary of the Interior has rejected all bids and will dispose of the timber as above stated.

The Secretary of the Interior has executed contract with Roebbling's Sons & Co., of Trenton, N. J., for furnishing approximately 685,000 pounds of copper wire required for the transmission line and other purposes in connection with the Salt river irrigation project, Arizona. The contract price is 15¼ cents per pound.

It is estimated that the recent drop in copper has saved the Government approximately \$100,000 on this one transmission line.

The Interior officials are wrestling with a problem brought up by a clever scheme on the part of settlers to obtain large land damages from a new railroad being built in southern Idaho.

The plan of operation is for the settlers who have taken up 160-acre homestead claims to settle with the railroad right of way agent at the best terms obtainable. Having done this the company has then proceeded to construct the road. As construction proceeds, however, it is

discovered that an entirely new set of men turn up and demand damages. It appears that the original settlers have gone to the local land office, relinquished to some friend or relative a half or more of their homesteads, and that the new entryman is then in position to demand from the railroad new compensation for the right of way across the entry.

The railroad company is seeking to find some way to put a stop to this to them new and very profitable industry.

Mr. I. W. McConnell, engineer in charge of the construction of Gunnison Tunnel, Colorado, has been in the Washington office a few days on business connected with his work. While here Mr. McConnell received appointment as supervising engineer in charge of reclamation work in Colorado, Kansas, the North Platte project, Nebraska-Wyoming, and the Belle Fourche project, South Dakota. He will visit the Garden City project, Kansas, on his way home and early in November will inspect the northern projects under his supervision.

Speaking of his work on the Gunnison Tunnel, Mr. McConnell said:

"For about a year past we have been running in granite rock on the east end, which is fairly uniform in the difficulty of driving tunnel. We have been interrupted at intervals by the flow of water and within the year have tapped practically all the springs of that ridge, so that we have reason to believe now that the available water supply on the north side of the ridge has been drained into the east end of the tunnel. The entire flow amounts to about 350,000 gallons in twenty-four hours. On the west end last December we encountered a heavy flow of water and carbonic acid gas. The flow of water amounted to about 5,000,000 gallons per day of twenty-four hours. The flow of gas was so heavy and accompanied with such high temperature that it was necessary to drive a new ventilating shaft, which was 700 feet in depth. This shaft was completed in April and progress resumed in heading. Since that date the heading has progressed about 2,000 feet through a region of geologic faults, which contains disintegrated sandstone, badly broken shells, and lime.

"About four and a half miles are now completed. Within the last two weeks we have run into granites on the west heading, so we anticipate now that we will complete the tunnel in granite. There are practically 9,000 feet to be driven and we expect to finish that at the rate of 500 feet a month. During the month of August we ran through a bed of marble, not perfect enough for building purposes, but susceptible of high polish in small pieces.

"We expect to furnish water for irrigation in 1909. Of the 150,000 acres under this project, 35,000 were public lands, and so eager are the farmers to obtain homes in this valley that 25,000 acres have been filed upon already and the settlers are living on their claims in compliance with the homestead act and waiting patiently for the time when water can be turned on. Irrigated land in this section is easily worth \$100 per acre. Fruit lands under the project will be worth from \$500 to \$1,000 per acre. Land without water rights is selling at from \$10 to \$60 per acre."

Mr. J. H. Quinton, consulting engineer in the United States Reclamation Service in charge of work in Nevada, Utah, and Colorado, with headquarters at Provo, Utah, has resigned the supervisory work of his district on account of ill health, but will continue in the service on a consulting basis.

Mr. Quinton was born in Ireland and educated at Queen's College, Belfast, and Queen's College, Galway. He came to this country in the early seventies and has been prominently identified with important railroad and canal construction and general engineering work throughout the West since that time, having built more than seventy tunnels, some of large size.

It is probable that the several states which have been under his supervision will be added to adjoining districts.

The work of the Reclamation Service is being somewhat embarrassed and delayed by claims for damages from conditions which arise in connection with construction work. Some of these damages undoubtedly have a

proper basis, and every reasonable effort is being made to secure payment of a just compensation; but the proper claims are to a certain extent delayed and embarrassed by a great number of more or less fictitious or exaggerated statements.

A very common mistake made by claimants is to attempt to swell their claims by adding items which, upon examination, prove to be absurd. The claimant frequently overlooks the fact that the men who examine such claims are chosen for their ability and familiarity with such matters, and when they find misstatements of facts or exaggerations they naturally assume that the claim, as a whole, is weak. Very often a just and proper claim for a small amount is so weighted down with fictitious items that it is practically impossible to separate the wheat from the chaff.

The very fact that a claim is against "a great and generous Government" seems to encourage the claimants to believe that they can expect payment of damages for items which in ordinary business practice would not be considered. Water temporarily diverted from a canal during repairs is held by them to result in vast damages, whereas, as a matter of fact, if the same repairs were carried on by the people themselves, they would never for a moment consider the matter other than as a slight inconvenience, which must be endured in the same degree as rain or snow storms.

For example, in Nevada one man put in claims for damages which were based on the fact that he did not receive water just when he wanted it. It was shown upon evidence that if it had been offered he would not have received water because of the fact that the rainfall in that year was sufficient and that the works of the Government had no influence whatever on the amount of water which came to him. Also, at the particular part of the year when he might have had the water, he neglected to use it, thinking that fortunate rains might occur again.

The claimant also put in an item of loss on feeding several hundred head of animals, and as a matter of fact, merely hoped to be able to acquire them, and estimated the profits which he might have had if the water had been received in sufficient quantities to supply a certain number of head of stock.

The point which is being emphasized with all of these claimants is that the Government will endeavor to treat them as fairly as would an individual; but that the fact that the Government is owning and operating ditches will not enable them to secure great profits from accidental occurrences or misfortunes in which they have been contributory participants. In other words, if as part owners of a ditch they have been accustomed to suffer certain disappointments and losses, the fact that the Government for the time being is operating the ditch does not give them a foundation for large claims for alleged damages due to rains, frosts, or other weather conditions, or to the ordinary accidents to which all such enterprises are subject.

That the stringency of the money market is not affecting the farmers under the Truckee-Carson irrigation project, Nevada, is evidenced by an official report for the month of September received at the office of the Reclamation Service in Washington.

During September the third crop of hay was cut in the valley and the price of alfalfa is quoted at \$12 per ton in the stack, while baled hay is being sold at \$18 per ton. Eggs bring 60 cents per dozen, and other products are correspondingly high. Potatoes sell at \$35 a ton wholesale in spite of the fact that the largest crop of potatoes ever grown in the valley was harvested.

The farmers of the project have formed an organization to be known as the Truckee-Carson Farmers' Club, for mutual benefit in social and business matters.

The completion of the second unit of this project during the season just passed has thrown open a large additional acreage to settlement, and the unusually fine facilities offered to farmers in this section are attracting a large number of desirable settlers.

The actual pumping of water from the Missouri river into the canal system of the Williston irrigation project in western North Dakota has begun, and until cold weather prevents, tests of the apparatus and the gradual filling and

priming of the main canals and pressure pipes will continue in order that the system may be in good condition to deliver water for next season's crops.

A great deal of interest attaches to this project by reason of the fact that it is the first to be undertaken in North Dakota, and also because of the unique engineering features in connection with it.

The Missouri river has a habit of constantly cutting its banks and changing its channel, so that it was found impossible to locate any structure for the diversion of water by gravity without incurring enormous expense to protect it from the scour of the stream, moreover its grade was so flat that any gravity canal would be of prohibitive length. Fortunately large beds of lignite were discovered in the vicinity, affording cheap fuel, and the engineers conceived the plan of building a power house at the coal mines and conveying it electrically to the river. The pumps are placed on floating barges, which will accommodate themselves to changes in the river channel and in the water level. The water is delivered through pipes with flexible joints into several basins located at sufficient distance from the shore to be safe from encroachment by the shifting river. From these basins the water will be pumped into canals to cover the irrigable lands. The basins also serve for the purpose of settling silt, large quantities of which are carried in solution by the Missouri river. During the winter the barges will be drawn out of the water to points where they will be safe from ice gorges and sudden freshets.

On September 25 the steam turbine generating machinery was started up for the first time, and on the following day the electric power at 22,000 volts was sent over the transmission line to the intake pumping station. On September 27 the two pumping units located on the barge were started. During the present month the pumping system has been operated at various times, raising the water gradually in the settling basin so that the banks could be puddled wherever there was any indication of weakness.

A semi-gas producing furnace designed for burning lignite coal is used. As the mine is carried farther into the vein the quality of the coal improves, and the little difficulties experienced in starting the plant to operating satisfactorily are being overcome. It is expected that 5,000 acres will be irrigated during 1908.

The Williston power house will also supply power for the Buford-Trenton project, transmitting it by wire twenty-two miles. The installation of the electrical apparatus and the four pumping units in the station which receives the power from Williston has been completed at Buford, and the pumping machinery will probably be mounted on the barge this month. Some obstacles have been encountered in securing right of way for the transmission line, but the wires will be manufactured this winter and it is hoped to have them placed on the poles early in the spring so that power may be transmitted in time for supplying water as anticipated. It is expected that more than 3,500 acres can be supplied with water under the Buford-Trenton project in 1908.

During Secretary Garfield's recent trip through the West he visited the Yakima valley in Washington, where the Reclamation Service is constructing one of its largest irrigation projects. That the Secretary was greatly impressed with the orchards and their enormous yields is not to be wondered at, now that the harvest reports are in.

The superintendent of irrigation under the Sunnyside canal, in a letter to the Washington office, gives some interesting figures in this connection. He said in part:

"From 54 Beurre D'Anjou pear trees, occupying two-thirds of an acre, the owner shipped 950 boxes to New York City, realizing from them net on board cars here \$3,100. One acre of Concord grapes on a farm near Zillah yielded this year over 3,500 baskets of choice grapes, representing a net profit of \$550 to the owner. An orchard of forty acres which I showed Secretary Garfield when here, and in which he was greatly interested, was purchased a year and a half ago for \$18,500. Last year the owner sold from this orchard, which consists of pears, peaches, apples, prunes and cherries, \$16,250 worth of fruit, realizing over \$12,000 net. This year his yield was larger and prices better, and while he has not yet disposed of his entire crop, he estimates his net profits at over \$25,000."

These orchards were all irrigated this season by the government through the Sunnyside irrigation system. About 40,000 acres received water, and this area will probably be increased by 4,000 in 1908.

Mr. H. N. Savage, supervising engineer of the United States Reclamation Service, in charge of work in Montana, North Dakota and northern Wyoming, who is spending a few days in the Washington office, said this morning:

"The United States has just completed the construction of the distribution system for the entire Huntley irrigation project, the work having been voluntarily turned over to the United States by the contractors and sureties November 16, 1906. The cost of doing the work by the government has proved to be somewhat less than was the cost to the contractor during the time of his management.

"One hundred and forty entries have already been made. The average unit farm contains about fifty acres of irrigable land. There are already more entries than there could have been had each of the farms under the project been given an area of 160 acres. About twenty-five houses have already been built. The settlers are putting up substantial cottages, with barns and corrals. Several of them have already irrigated their land and are plowing in anticipation of full crops in 1908, which will be the first season during which water is delivered.

"The pumping plant, which lifts water from the main canal by power generated at a drop in the same canal to cover about 3,000 acres of land located fifty-five feet higher than the main canal, is erected, completed, and will be tested as soon as water can be turned into the system in the spring. All the canals under the project have been put into commission, water having been first turned by the Secretary of the Interior on June 28th and continued until October 15th. No breaks whatever have occurred in the canal banks, and all the banks have been thoroughly soaked and puddled.

"The Chicago, Burlington & Quincy Railway Company and the Northern Pacific Railroad Company have established stations at five-mile intervals throughout the project, and sidings have been constructed and local trains stop at the new stations. The average distance of all the farms on the project from a railroad station is less than two miles. A good class of settlers are entering the lands and the outlook for the early and general entry of all the lands is exceedingly good."

Sun River Project:

"The first unit of the Sun River project will be advertised for entry during the coming winter. The construction of works will be completed in time to furnish water for irrigation during the season of 1908. About 16,000 acres of land will be opened for entry located twenty-five miles west of Great Falls and tributary to the Great Falls & Shelby branch of the Great Northern Railway System.

"The contractors are getting on very well with their canal contracts, and the Reclamation Service is building the structures by force account, no bids having been received in response to advertisements. Plans are being prepared for constructing the works required for the next unit of the project, and it is expected that advertisement will be made for bids in the spring or early summer of 1908.

St. Mary Project:

"Construction work on the St. Mary Canal has been carried on continuously throughout the working season, the work being performed by the Reclamation Service. An eighty-ton steam shovel and steam excavating plant have been employed in excavating the heavy work involved in constructing the main canal, also a large force of teams. Work has been opened up at several points on the 26-mile canal. The canal when completed will have a carrying capacity of 850 cubic feet per second. On account of the climatic conditions work is being discontinued through the winter.

Lower Yellowstone Project:

"On account of the scarcity of labor the Lower Yellowstone project contractors are having difficulty in completing their work on schedule time. All the power actuated equipment it is practical to use has been in service throughout the working season. One of the contractors has three mammoth orange peel dredges and one steam shovel at work and a large force of teams. Other contractors have outfits of similar magnitude. It is expected that all of the canals and structures will be completed in time to turn water into the canals some time in the summer or fall of 1908.

Supreme Court Decisions

Irrigation Cases

NEGLIGENT ALTERATION OF CHANNEL.—

Where defendant negligently constructed and maintained a river cut-off, so as to cast the waters with the excavated material on contiguous lands in greater volume and with more injurious consequences than the water naturally flowing, he was answerable for the damages sustained, whether he constructed the cut-off as owner of the land or as a licensee.

Neumeister v. Goddard. Supreme Court of Washington, 113 Northwestern 733.

BROKER NOT ENTITLED TO COMMISSION ON TRANSFER.—

Where, to acquire means of irrigating for lands so as to make them salable, they were transferred to a land and irrigation company, the owners taking stock and bonds therefor, the transaction was a consolidation of interests, and not a sale of the lands within a contract entitling plaintiff to commissions for services in effecting sales of the lands.

Close Bros. & Co. v. Browne. Supreme Court of Illinois, 82 Northeastern 629.

NOTICE OF WATER BEING REQUIRED.—

Where an irrigating contract contains a stipulation to the effect that the contracting company "shall be entitled to a written notice of not less than 10 days before water will be required on the premises," which shall be served on a particular officer "and shall state, as nearly as may be, the number of acres to be irrigated at that time," no damage can be recovered for failure to furnish water, in the absence of allegation and proof that the notice so required was given, unless it be satisfactorily shown that the inability of the company to furnish water was admitted.

Mathieu v. North American Land & Timber Co. Supreme Court of Louisiana, 44 Southern 721.

LIABILITY OF IRRIGATION COMPANY.—

In the (rice irrigation) contract before the court, the irrigating company (defendant) is made the sole judge as to when the water shall be furnished, and in what quantities, and it is otherwise stipulated that it shall not be liable for failure to furnish water, when such failure is caused by deficiency of water at its source of supply, accidents to machinery, injuries to canal, or other failures or accidents over which it has no control. Held, that the control vested in the defendant is accompanied by a corresponding measure of liability, and is exercised at its peril, and that the allegation that, having control of the water, it failed to furnish same, on proper demand, under the contract, and that plaintiff thereby lost his crop, would disclose a cause of action, and if sustained by proof would entitle plaintiff to recover, unless defendant could show that its failure to furnish the water was attributable to one or more of the causes exempting it from liability in such case.

Mathieu v. North Am. Land & Timber Co. Supreme Court of Louisiana, 44 Southern 721.

MEASURE OF DAMAGES FOR OBSTRUCTION OF FLOW.—

In a suit for the obstruction of the flow of water for irrigation to which plaintiff claimed himself entitled, by reason of which his crops were damaged, the measure of damages was the difference between the amount realized from the crops and the amount that would have been realized had water been furnished, less the cost of raising, harvesting, marketing, etc.

Tubbs v. Roberts. Supreme Court of Colorado, 92 Pacific 220.

APPROPRIATION OF WATER.—

D., having excavated an irrigation ditch drawing water from a natural stream, abandoned the land, of which defendant subsequently took possession, after which defendant made use of water flowing in the ditch by the construction of certain laterals. Held, that defendant having made no appropriation of water from the stream, and having acquired no rights from D. by conveyance, appropriation, or

otherwise, his right to water was measured by the quantity he diverted from the ditch through the laterals constructed and applied to a beneficial use before plaintiff's appropriation of water in the stream for the irrigation of his land.

Tubbs v. Roberts. Supreme Court of Colorado, 92 Pacific 220.

WATER RIGHTS OF UNITED STATES GOVERNMENT.—

The action of the Secretary of the Interior or other departmental officer of the government in approving the maps of location of irrigation canals or ditches over public lands or reservations, as provided for by Act March 3, 1891, c. 561, §§ 18, 19, 26 Stat. 1101, 1102 [U. S. Comp. St. 1901, pp. 1570, 1571], cannot give the companies constructing the same any right to appropriate the waters of a stream, nor estop the United States to assert a priority of right thereto, where it exists, against either such companies or users who may be supplied by them.

United States v. Conrad Inv. Co. Circuit Court, District of Montana, 156 Federal 123.

WATER RIGHTS IN BLACKFEET RESERVATION OF MONTANA.—

The Blackfeet Indian reservation was created by a convention with the Indians, as shown by Act May 1, 1888, c. 213, 25 Stat. 113-129, by which the land was assigned to them for their exclusive use and occupancy that they might be assured of permanent homes, and with the design that they should ultimately take allotments in severalty. The reservation is in part bounded by the center line of Birch creek, a considerable stream, and while a considerable part of the land is capable of being used for farming, it is arid, and requires irrigation. Held, that the creation of the reservation operated as a reservation of so much of the waters of the creek as might at any time in the future be required and could be utilized in carrying out the purposes of the treaty; that, so long as the government was administering the affairs of the Indians, it had the right to determine as an administrative question the quantity of water required and to take the same when and where it deemed necessary, the rights of any others to appropriate water being subject to such paramount right.

United States v. Conrad Inv. Co. Circuit Court, District of Montana, 156 Federal 123.

FIVE YEARS' USE OF WATER.—

The burden is on one claiming the right to use water by prescription to establish such right, but is discharged by showing continuous occupancy and use of the water, as though he were the owner, for more than five years, whereupon it devolves on the other party to show that the use was permissive or without his knowledge.

Gurnsey v. Antelope Creek & Red Bluff Water Co. Court of Appeal, Third District California, 92 Pacific 326.

PRESCRIPTIVE RIGHT TO WATER.—

Where a right is granted to take water for certain purposes, and grantee uses the water as thereby permitted, and also in a manner or for a purpose which is an enlargement of or an addition to the use granted, he may nevertheless acquire the right to such other use by prescription, as if there had been no express grant to take for any purpose.

Gurnsey v. Antelope Creek & Red Bluff Water Co. Court of Appeal, Third District California, 92 Pacific 326.

WATER RIGHT IS REAL ESTATE.—

A perpetual right reserved in a contract to have carried by a ditch and furnished the owner of certain lands sufficient water to irrigate them constitutes an easement in the ditch, which is real estate.

Farmers High Line Canal & Reservoir Co. v. New Hampshire Real Estate Co. Supreme Court of Colorado, 92 Pacific 290.

RECORDING OF IRRIGATION CONTRACT IS NOTICE TO ALL.—

The recording of a contract creating an easement in favor of certain real estate and binding upon the owners of an irrigation ditch, and all leases, deeds or contracts of or relating to the ditch or the land, they being contracts relating to real estate, constitutes under the statute constructive notice to all of the contents thereof and the rights of the parties thereto.

Farmers High Line Canal & Reservoir Co. v. New Hampshire Real Estate Co. Supreme Court of Colorado, 92 Pacific 290.

SUIT AGAINST SUBSEQUENT PURCHASERS OF DITCH FOR FAILURE TO SUPPLY WATER.—

The perpetual right of a party and his heirs and assigns to have the water for his land carried through a certain ditch is an easement appurtenant to the land in whose hands it might be, so that, where the easement and plaintiff's ownership of the land are established, there was the requisite privity of estate to entitle plaintiff to sue subsequent purchasers of the ditch for failure to supply water to his land.

Farmers High Line Canal & Reservoir Co. v. New Hampshire Real Estate Co. Supreme Court of Colorado, 92 Pacific 290.

SUIT BY OWNER AND TENANT AGAINST DITCH COMPANY.—

Where an owner of land, which was entitled to a supply of water for a ditch, leased the land, covenanting in the lease to supply sufficient water to raise crops, a judgment recovered by such owner against the ditch company for failure to supply sufficient water to raise the crops, whereby the lessees were unable to pay the rent, will be a bar to any action by the lessees for the same failure.

Farmers High Line Canal & Reservoir Co. v. New Hampshire Real Estate Co. Supreme Court of Colorado, 92 Pacific 290.

OWNER ONLY HAS RIGHT TO SUE DITCH COMPANY.—

Where the owner of land, which was entitled to a supply of water for an irrigation ditch, leased the land, covenanting in the lease to supply sufficient water for irrigation, such owner is the real party in interest, and entitled to sue for a failure of the ditch company to supply water necessary for the raising of crops on the land, whereby the lessees were unable to pay the stipulated rent to the owner.

Farmers High Line Canal & Reservoir Co. v. New Hampshire Real Estate Co. Supreme Court of Colorado, 92 Pacific 290.

IRRIGATION CONTRACT CREATES EASEMENT.—

In a contract the owners of an irrigation ditch and their lessees covenanted jointly and severally, for themselves and each of them, their successors, assigns, etc., to furnish water for the lands of certain adjoining landowners, their heirs, executors, administrators, assigns, etc., for a certain price. The contract further provided that the covenants on the part of the owners and the lessees of the ditch touching the furnishing of the water should run with the right of way and ditch and with the lands, forever, and be obligatory upon and in favor of the owners and proprietors of the ditch and lands, and that by virtue thereof the owners of the land should at all times receive from the ditch all the necessary water for the irrigation of the lands, any change in the ownership, control or management of the ditch notwithstanding. *Held*, that the contract created an easement and covenants running with the land, binding upon the owners of the ditch.

Farmers High Line Canal & Reservoir Co. v. New Hampshire Real Estate Co. Supreme Court of Colorado, 92 Pacific 290.

PERCOLATIONS—TUNNELS.

Through defendants, for the purpose of collecting and carrying percolating waters, constructing a tunnel commencing on plaintiff's land, without her permission, and then extending through defendant's land, plaintiff is not entitled to have adjudged to her the waters which percolated into the tunnel on defendant's land.

Cohen v. La Canada Land & Water Co. Supreme Court of California, 91 Pacific 584.

DIVERSION OF WATER—RIPARIAN OWNERS.—

Where in a contest between riparian owners as to their respective rights in a creek there was evidence that, notwithstanding defendant's diversion of a miners' inch of the waters through a pipe, there was always water flowing down onto plaintiffs' land, the court properly found that defendant had not acquired an adverse right to all the waters of the creek, and had not diverted or acquired any right to such waters other than to a quantity sufficient to supply the pipe.

Gutierrez v. Wege. Supreme Court of California, 91 Pacific Reporter 395.

THE INTERLAKEN SCHOOL.

An interesting departure in modern education is the Interlaken school at Laporte, Indiana. This boarding school for boys is founded upon the plan of the German rural educational schools and is intended to develop a boy normally, not merely to enable him to memorize books but to use his head and eyes and hands.

The faculty live right with the boys and as the school is limited in number, there is plenty of room and time for all. Believing that outdoor activities are better for all than special athletics for a few, the boys are given plenty of outdoor work and play. Each boy has individual instruction and in this way can make more rapid progress than one who studies in a large class.

The Interlaken school has a branch in southern Germany, where its pupils go for the finishing year of the course and are taken on trips over the Alps into Italy and other countries to study at the remarkably low cost of \$1.50 a day.

This school is one of a chain of schools established throughout England, German, Poland, Sweden and France and was founded by Dr. Rumely, who has lived in these schools and studied their methods, finding them better adapted to the needs of growing boys than many of the one-sided systems we so frequently come in contact with. It teaches a boy, not only the knowledge necessary for his education, but the knowledge of how to live.

(WATER RIGHTS, SAN LUIS VALLEY.)

Around Fort Garland, at the eastern end of the valley, a co-operative plan is being developed, by which it is planned to build a reservoir of large capacity and bring an area of about 35,000 acres under cultivation.

Another source of water supply which may some day prove of value for irrigation purposes is the artesian wells, although there has as yet been no occasion for using this water for aid in cultivation. Throughout nearly the whole extent of the valley a constant flow of pure, cold, artesian water is obtained at depths varying from one hundred to three hundred feet. There are many artesian water-bearing strata, one below the other, the water of which varies somewhat in strength of flow and temperature. Most of the wells sunk are three inches in diameter and flow from one thousand to five thousand barrels per day. The temperature of the water varies (in wells from one hundred to three hundred feet in depth) from 40 to 50 degrees. A six-inch well at a depth of 900 feet, by actual measurement, flows 720,000 gallons per day. The supply of this artesian water is practically inexhaustible. The valley being a basin surrounded on all sides by high mountain ranges having thousands of square miles of water-sheds pouring their waters into the strata beneath the valley, this water can only fail when these mountain ranges are no more. Nearly all the homes in the towns and on some of the ranches have their own water works system, an hydraulic ram being installed in the well, which forces the water into a tank in the attic or upper portion of the house.

FRUIT VARIETIES.

THE DIPLOMA CURRANT AND ITS ORIGINATOR.

CHARLES A. GREEN, ROCHESTER, N. Y.

Seventy years ago a son was born to a prominent Rochester, N. Y., nurseryman. When this son was still a young man his father died, leaving the son a large inheritance. The son was industrious and frugal. He was endowed by nature with a desire to improve our various hardy fruits. Early in his life he began to hybridize the apple, peach, pear, plum, cherry, grape, currant and almost all of the fruits grown in this locality. So deeply interested was this son in his work improving fruits that he neglected opportunities to marry, and has never had a home of his own.

Has this man increased his fortune by these labors of a lifetime? No, instead of that he has seen his inheritance, that came to him from his father, fading away year by year. He is now an old man, poor in this world's goods, but joyous in the satisfaction of knowing that he has done the world great service in introducing many valuable new fruits that have been created through his skillful manipulation.

This man's name is Jacob Moore. He originated the Brighton Grape, the Diamond Grape, the Bart-Sec Pear, the Red Cross Currant and many other new fruits, among these the Diploma Currant.

Jacob Moore's greatest work has been done in improving currants. When I visited his grounds 10 years ago I found there at least twenty new varieties of currants, of various colors and sizes, but all remarkable in one peculiarity or another. These new currants attracted wide attention. They were exhibited at the Pan American exposition at Buffalo, where Mr. Moore received a diploma for the largest and best exhibition of currants ever exhibited in this country. One of these varieties of currants being larger than all the others, and having the longest stem, it was given the name diploma currant.

Having known this new currant for ten or more years and having great confidence in it, I have planted many thousands of plants of this variety for fruit and also many thousand plants for propagation. It is my opinion that it will prove to be the largest currant in cultivation. Since it is remarkably productive and a strong grower, I see no reason why it should not become a general favorite.

But how sad to consider the disappointment of an old man like Jacob Moore, encumbered now with the infirmities of age, realizing that his life work, which has been of great value to the country at large, should be so little appreciated! The man who produces by his skill or discovery an improved variety of fruit, and makes the discovery known over this wide country, benefits his fellow man to the extent of many million dollars, but there are few who realize this. Possibly after Jacob Moore has died, and his fruits are grown on almost every hillside of America, there may be a few who will sound his praises, but great masses of our people will never do him the honor he deserves.

ECONOMICAL RATIONS IN BEEF PRODUCTION.

Bulletin No. 100, entitled "Economical Rations in Beef Production," just issued by the Department of Animal Husbandry of the Nebraska Experiment Station, contains forty pages of experimental data, together with comments upon each of the problems investigated. The results cover a period of four years and are briefly summarized at the close of the report as follows:

Prairie hay when fed with corn alone to fattening cattle gives small and unsatisfactory gains and very little or no profit.

Alfalfa-hay with corn alone gives large and profitable gains.

The use of a well-cured corn-stover with alfalfa and corn, while it may not produce large gains, will make the gains less costly because of its low market value, thereby increasing the profits over corn and alfalfa alone.

In feeding only prairie hay as roughness to fattening cattle, much larger and more profitable gains can be made if linseed-meal or possibly some other protein concentrate is fed with corn in small quantity rather than feeding corn alone.

The results of two experiments indicate that linseed-meal is a little more valuable than cotton-seed meal and much more valuable than wheat bran for supplementing corn when fed with prairie hay or corn-stover.

When alfalfa is made at least half of the roughness with prairie hay or corn-stover, good gains may be made and at less cost than when no alfalfa is fed, the protein being supplied by the use of linseed-meal. In other words, it is possible to grow protein on the farm at a price much below what it will cost on the market in the form of some commercial protein food.

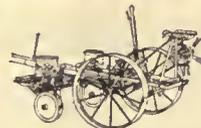
Corn-stover cut immediately after the ears ripen and cured in shocks possesses a value fully two-thirds as great as prairie hay. The part usually consumed, viz., the leaves and upper portion of stalk, is quite the equal of prairie hay pound for pound.

The results of a single experiment in which but little more than half a full feed of corn was supplied two lots of fattening steers suggest the possibility of making a larger use of hay in finishing cattle for market than is ordinarily made and at less cost, especially where hay is relatively low and corn high in price.

From a commercial point of view the results of this entire series of experiments go to show that cattle feeding can be made profitable when discretion is used in the selection of foods for the ration. On the average farm in Nebraska where grain and hay command figures below Lincoln prices and where cattle are undisturbed by frequent weighings which experimental feeding necessitates, the profits can be made much greater than those reported in this bulletin. Good feeding will make our corn bring more as beef than when sold direct to the elevator companies even though the selling price of finished cattle is not far in advance of cost price as was true in many of these experiments. The importance of manure and the growing of alfalfa and clover as agencies contributing to the maintenance and increase of land fertility argue further for this mode of selling a larger part of our annual corn crop. The cattle industry deserves much greater attention in this state than has been given it in the past.

This bulletin will be sent free to all residents of Nebraska who request it by writing to the Nebraska Experiment Station, Lincoln, Nebraska.

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The Home

CAKES ONE CAN MAKE AT HOME.

A few fancy cakes are always an addition, and any one who understands how to make and use *fondant* (the French cream icing described in the article on cake-making) can do wonders with a comparatively plain cake recipe. The batter may be baked in tiny molds or dropped on flat pans, baked and put together in pairs with a jelly or cream filling before being iced. Among some specially good cakes are the following:

JUMBLES.—One pound each of butter and sugar, two pounds of sifted pastry flour, three eggs, nine teaspoonfuls of orange-juice, a scant teaspoonful of salt, three teaspoonfuls of baking-powder. Handle lightly, roll rather thin, and sprinkle with granulated sugar before baking in a quick oven.

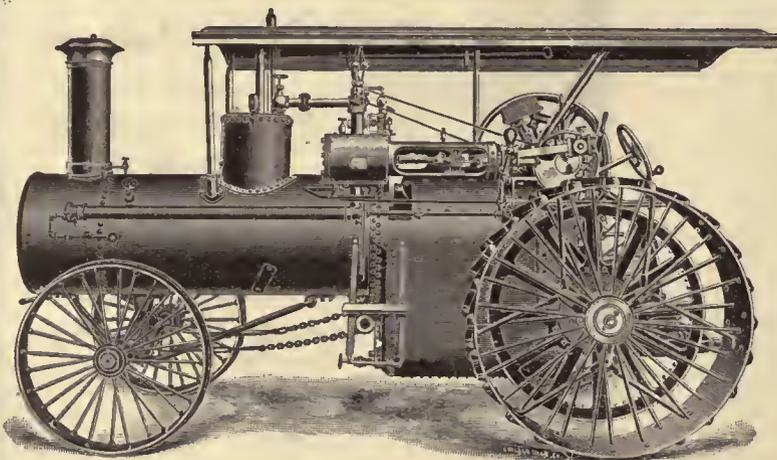
SPICE FINGERS.—Cream thoroughly three tablespoonfuls of butter with a scant cupful of brown sugar, adding a teaspoonful of powdered cinnamon, a half teaspoonful each of nutmeg and allspice, a quarter of a teaspoonful each of ginger and salt. Stir one teaspoonful of sifted baking-soda into one cupful of rich sour cream, and as it foams add it to the spice mixture alternately with enough graham and white flour (half and half) to make a soft dough. Turn on a floured board and knead into it three tablespoonfuls of seeded raisins, three of currants, and one each of chopped citron and candied orange-peel. Roll out very thin, cut in strips with a jagging-iron, then sprinkle with powdered sugar, and bake in a moderate oven until brown and crisp.

CHOCOLATE SPONGE CAKES.—In a saucepan put one cupful of fine granulated sugar, two tablespoonfuls of grated chocolate, and one teaspoonful of vanilla. Stand over hot water on the fire until mixed and melted, then take off and beat until very light, adding by degrees one cupful of sifted

pastry flour mixed with one teaspoonful of baking-powder. Beat steadily for fifteen minutes, then fold in quickly the stiffly whipped whites of four eggs. Fill tiny greased molds, bake in a slow oven, and ice with white *fondant* or boiled icing, and decorate with chocolate drops.—From the *Cooking Circle* in "The Circle" for January.

MINIATURE CITIZENS OF OUR REPUBLIC.

There is a school city at the Thirteenth Avenue School in Newark, N. J., where a sense of civic responsibility has extended not only to the care of the school building and immediate surroundings, but to the entire school district. There is, for instance, a young truant officer and a street inspector for each street in the district who report any violation of the school or city ordinances occurring on their streets. Suppose, for example, an ignorant immigrant family dump their ashes on to the sidewalk instead of into a barrel. The child who is the school city inspector for that street reports the matter to his chief, the commissioner of public works, the commissioner to the mayor, and the mayor to the principal. The principal then calls to his office the child of the offending parents, explains the ash ordinance, and charges the child to request the parents in future to observe the ordinance. If the same complaint is again entered against the same family, the principal adds to his request a threat to notify the city police if they refuse to comply. Such a threat has in every case been effective without the actual intervention of the police. Some time ago Mr. Gill wanted to organize a school city in a certain large school near New York city. Although completely in sympathy with the idea, the principal withheld his consent because, as he explained, the worst boy in his school was unfortunately the most popular, and would hence undoubtedly be elected as the head of a school city. Mr. Gill finally secured his permission, however, to a provisional organization. Accordingly the elections were held, and the "bad boy" was not only not elected to the chief office, but was not even nominated for any office whatsoever. Substantially the best pupils in the school were elected, and the provisional government became permanent through the consent of the principal. The "bad boy," however, did not take seriously the "sacred responsibilities" of citizenship, and began



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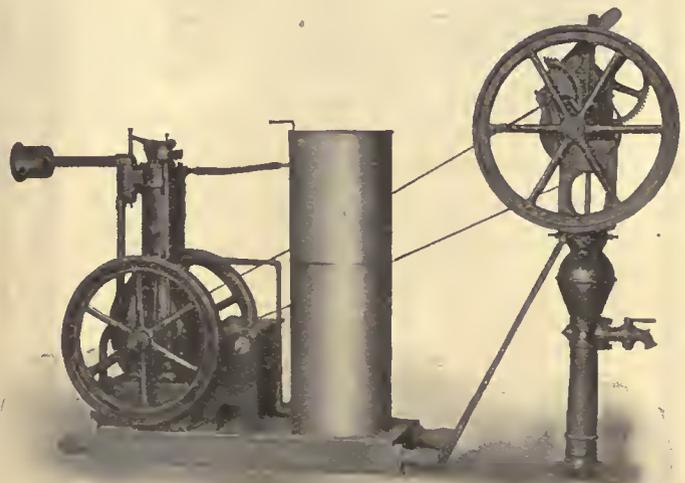
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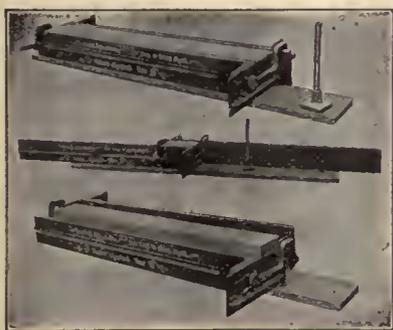
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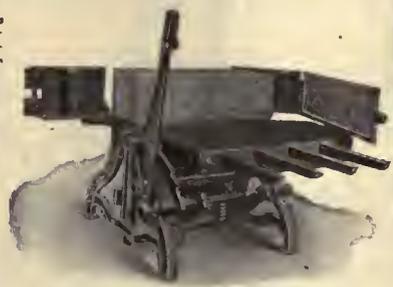
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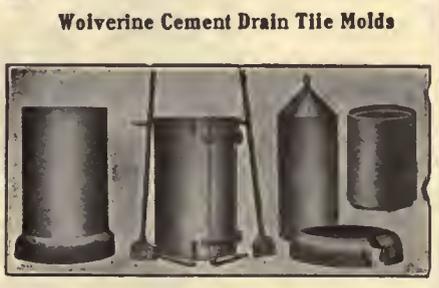


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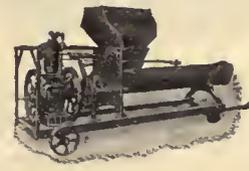


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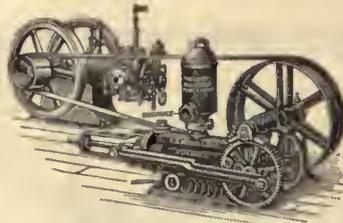
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FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

MYERS
BACK GEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

5, 7½ AND 10"
STROKE

FOR BELT,
WIND OR HAND
POWER

FIG. 1113



2½" DISCHARGE

BULLDOZER
WORKING
HEAD

1½" BRASS ROD

PIPE FLANGE

RABBETTED BOX

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BULLDOZER
POWER WORKING HEAD
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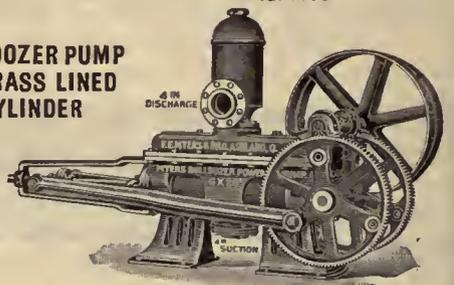


FIG. 813

MYERS BULLDOZER
WORKING HEADS

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5", 7½", 10" STROKE
DISCHARGE 2½" OR 3"
SUCTION 2" TO 4"

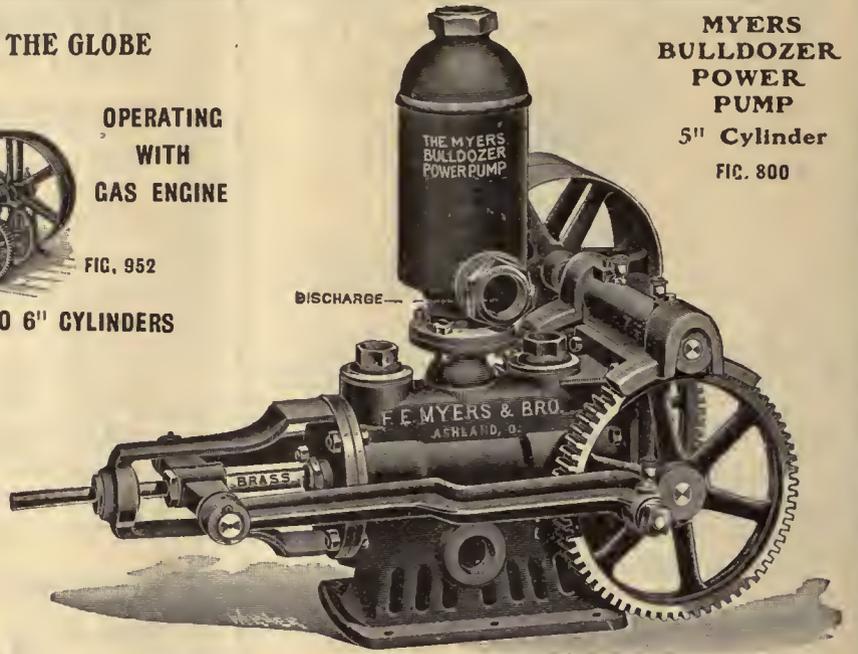
NO. 364

12", 16", 20" STROKE
REGULARLY FITTED 4"
DISCHARGE
SUCTION 8" OR LESS

MYERS
BULLDOZER
POWER
PUMP

5" Cylinder

FIG. 800



DISCHARGE

F. E. MYERS & BRO.
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FIG. 1079

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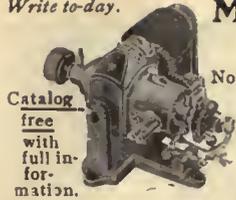
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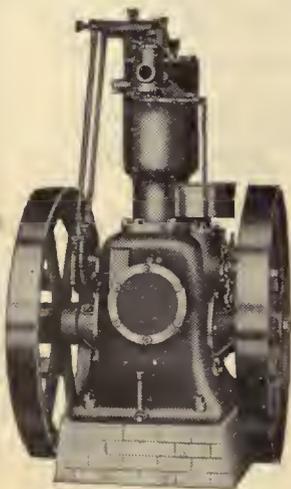


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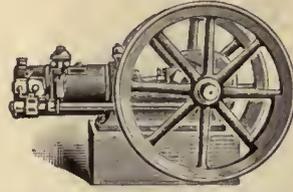
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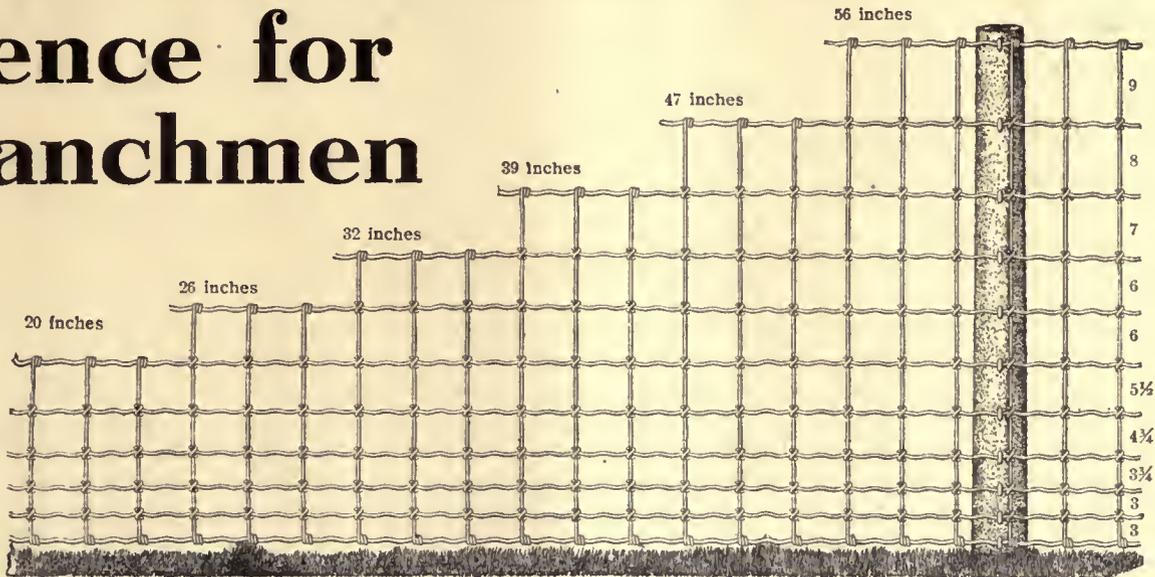
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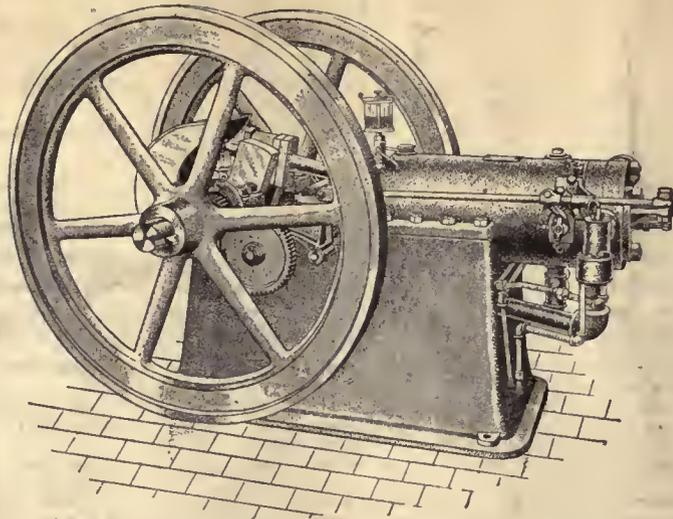
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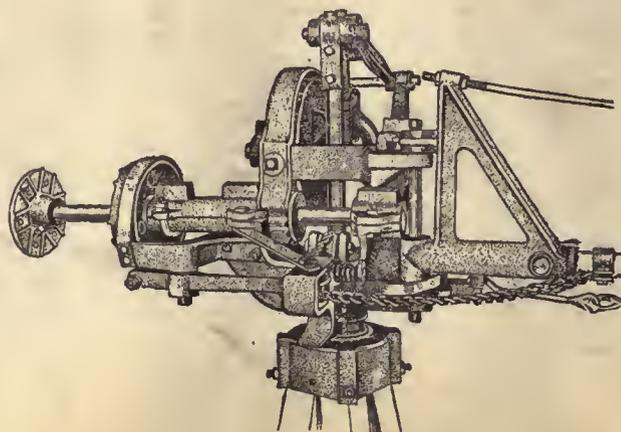
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VOL. XXIII.

CHICAGO, FEBRUARY, 1908.

No. 4

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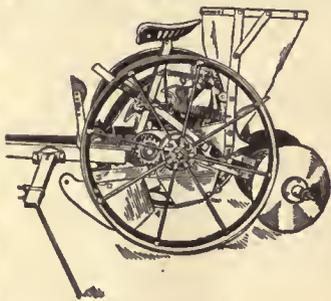
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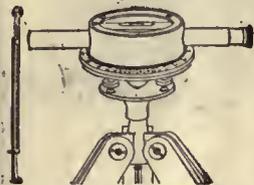


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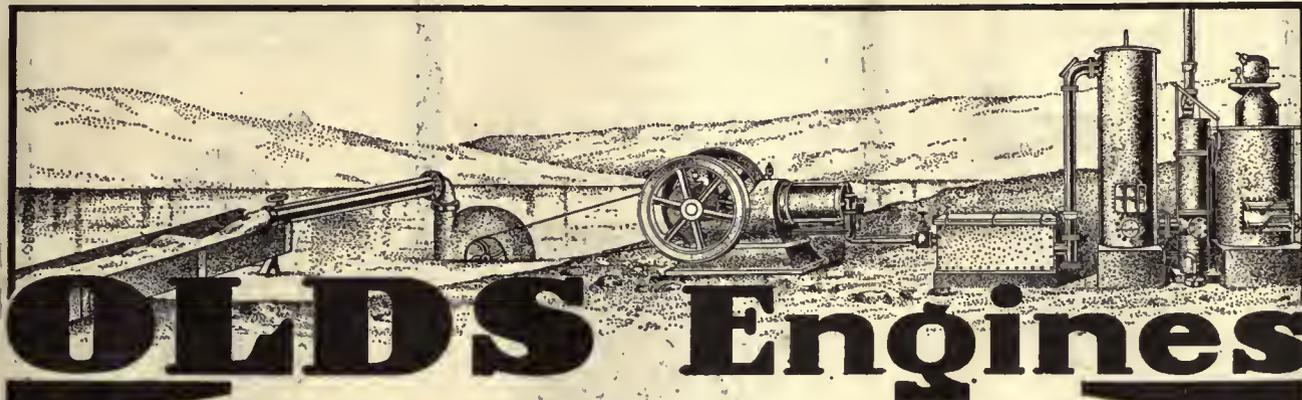


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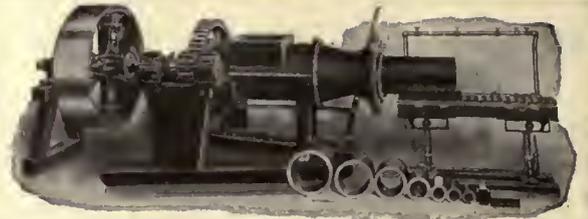
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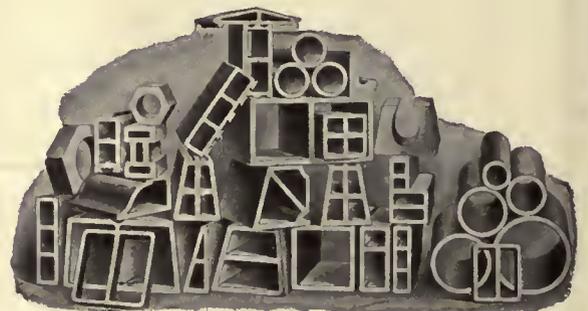
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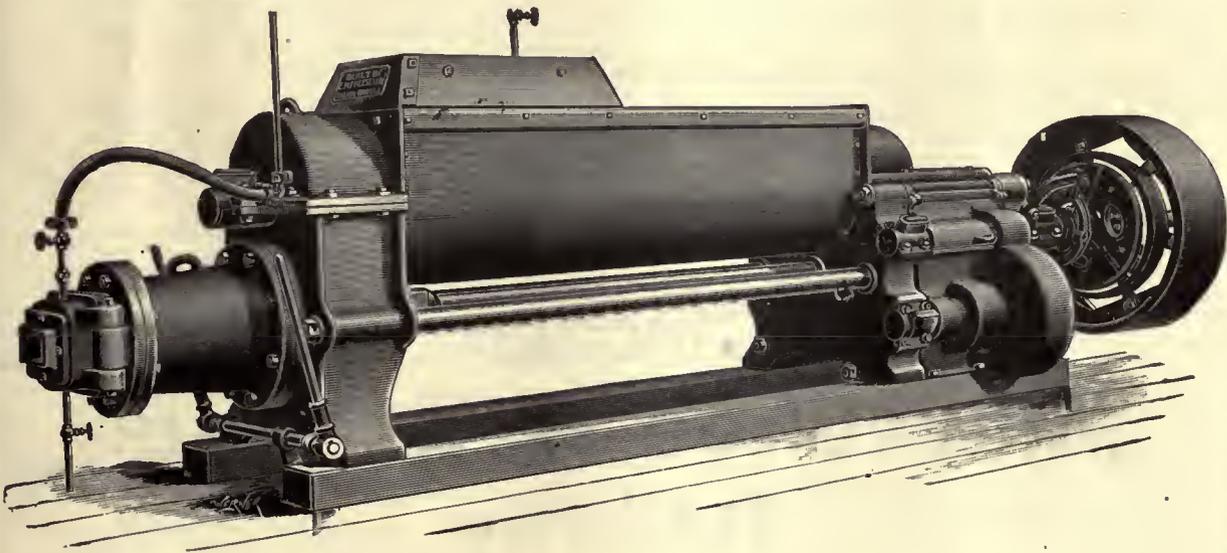
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The Judith Basin, in central Montana, offers exceptional opportunities in farming, particularly in wheat and alfalfa raising, as does also the country along the new line in Washington.

The fruit grower will find a particularly good field along the new line in Washington. Apples, pears, plums, cherries, apricots and small fruits grow well there. Last year hundreds of acres of bearing orchards produced crops which brought as much as \$500 to \$600 per acre.

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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, FEBRUARY, 1908.

No. 4

THE IRRIGATION AGE

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ARID AMERICA

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MID-WEST
THE FARM HERALD

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D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

Do Forests
Conserve
Moisture?

Mr. Shumway has something further to say in the editorial columns of this issue, and among other matter sends in a communicated article on the question of whether forests do or do not conserve water. We would like very much to get an expression from some of our western readers on this subject.

Articles by
Van Dyke.

Arrangements are under way whereby it is hoped that we may be able to secure the right to publish in serial form the most complete work on irrigation which has ever been produced, by the eminent writer on this subject, Mr. T. S. Van Dyke, of Daggett, California.

Mr. Van Dyke is, by all odds, the best writer on irrigation topics in this country, if not in the entire world, and we feel justly proud of having secured the first right to publish this matter, which will appear later in book form under the title "The Art of Irrigation." The author has been engaged in actual irrigation farming for many years; has met it in all of its varying phases; has encountered success and failure alike, and is fully competent to thoroughly exploit this important subject. It is safe to say that when completed this will form the standard work on irrigation in the world. The series will carry through each issue of THE IRRIGATION AGE for from two to two and one-half years and will be of invaluable assistance to every one actually engaged in, or those who are making a study of farming by irrigation.

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George H. Maxwell is again furnishing newspapers throughout the country with photographs of himself and writing articles as editor of *The Talisman*.

Maxwell gained notoriety through this sort of work years ago and clearly overdid the matter, so much so as to cause the rejection of his matter by a majority of the leading papers. He always has "an ax to grind" when he reaches out to secure notice in any publication and it would be well for western papers to scrutinize carefully all matter which he submits for publication.

Readers of THE IRRIGATION AGE manifest considerable interest in its new department of Supreme Court Decisions.

We are pleased to announce that subscribers in any state of the Union will find in this department the latest decisions of the Supreme Court of their own state, including also those of the Federal Circuit Courts and the Supreme Court of the United States. Attorneys for land and irrigation companies desiring to be informed of current cases will find this department a great saver of time, giving in a single number of THE IRRIGATION AGE the syllabi of cases scattered through thirty-five different periodicals.

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Conservation of Water Resources. We would call the attention of our readers to an article in this issue on the "Conservation of Our Water Resources," by Mr. David Megahy. This correspondence came as a result of an editorial in our January issue and is well worthy of perusal by those interested.

The circulation of **THE IRRIGATION AGE** is growing more rapidly at this time than ever before in its history. We have arrangements made whereby personal solicitation among irrigation farmers in the western states is now going on, and we are adding to our list at the rate of from 100 to 400 new names each week. This is very gratifying and shows appreciation of this journal. Advertisers will do well to give consideration to the fact that **THE AGE** is the only publication of its class in the world and is reaching thousands of live buyers of all classes of farm machinery, earth moving machinery, etc.

Lining of Ditches and Reservoirs. We are beginning in this issue an article prepared from Bulletin No. 188, issued by the Experimental Station of the College of Agriculture, University of California, from "Lining of Ditches and Reservoirs to Prevent Seepage." This bulletin was prepared by Prof. B. A. Etcheverry and its contents cover a long series of investigations and experiments undertaken by the Experiment Station in 1906.

The water which sinks into soil from ditches and reservoirs is one of the chief sources of waste in irrigation. In gravelly soils and where ditches cross gypsum strata the loss sometimes amounts to more than half the total volume. One feature which is of more than ordinary importance is that the water which escapes is often worse than wasted. It collects in the lower lands; fills the soil; drowns the roots of trees and plants; brings alkali to the surface and is a prolific breeding place for mosquitoes. Muddy water soon silts up muddy ditches, but where the water is clear seepage losses are likely to be permanent and some sort of lining to stop this becomes an important matter.

This subject will be gone over fully in a reproduction of Bulletin No. 188. Prof. Etcheverry has handled the subject in a masterly way and our readers will find much of value and interest in perusing this article.

An editorial in our issue of January stirred up a hornet's nest, and brings in to us many protests from people throughout the west concerning the activity of the head of the Forestry Bureau. As explained in the January issue, **THE IRRIGATION AGE** is inclined to the belief that Mr. Pinchot is innately honest. The principal cause of criticism of the gentleman in the past has been in the line of explaining how some of the bureaus at Washington are taking over power not intended by the framers of the law under which these bureaus were established, and while these errors would, no doubt, be corrected in time, it seemed only fair to bring them to the attention of the public from time to time so that the correction may be made more readily than if it were accomplished by the protests of widely separated individuals who realize that too great a centralization of power in any bureau head is liable to work much injury to the individual who has no other recourse than through the devious channels of protest to his congressional representative in Washington.

One pleasing feature of the situation as it is seen by us is that the western Congressmen are awakening to a realization of the possible injury which may be wrought and things seem to be moving in so far as the campaign of centralizing all power in Washington is concerned. The people of the west will, we believe, begin to realize the danger of this kind of centralization when they understand fully the object of Mr. Pinchot.

A recent meeting of the American Live Stock Association at Denver was in favor of a leasing system. This plank carried regardless of the fact that Colorado itself is opposed to this theory. The element that carried the convention came from Texas, where there are no public lands. It is stated, and with perhaps a good show of truth, that the Texans propose to get leased land in Colorado, Wyoming and other western states and bring their flocks and herds into that territory. The President sent a congratulatory telegram to the officers of the association because it endorsed Mr. Pinchot's theories. This is a fine condition for the citizens of western states to face, where there is much public land. What **THE IRRIGATION AGE** would like to see is some reform in land laws which will give the remaining settlers on public lands enough land to enable them to make a living and protect them absolutely in their business. If a settler was entitled to 160 acres in Iowa, he should get from four to six sections in many places in the inter-mountain regions. Yet, Mr. Garfield says the public domain is passing too rapidly into the hands of settlers. This shows how superficial was his inspection last summer. It has been suggested by some that he stayed too close to the Pullman car and the conveniences of civilization during that trip

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to find out anything about range or land conditions excepting for contact with individuals representing vested interests who made it their business to meet him here and there on his journey and bring their views on the subject directly before him. It can be readily seen that the representatives of vested interests would be more likely to get in contact with Mr. Garfield than would the settler whose interests are vital and at stake. THE IRRIGATION AGE does not presume to represent any of the range interests but it proposes to take the part of the man who is to make a home. The irrigation and dry farmer whom we represent, rather than the owner of live stock, needs protection. This class is not able to have organizations to represent them. They are scattered throughout the country and cannot come together. They are not men of wealth and as a rule not men who study conditions or try to formulate laws and regulations for their own relief. This element must be depended upon for our ultimate permanent growth. We do not deny but that the live stock interests need protection and fully believe that they have a cause which should receive the attention of our law makers. They have produced what wealth is represented in some of the thinly peopled sections of the west today and stand, as a rule, among the best class of citizens. They see the day coming when the open range business must give way to the farm and the small live stock interests. Our readers, generally, throughout the west are requested to write us and give us their views concerning the situation as they see it. If an injustice is being done to the small farmer, let us get together and explain the situation through the columns of THE IRRIGATION AGE. It is only through publicity of this character that the small man may receive the attention which is his due.

Controversy Between Authorities. Much speculation has been rife during the past few weeks, due to a clash between plant investigators of the United States Department of Agriculture and those whose time, efforts and money are being devoted to the exploitation of the spineless cactus as a means of rejuvenating the deserts of the Southwest. In bulletin No. 116, entitled "The Tuna as Food for Man," the United States Department of Agriculture has placed itself on record as antagonistic to one of the greatest plant industries of the age. This bulletin says in part: "Enthusiastic magazine writers would revolutionize conditions in arid regions by the establishment of plantations of prickly pear without spines, thus converting the most arid deserts into populous, prosperous communities. Experience teaches, however, that the spineless varieties of cultivation are not hardy under natural desert conditions, that all of the valuable spine-

less species which produce either fruit or forage in economic quantities require considerable precipitation at some time during the year, and that the economic species are not known which thrive under a minimum temperature of less than 10° F. One exception to this may be noted, but the quantity of stock feed produced by this species is comparatively small and its distribution limited."

This paragraph directly concerns Mr. Luther Burbank and his colleagues, whose work in developing the spineless cactus has passed the experimental stage. Those of us who are privileged to know Mr. Burbank are forcibly impressed with the modesty of the man whose creations have had so great a bearing on the agricultural and horticultural world, and yet about whom so little is known. As commercialism and self-glorification play no part in Mr. Burbank's work, one would naturally give credence to any statement of fact made by him when he relates what he has actually accomplished in the new cacti produced, the perfection of which is the result of sixteen years of propagation. The progress of his work in developing an economic *Opuntia* is to be found in the records of the National Irrigation Congress, held in Sacramento on September 5 last. The following sentiments from Mr. Burbank's speech will give our readers a fair idea of the present status of the culture.

The term thornless cactus is quite indefinite, for it is no more of a novelty than thornless watermelon; however, among the cacti growing to immense size with corresponding rapidity and co-relative latent possibilities, there were none devoid of thorns until now.

The *Opuntias* present the greatest commercial possibilities of the cacti. Burbank's farms have produced spineless *Opuntias* having three to four times as much weight of food per acre as their thorny wild parents. Also some of the improved *Opuntias* can stand *five to ten degrees more freezing* than others which are wild.

The *Opuntia* is by all means the hardiest, most rapidly growing, prolific and *adaptable to conditions of moisture, temperature and soil* of all the great cactus family.

At least one crop of very delicious fruit is borne each year, to say nothing of the quantity of fodder developed in a single season. The *Opuntia* is all food or fodder.

While due consideration is given to the value of the delicious fruits of the improved *Opuntia*, the prime issue is that of supplying a dependable forage crop for arid regions. It is found that all herbivorous animals relish the cactus, and can, of course, eat the spineless *Opuntia* without fear of the results brought about by the thorn. They will support animal life without other food, and when fed as part of a balanced ration will produce beef and mutton.

There is no danger of the *Opuntia* running wild and again producing thorns when set out in the desert, for the cactus was originally thornless.

Leaving its undisputed fodder value out of the question, the tremendous value of the *Opuntia* to stockmen may be gained from the fact that last year one-year-old plants in California, on unsuitable cactus ground, produced an average of over ninety tons of fodder to the acre. This means a crop of about two hundred tons per acre for older plants in cactus country.

The spineless cactus has passed the experimental stage, and its commercial propagation has been undertaken by a Los Angeles corporation known as The Thornless Cactus Farming Company, to whom Mr. Burbank has intrusted the varieties which he has perfected for distribution, and this concern is endeavoring to very rapidly get the new fodder and fruit plants into the localities where they will do the most good.

EDITORIAL NOTES.

BY G. L. SHUMWAY.

Wyoming's Wool-Growers' Convention, and the National Wool-Growers' Convention, at Helena, have recently expressed themselves in no uncertain terms, regarding the Grazing Bill proposed in Congress. One by one the industrial congresses of the west announce their opposition to policies of Federal Control. Here are two of the resolutions adopted that gives the spirit which seems to permeate the entire west:

"No. 3.—Resolved, That we are opposed to the imposition of regulations by public land officials, whereby the rulings of the department officers are interpreted as being above and superior to law.

"No. 4.—Resolved, That we deplore the methods adopted by Gifford Pinchot, chief of the Bureau of Forestry, in disseminating wrong impressions of the existing range and forest conditions in Wyoming, through eastern newspapers and magazines. False statements are written as truths, and misrepresentations become prolific with suspicions as to the honesty and integrity of Wyoming stockmen. Such policies are detrimental to the integrity of government officials, and retard the development of our state."

There is more of the same kind, but is it not a pity that the conduct of our bureau heads is such, and their theories so intense, that an industrial congress must give the lie to their oft-reiterated accusations. It can be said without fear of contravention that several of our recent industrial conventions were not controlled by "lick-spittles of the federal bureaus" as our friend Lute Wilcox so tersely put it. Only Sacramento disgraced herself by going over body and breeches, and not giving the delegates opportunity to express themselves.

"Hands off" is the slogan of the entire west, and it applies to bureaus in the ramifications of their usurpations, in official capacity as well as attempts to control industrial expression, and in the dissemination of "tainted news."

Nothing has been so severely censured (and justly so) of recent date, by the muck-rakers, and enthusiastic reformers, as "the system's" policy of scattering "tainted news," but the press bureau of our federal government can put the system to the bad, in holding up the shining virtues of its satellites, and lauding all their undertakings.

Yet there are dozens and no doubt hundreds of silent workers, without salaries, or other means of self-exploitation at public expense, who are daily performing more actual public service than the most advertised man in the entire Washington contingent. I refer to such men as H. A. Green, who originated "Tree-Growing Clubs of America" and Luther Burbank, and men of that stamp. An individual finds it necessary to originate an outside movement for the purpose of promulgating the work, for which the Forestry service was created, and from which it has been diverted. It remained for an individual to create a spineless cactus, while we have a bureau of plant industry supported by the government. The trouble with our federal organizations are that they are too much taken up with politics, self-congratulations, etc., to devote much time to the actual work for which their being exists.

Following the sheep men's convention came the meetings of two live stock associations. The executive committee of one, which was dominated by Murdo McKenzie, who runs some 40,000 head of cattle on forest reserves, was naturally favorable to the government policy. Mr. McKenzie comes about as near the eastern conception of a "cattle baron" as there is in existence today, yet he is hand and glove with the administration, which pretends to oppose all that he represents.

Just a word to the east regarding this bogie man that press bureaus and eastern contemporaries have builded, and called the "cattle baron." They tell us that parents in the eastern section of the United States tell their children to be good or they will be given to the cattle barons. In the middle west he is a monstrous creature, and visions picture horns and hoofs and armor as his rough exterior, and so vivid are impressions we have obtained that here in the west, where we have lived for more than two score years and have never seen a cattle baron, we imagine he must live just over the hill.

Brothers, the cattle baron is a dream man, like the night man and other intangible vagaries of the cruder years of our civilization. Unfortunately, there are many people, some of them fairly well up in official and other circles, who still cling to the traditions and superstitions of earlier years, and they prove easy marks for those who have ulterior designs.

"Hands off" is the slogan of the west, and if heeded, the west will eventually be a land of homes. Occasional disputes will arise, may be a man will be killed occasionally, but one small mine horror, or railroad wreck, will exterminate more human beings than all the range disputes of a hundred years.

The Denver Stockmen's Convention represented the small stock man, and is entitled to consideration, as the voice of cattlemen of moderate means. Home-makers want no herds of 40,000 cattle running over and tramping out their meagre crops. They want no wide boundaries established in their neighborhoods, that condemns vast tracts to wilderness forever. Leave the west to work out her own destinies, and she will do it well, and show the same integrity and pure purposes that has marked the history of pioneers before meddlesome brain-storm patriots discovered that the vanguard of civilization needed guardians.

There has just come to hand an article by one of the most eminent men of the west, which is remarkable in that it goes into scientific calculations to determine what if any fact exists to substantiate the catchy phrases of the prolific advertiser of the forestry department. The argument emphasizes our notes in January IRRIGATION AGE, relative to trees and shrubbery drying wells, springs and streams, which observation and contact had brought to our minds.

The article quotes from Professor King of the Agricultural College of Wisconsin, whose ample field of research extends through the primeval forests of Eau Claire, Rhinelander and to the Peninsula. Listen: "Every pound of dry matter contained in a tree consumes 500 pounds of water." "Ten thousand square miles of forest consumes 16,000,000 acre feet of water." In other words, the trees represented in a single load of lumber has consumed sufficient water to irrigate a small farm, and still we will hear from the forestry department the catchy remark, "Save the forest and store the floods."

The article mentioned by Mr. Shumway is here-with given in full:

The Bureau of Forestry at Washington is such a prolific advertiser and its chief is such a capable politician that he has permitted theories to be published both in his own press bureau, conducted at the expense of the government, and in papers and periodicals he

can influence, which have absolutely no foundation in fact or no relation to a scientific study of forestry. Yet this chief is presumed to be a man of science. How politics perverts the good will and intentions of those who are supposed to represent truth and truth alone!

We must allude to the famous motto, "Save the Forests and Store the Floods" devised by George H. Maxwell, and adopted by his disciples of the Bureau of Forestry and of the Hydrographic Division of the Geological Survey, as formerly constituted. Save the forests? Not by removing the tariff on foreign lumber, because the Bureau of Forestry has fattened through co-operation with the Lumber Trust. Should the tariff on lumber be removed, the demand for timber for commercial purposes at home would decrease so much that the forestry problem would take care of itself and the Bureau of Forestry would be of no more use to the people than would a department charged with the conservation of the moisture of the seas. When we eliminate the forests on the mountains of the west the people interested in irrigation will receive twice the volume of water to store and to apply to a beneficial use. The only scientific data referring to this subject bears out this assertion. Prof. King of the Agricultural College of Wisconsin found that for every pound of dry matter produced in a tree the tree itself absorbed and dissipated 500 pounds of water.

What does this mean? A tree under ordinary conditions requires a space of at least twenty feet square. In sixteen years it will grow so that, including all the leaves it sheds each year, it will contain a ton of dry matter. To produce this the tree must have used 1,000,000 pounds or 16,129 cubic feet of water. This means a yearly average demand of 1,000 cubic feet of water. This volume would cover the square of twenty feet to a depth of 30 inches each year. Every state having large forest reserves has to provide more water for the preservation of the forests than is counted in all of its flowing streams. A state having 10,000 square miles of forests must furnish 16,000,000 acre feet of water for them, or sufficient water to cover 16,000,000 acres of land one foot in depth.

In the face of such scientific evidence, how can any bureau, no matter how anxious it may be to mislead the public on its own behalf, advocate the theory that trees conserve moisture? How long would a tree have to grow to deposit enough vegetable matter around its roots to hold 1,000 cubic feet of water, the average demand of the tree for a single year? If a tree forty years old will conserve a cubic foot of water in this way and hold it until it can be used by the irrigator we will be surprised. At that time the tree will have wasted (except in so far as its own life is concerned) more than 40,000 cubic feet of water. No vegetable growth saves moisture. The dry farmer can tell you this. He does not plant trees to save the moisture that falls, but he cultivates the soil, thus preventing evaporation, in a large measure, from the surface. Until the Bureau of Forestry plants a tree and measures accurately the water it requires and keeps a record of the volume of water it retains by a deposit of leaves and other vegetable matter or shows that beneficial results come from shade furnished by it or winds broken by it, we hope that its organs, both governmental and political, will keep silent on this subject.

Lining of Ditches and Reservoirs to Prevent Seepage Losses

By **PROF. B. A. ETCHEVERRY**
Berkeley, Cal.

Examination of Lined Ditches in Southern California.—About 1880 all surface waters in southern California were being diverted and used. The heavy profits derived from irrigation and the rapidly increasing price of orange land since then caused a great demand for additional water. The development of the country depended on water, which was, and is even more so at present, the most important question for that locality. All available water supply must be developed and all waste prevented. This meant the rapid development of underground waters by wells and tunnels and the storage of flood waters, and explains the large number of wells yielding probably a good deal more water than the flow of surface water in midsummer.



Fig. 1. New Bear River Valley Company's Canal; Lined with Cobbles Set in Lime Mortar and Painted with Cement.

It was here naturally that the loss of water due to seepage was first felt. Every drop of water saved meant increased prosperity. The value of water increased rapidly after 1880. Water valued at \$30 per miner's inch in 1880 had a value of \$300 in January, 1883, and \$720 in 1888. This naturally meant better use of water and a higher duty of water. The duty of water increased to one miner's inch for four or five acres, and has still increased until at present this duty for some of the best citrus lands is one miner's inch for ten acres.

Most of the improvements for economy of water and for the decreased loss in transportation were started after 1880.

Canals were first paved to prevent seepage and erosion; and to permit the use of an economical section. This paving was then improved upon by paving and cementing. Plastering with cement mortar and the use of concrete for lining came into use soon after.

At about the same time the use of steel or cement pipes was introduced. They have since become much in favor in southern California, when the volume of

water to distribute is not large, and have to a great extent replaced the smaller open ditch.

While for these parts of southern California there is no doubt but what the use of cement in some form will always be the most generally used material for canal lining, it is expensive and its use is only justifiable where the value of water is very high, or where excessive seepage must be stopped.

For districts where water is plentiful the seepage loss may not be of so much consideration, or at least not so great but that a concrete lining would be prohibitive. The canals or even the laterals of these districts carry several times more water than the largest canals of southern California. The lining, if concrete were used, would have to be stronger and the cost large.

Other considerations besides seepage must, however, be studied before one can decide whether it would be beneficial to line the water channels, and other linings should also be investigated.

A good lining should fulfill the following requirements: (1) It should stop seepage. (2) It should prevent gophers and squirrels from burrowing through the banks. (3) It should prevent vegetation. (4) It should prevent scouring. (5) It should not be easily damaged by the tramping of cattle and by the action of the weather.

No doubt concrete will answer for all these requirements, but cheaper linings in many cases will be more economical. It was mainly to inquire into this that these investigations were undertaken, in May, June, July, and August, 1906.

These investigations include first a journey around some of the irrigation districts of California to learn the different types and methods of lining canals in use, their cost and detail of construction.

CANAL LININGS IN CALIFORNIA.

Naturally the best types of canal linings are in southern California, very little having been done in other parts of the state.

A study of the various types shows that they can be classified as follows:

- (a) River boulders set in lime mortar and pointed with cement mortar.
- (b) River boulders or cobbles placed behind a wooden form and cemented together with cement mortar rammed between the cobbles.
- (c) Cement concrete from 3 to 6 inches thick.

- (d) Cement mortar plaster $\frac{1}{2}$ to 1 inch thick.
- (e) Heavy road-oil.
- (f) Clay puddle.

RIVER BOULDERS SET IN LIME MORTAR AND POINTED WITH CEMENT MORTAR.

This method has been extensively used in the San Bernardino Valley. Good examples of this type are seen in Redlands, Crafton, Highlands, and San Bernardino. This type of lining was probably introduced in 1882 to 1883, when the Ontario Colony Enterprise, receiving its water from the San Antonio canon, paved its canal, 5 feet wide at the bottom, 6 feet wide at the top, and $2\frac{1}{2}$ feet deep, with rocks laid in hydraulic lime water and plastered over with cement mortar. This lining was 8 inches thick and cost about 60 cents per lineal foot, or about 6 cents per square foot, which is very much cheaper than the average cost per square foot of this type of work since then. This low cost is probably accounted for by the cheap Chinese labor used at that time, the rate being \$1.25 per day; also the small cost of the lime, \$1 a barrel, and the rock not having to be handled at great distance.

The cement plaster was mixed in the proportion

The ditch is excavated to a definite cross-section, this cross-section being of such size that after receiving a lining of about 1 foot in thickness it will be the required finished cross-section. After the excavation, mold frames with boards are used to guide the lining work; between the mold boards and the sides is a space of 1 foot which is the thickness of the lining. Into this space a layer of cobbles about 1 foot in thickness is built, with the interstices filled with small stones; a grout formed of one part of lime to seven parts of clean, sharp sand is then poured in and tamped in order to fill all voids. The lining of the sides is built up in this manner in consecutive layers 1 foot at a time. The bottom is usually paved before the sides, the mold frame resting on the bottom. The lining is generally allowed a few days to harden, then the mold boards are removed and the cement plaster put on. This plaster is a mixture of one part cement to three parts of clean sand and is applied about $\frac{1}{2}$ inch thick, giving a smooth surface.

The size of the ditch thus lined was $2\frac{1}{2}$ feet to 3 feet wide at the bottom, about 4 feet deep, and side slopes of about 1 on 4. (Fig. 1.) The approximate cost was 15 cents a cubic foot. The price of labor and materials was as follows: Cement, \$3.75 a barrel; lime,



Fig. 2. Hemet Land and Water Company's Canal; Lined with Cobbles Set in Cement Mortar.

of one part of cement to three parts of sand with lime water. The bottom was finished with a thin coating of cement and sand in equal quantities. The lime mortar was one part of lime to five parts of said.

This type of lining, while largely used since then, is now employed mainly where repairs are necessary. Accurate data as to cost and details of construction are difficult to obtain. A great deal of this work has been replaced with pipes. The new Bear Valley Water Company and also the Crafton Water Company have good examples of this construction. The ditch known as the Highlands ditch, and the Old Redlands ditch, known as the South Fork ditch, both diverting water from the Santa Ana river, are paved and cemented. While parts of these ditches were first paved with cobbles or rocks without the use of lime or cement mortar, or paved with cobbles or rock faced with cement mortar without the use of lime mortar, the more recent type of construction consists mostly of cobbles laid in lime mortar and pointed or faced with cement mortar. The method of construction used by the Bear Valley Water Company is as follows:

\$1.30 a barrel; ordinary labor, \$2 per nine-hour day; masons, \$3.50 to \$4 per eight-hour day.

The method used by the Crafton Water Company was very similar. The ditch was excavated with scrapers and shovels. No form was used for lining; the sides and bottom were put in by line, the cobbles being placed to line and grade in lime mortar, the interstices between cobbles being filled and chinked. The surface was evened off by forcing in cement mortar with a trowel, and a coating of this cement mortar about $\frac{1}{2}$ inch thick covered the sides and bottom. The rock lining was about 1 foot in thickness. This work was done in 1893, thirteen years ago, and was limited to the intake canal (one mile long) of the Crafton Water Company. According to one of the former directors of the company no repairs have been made during these thirteen years. The work is still in good condition. The average cost of this class of lining would probably be about 13 cents per square foot. While substantial and satisfactory, a stronger and not much more costly is the next class described.

(To be Continued in March Issue.)

The Campaign Against the National Land Laws

D. H. ANDERSON.

Never in the history of our country have wise national laws been subject to more unjust and need-less criticism than has been heaped upon the statutes providing for the disposal of the public domain. The opposition to these laws is based on selfish motives. Those who have defended the laws have not been provided either with funds or with a means of advertising. The public domain has been disposed of to settlers under laws more liberal than those remaining on our statute books today for the past 100 years. The Mississippi Valley was settled under conditions most favorable to the pioneer. He could use the forests unrestricted and his herds and flocks were grazed on the public land surrounding his home. He prospered and his posterity have received all the benefits that have come from a wise administration of liberal statutes, providing for the growth and up-building of a new country. The world cannot produce another valley which in any way compares with this. Nebraska and Kansas and many other states were settled under laws even more liberal. Since a large proportion of the lands in these more recently formed states have passed into the hands of private parties, the tree claim law and the preemption law have been repealed.

The lands remaining open for settlement at the present time present greater difficulties to the settler. He is required to surmount obstacles which were deemed insurmountable only a few years ago—yet with all of the natural difficulties he is forced to contend with, he is now regarded as a criminal by those in authority. A man who follows the example of the pioneer of the Mississippi Valley—using the unoccupied public domain during the time when there is no demand for such land by the homesteader, is an outlaw in the minds of those who have the ear of the present administration. The bureau chiefs to whom I shall refer explicitly hereafter have no personal knowledge of the difficulties which confront the settler under prevailing conditions. He is often unable to maintain himself upon his own homestead and is compelled to go elsewhere during a part of the year to earn a living for himself and his family. During this time the agents of the department send detectives to photograph his claim and the improvements he is required to make under the Rules and Regulations made without authority of law at Washington. His every move is watched, and if he uses the public domain to pasture his herds or flocks he is stealing from the government and robbing posterity. Those who have won out, have built up homes that would be a credit to the Mississippi Valley. They have undergone greater hardships than have any people who have settled within the limits of the United States. They have earned everything that they have obtained from the public, yet a man who has made a success,—who has carved out a home, and probably accumulated some wealth is regarded as a target for criticism and persecution by the

agents of the government. The use of the public domain does not restrict the operation of the existing land laws. Wherever it is possible for another family to exist, the field is clear. There are no serious range conflicts and the range grasses will today support more livestock per acre than when they were first used by the pioneer, thirty years ago. In spite of these facts, the press bureaus of the great administrative machines at Washington have led many thinking people to believe to the contrary.

The reader will naturally inquire as to the motives for such attacks as have been made on the national land laws. If it were not that some power in the hands of a few engenders a desire for greater power, it is possible that the campaign against these wise statutes would never have been initiated. No one who has studied the rapid development and growth of a few bureaus at Washington can say that this has been natural. It has been the result of wide advertising and co-operation with those who have money and position, but whose motives are of the most selfish and dangerous character.

The Bureau of Forestry and the United States Geological Survey have from the beginning of their careers been great advertisers. They conduct press agencies which are maintained at the expense of the government. Seven or eight years ago certain railroad interests controlled large areas within the forest reserves. These tracts, amounting in one case to 6,000,000 acres, were turned back to the Bureau of Forestry and the railroad given in exchange land scrip which had at the time a value of about \$3.50 per acre.

During the winter of 1902 and 1903 THE IRRIGATION AGE printed a review of the work of a certain attorney who operated in conjunction with these bureau chiefs. This review contained in part the following paragraph:

"CO-OPERATION WITH GOVERNMENT OFFICIALS."

"Before the plan submitted to the railroads by Mr. Maxwell was accepted he had the campaign fairly well outlined in his mind. He saw that it would be necessary for him to become intimate with government officials who could bring him into contact with congressmen, members of the cabinet, and even the President. He had already become acquainted with those who had ambitions to direct the irrigation policy of the country, and through them he met heads of bureaus in Washington who hoped, through his co-operation, to broaden the sphere of their influence and work. We do not wish to bring these men into disrepute and do not say that their ambitions are either to be commended or condemned. We do say that their methods are open to criticism. That they have been working with Mr. Maxwell for the past two or three years is an established fact. The readers of "Forestry and Irrigation" can easily inform themselves as to the bureaus which are working with Mr. Maxwell to maintain that publication. Those who were at the Irrigation Congress held in Chicago in 1900 have no doubt as to who the gentlemen are, and they fully appreciate the support which the National Irrigation Association has since received. The arrangement made with Mr. Maxwell by these officers is not known, but since 1900 the National Irrigation Association has advertised these

men and their work in return for substantial support of another kind. Mr. Maxwell has, through one of these men, been able to confer with the President upon more than one occasion. Through the favors extended by another, he has met Congressmen who have been particularly active in the movement for national aid, and has thus been brought into contact with the Secretary of the Interior. He has had their support in meetings of the Irrigation Congress or wherever their services has been needed. He has been introduced into clubs at Washington, and has appeared before engineering and scientific societies. Only a short time since, both Mr. Maxwell and one of his government assistants appeared before an economic society in Washington to promote their mutual policies. Through the publications controlled by Mr. Maxwell he has been able to repay his debt to these gentlemen. Besides, he has flooded the country with material sent to the daily newspapers, advertising those who have been of service to him. He has realized that should the government embark on a plane whereby the west is to be reclaimed, it would be to his advantage to have his friends maintained in places where they would be valuable in carrying out the policies of the National Irrigation Association. We have a bale of newspaper clippings sent out by this bureau relating to the thorough training and wise experience of the men with whom Mr. Maxwell has found it advisable to work."

The chief of the Bureau of Forestry and the chief of the Division of Hydrography of the United States Geological Survey, being ambitious and understanding fully the advantage of co-operation with any agency which might advertise them, had already made arrangements with this attorney with this end in view. He was charged with the duty of starting and maintaining a campaign against the United States land laws, his aim being to curtail the operation of these laws and to create an artificial demand for land scrip. His work was successful. Within three years land scrip advanced from \$3.50 to \$10.00 and \$12.00 per acre. In this campaign he had the co-operation of the bureau chiefs above referred to and the holders of the scrip in a single instance, must have profited by \$20,000,000.00 or \$30,000,000.00 by an expenditure of from \$200,000.00 to \$300,000.00 per year. This campaign required great press bureaus. These were provided and while the attack on the land laws was the principle theme, yet the bureau chiefs were not forgotten. Their policies and their records were advertised from coast to coast. The campaign against the land laws ended in so far as the attorney was concerned when land scrip advanced to a figure which seemed to be the maximum. In the meantime, the bureau chiefs had so closely followed the campaign, seemingly blind as to its purpose, that they absorbed all of the arguments presented and have since the close of this remarkable and spectacular fight, led the opposition to statutes which have been proven by time and experience to have been wise and necessary in the development of a new country. This co-operation with a great news agency not controlled by the government was very advantageous to these bureau chiefs. The Bureau of Forestry has grown beyond the wildest dreams of the most enthusiastic lover of trees; and the former chief of the Bureau of Hydrography of the

United States Geological Survey has become so strong that he first caused the removal of the chief of the survey,—occupied that position for himself for a while and then had a new bureau established for his personal benefit, and he is now the chief of the United States Reclamation Service. Both of these chiefs have learned the value of advertising. They still maintain their own press agencies at the expense of the government, and they issue many bulletins and papers which advertise them and their theories instead of publishing facts and data for the use of the public at large.

This leads us to a better understanding of the existing conditions. By close association with the attorney for the holders of land scrip these bureau chiefs learned the art of self-promotion and obtained a false impression of the operation of the land laws. They found that by further curtailing the operation of these laws it would be possible for them to take away from the land office large tracts which they could manage. They advertised through their mediums and through the papers and periodicals they could reach that their work was designed for the benefit of the home-builder and posterity. Without any authority from Congress and without any law covering the subject an empire has already passed from the people into the hands of the Bureau of Forestry.

The most serious condition arises from the fact that the chief executive, he who has won a place in the hearts of the people, because of his honesty and fearlessness, depends wholly upon these men for advice when questions relating to the management of the public domain arise. The ideas and arguments used by an attorney who conducted a campaign to enrich a few by millions at the expense of the many, are now accepted without question by the President and his messages to Congress contain statements which might have been clipped from the papers during the time when the great opposition campaign was in progress. What a condition the settler on the remaining public lands must confront! A campaign which was begun through selfish motives and which received the support of government agents through selfish motives has obtained such momentum that the needs of the newer states and the necessities of the pioneer are forgotten in the struggle for bureaucratic power. Without consulting those directly interested,—those whose livelihood and welfare are dependent upon wise laws relating to the disposal of public lands, and a just administration of those laws, these bureau chiefs now recommend a measure which will place the vacant public domain in such condition that the newer states, which are burdened with the responsibility of maintaining law and order, will not be able to develop, except as rules and regulations made in Washington may permit.

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work for new beginners in irrigation.

The Conservation of Our Water Resources

DAVID MEGAHY.

In considering a question of this nature, the first care before accepting any proposed policy should be to insure the protection of the settler and home-builder. Legislation enacted by the state of Wyoming relating to the control of water resources has been passed with this fundamental object always in view. It is impossible for those who have not experienced pioneer life or who have never made a study of conditions under which settlement takes place to understand the difficulties which confront the settler or to formulate laws or regulations relating to the control of our natural resources which will assist him instead of being a detriment to his progress and prosperity. A settler generally depends largely upon public officers for advice. It is difficult if not impossible for him to present his cause in such a way that he will be understood unless he is given an opportunity to do so verbally. Rules and regulations made at Washington are often not understood even by the local officer who is charged with their administration. The settler seldom sees the local officer, and when he makes an inquiry, the rules and regulations are generally sent him without interpretation. Under these conditions any policy which will lead to a centralization of control of all natural resources at Washington will tend only to increase the hardships of the settler and render his condition less enviable.

In order that we may clearly understand the present power and influence of some great bureaus at Washington we must study their policies and their methods of securing support. Those who scrutinize the papers and magazines of the times cannot fail to notice that articles identical in purport and language are published on the same day in many widely separated towns and cities. The reader who desires to continue his studies will find that these large bureaus at Washington control press agencies which are conducted by men employed at the expense of the government. These press bureaus are maintained for the sole purpose of advertising the chiefs of the bureaus, creating public sentiment in favor of their policies and criticizing and ridiculing all persons and policies which in any way oppose these great administrative machines. The heads of these press agencies may be designated on the pay roll as statisticians or by some other title which protects the bureau and serves to mislead the public. By co-operation with staff reporters at Washington, dispatches indorsing the policies of the bureaus are sent to the press of the country. These great bureaus have other opportunities for exploiting the chiefs and their policies. Certain periodicals have been established and have received government support for their purpose. Two prominent bureau chiefs for several years co-operated with a moulder of public sentiment employed by the railroads and hundreds of thousands of dollars were spent each year in advertising these favored men and at the same time criticizing and condemning those who have unfortunately nothing but ability and a creditable official record to recommend them. Many publications issued by these bureaus are

designed to secure the indorsement of the people regardless of the truth or of scientific fact.

It would be presumed that the business of these great bureaus would consume the time and energy of any single man charged with such a responsibility and that he would have little opportunity or occasion to appeal to public sentiment to obtain support for his department. Work well done is generally recognized even under a republican form of government. Regardless of this natural assumption, these bureau chiefs spend much of their time attending conventions and resorting to all kinds of political expedients to obtain favorable indorsements from meetings called for the purpose of obtaining an expression of sentiment from the people. I shall refer to one striking example of the past year. The last session of the National Irrigation Congress met in Sacramento early in September. Some weeks prior to the opening of the Congress two bureau chiefs, pursuant to directions sent we know not how, met the local secretary of the congress at Chicago, where the program of the congress was outlined to their satisfaction. Having been warned that discussion might take place at this congress, which would not be pleasant to the bureau chiefs or of a nature indorsing their policies, steps were taken to avoid this in so far as possible. The records of the Congress are sufficient evidence of the success of the plans made in Chicago.

While we of the west can easily satisfy ourselves regarding the activity of these men in our local affairs, yet we seldom appreciate the workings of the great bureaus at the national capitol. The writer has appeared before committee of congress where some of these bureaus have been represented by their chiefs and by an army of employees. He has been able to study their system of lobbying and fully appreciates the disadvantage resulting to any department of the government or state whose interests may conflict in any way with one of these great machines as long as the present practice is allowed to continue.

The history of civilization shows conclusively that the best use of natural resources is made when the control of such resources is intrusted to those locally concerned either in development or in their conservation. Under all conditions the burden of public control and maintenance falls on the community where the natural resource is found, and this has been recognized by the great bureaus at Washington. In spite of the fact that some of those bureaus receive millions of dollars annually, they still advertise the fact that the cost of their local administration in the field is already self-supporting or will soon be in that condition. These bureaus hold that while the government does not need the fees obtained from such a source, yet the principle should be enforced which requires the party benefited to pay for the benefits received. Under this theory our seaport towns should defray the expense of constructing and maintaining the navy; the Panama Canal should be dug by those who are interested in the commerce of seas; the Great Inland Water Ways should be

constructed at the expense of the territory directly tributary to these works; the Department of Commerce and Labor should be maintained at the expense of laboring classes and others directly concerned, while the Department of Agriculture should be conducted by levying tribute on the farmer.

In discussing this subject, manifestly one of great interest and importance to the people of the west, it is necessary that we allude briefly to some of the theories which have had their origin in the bureaus. In this connection I have the pleasure of referring to an official publication of the Bureau of Forestry, entitled "The Use of the National Forests," which first saw the light of day on June 14th of the past year. I regret that time does not permit a detailed discussion of the policies indorsed and the catching phraseology in this little book of forty-two pages. On page 13 the following paragraph occurs:

"What happens to the water? Nothing except that the flow is steadier. The creation of a national forest has no effect on the laws which govern the appropriation of water. This is a matter governed entirely by state and territorial laws."

On page 20 it is stated that one of the most vital reasons for making and maintaining national forests is to save every drop of water and make it do the most effective work. This is followed by a paragraph which is supposed to be an argument sustaining the theory that forests do conserve water. On page 24 it is stated that in accordance with the principle that when a private party uses a thing which belongs to all the people he should pay for it, so a reasonable charge is made for the water conserved by the forests. The writer has studied the question of the effect of forests on the run-off of streams for more than twenty years. He has made measurements for the purpose of demonstrating whether or not the theory has any foundation in fact. He has conversed with those who have made similar investigations and particularly with people who have been living within forested areas especially in Wyoming. It was found several years ago that the Forestry Bureau needed a recognition of the theory in order that it might obtain support where late water is required for irrigation. Although the officials of the bureau are scientific men, yet when it comes to an appeal to public sentiment they do not hesitate to indorse any theory which will gain support regardless of the scarcity of scientific data which might establish the value of the same. It is my opinion that the people at large have heard this theory stated so often as a fact that it is now seldom questioned. The writer has made inquiries in every possible direction for some scientific information which will bear out the theory. The bureaus at Washington have been called upon and to date not a single fact has been presented which in any way sustains it. The so-called arguments set forth in the publications I have just referred to are the stock-in-trade phrases of those who need the theory and who are willing and anxious to lead the people to support it without giving reliable reasons for so doing. I do not deny that forests have an influence on the flow of streams in certain localities. We do know that it requires a large volume of water to support a forest and the water taken up by the trees is all dissipated in the air. The water belongs to the people of Wyoming.

Why should the state not charge the government for the water needed to support the forests? Any man desiring to satisfy himself relative to actual conditions should camp on our mountain ranges during a spring and summer season. Those who have accepted the theory of the Bureau of Forestry without question will be surprised to find that the floods of a destructive nature come from the snows which fall on the forested areas. These floods carry drift which damages irrigation works and all other structures along our streams. The observer will be able to satisfy himself that no snow remains in forested areas after the first of August and that no water of sufficient volume to be measured, comes from such areas after that date. They will find further that practically all of the late waters come from regions above timber-line. Trees break the winds and the snow which falls lies in a blanket. It evaporates from the branches of the trees with the return of warm weather and melts on the ground and the water runs away in a single week or two, causing our high and dangerous waters. Vegetation has but little chance to grow where the rock is constantly disintegrating and where the water percolates rapidly into the ground. On these slopes the wind has an unbroken sweep and great drifts are deposited. These drifts melt slowly and furnish much of the late water, whether they be located above or below timber-line.

Not being satisfied with placing the burden of administration of forest reserves on local people, it is now proposed that a charge should be made for all water that comes from the reserves. The money received is to go to the bureau which will enable it to pay more men to police more forest reserves so that more fees can be collected to administer other reserves and so on without end. This policy is indorsed by bureau chiefs regardless of the fact that their theory of forest conservation of the water has not been substantiated by scientific data; and in face of the provision of the constitution of Wyoming, ratified by Congress, which reserves ownership and control of the water within boundaries to the state. Section 1, Article VIII, of the constitution reads:

"The water of all natural streams, springs, lakes or other collections of still water, within the boundaries of the state, are hereby declared to be the property of the state."

Section 31, Article I, of the constitution reads:

"Water being essential to industrial prosperity, of limited amount and easy of diversion from its natural channels, its control must be in the state, which, in providing for its use, shall equally guard all the various interests involved."

If water users can be charged for water which runs from forest reserves, it is probable that settlers living to leeward of such reserves will in a short time be obliged to pay the Forest Service for the shelter they may receive from the winds. This would be more logical, in the light of our present knowledge, than a charge for water supposed to be conserved. The people of the west love trees. However, they have a greater love for mankind. A forest should be used to benefit the race to the greatest possible extent. It can be reproduced in fifteen years, hence it should never be permitted to restrict any business which has grown up only through the exertion of the people for a generation.

When we study conditions we find that waste of those natural resources which belong to the people has thus far taken place under national statutes. These great bureaus advertise through their various mediums that our natural resources have already been wasted in a large degree. They estimate that the coal, the oil, the lumber, and even the public domain have been squandered and their mathematicians tell us in language plain that one resource will fail us in twenty-nine and one-half years, another seventeen and five-sixteenths years, and so on through the list. This waste, this evidence of prodigality has taken place under national laws, and under national supervision and administration of these laws. The unjust steward now comes to his master, the people, and argues that matters will be corrected by a more centralized national control. The states have done more to bring about recognition of public interest in all resources under their jurisdiction than has even been attempted by the nation at large. Why is it now necessary to centralize authority over all natural resources at the national capital? There is no question regarding the attitude of the great bureaus on this important problem. Recently the Inland Water Ways Commission, of which two great bureau chiefs are members, recommended that the government should control all water power sites. It is difficult enough to do what little business must be transacted at present with federal authorities whenever any development is undertaken. We have to wait months and years for a decision relating to a simple right of way application unless we are fortunate enough to have paid attorneys and lobbyists in Washington.

Wyoming has never received enough capital to date to enable her to fully understand the extent of its water power resources. She needs light, heat and electric power. Her people invite capital to undertake hydro-electric development. This kind of development would be carried on under the same wise laws and regulations as govern the use of water for irrigation and the national government has never suggested any rules or regulations relating to the supervision or administration of any natural resources under its jurisdiction which compares in any manner favorable with the laws of Wyoming relating to the use of water. We do not wish to apply the same principles in the management of our streams that the government now indorses in the control of forest reserves. They should not be kept mainly for the benefit of some great bureau at Washington, posterity and wild animals. To date no misuse has been made of the water power resources of Wyoming. Her citizens know more about its rivers and about possible power development than any bureau in Washington, although they lack press agencies for advertising their theories. When they have developed the water power of the state to its full extent under state laws and local supervision, they may rest satisfied that the people most concerned will be using this great natural resource in such a way as to benefit themselves in the largest measure. What they need is development. These people have never obtained enough real growth to enable them to distinguish between monopolies fostered by the government and those which thrive independently. That which the state has undertaken so far relating to the management of natural resources has been carried on in a manner eminently satisfactory to

the people at large. If possible they would like to avoid monopoly. They cannot discourage investors generally because of being afraid of monopoly. If the state finds that evils of this kind will result even when development is carried on under the wisest rules and regulations it can frame, it will then be time for its citizens to display the flag of distress and to call on the conservers of all things for relief. Her citizens have more interest in natural resources and in the welfare of posterity than those federal officers who now assume to exercise so much concern for themselves and their children, yet show it in a different manner. They wish development to be carried on properly and under local control in order that it may improve conditions for those who follow. The responsibility of this work will develop great men who will spend their lives in the west and whose influence will be felt in succeeding generations. The pioneer of the Mississippi Valley burned the forests in order that he might build himself a home. He had many of the difficulties and hardships to contend with that confront the settlers of Wyoming. The timber he destroyed would doubtless be of considerable value today, yet the civilization he created is of greater value than the combined forest wealth of the world. If western men do their part towards assisting the builder of the west they may well believe that posterity will thank them as they no doubt thank their ancestors for establishing homes in the wilds of the central valleys, even though this were done through the destruction of some natural resources.

IRRIGATION IN CHILE.

Increased Interest and Large Possibilities Are Manifest.

Consul Alfred A. Winslow, of Valparaiso, makes the report that the agricultural interests in Chile are giving irrigation much more attention than ever before. His statements continue:

The two or three dry years preceding the present are largely responsible for this. Over quite a portion of what had been considered fairly good farm lands crops for those years were almost total failures. The lack of moisture is the principal cause of the failure to have a fair crop in this county, unless it be on land that has been seeded with the same crop for several years in succession. The soil of Chile is naturally very productive and will grow almost anything if water can be supplied.

There are a large number of small rivers running down from the snow-capped Cordilleras that can be made to turn their valleys into productive farms were scientific irrigating methods adopted, where at least two crops of corn, potatoes, garden vegetables, beans, etc., could be grown each year. The possibilities along this line are great and with a good market for all in sight.

The Chilean government understands this and encouragement is given to those who seriously undertake this work. The poor native, of course, can do practically nothing along this line, for it requires capital to develop the system. The government of Chile has not as yet gone so far as to construct a public irrigation system, but this may come soon. At present there are several valleys partially under irrigation, with good results.

THE SIXTEENTH NATIONAL IRRIGATION CONGRESS.

Matter received recently from the headquarters of the Sixteenth National Irrigation Congress, Albuquerque, New Mexico, indicate that preparations for this meeting are progressing very satisfactorily. The office of the Congress is located in the Commercial Club building in Albuquerque, with Col. Williard S. Hopewell, chairman of the Board of Control, and Col. R. E. Twitchel, secretary. These gentlemen are aided by a corps of efficient clerks who are engaged day and night sending out literature to the various executive committeemen and others prominently identified with irrigation matters in the seventeen states and territories in which work under the Reclamation Act is carried on. A great deal of correspondence is also being carried on with eastern manufacturing firms, farm journals and commercial organizations.

The great railway companies whose lines traverse this territory are manifesting great interest in the successful outcome of the Congress and are aiding New Mexico in every way to make this the greatest session of the Congress yet held. We are assured that the very best rates possible will be made by the Transcontinental Passenger Association and the active cooperation of the Atchison, Topeka & Santa Fe System in advertising the Congress and Exposition has been assured by the executive officials of that company. The lowest of rates will be announced in due time. Special freight rates for exhibits will also be made, and the Denver & Rio Grande system will transport all exhibits over its lines in Colorado and New Mexico free of charge. The several passenger departments of the railway companies are taking the liveliest sort of interest in preparation for proper and extensive advertising of the Congress and all New Mexico communities which desire to take the fullest advantage of this sort of advertising should get their literature to the office of the board of control at the earliest possible day.

Already reservations for twenty-five thousand feet of space for exhibition purposes have been made for New Mexico communities, notably the Pecos and Mesilla Valley, Colfax county, Otero county, San Miguel county and other places full reports as to which will be announced later.

The city of Albuquerque will build a convention hall for the accommodation of the Congress which will cost upwards of twenty-five thousand dollars and will be a permanent structure of magnificent dimensions and having a seating capacity of five thousand. There will be a steel truss roof without a pillar to obstruct the view in the vast auditorium.

Bulletin No. 104.

Is just issued by the American Well Works, Aurora, Ill. It illustrates all the styles of centrifugal pumps made for different purposes for such pumps such as farm irrigation, drainage, brewery pumps, fire pumps and many other similar purposes. This well known firm also furnishes complete literature in regard to machinery for well drilling, oil, gas, etc. Our readers will do this publication a favor by stating where they read this notice, in writing this firm.

THE SALINAS VALLEY, CALIFORNIA.

Look for Government Aid.

(Special Correspondence.)

As the January number of the IRRIGATION AGE contained an article on the Salinas valley, in Monterey county, California, setting forth its charm of climate, fertility of soil and the fact that its people have had surveys made with a view to ascertaining the feasibility of making it a project for government irrigation, perhaps a few words as to further steps that have been taken may be of general interest.

The surveys spoken of were not made altogether at the expense of the people of the valley. The report of the engineer who made it, at the request of the Salinas Valley Irrigation Association, contained much valuable data from Report No. 89, by Homer Hamlin of the government geological survey, issued about six years ago. This data all related to the reservoir sites on the magnificent feeder streams of the Salinas—the San Antonio, San Lorenzo, Arroyo Seco and Reliz rivers.

The balance of the report, made at the people's expense, gives the cost of a wier dam in the Salinas river at Wunpost, the head of the valley. While there is no reservoir site here, this dam could supply the 80-mile long, 40-foot wide and 7-foot deep canal with abundant water for winter and spring irrigation. Then, when the winter floods had ceased (which in ordinary seasons occurs about the first of June) the waters of the San Antonio reservoir would come down the river bed into the ditch at Wunpost; those of the San Lorenzo would come in at King City, 30 miles further down, and those from the Arroyo Seco at Greenfield in about the center of the valley. Thus would there be water in superabundance for irrigation the year around.

While the report as to cost of the main canal is not accurate, no lines having been run, it served its purpose at Sacramento last September in demonstrating to the Reclamation Service, California's governor, and his representatives in Congress, that here is the best project of its size ever started; that approximately \$3,000,000 will make from 150,000 to 200,000 acres of \$20 land worth \$150 per acre up.

Chief of the Service Newell and Chief Hydrographer Leighton were much interested in the project as set forth by the delegates from this valley to the congress, and later had Engineer Clapp, head of the geological department in California, look it over. His visit has resulted in visits by several other of the government engineers, among them Mr. Marshall, under whose supervision all the topographical work is being done in the Sacramento valley.

These engineers confirm everything as to soil, climate, water supply, apparent quality of water, feasibility and probable cost, that is claimed by the people of the valley. They regret there are no funds available now to begin the work, but have suggested that the people organize and raise \$25,000 for a topographical survey which would include 250,000 acres, and when completed, present a contour map of the project to the reclamation people. By the time that was completed there would surely be money available and the actual work of construction would begin.

Such a survey and map would cost the landowners 10 cents an acre—not a very large sum. Unfortunately, some of the largest owners are so obtuse they can not see the great benefit to themselves, and this fact is retarding progress.

The *Rustler*, published at King City (whose editor is secretary of the Salinas Valley Irrigation Association), set the movement going, and that paper is engaged in a campaign of education along the line of the benefits of irrigation.

The Reclamation Service will take up the project as soon as the money in the revolving fund becomes available, provided the people are "Johnny on the spot" with a contour map, made, preferably, by government engineers.

So the whole matter is up to the landowners to "dig up," or to the people to influence their representatives to secure an appropriation. As the big fellows are "land poor" the latter way seems the only way out.

THE FEDERATION OF TREE-GROWING CLUBS OF AMERICA.

To Heads of Families.

MY DEAR FRIENDS:—In thus addressing you I have in mind persons who are unselfish and have the disposition to join a movement to better mankind, socially, morally and financially.

I here appeal to such people to familiarize themselves with the methods and aims of the affiliated Tree Growing Clubs of America.

The promoters of this movement have no other thought but to do good. Their motto is: "Useful Effort."

They aspire, with the aid of children, to restore the timber supply of the country, and by so doing improve conditions everywhere.

We think that too little attention is given to building character in our children, and believe that, through our system, more can actually be accomplished in that direction than by any method heretofore suggested.

Preaching, coaxing, threats, and various forms of punishment fail to make our youths any better than they are.

It is true that example has a beneficial influence over the shaping of the character of a child, but something else is required to obtain general results.

There is a "back to the wild" tendency with us all, which is more dominant in children.

An avenue to highest ideals is provided by nature study.

I believe that home pets wield a good and lasting influence, but in plant life there is a more far-reaching latitude.

Under my personal observation are children being led, unconsciously, into becoming noble characters through growing trees.

Arbor Day never can be what its promoters intended until our children themselves raise the trees to be planted.

Children cannot be driven into taking an interest in arboriculture; they must be led by example, guided, encouraged and made to feel that they are factors in a great movement.

As an acorn is developed into a tree by surrounding it with conditions fitting nature's laws, so shall we environ our children, for each one of them possesses the germ for a useful character.

The delight and satisfaction coming to one as the shoot first peeps from an acorn through the soil, is pure happiness.

An affection, delicate and sweet, at once takes hold of the one who has caused life to come from this inanimate thing, and grows into real love as leaves unfold from the tender baby stem.

You watch it daily, for the change is rapid, and should misfortune come to your loved plant, real grief, gentle maybe, but pure, will be experienced.

"Joy has its grief and grief its smiles."

Right here commences noble sentiment; and I claim that a child mind must be made susceptible to ideals before further development of character can progress.

When it is understood that a tree breathes through its leaves and takes food and drink through its roots, we know that intelligent care must be given it, else the plant will not thrive.

A duty has now been provided for the grower of the little oak tree, which will become a pleasant one. Interest will keep pace with development, and only suggestion will be required to have the new silviculturist plant seeds of other kinds of trees.

When a tree is old enough to transplant in its permanent resting place, it is probable that its youthful grower, who has nursed it to that age, will have a desire to wish the tree to become an ornament, and a monument to his or her industry. It will be found that trees can be readily sold when in good condition. Here is created the opportunity to earn money through useful effort, and a business idea has been established.

I suggest that, as an incentive, clubs offer prizes to be given to the children making the best showing, in each class, in tree growing.

This will start them, but it is understood of course that, previous to this prize offering, the club's permanent school committee will have appeared before the children and besides explaining the objects of the club, viz., to plant trees along streets, roadways, cross-fences and unused lands, let the children know that their co-operation is necessary to carry out the purposes of the organization.

Bear in mind that, for the first time, a method of growing trees of all sorts successfully, by young and old alike, has only now been made known, through the agency of the officers of the National Tree Growers' Association.

Explanatory books upon the subject will be provided to clubs, as well as many other valuable works on the subject of arboriculture, free of charge.

It is the intention to bring about another school holiday in the Fall of the year, where tree growing clubs exist, to be called Seed Gathering day.

After another year a system of exchange between clubs will be established, to distribute varieties of trees and seeds, one section with another, which will result in the introduction of useful kinds not before grown in these localities.

Get together, you good people, and organize a tree growing club now. You know the right people in your community, invite them to your home.

Select a president and secretary-treasurer and send to D. H. Anderson, 112 Dearborn street, Chicago, Ill., or to the Monterey Tree Growing Club, Monterey, Cal., for a plan of by-laws.

At the present time it is quite impossible to obtain seeds of but a few useful trees, but this will shortly be remedied. The Monterey Club has been distributing large quantities of seed and has some more for the asking. Anyway, commence with acorns and you will be amply rewarded, for remember that this in this country everybody is using oak wood but no one is growing oak trees.

The Monterey Tree Growing Club has thousands of live chestnut, oaks, pines and other trees on hand now, so get busy!

The official organ of the Federation of Tree Growing Clubs of America is the IRRIGATION AGE, an old and influential magazine, published in Chicago.

Very respectfully yours,

H. A. GREENE,

President Federation of Tree Growing Clubs of America.

CIVIL AND IRRIGATION ENGINEERING

PUMPING PLANTS.

BY L. G. CARPENTER.

[Professor of Civil and Irrigation Engineering, Colorado Agricultural College, Fort Collins.]

Pumping will undoubtedly be used to a greater extent in the future than in the past. There has been an increasing tendency during the past few years for its use. The unfortunate experience in pumping about fifteen or twenty years ago and the disappointing experiences due to expecting too much from pumping have prevented further attempts at using it until recently.

Within proper limits, a great deal may be expected from pumping. When the water is within a moderate distance of the surface of the soil, in quantities large enough to supply a good stream of water, and where the material in the soil and sand is coarse enough to furnish a sufficient stream, a great deal may be expected of it. Many of the earlier failures were due to lack of mechanical skill on the part of the people who tried to pump, so that they were not able to keep their engines in repair or to make small repairs. A number, however, have continued pumping for many years, and some with great success.

The cost of a plant may be set against the cost of water rights in a ditch. The cost of pumping will be considerably more than the usual cost of assessments; hence, unless the cost of a plant is less than the cost of a water right, there is usually no economy. On the other hand, there is the advantage that water may be had under favorable conditions, whenever needed.

The scope of pumping is generally limited. It is best adapted to small areas. It is easy to overestimate the amount of water that a well will furnish. We very often hear of inexhaustible wells. Some of these statements are laughable, were it not that sometimes they may be misleading. I have heard people say that a well was inexhaustible—that it supplied enough water for five head of horses.

When water is taken for irrigation, it should be remembered that the amount required for a good many head of cattle would not furnish much water for irrigation and that when a steady draft is made on the well the water is lowered by a noticeable amount, and unless the water is furnished as fast as it is withdrawn the volume of water stored in the soil will be materially reduced and the capacity of the well diminished. No well has an inexhaustible supply. It should not be forgotten that the water must come from somewhere and that it is

either the rainfall or the inflow from ditches around. Where the water stands in the soil it is practically a small lake, and hence, as the water is reduced in level, the supply may be permanently lowered, and it will be unless the inflow is equal to the discharge and there is time between the periods of pumping for the level to recover.

Fortunately there are many places in the river bottoms where the gravel and sand is coarse and where the water can flow with relative ease. Under these conditions the wells may furnish one-fourth of a gallon of water per minute for each foot that the water is lowered and for each square foot of area of the whole surface. The rapidity of the inflow would increase as the water is lowered, within certain limits, so that for every ten feet of lowering of the water table every square foot will be apt to furnish in the neighborhood of three gallons a minute. This lowering of the water may be expected, and especially under severe pumping. If it recovers rapidly after the pumping has stopped, then there need be no particular anxiety felt about the supply up to that extent.

The effect on the permanent supply may be examined by sinking some small wells, or holes, which will go down to the water surface and determine whether this pumping has any effect on the permanent supply, and how much. Before one makes a large investment it would be well to make some tests and determine what this effect is. In many places pumping plants of moderate capacity can be used with a great degree of profit, while pumps of larger capacity may be failures and prove very disappointing. Moderate lifts are thus to be considered when it is to be remembered that every additional foot of lift means an additional cost in the way of fuel.

If the cost of the plant is properly estimated, the supply to be expected is also known and the expense of maintenance and production has not been underestimated, then a pumping plant undertaken with these conditions understood should prove very satisfactory in hundreds of places.

There have been a few cases where pumping has been for the purpose of obtaining water surreptitiously by obtaining water from a neighboring ditch or stream. Cases of this kind have not been numerous enough to have made a body of legal decisions, but in general it may be said that if the withdrawal of water by this means damages the possessions of others it can be prevented.

Supreme Court Decisions

Irrigation Cases

SEEPAGE FROM IRRIGATION DITCH.—

The owner of an irrigation ditch, seepage of water from which, not intentionally caused, injures the property of another, is liable for the injury only in case of negligence.

Fleming v. Lockwood. Supreme Court of Montana, 92 Pacific 962.

DUTY OF COMPANY MEASURED BY STATUTE, NOT BY ITS OWN RULES.—

The measure of the rights, duties and liabilities of a water company and the consumers of the water is fixed by statute and contract, and not by the rules of the company.

Downey v. Twin Lakes Land & Water Co. Supreme Court of Colorado, 92 Pacific 946.

ADJUDICATION OF PRIORITIES.—

The volume of the priority awarded an irrigation ditch in adjudication proceedings is *res judicata*, and the decree cannot be disturbed in subsequent litigation on the question of abandonment of the priority, but evidence of abandonment in such a proceeding must be limited to acts of the owner subsequent to the decree.

O'Brien v. King. Supreme Court of Colorado, 92 Pacific 945.

DIVERSION—BURDEN OF PROOF OF ABANDONMENT.—

In action to restrain the unlawful diversion of water to an irrigating ditch, where plaintiff claimed that the defendant had lost by abandonment the right to use all or some portion of his decreed priorities, the burden is on plaintiff to clearly and definitely prove the amount of water actually and intentionally abandoned.

O'Brien v. King. Supreme Court of Colorado, 92 Pacific 945.

CONSUMER CAN COMPEL COMPANY TO CONSTRUCT HEADGATE.—

Where it is practical for two or more consumers to draw water from a canal for the irrigation of their lands through one headgate, that may be done, but where a water consumer cannot thus obtain water he is entitled, under Mills' Ann. St., Section 2288, to compel a water company to construct a necessary headgate at the expense of the water consumer.

Downey v. Twin Lakes Land & Water Co. Supreme Court of Colorado, 92 Pacific 946.

LAND ALREADY UNDER DITCH EXEMPT FROM OPERATION OF STATUTE.—

The provisions of sections 46-53, inclusive, art. 3, c. 93a, Comp. St. 1903, are not applicable to a case where land is at the time of the organization of the irrigation district under a ditch already constructed of sufficient capacity to water the same, such land being expressly exempted from the operation of said law by the proviso in section 1 of said article 3.

State v. Several Parcels of Land. Supreme Court of Nebraska, 114 Northwestern 283.

IRRIGATION DITCHES.—

The proviso in section 1, art. 3, c. 93a, Comp. St. 1903, that "where ditches or canals have been constructed before the passage of this act, of sufficient capacity to water the land thereunder, for which the water taken in such ditches is appropriated, such ditches and franchises and the land subject to be watered thereby shall be exempt from the operation of this law," is for the benefit and protection of the owner of such land, as well as for the owners of such irrigation ditches.

State v. Several Parcels of Land. Supreme Court of Nebraska, 114 Northwestern 283.

POWERS OF COUNTY BOARD.—

In the organization of an irrigation district the judgment of the county board as to those matters which are by the statute committed to its consideration, investigation and determination may not be collaterally attacked, but the question whether land is under a ditch already constructed of sufficient capacity to water the same is not by the statute left to the adjudication of the county board. The proviso in section 1, art. 3, c. 93a, Comp. St. 1903, expressly exempts such lands from the operation of the law.

State v. Several Parcels of Land. Supreme Court of Nebraska, 114 Northwestern 283.

FAILURE OF CONTRACTOR TO COMPLETE DITCH.—

Where, by the terms of a contract for work to be done for a reservoir company, the company, upon inability of the contractor to perform, reserved the right to complete the work and deduct the cost thereby incurred from the total amount to be paid the contractor, the company, upon being obliged to complete the work, was entitled to the amount it cost to finish the work, which was not necessarily the amount paid the persons who completed it or the amount entered upon the company's books as the cost thereof.

Hottel v. Poudre Valley Reservoir Co. Supreme Court of Colorado, 92 Pacific 918.

BEGINNING PAYMENT FOR WATER UNDER IRRIGATION CONTRACT.—

While parties to an irrigation contract could agree that payment should begin when the irrigation company had complied with its contract and was ready to furnish water, it was equally competent for them to agree that payments should begin only when water was actually used. In a suit on a written contract for furnishing water, in which contract the time when the first payment was to fall due was left blank, defendant could show by parol testimony that payment was not due until he should require and use water in irrigating his lands.

Fresno Canal & Irrigation Co. v. Hart. Supreme Court of California, 92 Pacific 1010.

CONSUMER'S RIGHT TO A HEADGATE.—

A water company conveyed water rights by deed, stipulating that the grantee might relocate the rights, providing location could be made on land lying nearer the headgate of the main canal, and without detriment to, or any liability of, the company. A third person acquired a half of an eighty-acre water right. This land was lying nearer the headgate of the main canal than any of the land which had theretofore been irrigated, and the land could not be irrigated by water taken from the main canal through any existing headgate. *Held*, that he was entitled to a headgate as against the objection that a multiplicity of headgates weakened the canal and increased the expense of maintaining it, since the detriment or liability

mentioned in the contract meant detriment or liability out of the ordinary; especially when considered in connection with Mills' Ann. St., section 2288, requiring owners of any canal used for irrigating purposes to construct the necessary outlets for a proper delivery of the water to persons having right to the use of the water, etc.

Downey v. Twin Lakes Land & Water Co. Supreme Court of Colorado, 92 Pacific 946.

IRRIGATION—COMPUTATION OF WATER RIGHTS.—

A contract for a sale of land also provided for a conveyance of four shares of water to July 1 in each year, and two shares after that date. Two of the shares which continued after July 1 were first-class rights, and the two shares terminating on July 1 were third-class rights. Thereafter, an equalization of all the rights of the water corporation was had, whereby the first-class rights were increased 5 per cent and the third-class rights reduced 33 1-3 per cent, and the sum of the shares, when so reduced and multiplied by 2, represented the amount of water each owner was entitled to in the corporation. *Held*, that the shares to which the vendees were entitled under such contract were 6.86 2-3, and not 6 2-3 shares, as found by the trial court.

Brixen v. Jorgensen. Supreme Court of Utah, 92 Pacific 1004.

A KIND WORD.

We are in receipt of the following note from one of our old-time subscribers, which speaks for itself:

1532 South Washington Avenue,
Denver, Colo., Jan. 24, 1908.

The IRRIGATION AGE, Chicago, Ill.

Dear Sirs:—Bill received. Please continue to send the AGE, as I can't, it seems, do without it.

Yours truly,

JOHN J. LONG.

If the IRRIGATION AGE is good for Mr. Long, it is good for you.

Twin Falls (Idaho) News—State Engineer James Stephenson has returned from Butte, where he inspected the reservoir site and source of water supply for the project which is about to be launched by the Cedar Creek Reservoir & Irrigation Company in the southwestern corner of Twin Falls county. This company will ask for and will undoubtedly receive a Carey act segregation of 50,000 acres, of which fully two-thirds is within the boundaries of this county. The surveys have been completed and the company is prepared to go ahead with construction work so soon as the necessary formalities have been performed. This includes an application to the state land board for the segregation, the state's application to the government and the grant of the latter. Under favorable conditions the formal operation should not take longer than four months as the way is clear and there is nothing to unravel but red tape. The tract to be covered by the Cedar Creek project is to be watered by means of a huge reservoir near Butte, which is between the Salmon river bridge and Three Creek. Mr. Stephenson, who carefully examined the reservoir site, pronounces it one of the best he has seen. It lies in the form of a huge basin, the outlet of which can easily be dammed.

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The Drainage Problem in the San Luis Valley.

Why it will be necessary for the state law to provide for the drainage of the region. The raising of grain and potatoes in the valley and some of the enormous crops of each.

W. A. Anderson.

Some years ago careless methods of farming and irrigating brought into the eastern portion of the San Luis valley a vast amount of alkali. As is always the case where this bane of the irrigation farmer is found unless an effort is made to get rid of it, the alkali conquered the farmers and many finely situated ranches were abandoned. For several years thereafter no effort was made by property owners to raise crops on the land, and each year the alkali became thicker and the land less valuable. Much of this land is around Hooper and Mosca on the narrow gauge line of the Denver & Rio Grande railroad from Salida to Alamosa. Naturally the news of the abandonment of San Luis valley farms was not limited to the comparatively few who were compelled to move out and unfavorable reports which spread from this movement did much to seriously interfere with the rapid settlement of the district. Ill news travels much faster and is much more widely published than news of a favorable character and it was some years after the emigration of the agriculturists from the eastern portion before the valley "boosters" and real estate men were able to overcome the prejudice against the valley as a whole. Even today it is not unusual to hear people remark that they would not take valley land as a gift, when if they knew the true state of affairs and the real value they would be only too glad to purchase a section or a half-section if for nothing more than a purely money making investment.

But even that section of the valley where the alkali deposits drove settlers out will in time be exceedingly valuable property again. Land there at one time sold as high as \$50 an acre. Today it can be bought for \$10 or \$12, but unless all signs fail it will not be many years before it again reaches its high water mark and even goes above it. This is because of the "re-reclamation" of this land by means of drainage ditches. About three years ago some interested parties got the government reclamation service interested in the alkali lands of the San Luis valley, and in the summer and fall of 1906 government experts were sent out who showed the farmers, by a series of lectures, how the land could be reclaimed from its alkali, for without this plague the soil is as fertile as in any other section of the valley or in any other section of the state. Following this, in the summer of 1907, civil engineers were sent out by the government service who surveyed the land and ran levels for main and lateral drainage ditches.

What the valley really needs, however, more than any other thing, and what must of necessity come within a few years if it is not to be had now, is a district drainage law. This is the one thing at the present time which stands in the way of the rapid and complete development of the region. The geography and geology of the valley must be recalled for an understanding of the difficulties that confront the people of this region and their need of the co-operation of the rest of the state.

The irrigators of the San Luis valley require no financial assistance nor propose any plan of public improvements to be undertaken by means of funds drawn

from the state treasury. Although such a use of the public improvement fund might be justifiable under the circumstances, all that the people of the valley are asking is that the laws of the state be put in such shape that they can undertake this work for themselves and pay for it themselves.

The San Luis valley is a great saucer or basin, the bed of an ancient lake, with the slope of the rock strata following closely the surface contours. When sediment bearing streams discharge into a body of water, the coarser and heavier materials are deposited nearer the shores, while the lighter and finer clays and sands are carried farther toward the middle of the lake. The sediments are also much thicker near the shore than they are farther out. In the San Luis valley the gravels and sands are coarsest and thickest along the northern and eastern and western sides near the foot of the mountains, while in the center the soil is composed of fine silt, and the rocks beneath are made up of thin layers of fine grained and closely compacted shales.

A writer in the Pueblo *Chieftain* of September 8, 1907, gives a comprehensive explanation of how the lands are alkali and the means of remedying the evil. Here is what he says:

"On the rim of the valley where the rainfall is heavy and the soil porous, the water from the natural precipitation or from irrigation sinks into the soil and is carried away by natural drainage. In the center of the valley, on the contrary, where the rainfall is very light, where the evaporation is very rapid and where the natural drainage is obstructed by impervious layers of fine grained and closely compacted soil, the course of the water is not downward, but upward by evaporation into the air. And as water in evaporation leaves behind it the mineral salts that ground waters carry in solution, the surface of the ground soon becomes coated with a deposit of lime and magnesia salts that have been leached out of the soil and deposited upon the surface by the evaporated waters. And as a surplus of these salts at the surface makes the ground unsuitable for the growth of many valuable crops, there are in the middle of the San Luis valley thousands of acres of land, much of which was at one time under cultivation, but which has now been abandoned and has reverted to the wilderness in worse than its original condition.

"Now it is evident that in order to restore these alkali lands to fertility, all that is necessary is to change the course of the ground waters so that they will carry these alkali salts downward and distribute them through the soil instead of leaving them in a crust upon the surface. That this can be done has already been established by experiments in the region near Mosca and Hooper.

"The even slope of the valley lends itself readily to drainage works, and the water taken from the sub-soil of one area may readily be used for the irrigation of the next lower level, and so on successively until it finally reaches the level of the central stream.

"While short ditches can be undertaken by private landowners, some method of co-operative effort is needed for the drainage of a larger district, and for this the landowners of the valley find the state law defective. What is wanted is a drainage district law which will enable the people to organize and co-operate in building the drainage canals. Such a law, carefully prepared and comprehensive in its scope, was presented to the last general assembly, but it received scant consideration and probably never come within the knowledge of the average senator or representative.

"Such a bill will be presented to the next legislature, and it is hoped a better knowledge of the conditions in the San Luis and better understanding of the very reasonable request of the people of that region will insure its approval.

"As an example of what may be done in the way of reclaiming land from alkali, a farmer northeast of Monte Vista told me five years ago eighty acres of his land had yielded but 200 bushels of oats because of the alkali in the soil. By careful work he has almost entirely rid his soil of the substance, so that in 1907 eighteen acres yielded close to 500 bushels.

"While it has been the field pea that has brought the valley to the front during the past few years more than any other one product, it is by no means the most prolific nor the most widely raised crop in the valley. It was grain that first brought the region before the public as an exceptionally fine agricultural section, and grain is still being extensively raised—in fact, might still be said to be the staple crop of the valley. In a way the field pea has done much to increase the quality of the grain and in many instances also the quantity. I have before written of the way in which the field pea supplies nitrogen and humus to the soil, elements which grain takes from it. It has been the case in almost every instance that grain planted on land which the year before had been given over to field peas has a more prolific yield than grain on virgin soil or on other land. An estimate of the amount of different kinds of grain raised in the San Luis valley during the season of 1907 was made by Hon. R. G. Breckinridge, manager of the Monte Vista Mining & Elevator Company, and is as follows:

Oats	350,000 bushels
Barley	100,000 bushels
Wheat	350,000 bushels

"There are seven large flour mills in the valley which take all the grain raised. The seven mills have a combined capacity of 1,300 barrels a day. Phenomenal crops of grain have been recorded. Wheat has gone as high as sixty-two bushels to the acre; oats to one hundred and twenty bushels and barley to seventy-five bushels. This last fall I stood for a time watching a threshing outfit on a farm some eight or ten miles south of Monte Vista. The grain seemed to be especially heavy—in fact, heavier than I had ever seen—and on inquiry later I learned that the forty acres of oats yielded an average of ninety bushels.

"Of course, these figures are above the valley average. A comparison between the average yield of crops for non-irrigating farming through the United States and the San Luis valley is interesting:

	United States at large.	San Luis Valley.
Barley, bushels	20.4	35.3
Oats, bushels	29.6	36.4
Wheat, bushels	12.3	32.5
Potatoes, bushels	80.8	250.00
Hay, tons native	1.28	2.16
Alfalfa .....	...	4.00

"Another crop that has brought fame to the valley is the potato. It was on the farm of Mr. R. A. Chisholm, not far from Del Norte, that the largest crop of "spuds" on a measured acre of ground was raised. The record, I believe still stands unbeaten. It will be some time before any farmer can again get 50,852 pounds, or 847½ bushels, of tubers from one acre of ground as did Mr. Chisholm. The harvesting was done by disinterested parties, who made affidavit to the truth of figures. The remarkable yield won a prize offered by an agricultural paper. It is not unusual to get potatoes weighing between four and five pounds. During the season of 1907 some 500,000 bushels were raised in the territory contiguous to Monte Vista alone. Two-thirds of this enormous crop were shipped to eastern and southern markets. No trouble whatever has been experienced in finding a market for San Luis valley "spuds," and in many sections of the east and south they command a premium over the world-renowned Greeley potato. Five hundred thousand bushels is 300,000 hundred weight, and taking eighty cents per hundred weight as an average price, it is readily seen that the crop was worth \$240,000.

"Potatoes must be considered a minor crop in view of the small acreage, as only about 2,000 of the 100,000 acres of farmable land within twelve miles of Monte Vista were planted in potatoes this year. As to profits realized, it is seen from the above figures that the average gross income from an acre of potatoes is \$120. The average expense, assuming that a farmer does not do any of the work himself, but hires it all done, has been calculated to be \$37 per acre; thus it is seen that the average profit, clear of all expenses, to the San Luis valley potato raiser for the year of 1907 is \$83 per acre. The original cost of this land is from \$30 to \$60 per acre. A few representative crops are given below:

"George Cole had the largest yield per acre reported. From four acres he raised 2,296 bushels, or 574 bushels per acre, which, when sold, netted him a profit of about \$250 per acre.

"E. C. Wright had in seventy acres, which netted him a profit of \$125 an acre, clear of all expenses. And this on land which he paid \$50 an acre for about a year ago.

"Zinser Brothers had in 130 acres, which yielded 36,000 bushels, or 280 bushels per acre, which netted them a clear profit of nearly \$100 per acre.

"J. S. Campbell sold \$2,465 worth off of an eighteen-acre field.

"Tom Johnson raised 1,600 bushels on a four-and-a-half-acre patch. These, when sold, brought \$716, or \$159 per acre gross."

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CORRESPONDENCE


THE BURKETT RANGE CONTROL BILL.

The following letter is in reply to one sent out by the editor and is written by a gentleman who fully understands the situation:

January 15, 1908.

Editor IRRIGATION AGE:

Dear Sir: I have yours with request for an expression of views on the Burkett range control bill. I notice the bill is being generally condemned by those who have heretofore opposed such legislation, and also that even those who have heretofore been inclined to a favorable leaning towards the idea of federal range control—largely, in my opinion, because the administration is supposed to favor it—find much to criticize in this measure. I am not surprised at this development of the situation, for the proposed legislation is so fundamentally wrong in its purposes that it is not possible that the details of the same can be satisfactory to any one actuated with an honest desire for the healthy, unimpaired development of the West and alive to the importance of maintaining that local control over local affairs which is the corner stone of our institutions.

It should be remembered that the idea of federal range control is not the natural growth or development of our land system or of the needs and demands of western people, but that it is purely an exotic, sprouted and incubated in the bureaucratic hothouses of the forest service, sedulously cultivated by the officials of various government bureaus through the lavish use of the fertilizing influences of vast patronage and transplanted into the field of legislative experiment by a gentleman who is conscious of the fact that it cannot be reared in his own particular political vineyard, and who has therefore probably taken little pains to learn of its character.

The federal range control idea is founded on the theory that there are vast unbroken stretches of land in the West wholly unfit for any other purpose than that of grazing the natural grasses which grow thereon; that over extensive areas we have practically reached the limit of development; and that these lands should be permanently retained in the hands of the national government, their use administered by its officials and the returns therefrom passed into the national treasury. This policy would overturn the theory of public lands heretofore held by our people and recognized by the highest courts—to-wit: that the public lands are held as a trust by the government for the people, to be gradually passed into private ownership and control in such manner and in such areas as shall guarantee their highest and best use and establish a home-owning, land-owning citizenship.

Until our people shall have definitely determined that we shall depart from the system of private ownership of lands and local control of local affairs, it is impossible that any federal range control system can be satisfactory in its details to any one except powerful individuals and corporations who are willing to trust to official recognition for large and special favors, for no system which vests in the hands of an official not directly responsible to the people the right to say how many, what kind, when, where and how live stock may be ranged upon the public domain, and how much shall be paid for the privilege, can in the nature of things be otherwise than galling, oppressive and harmful to the average citizen to a degree beyond the power of words to express. That such a system would breed discontent, develop favoritism and be as fruitful of injustice as a porcupine of quills is, it seems to me, too patent to require extended proof.

If, disregarding the fundamental error embodied in the Burkett bill, one peruses its pages with a view of examining it in detail, the objections to it multiply indefinitely. In the first place, it is open to the general criticism that its language is neither clear nor explicit; that it is so drafted as to conceal quite as much as it purports to make plain, and a careful perusal of the measure arouses the suspicion that its ambiguity and indirection is studied and for a purpose; that the framers of the bill had not the courage to write in plain language what they really expected to accomplish under the legislation.

Section 2 of the bill purports to provide for local participation in range control, and yet the final decision in every case is left with the Secretary of Agriculture, if the local committee does not agree with the federal official in charge.

While Section 3 of the bill purports to leave lands open to settlement, yet under its provisions any large stock outfit, by the expenditure of a hundred dollars in "corrals, reservoirs, wells or other improvements" at intervals over their range, could permanently control the same and prevent settlement indefinitely.

Section 5 evidently contemplates that there will be very little settlement or development after this system is established, for it proposes certain government reserves for school houses, churches, etc., as though assuming that with this Russianizing of the western country it will be necessary for a kindly, paternal government to make special arrangements for the location of our churches and school houses, and the climax of all of this scheme of permanent federal landlordism is contained in the provision giving us a measly ten per cent of the moneys paid by our people for the privilege of continuing to live in the States which they have builded and whose industries they have developed.

I have referred but briefly to the details of the bill because, as I stated in the earlier part of my letter, the theory of the measure is so fundamentally wrong that in the very nature of things the details must be obnoxious. But if one is disposed to examine the bill carefully many other objectionable features of detail will be found. For instance, although the brief of the bill sent out by its sponsors contained in display type the statement that "no change in water laws" was contemplated, the fact remains that Section 5 contains a provision intended to give the national government at least concurrent jurisdiction with the States over all waters on the public lands. The legislation, therefore, is not only intended to centralize land control, but to further the long-cherished ambition of the bureaus for control over our water resources.

I do not believe that the measure or any one like it can possibly become a law. I think our people will insist that we shall continue the policy of gradually passing the lands into the hands of individuals and under which, in the meantime, the public domain shall be left free to exploration, settlement and development. That the conditions under this system are not in all cases ideal or entirely satisfactory no one familiar with them will pretend to claim, but infinitely worse than any conditions that have ever existed or are likely to exist on the public range would be the conditions which would be established by federal range control.

Very truly yours,

EDITOR THE IRRIGATION AGE:

OAKLAND, CAL., January 23, 1908.

I was greatly interested in the article that appeared in your January issue, entitled "A Practical Solution of the California Reclamation Problems." The plan you advised for financing the reclamation of the Sacramento Valley was admirably worked out, and I believe it is practicable. The article is worthy the attention of everyone interested in the development of the Pacific Coast, and the Coast newspapers should take up the plan and agitate its adoption as soon as possible, for the reclamation of the million or more acres of land now subject to inundation in the Sacramento Valley would alone add untold millions of wealth to the State of California.

I am familiar with most of the types of dredges in common use to-day, but the dredge mentioned in the article—the Bed Rock Pneumatic Pipe Dredge—is entirely new to me, and since you think it can be successfully used in dredging the California rivers and building levees it must differ greatly from any of the ordinary dredges, as each has its limitations in the class of work that must be done in reclaiming the Sacramento Valley.

Would you kindly tell me if any of these Bed Rock Pneumatic Pipe Dredges are in operation, and if so, where can they be seen? Where are they built and in what particular, if any, do they differ from the suction dredge?

E. C. McEndree.

The article you refer to is already creating considerable comment and we believe the plan outlined is worthy of the most serious consideration on the part of those interested in the development of the State of California.

Many plans have been devised at different times for the reclamation of a few thousand acres in the Sacramento Valley, but any plan heretofore advanced that was comprehensive enough to take in the whole Sacramento Valley for reclamation was founded on the promise that the Federal Government would supply most of the funds for carrying on the

work. Experience has shown, however, that with so many projects for irrigation and reclamation and river and harbor improvements in almost every State in the Union it is next to impossible to secure an appropriation from the Federal Government for so gigantic an undertaking as the dredging of the Sacramento river and the reclamation of over a million acres of land in the Sacramento Valley. An appropriation of a few hundreds of thousands of dollars annually from the Federal Government would only be a drop in the bucket and would not go any further or be more successful in attacking the Valley problems than the many private enterprises that have attempted reclamation on a large scale only to make a failure of it as a rule.

Concerted action throughout the Valley is what is necessary, and this can only be brought about by the judicious expenditure of millions annually for a period of several years. To raise the money at the rate required and to be independent of Federal aid, the plan advocated in the article referred to by our correspondent seems to fill the bill better than anything else that has ever been advanced.

It is true that none of the types of dredges in general use to-day could successfully cope with the many and varied problems that have to be met in reclaiming the Sacramento Valley, and the fact in itself is accountable for the failure of the majority of reclamation projects that have been tried. In fact, we are confident that even with a very large Federal appropriation annually the work could not be successfully accomplished with the ordinary dredges, but the advent of the Pneumatic Bed Rock Pipe Dredge has solved the dredging problems, for this device in itself is able to cope with every dredging problem that might be encountered in reclaiming the Valley and restoring the river to a navigable stream.

The Pneumatic Dredge is controlled by Chicago people, and our attention was first drawn to it during the time the Irrigation Congress was in session in Sacramento, Cal., last October, where a dredge of this type was successfully operating in the South Side Park on a city contract, which was accepted at a figure per cubic yard nearly 60 per cent lower than the next lowest bidder and yet the dredge is clearing 40 per cent out of the money paid by the city; thus showing how economical it is when compared with the older types of dredges. We are told this dredge is still in operation in the South Side Park in Sacramento, and believe this is the first dredge of this type that has been installed anywhere, and all the machinery in use was purchased or manufactured in Sacramento.

The Pneumatic Pipe Dredge differs greatly from the suction dredge. In fact, they have nothing in common. Its construction is very simple, yet it is difficult to explain. The machinery used consists of a boiler, air compressor and a pump—all standard—and can be purchased almost anywhere. However, the chief point of interest is the "head" with which the dredging is done. This "head" is attachable to standard

pipings and is the only thing about the dredge that is not standard.

The pipe, with the "head" attached, "jets" its way to bed-rock, and then, after the water "cutters" have been turned on to stir up the sand, and compressed air is turned into the discharge pipe, the pipe throws up sand, gravel, muck and even clay until the discharge consists of almost solid material.

The Pneumatic Dredge can sink itself to almost any depth and bring up sand or gravel from any point desired. In fact, it was first invented to reach deep lying layers of gold bearing sand without removing the usually worthless top dressing, but when put into actual operation it was soon recognized as one of the greatest dredging devices in existence. Although it is operating on a contract in developing the South Side Park at Sacramento it has been discovered that the sand it is dredging contains \$1.40 in gold per cubic yard. In fact, to-day the dredge has virtually developed a gold mine in the heart of the City of Sacramento. What \$1.40 in gold per cubic yard means can best be judged from the fact that scores of gold saving dredgers operating so successfully in California are making their millions annually out of sand that averages only 17 cents per cubic yard.

Briefly, the dredge can sink to any depth and bring up material that is from 40 to 60 per cent solid matter, or it can be used for river and harbor deepening and will dig a channel fifty or more feet in depth as easily as it can dig a channel fifteen or twenty feet deep.

The suction dredge depends on a vacuum to lift its sand, so that there can never be more than 15 pounds pressure to the square inch in lifting, whereas the Pneumatic Pipe Dredge, which is virtually a hydro-pneumatic ram, can use a pressure of from 100 pounds up to 200 or 300 pounds to the square inch to lift its material. That it is a great success is being demonstrated daily, and prominent engineers are visiting Sacramento to see its operations.

It is claimed for this dredge that it will dig deeper, lift material higher and deliver it farther at much lower cost than any other dredger, while the cost of building the dredge is only a small fraction of the cost of other dredges of similar capacity.—[Editor.]

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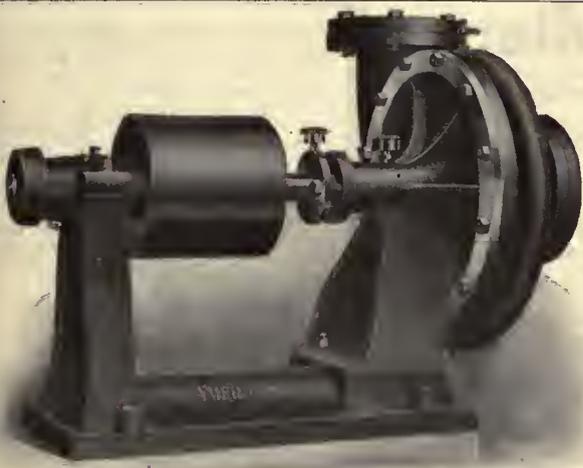
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1¼ inch. Per foot, 5c	6 inch. Per foot, 42c
1½ inch. Per foot, 6¾c	8 inch. Per foot, 75c
2 inch. Per foot, 9c	

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The Underflow

BY L. G. CARPENTER.

[Professor of Civil and Irrigation Engineering, State Agricultural College, Fort Collins, Colorado.]

A great deal has been said about the "underflow," and the term is so subject to misconception that I dislike to use it. It is used to convey the idea of a great and progressive movement of water, perhaps from the mountains, extending across a great extent of country. One would suppose that there is an extensive underground stream flowing at the pace of a river. These conceptions are all wrong. There may be a movement of water, but it is no different from the underground movement occurring everywhere, and to a greater extent in the East, for there in the more humid climate there is more water in excess of evaporation to contribute to the ground water. If the great slowness of the movement of this underground water is realized, then the term is not so objectionable. Water will flow through all soils, but slower as the soil is fine. In a moderate clay the speed may be but a few inches per day; in sand it is not apt to exceed ten feet a day, or consid-

erably less than a mile a year. The sand of the Arkansas and the Platte valleys rarely furnishes a velocity much greater than this. If the surface of the underground water is traced it will be found to be of much the same contour as the surface—low where the ground descends and higher on the hills. This is because the ground water is nearly all of local origin. The ground water slopes as the surface does. Even in the sandy streams which seem to lose their water it is found that the level of the ground water is higher than the water of the stream, unless at floods. In the case of hundreds of miles of levels run across and in the vicinity of the Arkansas river, in connection with the defense of the Kansas-Colorado suit, this was invariably found to be the case, and so in other streams. There is an underflow in the sense that there may be a flow underground and that it goes down hill. But that there is a general underground movement over large areas and from great distances is a mistake. The people in eastern Colorado and in Kansas often delude themselves with the notion that their good water comes from the mountains. Usually the source is near by. A stretch of sandhills is one of the best of gathering areas, because practically all the water which falls on them soaks in and reaches the ground water, and loses little by evaporation. Because underground water moves slowly the amount of water is often overestimated.

Horticulture

Dwarf Apples.

BY W. PADDOCK.

[Professor of Horticulture, Colorado Agriculture College, Fort Collins.]

Unlike the dwarf pear, which is budded or grafted upon quince stock, the apple, when grown as a dwarf, is worked upon dwarf forms of the same species. Dwarf and many other curious forms of any plant may appear where many seedlings are grown. The dwarf or bush lima bean may be mentioned as an example. The bloomless or seedless apple, of which so much has been said of late, has appeared at many places, both in the United States and in Europe, as is shown by the literature of horticulture.

There are two types of these dwarf apples which are used for stocks, known as the Paradise and the Doucin. The exact origin of the Paradise apple is not known, as several ancient writers describe different apples under this name, or the apple of Adam. One writer describes a variety as the true Paradise in which the bite of Adam and Eve can be seen. This notion probably comes from a peculiar blush on one side of the fruit. It is evident then that the name has been applied to many different forms, all of which make a tree of about the same height, ranging from six to eight feet.

The origin of the Doucin is more certain. It appears to have originated in Italy and was first brought to notice probably in the sixteenth century. This

makes a larger tree than the Paradise being about midway between the latter and a standard tree. For this reason the Doucin has not been much used as a stock. Nearly all the dwarf apple trees in this country are propagated on the Paradise stock.

Most of the stock is grown in France where our nurserymen procure their supplies. The stocks are commonly grown by mound layering; that is, an established tree is cut off to within a few inches of the ground and the stub is covered with earth. Numerous suckers are thrown out, which take root in the mound of earth. When well rooted they are taken up and set in nursery rows.

The pruning of dwarf trees must be more severe than that of standards if they are to be kept small. This will also result in more bearing surface and the fruit buds will be more evenly distributed over the entire tree rather than at the top.

The cultural requirements are the same as for standard trees.

In planting, dwarf apple trees should be set about ten feet apart each way.



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though they are sometimes put closer together.

Commercially such trees have not as yet proved successful and there are comparatively few of them grown. But since thorough spraying has become so essential in many parts of the country, if trees are to be grown at all, much interest is being taken in this phase of orcharding. The State Experiment Station of New York has several experimental orchards of dwarf apple trees located in different sections of that state. The chief object of these trials is to determine the commercial value of such trees. The general trend of opinion as gleaned from Cornell bulletin No. 116 is that dwarf apple trees have not been sufficiently tried to prove their worth, but it is not to be supposed that they will produce as many bushels per acre as standards. However, the occasion may arise when their use would be extremely desirable. Then, for people who have small space to devote to fruit growing, dwarf trees could be grown to advantage where standards might be impossible.

Dwarf Pears.

BY W. PADDOCK.

[Professor of Botany and Horticulture, State Agriculture College, Fort Collins, Colorado.]

Since the advent of the San Jose scale much interest has been taken in dwarf fruits, particularly in the East, the reason being that with small trees this most serious of orchard pests may be more easily combatted. Then, dwarfing induces early bearing, and with pears in particular extra size and quality are secured because of the greater ease with which small trees may be pruned, thinned and sprayed.

Dwarf pear trees, however, have been in much favor with eastern orchardists for many years, and many large and profitable orchards are of this kind. Some of them are profitable and the trees are in good condition after having been planted fifty years. This does not bear out the common notion that dwarf trees are short lived.

There is no mystery connected with the dwarfing of trees. Cions of standard varieties are grafted or budded on small growing species within the family, or upon dwarf forms of the same species. In the case of pears the stock used is the quince. The quince is slow growing and seldom attains a height of more than twelve feet, usually less. Some varieties of pears will not unite with the quince, so what is known as "double working" is resorted to. This consists first in grafting a pear variety which is known to unite with the quince, such as the Vicar; then, when this has attained sufficient size, again grafting to the desired kind.

Dwarf pears should be planted deeper than standards; the union of cion and stock should be at least four inches below the surface of the ground. This is largely for the purpose of protecting the trees from breaking, as the union between stock and cion is never too perfect. Some think it an advantage to have the pear cion take root, as this results in a stronger tree. While this is

true, it has the disadvantage of requiring more vigorous pruning of the top in order to prevent the tree from becoming too tall. In some instances it is desirable to prune the roots as well, but this is not a difficult matter, since they are formed so near the surface of the ground.

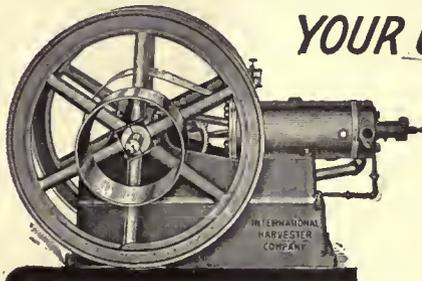
Dwarf pears should not be allowed to attain a height greater than twelve feet, else the end sought in planting them will be defeated. Severe pruning must usually be practiced, often as much as one-half to two-thirds of a season's growth must be removed, especially during the early life of the tree. By careful training the top may be spread so that a comparatively large amount of bearing surface is secured. Dwarf pear trees are

often planted as close as ten feet apart each way, making 435 trees to the acre. At this distance the trees will be too close together; fifteen feet each way, or 193 trees to the acre, would no doubt be preferable.

The culture of dwarf pears does not differ from that of standards, but it is usually thought that the quince stock will thrive better in heavy soils.

Any variety of pear may be dwarfed; the kinds most commonly propagated in this way are, first of all, the "Anjouleme." This variety takes first rank, no doubt because of the large size of the fruits when well grown. Other popular kinds are the "Louise," "Anjou," "Clairgeau" and, to a certain extent, the "Bartlet" and the "Seckel."

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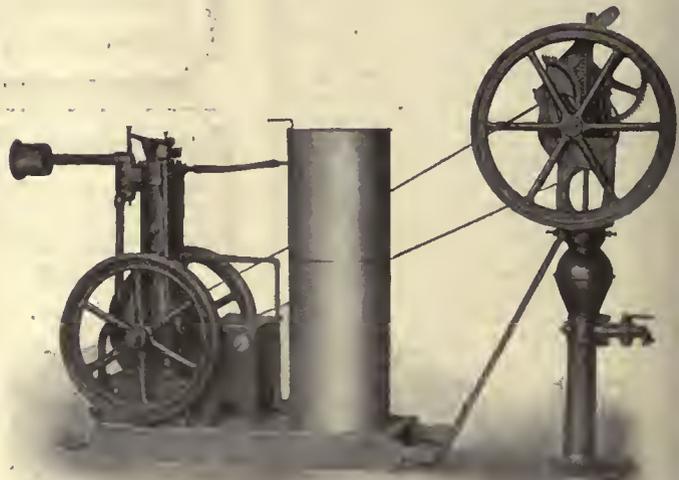
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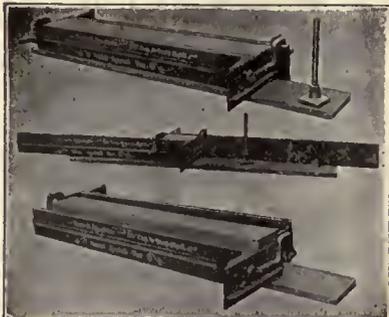
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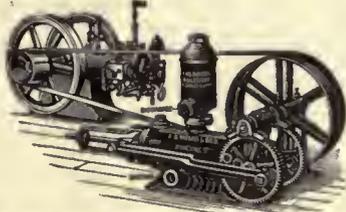
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FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

MYERS BULLDOZER POWER PUMP

5" Cylinder
FIG. 800

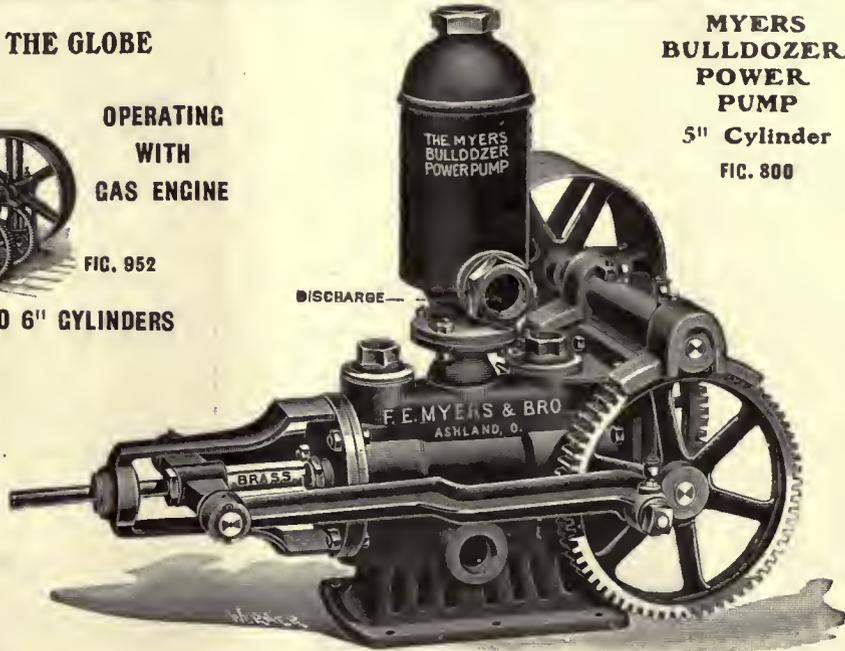


FIG. 1079

MYERS BACK GEARED WORKING HEAD

TAPPED FOR 3" PIPE

5, 7½ AND 10" STROKE

FOR BELT, WIND OR HAND POWER

FIG. 1113



BULLDOZER WORKING HEAD

BULLDOZER PUMP 6" BRASS LINED CYLINDER

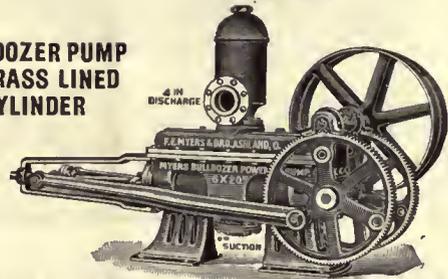
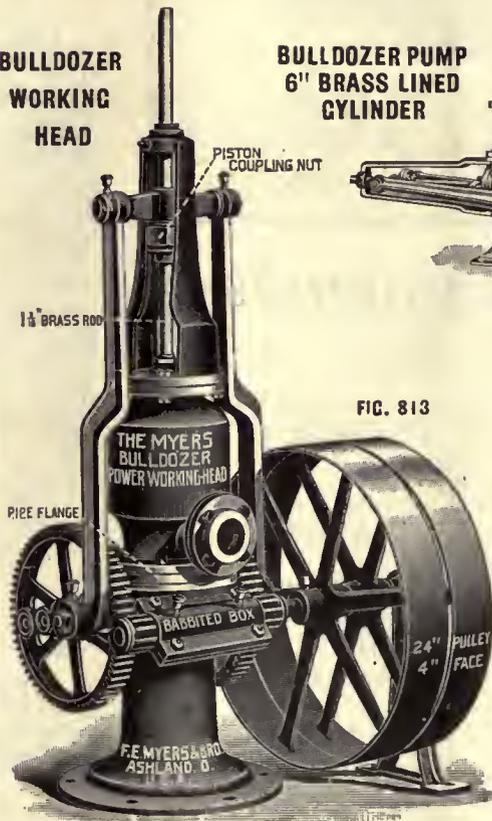


FIG. 813



MYERS BULLDOZER WORKING HEADS

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5", 7½", 10" STROKE
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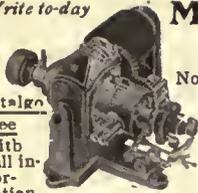
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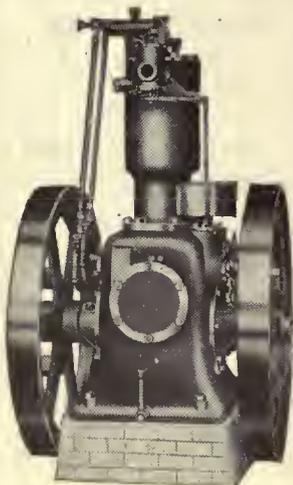
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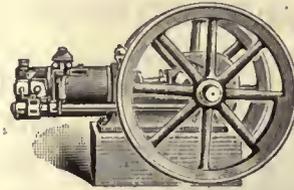
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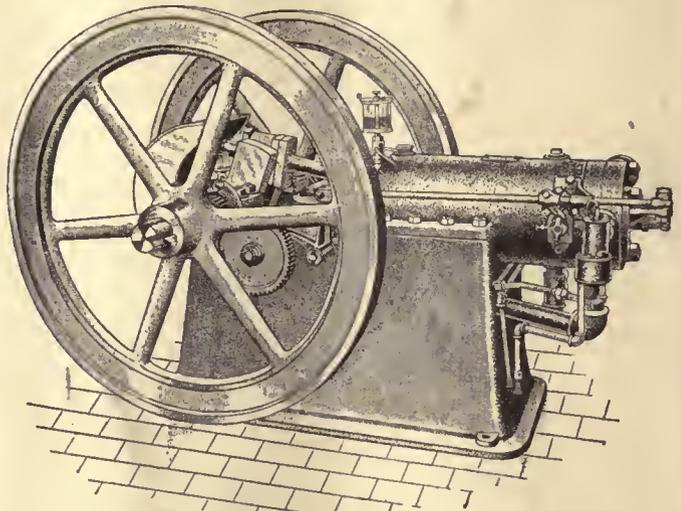
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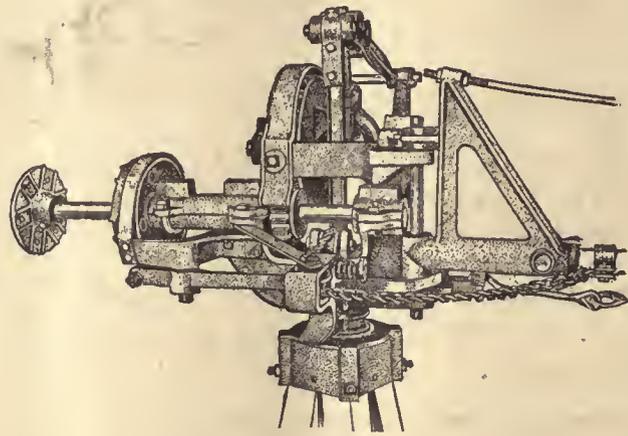
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THE IRRIGATION AGE

PUBLISHED IN THE INTEREST OF IRRIGATION FARMERS,
DEALERS IN AND MANUFACTURERS OF IRRIGATION AND
GENERAL FARM MACHINERY.

VOL. XXIII.

CHICAGO, MARCH, 1908.

No. 5

IRRIGATION DITCHES DUG READY TO LINE



Loss of water by seepage or leakage in irrigation ditches ranges from 1 per cent. to 12 per cent. per mile. To prevent this loss up-to-date irrigators are lining their ditches with concrete, but it has been found that a good lining—a lining which will endure—can be built only when a good foundation or base is prepared for it. The sides and bottom of the ditch must be smooth and true to slope and grade, or the lining will be irregular in surface and thickness, and, therefore, in strength. The soil forming the sides and bottom must, moreover, be as compact as nature allows, or else the lining will receive unequal support and crush in or crack.

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Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need

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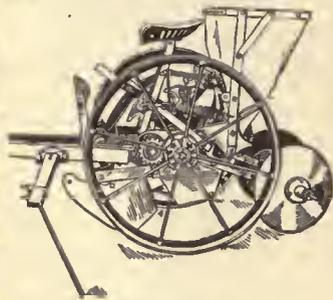
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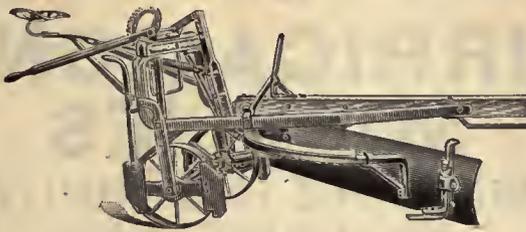
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SAVES THIS MAN A THIRD**

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"Since purchasing my Twentieth Century Grader I have reduced my force of men until I am only using one-third as many as before, and the work done by this machine is far superior than can possibly be done by hand and has a much more finished appearance. I have fifty acres in my truck farm, and can very easily manage it with one machine. I am very glad to recommend it to any one for same. I also wish to recommend it to be a first-class machine for making of good roads."

(Signed) HERMAN BLUEHER.

The above comes hot from the real irrigation farmer, who knows what he's "driving at." He finds that our 600-pound grader is just the machine for every kind of work in field or highway. It is easily handled by two or four horses.

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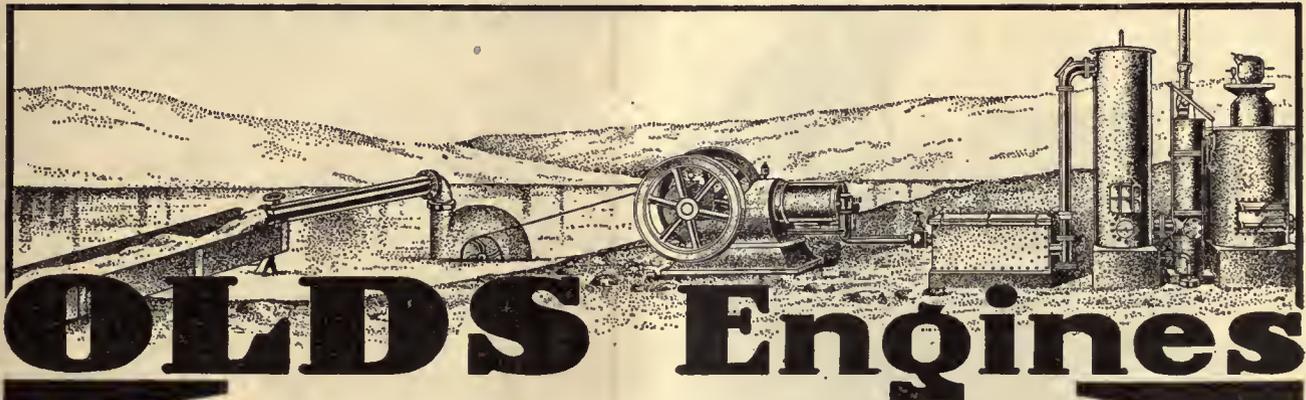
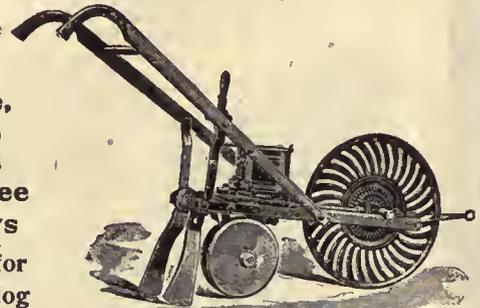
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Write to them or to me, and you will receive it by return mail. The Olds Engine is the best and cheapest Engine you can buy. It is the simplest in construction, most economical to run, will do your work at the smallest expense, and does not get out of order. This company has been making engines—and nothing else—for thirty years. We are engine specialists.

It stands to reason that a big, successful concern like this, that makes one thing, must make that one thing well. Our new factory is the most complete and up-to-date engine factory in the United States. Because of its complete equipment we can build engines of the highest efficiency at the very lowest cost. That is why we can give you a durable, simple, strong, highest-grade, perfect-working, long-lived engine at a low price. This liberal proposition is the crowning reason on top of a lot of good common sense ones, why you should buy an Olds Engine and none other.

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Our new catalogue tells about them in detail. I especially want to call your attention to our Hopper Jacket Engine on skids or wheels, 3 to 12 h. p., which is ready to run when you get it. Fill it with gasoline, throw on the switch, turn the wheel—that's all. No piping to connect, nothing to set up, always ready, can be moved anywhere.

All Olds Engines run properly, are easy to start winter and summer. The U. S. Government uses them. **DON'T FAIL TO WRITE for our new catalogue and the liberal proposition at once.** Address the home office or any representative. Do not buy any other engine until you have got my liberal proposition. It is something unusual. You certainly want to know about it.

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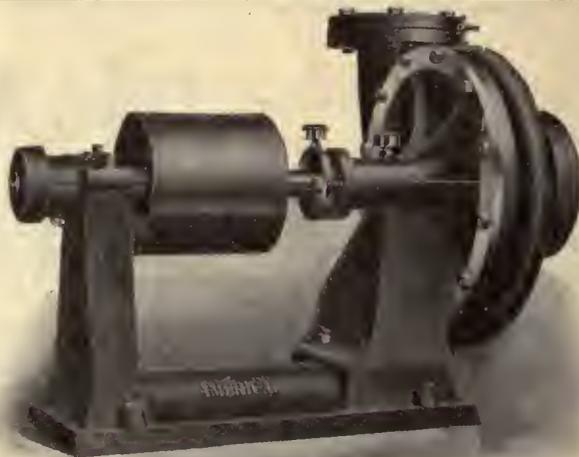
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**We built our enormous business
by always giving our Customers
Absolute Satisfaction.**

PIPE BARGAINS.

STANDARD BLACK WROUGHT IRON PIPE

Overhauled, with screwed ends and threaded couplings, suitable for water, gas, oil, etc.

1 inch. Per foot, 4c	2½ inch. Per foot, 14c
1¼ inch. Per foot, 5c	6 inch. Per foot, 42c
1½ inch. Per foot, 6¾c	8 inch. Per foot, 75c
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WELDED CASING.**

This Casing is the highest quality pipe manufactured. It only differs from standard pipe in that it is lighter in weight but, being made especially good, it will stand just as high pressure. It is all carefully overhauled and inspected before shipment. Threaded at ends with casing threads, fourteen to the inch. Covered with a preparation of asphaltum and graphite, thus insuring its wearing qualities. Suitable for irrigation purposes, because of its light weight. Freight will be much less than on standard pipe. It is about ¼-inch thickness and is fitted with brand-new casing couplings.

The sizes mentioned below are outside diameter:

1¾ inch. Per foot, 8½c	3¾ inch. Per foot, 16½c
2¾ inch. Per foot, 12c	4¾ inch. Per foot, 20c
3¾ inch. Per foot, 14c	5¾ inch. Per foot, 34c

CENTRIFUGAL PUMPS.

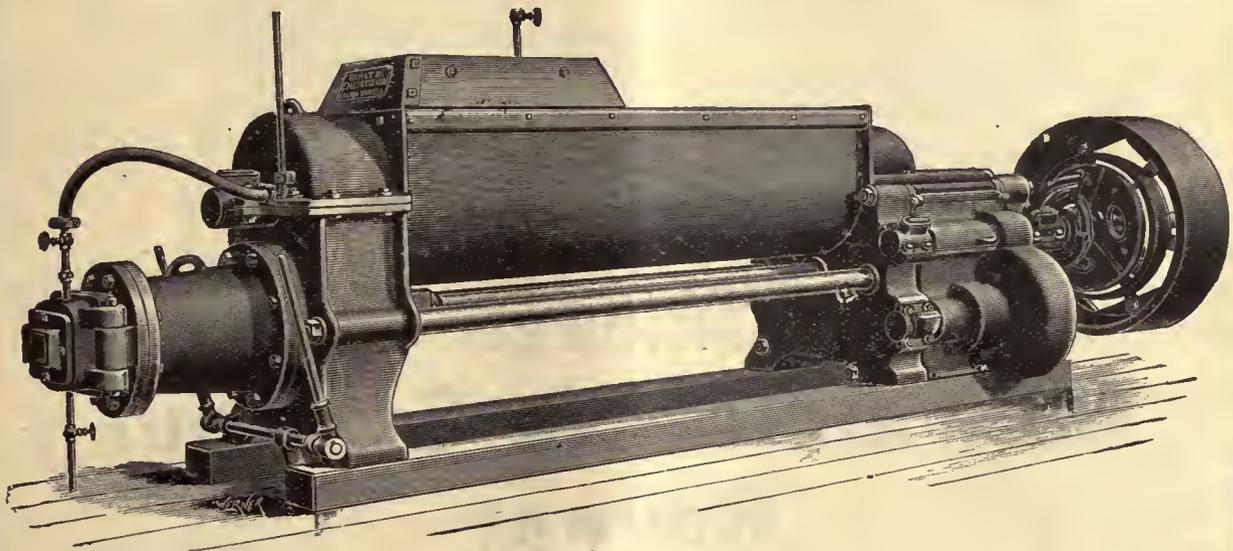
- 1—No. 4 Centrifugal Pump, direct connected to Westinghouse Engine.
- 1—No. 6 Centrifugal Pump (belted).
- 1—No. 5 Belted Centrifugal Pump.
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Put your money in a new country—invest it where it will prove worth while—along the Pacific Coast extension of the Chicago, Milwaukee & St. Paul Railway in the Dakotas, Montana, Idaho and Washington.

The building of this new line opens up a country full of money making possibilities for the investor, the merchant, the workingman and the professional man, as well as for the farmer, the fruit grower and the stockman.

The investor will find excellent opportunities to secure rich farm lands now selling at \$10 per acre, and upwards, which are certain to increase in value within the next few years.

The merchant, the workingman and the professional man should avail themselves of the splendid openings offered in the new towns along this latest trans-continental railway.

In the Dakotas three new towns—Lemmon, Butte County, South Dakota; Hettinger, Adams County, North Dakota; and Bowman, Bowman County, North Dakota—have recently been established on the Pacific Coast extension of the

Chicago Milwaukee & St. Paul Railway

A little over three months ago the sites of these towns were open prairie lands. Today, at each place, a well built town, with a population of close to 500, is established; stores of all kinds are represented; also banks, hotels, restaurants, trades and professions. **But there is plenty of room for more.**

The farmer will find in this newly opened country the **best agricultural openings in America today.**

In the Dakotas, and in Montana, along the new line, the soil is a dark loam with a clay subsoil; good water is plentiful; rainfall is ample to raise the crops; the climate is healthful; the air is dry and invigorating; winters are mild; growing seasons are long. The deeded lands sell at \$10 per acre, and upwards. **Last season many farmers made enough money from the first year's crops to pay for their land.**

The Judith Basin, in central Montana, offers exceptional opportunities in farming, particularly in wheat and alfalfa raising, as does also the country along the new line in Washington.

The fruit grower will find a particularly good field along the new line in Washington. Apples, pears, plums, cherries, apricots and small fruits grow well there. Last year hundreds of acres of bearing orchards produced crops which brought as much as \$500 to \$600 per acre.

The stockman will have no difficulty in finding suitable grazing lands at low prices in the Dakotas and Montana along the new line. Cattle graze almost all the year round on the nutritious grasses, with little or no protection from the weather, and fatten without being fed any grain whatever.

Pamphlets describing these openings are free for the asking.

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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, MARCH, 1908.

No. 5

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, - - CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

A Home-
steader. We are publishing in this issue an article which appeared recently in the *Post*, of Denver, Colo., under date of February 23, 1908. This article is signed "A Home-
steader," and is well worthy the perusal of everyone interested in western development.

Mexico
& Orient
Railway. Great development may be expected in Texas along the line of the Kansas City, Mexico & Orient Railway. This company, under the management of Mr. Stillwell, is pushing ahead and will do much for sections of Texas not reached by other lines of railway.

In this issue we are publishing an article by Mr. Parker of Grandfalls (in the Pecos Valley), Texas. This town is near where the Kansas City, Mexico & Orient Railway will cross the Pecos, and it is the intention of the officials of this railroad to irrigate a large area in that valley, by water taken from the Pecos river and supplemented by a storage system further up the stream towards Barstow. The canals that supply water for irrigation around Grandfalls aggregate something like one hundred miles in main canals and laterals. Should the Kansas City, Mexico & Orient railway people develop 40,000 or 50,000 acres on the opposite side of the river it can readily be seen that great benefit would come to that section as the result.

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Official organ Federation of Tree Growing Clubs of America.

Official organ of the American Irrigation Federation. Office of the Secretary, 309 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 23 years old and is the pioneer publication of its class in the world.

Metcalf's
Views. Matter contained in our February issue concerning "The Conservation of Our Water Resources" and "The Campaign Against the National Land Laws," have created a great deal of comment throughout the West and has brought to us many letters expressing sympathy with our views. Among them is a letter from E. D. Metcalf, a prominent citizen and canal owner of Buffalo, Wyoming. The article appears in our Correspondence Department of this issue. Mr. Metcalf has lived in Wyoming for many years and is a solid and reputable business man whose views should have considerable weight among those interested in these subjects.

Tree
Growing
Clubs. We are publishing in this issue further data concerning the Federation of Tree Growing Clubs of America prepared from outlines offered us by Hon. H. A. Greene. A great deal of interest is being manifested by our readers throughout the country on this subject. There has never before been a way suggested (by which everybody, anywhere, no matter what may be his surroundings), to successfully grow trees, without much preliminary labor and discouraging results. One is confronted in all the directions for growing forest trees with requirements almost impossible for most people.

The most useful trees require still greater labor and care than the softer and quicker growing trees,

which is not the case in our method. In transplanting and shipping young trees, besides the expense and labor met in the old method, the loss by dying is great, and greater still unless done at a certain season. An oak, for instance, can be shipped to any destination at any time without danger of its dying. A young tree in a can is safe from gophers, moles and even chickens.

Our growers of trees for forest planting consider 35 per cent an excellent record if they can get that per cent of trees to live after transplanting. The loss is due to their being compelled to plant out before the tree is old enough to withstand the change, for to wait longer would necessitate the labor of wrapping a lump of earth about the roots and very gentle handling in transferring to planting place, then particular care not to disturb the earth about the roots when taking away the cloth. There is warning not to transplant on a sunny day, and other methods not necessary in the can method.

It is our belief that the government should appropriate a sum of money to be expended by state foresters in sending out club organizers and letting the people know how easy it is to grow trees, no matter how situated.

We have induced a number of people to plant an acorn in a can and place it on a window sill of their sleeping room for curiosity just to watch how wonderful is nature. We have received letters from such people regarding their plants, indicating that they have become "tin-cannisters." The article by Mr. Green is worthy of perusal.

The story has been put in circulation at Washington, and has been sent broadcast to the papers throughout the country, to the effect that Gifford Pinchot of the Forest Service will retire from that service at the close of President Roosevelt's term and go into the West and "grow up with the country." The report comes to us that Mr. Pinchot has a desire to mix in politics with a hope of ultimately being sent to the Senate from the particular state in which he decides to take up his residence.

THE IRRIGATION AGE can hardly credit this report, which comes from Washington in the form of a news telegram. It was our impression that Mr. Pinchot aspired to a Cabinet position, that of Secretary of Agriculture, and it is reasonable to suppose that in case President Roosevelt dictates the policy of the next administration he will have an opportunity to gratify this desire. It does not, however, seem possible that any administration could improve on the present Secretary of Agriculture, who has filled the bill satisfactorily in every way.

If Mr. Pinchot will permit us, we will suggest

to him that he be very cautious in selecting the state in which he contemplates locating. It may be that he will not ask our advice in the matter, but we will be glad to give it to him in case he expresses a desire to have us do so. There are many states in the West in which his chance for landing the United States Senatorship would be very slim, owing to the fact that there is strong antagonism to his policies and it would be necessary for him to change his doctrine in many particulars in order to harmonize the conflicting interests in a number of the Western states. For instance, it is our opinion that it would not be a good plan for him to attempt it in Colorado, Wyoming, Montana, and he would be entirely impossible, of course, in Utah, nor would he be in safe hands in Idaho. What he might accomplish in Nevada is problematical, although Nevada has been responsible for some peculiar political stunts in the past days. One gentleman who now holds the position of United States Senator from that state spends his time between Washington and San Francisco and occasionally mixes with his constituents at some of the main towns along the line of railway.

Since Mr. Roosevelt became President, Mr. Pinchot has been a powerful man in the administration. He was holding an insignificant position as Chief of the Forestry Division of the Agricultural Department. Government Forestry was then in its infancy and the work of Pinchot's division apparently counted for little. Mr. Pinchot quickly interested the President in the subject of National Forestry and while many westerners will tell you that he has frequently "stubbed his toe," the fact remains that he has lifted the Forestry Bureau from obscurity so that it is now directly in the limelight, with Gifford Pinchot as the central figure.

Grave criticisms reach us from time to time concerning the action of his subordinates and the latest howl concerns forest reserve water titles. We note that the people of Idaho are arguing to the effect that the methods of the Forestry Bureau in appropriating the water of streams that rise in the forest reserves, will ultimately work injury alike to the agricultural and commercial interests of that state. Concerning an effort on the part of one of Pinchot's men in Idaho to compel the State Engineer to make entries setting aside certain water privileges for the benefit of the Forestry Bureau, Mr. James Stephenson State Engineer, maintains that it is necessary for the Forest Service to obtain permits from the state of Idaho. He has refused to accept the applications of Mr. Pinchot's representative on the basis that under the State Constitution the water flowing into the state is primarily the property of the State, and that the appropriation of such waters must be made in accordance with the State laws. Mr. Stephenson states that in that connection that both the Reclamation Service and the

Indian Service have never called in question the requirements of their water appropriation law, but have made their appropriation through the State Engineer's office as the statute requires. The Lewiston *Tribune*, Lewiston, Idaho, goes into this matter very thoroughly and states:

"It will be observed that the Tribune has not misrepresented the forest service, but has reported the case exactly as it stands upon the record. Of course, the mental reservations of the functionaries as to the proper or improper uses for which they may desire the appropriation of the state's water courses have nothing to do with the requirements of the law. The homemaker who needs water for his little garden or his patch also serves a desirable purpose, but he must acquire his rights under the law just the same. If the law can, or should, be waived at all it would seem that the permanent home-builder should have greater consideration than the transient ranger or like mercenaries.

"The Forest Service calls attention to the fact that the department has changed its regulations since the 'Use Book' was issued, and hence the directions and guaranties vouchsafed to citizens then are not applicable now. The Tribune long ago called attention to the fact that this was exactly what would occur; that citizens had no legal standing or rights whatever in the vast territory comprised in forest reserves, if the bureau system should prevail; that the settlers would be at the mercy of the whims and caprices of petty satraps, and while they might be in good standing today they were just as apt to be in bad standing tomorrow. It has always been that way and always will be that way. The brief record of the Forestry Bureau, as already made, together with the painfully laborious efforts to get a benevolent and inoffensive service until the system shall have become more firmly established and more powerful, detracts nothing from the everlasting fact that free men and arbitrary government do not exist on the same soil, and that one or the other must go, as surely as that God reigns. As to which must go is one of the things the people are even now, unconsciously to themselves, perhaps, getting into the frame of mind that will determine."

It will be seen from the foregoing that Mr. Pinchot and his associates will not have easy sailing in the state of Idaho. On the other hand, we are informed that Mr. Pinchot states that he has no inclination to control all of the water privileges where the said water rises or flows through or out from a Forest reserve. So far as we know, however, he has never made that statement in public form and it may be necessary for him to explain his position more clearly in the future. Perhaps the best thing that could happen Mr. Pinchot would be a residence of a few years in one of the Western states where he could become better acquainted with the needs of the people. A man who holds a responsible position as that which he now fills, should obtain information on the ground rather than from the reports of badly paid, and in many instances incompetent forest rangers and supervisors. The editor of this journal has traveled many hundreds of miles through various reserves; has looked over the different headquarters of the rangers, and could, perhaps, suggest to Mr. Pinchot means whereby the time of these rangers could be put to a better advantage than that of hanging around the settlements rather than by remaining on their reserves, and studying plans which would be of benefit to the government and the settlers alike.

Opportunities in the West.

A recent visit by the editor of THE IRRIGATION AGE to Colorado and New Mexico points, has brought more clearly to our attention the fact of the wonderful development which has taken place in the state of Colorado. This is particularly true also of the territory of New Mexico. Never in the history of this territory has such development taken place within so short a time and it is safe to say that there are more home-seekers and land buyers going into New Mexico today than into any other section of the United States. This is caused first by the desire to obtain land holdings while there is yet a chance, in localities reasonably near to the present lines of railway. Another feature which attracts a great many people to New Mexico is the fact of its uniform healthfulness. That it is a country where the winter climate is not unduly severe and where people with pulmonary troubles usually find relief. It is an unfortunate fact that there are very few families in the country in which some member is not more or less afflicted with this dread disease, and where there is an inclination to change and establish a home in a new section of the west, people naturally look to a point where life may be made less burdensome through favorable climatic conditions. New Mexico has long been known as a resort for consumptive people and there are at present within her boundaries many colonies, in some cases isolated, of people who have gone there to seek health and relief. Where an opportunity for home building is offered in conjunction with conditions of this character it is only reasonable to expect that people would be attracted in that direction, and the immense passenger traffic of the few railway lines leading into that territory indicate what is going on in the way of development. The Atchison, Topeka & Santa Fe railway is the main artery through the territory of New Mexico, and was built through that section under varying conditions and titles, many years ago. The men who pioneered this project were men of unusual foresight and the system has prospered during a long period when there was, apparently, no desire for lands in that section, and no particular attempt made toward opening up new areas.

The hardy pioneers who first settled in that section are now reaping their reward, and land which was being offered a few years ago at 50c and \$1.00 per acre now readily commands from \$10 to \$15 per acre. As an illustration of the reward which may come to those who have pioneered in a seemingly desolate section we wish to call attention to a valley lying some twenty-five miles inland (near the mountains), from Las Vegas.

This valley opens some fifteen miles westward from the town of Watrous and extends on up to the head-

waters of the stream which gives it life, a distance of twenty odd miles. In this delightful place, some thirty years ago, two men (one an Easterner and the other a Scotchman) established a home. They have gradually accumulated land until today their holdings amount to more than 26,000 acres. They have perfected the title to this land so that it is absolute, and they have today on their ranch known at La Cueva (pronounced Quá-va), 1,075 acres seeded to alfalfa, 200 acres in meadow which produces fine hay, 500 acres of oats and some 1,700 or 1,800 acres ready for irrigation with ample water to cover same. They also have an additional 4,000 acres which can be irrigated and over 18,000 acres of pasture and dry farming land, on which large herds are maintained on good pasture and winter-fed and prepared for market on alfalfa and other crops raised on the ranch. This ranch is divided into thirteen enclosures, all have water and good shelter. These two gentlemen have a fine thirteen-room adobe residence with all modern conveniences and furnishings. A good ten-acre orchard in apples, and it is a fact that no blight of any kind has ever attacked this orchard. This is due, perhaps, to the elevation and lack of direct contact with other orchards nearer civilization. They have also a fine store building; a flour and feed mill which has a good trade with surrounding communities; in fact, everything which goes to make life comfortable. It is safe to say that the original cost of this land was but little over \$1.00 per acre. The land today is worth at least \$10 per acre, and would readily sell at about that price. It may be seen from the foregoing that while these men have lived in comfort and plenty during all of the years of their residence in this apparently out-of-the-way valley they have accumulated a goodly sized fortune, and are, in a way, entirely independent of the outside world.

This particular case is cited to illustrate what comes to men who pioneer a new country. They have the finest sort of shooting on the ranch, trout fishing galore, and many other things which appeal to the farmer-sportsman. Some day perhaps this great ranch will be cut up into modern sized homes and will accommodate three or four hundred families who will, in their turn, become well-to-do from their efforts.

These are the things which attract the men of the Eastern and Central states who is worn out or ground down by commercial and other conditions, and if more of them could understand the possibilities of the West, not only in New Mexico but in Colorado, Wyoming, Idaho, Montana, Oregon and Washington, we are satisfied that many more would close up their affairs at home and go into this new country where opportunities are greater and where the conditions are conducive to longevity.

In this connection it may not be out of place to

mention the famous Big Horn Basin of Wyoming which offers great opportunities for home builders. In that section of the country where water is abundant for irrigation purposes there are opportunities now being made by the development of irrigation systems which will make homes for thousands. It is safe to say that there will be from 5,000 to 10,000 new settlers in the great Big Horn Basin within the next ten years. New towns are springing up along the line of the Burlington railway, which is the pioneer line in that section, and some of them will undoubtedly develop into large and prosperous cities, owing to the fact that a splendid agricultural country surrounds them on all sides.

THE IRRIGATION AGE will be glad to give its readers additional information about any section in the West to which their minds turn or in which they may become interested.

MAYWOOD COLONY, CORNING, CAL.

Elsewhere in this issue we show a number of scenes from the celebrated Maywood colony, at Corning, Cal. These scenes tell a story. They show that Maywood is a real place, not one of those towns on paper which spring up in the West. The colony contains nearly 40,000 acres of fruit, alfalfa and garden land. It sells at from \$25 to \$75 per acre, in lots of from five to forty acres. Living there are 3,000 people, all of whom have enough to eat and wear. They enjoy six churches and no saloons. They have drying plants, packing houses, olive mills and all things necessary to make a market for what they produce. No pioneering at Maywood. Everything organized and moving along up-to-date lines.

W. N. Woodson, the head of this successful California colony, says to the public: "If you're feeling well and doing well where you are, don't move; but, if you're bound to move, make a good move by moving to Maywood colony." At any rate, write to Mr. Woodson and receive, free, some of his literature. It's instructive and so conservative that it will not mislead you.

Yukon, Okla., January 30, 1908.

THE IRRIGATION AGE,

112 Dearborn St., Chicago, Ill.

GENTLEMEN:

Enclosed find one dollar for subscription for the year to IRRIGATION AGE.

Thanking you for help I have obtained from it in the past, I am,

Yours truly,

A. S. PERRY,

Yukon, Okla.

Will pay for the IRRIGATION AGE
\$2.50 one year and the PRIMER OF
IRRIGATION.

A Homesteader's View of the Forestry Bureau's Policy.

[From The Denver Post.]

Stripped of all the habiliments of masquerade, under which the several measures appear, the cold and stubborn fact confronts us, that slowly but surely four-fifths to five-sixths of the soil of our commonwealth of Colorado, is passing into the domain of a foreign bureaucracy to be administered under the form of offensive landlordism.

It ever was and ever will be that the leasing from foreign owners, of the lands of a country, is demoralizing to, and a direct tax upon the people and institutions of that country. Merely because in this case the United States is that owner and the lands administered by a department at Washington, does not alter the principles involved in the slightest degree. The manner in which it affects the commonwealth of Colorado is precisely the same as if the owner were the czar of Russia and the lands administered from St. Petersburg.

The preservation of the forests struck an exceedingly popular chord with the American people and especially with the people of the East. Under this guise, therefore, it served as the cradle whereby the "innovation" was fostered, encouraged and grew, and all the time with the enthusiastic support of the people for the preservation of the forests. In said act of 1897 was incorporated the provision that the Secretary of the Interior might make such rules and regulations in their "use" as would serve their object, viz., the preservation of the forests, and upon the construction of that term "use"—doubtless intended relative to their use in cutting timber—and notwithstanding the act says: "No public forest reservation shall be established, except to improve and protect the forest." * * * "That it is not the purpose of the act to authorize the inclusion therein of lands more valuable for the mineral therein, or for agricultural purposes,



CORNING, THE MAYWOOD COLONY TOWN, AS SEEN FROM THE TRAIN.

Building on the right is the Southern Pacific depot; next Hotel Maywood; next Maywood Opera Hall, while the tower building is the home office of the Maywood Colony. From the tower, which is 75 feet high, the Maywood Colony, comprising 39,000 acres, is under one's eye. Mt. Shasta, 140 miles to the north, is in plain view, as well as the Sierra Nevada and Coast Range Mountains, which form the walls of the Sacramento Valley, and draw in closer at this point. Corning is a No-Saloon town.

When we pause to reflect that from its birth and ever throughout the entire growth of our republic and that of our magnificent edifice of Americanism, there was no principle, no material, no factor so abhorrent, so thoroughly eschewed and so foreign to the American soil as "landlordism," it seems amazing that this complete innovation—this revolution—should come about almost unawares and apparently universally assumed in the East, and largely acquiesced in throughout the West.

A little study and investigation, however, reveals the cause and affords an explanation, and by it is brought to light the remarkable combination of circumstances whereby a whole people are beguiled and led unwittingly into the creation of conditions absolutely abhorrent when realized.

The birth of this "revolution" was the congressional act of March 3, 1891, under which the "Yellowstone Public Reservation" was created, and acting under a very liberal interpretation of its provisions, the "Forest Reserves" came into existence. Those previous thereto, and the others formed later, were made legal by the act of June 4, 1897.

than for forest purposes," and further, "Nor shall anything herein prohibit any person from entering upon such forest reservations for all lawful purposes"—indicating clearly that the creation of these reserves was solely for the purpose of protecting the timber thereon; there has, nevertheless, been built up the most elaborate and complete system of arbitrary and obnoxious landlordism, ever inflicted upon a people, and undoubtedly by the autocratic dictation of one man, viz., the forester, under the guise of "Rules and Regulations."

He appears to take fiendish delight in seeking every possible scheme and pretext for taxing and annoying the people who must needs use the reserves,—permits must be had for practically every little trivial use, designated as "special uses," of which forty are listed—and he enacts the right that "the forester may make a reasonable charge for any permit, right or use." Firewood is charged for, rights of way for pipe lines, telegraph and telephone lines, power transmission lines and other industrial undertakings. Last year he charged pasturage against 11,658 men, each having less than forty head of cattle and doubled the tax of all stock-

men unfortunate enough to come in contact with his "touch."

In Ireland such enactments, with their manner of enactment, might possibly be construed as suggestive of landlordism.

This bureaucracy has expanded and grown until it now embraces in its holdings an area more than twice the size of Colorado, and in Colorado of nearly one-fourth its entire area, and has an annual budget of nearly \$2,000,000. Naturally, very few people come in direct contact with its actual operation, but the general public stimulated and enthused by the recent utterances of the President regarding the vital necessity of conserving the forests for forestry products and for conserving the rainfall, supplemented by the vast and extensive propagandá, by the men of the service, for educating the people through the local press have been carried with them enthusiastically, and mindful of the beneficent results being rapidly achieved under the reclamation service, they are now thoroughly

the job is done. Whole volumes then will be required in which to compile his "rules and regulations," viz., delegated congressional laws.

The stockmen are being coddled into popularizing the leasing of the ranges, as a measure for their benefit, and as a cheap attraction, provision is made for a local executive committee with apparently full powers, whereas, upon close analysis it will be seen that it is absolutely without any authority, while veiled in the background is the same "forester" with the same authority. In the present development of the regime, viz., the forest reserves, less obscurity is required, hence that committee is termed the "advisory committee," and in practical operation, stockmen are wisely careful, and for obvious reasons, how they advise contrary to the notions of the forester.

To please those who would insist upon every facility being afforded the farmer and the miner, ample provision is made whereby the lands shall be free for their appropriation. It is, however, in like manner



ANOTHER VIEW OF CORNING (MAYWOOD COLONY), CALIFORNIA, on "TURKEY DAY."

This view also shows fine hotel, erected and conducted by Mr. Woodson for the accommodation of tourists and homeseekers.

prepared and receptive to the plans for extending and enlarging the holdings of the bureaucracy to cover the entire public domain, including the minerals thereof, for the present at least, to the extent of the coal lands and also the water powers.

This explains how this measure has insidiously grown, attained its present gigantic proportions and aspires to future aggrandizement without attracting our attention to the vital principles involved.

The same alluring tactics which have been exercised so successfully in developing the forest reserve regime, are readily discernible in these new measures, and it is interesting and instructive to compare these initial steps with those more fully developed under their present plan. It is, indeed, fortunate that we have a going concern to serve as an object lesson.

The first essential is to induce the public to let them "get their foot in," and then a casual expression or two in the congressional act relative to being "under such rules and regulations as may be prescribed by the Secretary of Agriculture"—the forester—and

provided concerning the lands of the forest reserves, and likewise there appears that innocent little proviso of being "under such rules and regulations as may be prescribed by the Secretary of Agriculture," that is, the forester, of course, and we have come to know that it means a running fight and constant annoyance and harassment, for any man to acquire mineral or agricultural claims in the forest reserves. Every man in the service seems actuated by the principle that all lands acquired are stolen from them, and to be given up only when forced to. Such procedure is certainly not conducive to rapid settlement of the public domain, but rather will effectually serve to preserve it as a government estate for perpetual landlordism.

The retention in government ownership of our water powers, coal lands and later doubtless of all minerals, are but succeeding steps and future measures in the embryo and for the realization of which the unqualified success of the first plant, viz., the forest reserves, affords abundant encouragement.

Carried to ultimate conclusions, i. e., all results

from these plans and purposes fully realized, we may well conjecture what will be the status of the citizenship of Colorado and of all the other Western states.

That a very large percentage of the area of these reserves could not be classed as forest by any sane mind; that an exceedingly small percentage only could in any wise serve to conserve waters for our streams; that the factor of growth or reproduction of our forests is of very doubtful practicability; that the feature of protecting the forests—while but little needed at most—has grown to be but a mere incident in connection with the business or administration of these lands; that the leasing of the grazing lands, coal lands and doubtless later all mineral lands, and in fact the entire public domain—except such occasional pieces as the service may choose to adjudge suitable for farming purposes—is but the outgrowth and expansion of the

THE PRACTICAL DESIGN OF IRRIGATION WORKS, by W. G. Bligh (D. Van Nostrand & Co., New York), is a work which fills a want long felt by a number of engineers of high standing, who have in late years been called upon to take up the design and construction of important irrigation works. It should also prove a valuable and interesting reference work to those trained in irrigation work. The author's experience under the Italian government, and his travels in Egypt, America and other countries where irrigation is practiced make him a competent critic in this branch of the engineering profession.

The author takes up and treats separately each branch of the construction of irrigation works, gives complete rules and formulæ in every case, using profusely, drawings and cuts to illustrate his text. His chapter on "Weirs" is the first instance in which we have seen weirs treated separately from dams, which is a real improvement in this work over others similar to it, the two structures being, in practice, independent of each other and often entirely different in construction.

The author gives some very clear and concise criticisms on various works, in each case explaining his criticism fully,



TURKEY DAY AT MAYWOOD COLONY (CORNING, CALIFORNIA).

Corning enjoys the distinction of being, by far, the biggest turkey shipping station in California. Turkey herds range from 500 to 2,500. Average selling price at Corning, Plucked and drawn, is 24c a pound. The turkey is an 8-month crop and highly profitable.

forest reserve regime and an extension of that obnoxious landlordism over nearly the entire West—are facts which, when clearly understood, cannot fail to arouse the stubborn resentment of every true American, be he of the East or of the West.

The soil of this state and all its appurtenances should go to the people of the state, as has been the case in the other states. If the conditions pertaining to the productiveness of the soil are different, those different conditions should be met by giving the settler an equivalent, and instead of 160 acres, let it be 1,600 or at least a sufficiency; only possess the people of the state with their rightful ownership of the soil, and permit our citizens to be the owners of their homes, not tenants; and banish from us forever the curse of foreign landlordism. To make a good citizen and a patriot, let him be the owner of the soil—an American of America.

and where he finds fault with construction or design gives a practical solution of the difficulty according to his ideas. His criticisms on the Shoshone dam and the Minidoka canal head regulator should attract those interested in the construction of works of their class. W. T. LOVELL.

We wonder how it is that the department is so severe on the country papers and will not allow them to give a friend a copy regularly and send it through the mails, when they are allowing the forestry bureau to send out franks to every newspaper in the country for transmission to the Washington office copies of papers containing puffs of the service? That is just a stinking little piece of swelled head business, and we opine that there is no warrant in law for the distribution of these franks. *The Irrigator* would like to call the attention of Senator Fulton to the matter, and ask him where there is any statute giving such an abuse of the franking privilege to any man, or any set of men?—*Oregon Irrigator*.

THE CALIFORNIA RECLAMATION PROBLEM.

The article that appeared in the January edition of THE IRRIGATION AGE on the above subject and the brief editorial comment in answer to queries from a correspondent published in the February number, with reference to the pneumatic pipe dredge as a practical means of economically remedying existing evils, have aroused great interest among our readers and we have received many kind words of commendation of our course in opening our columns to the good work of stirring up public sentiment in favor of taking such steps as may be necessary to bring to a successful climax the strenuous labors of the various commissions that have investigated and reported on this same interesting problem.

Probably no other man alive today is so well qualified to pass an opinion on every phase of this subject as Mr. M. A. Nurse of Sacramento. For almost twenty years Mr. Nurse was chief engineer of the state of California, and during that time the thousand and one problems that affect the curbing of the flood waters of the Sacramento river and the reclamation and protection of the valley lands were continually before him. As a recognized authority on the subject he was appointed by the state of California as a member of a com-

"The report 1904-1906 is my own, and bears the indorsement of Commissioner F. D. Ryan and members of the auditing board, all prominent business men of our state.

"The pneumatic pipe dredge is designed to play an important part in executing the work of channel rectification and levee building herein recommended because of its superior merit and economy coupled with its ability to place the material for levee building at a proper and safe distance from the banks, and thus obviate the danger from caving banks and crevasses.

"Very truly,
"M. A. NURSE."

We have read carefully the reports that accompanied Mr. Nurse's letter and find them most interesting reading, embodying as they do the conclusions arrived at by highly trained technical engineers, after an exhaustive study of the various problems that enter into the subject of reclaiming the Sacramento valley lands. There is nothing in them to make us change our views that the basic principle underlying successful reclamation is to restore the rivers to their original beds as they were before they were raised by the injection of several hundred million cubic yards of hydraulic mining tailings.



ONE OF THE MANY FLOURISHING ORANGE GROVES AT MAYWOOD COLONY.

This particular orchard of 40 acres is 5 years old, and is now carrying a crop of from one to two boxes a tree. In Maywood Colony the orange, as well as the lemon, is entirely free from scale, and consequently spraying or fumigating is not practiced.

This is an ideal orange section, the fruit being bright and sweet, and ripening fully six weeks sooner than in the Los Angeles region.

mission of engineers "to investigate river and flood conditions in the Sacramento and San Joaquin valleys and to submit a plan for their improvement and control." Besides Mr. Nurse this commission was composed of Major T. G. Dabney, chief engineer of the Yazoo Mississippi Delta Levee District; Major Henry B. Richardson, member of the United States Mississippi River Commission, and Major H. M. Chittenden, U. S. A., in charge of the Yellowstone Park and the Missouri river.

We are much gratified to have such an eminent authority as Mr. Nurse endorse, as he does, the plan of reclamation outlined in the previous article on this subject, and back us up in our contention that the pneumatic pipe dredge is the *sine qua non* that makes successful permanent reclamation possible, as it brings the cost down to a figure that the poorest land owner in the Sacramento Valley can stand without fear of forfeiture.

Mr. Nurse writes as follows:

"Under separate cover I send you copies of reports and recommendation made by a commission of engineers who were selected by the state of California (because of their special eminence in river hydraulics and reclamation) to devise and submit plan for needed river improvement on the Sacramento and San Joaquin rivers and their principal tributaries.

The essentials to successful reclamation as seen by the commission of engineers in 1904 (Mr. Nurse being a member) were as follows:

(a) To confine the flood waters to the channels of the various streams by means of levees, so as to prevent destructive inundations of the fertile valley lands.

(b) To correct the alignment of the river by cut-offs where necessary, and to increase its channel capacity by mechanical means wherever current action fails to accomplish this purpose.

(c) To collect the hill drainage, which now loses itself in the basins, in intercepting canals and convey it into the river at selected points.

(d) To provide escapeways over the levees for surplus flood waters during the period of channel development, and to provide for the disposal of this water in connection with the hill drainage.

(e) To provide for the relief of the basins from accumulation of rain and seepage water by means of pumps wherever gravity drainage is not practicable.

We must not forget that when this report was issued the pneumatic pipe dredge had not appeared in the field and the engineers naturally based their conclusions on the cost of operations with the more costly and expensive operation of clam shell and suction dredges.

That the commission realize the importance of carrying on and completing the work in the shortest possible period of time under one general comprehensive plan is shown by the following recommendation:

"(1) Unity of Plan.—All parts of the Sacramento flood plain are so connected with one another that they can not be considered as independent units in any scheme of reclamation, but must rather be treated as a whole. Each portion of the territory should therefore be included in the general scheme, and all reclamation work within its limits should be in conformity with the broad plan embracing the entire valley. Even purely local work desired to be inaugurated by private parties should first be submitted for the approval of the proper authority, and its execution should be under state control. It is essential to the comprehensive and efficient management of the work in all its manifold details that it be under the complete control of one central authority, responsible directly to the state. This authority, whether a single individual or a commission, should be given the necessary power to prosecute the work with efficiency unhampered by any considerations except those of the best interests of the work itself.

"(2) If at all practicable, the entire funds for the work should be guaranteed from the start. It is only in that way that a close following out of the scheme can be expected,

can be done at as low a cost as three or four cents a cubic yard through the agency of large dredges.

"(2) The current contract prices that have come to the attention of the commission generally very much exceed these figures, and it is believed that a great advantage might be realized in the saving of cost by the installment of a large dredging plant by the state authorities, to be operated under the direction of the officials who are to administer the work of improvement, sufficient to do a considerable part, if not the whole, of the dredging. Such an installment, if only applied in part, would act as a salutary restraint on the prices bid by contractors.

"(3) The large masses of excavation to be made in the cut-offs must necessitate the conveyance of the material to considerable distances, placing the bulk of it outside the reach of the ordinary clamshell dredge. It is believed that hydraulic dredges, or other modern machinery, can be utilized for this class of work, and that it can be so handled at a price not far from 15 cents per cubic yard, or possibly less. The large quantity of work to be done will serve as a stimulus to contractors to devise the least costly methods of operating and will justify the installation of expensive plants."

In this connection a recent statement made by Mr. Nurse himself will prove of interest:

"Suffice it to say, relative to merit and superiority, that



ALMOND DAY AT MAYWOOD COLONY (CORNING, CALIFORNIA).

In this view are shown about 20 tons of almonds, worth, at the depot, 15c per pound, amounting to \$6,000. The almond finds a congenial home in the soil and sunshine of Maywood Colony, and is one of the important branches of horticulture at Maywood Colony.

or a close adherence to the original estimates of cost be possible. Any prolonged suspension of work in the progress of the development would probably have disastrous consequences.

"(3) Order of Prosecution of the Work.—In the plan of operations embraced in this report there is no reason for giving precedence in time to any part of the work recommended over the other parts, but the work may and should be prosecuted in all parts of the field simultaneously."

Had the members of the commission at that time been as familiar with the operation of the pneumatic pipe dredge as Mr. Nurse is today they could have naturally reduced the following estimates:

"(1) The question of fixing unit prices upon which to arrive at an expression of the cost of the work recommended to be done is perhaps the most difficult one that presents itself for decision; yet upon this one factor must directly depend the important matter of the sum total of the estimate of cost. The earth work in its various forms constitutes by far the largest part of the subject to be considered, and there is no certain basis known to the commission upon which to fix unit prices to represent the cost of the different characters of the work of this class. From statements made by persons whose experience in this kind of work gives value to their expressions a large part of the excavation and levee building

I believe, and honestly, too, after watching operations, that for one-fifth the cost of construction and equipment, one-fifth the cost of labor in operation, one-fifth the expenditure of energy and one-twentieth the cost of maintenance and repair it (the pneumatic pipe dredge) can beat any dredge in the state in the excavation and transmission of sand, silt, slickens or any other material easily disintegrated. I believe, too, we can do nearly as well in clay as we can in sand.

"Depth cuts no figure, and I would as soon undertake to cut a channel 50 feet in depth as to make it 10 or 20."

The following conclusions arrived at by the commission are based on sound premises and merit the careful attention of every land owner in central California:

"The methods of procedure that have been detailed in this report may savor of the heroic in character and bear a semblance of extravagance in the magnitudes involved. But the commission is constrained to believe that nothing of less magnitude than the measures proposed, and no other general plan than has been advanced, can be relied upon to bring about a permanent correction of the onerous evils under which the Sacramento valley has so long labored. The direct benefits to the entire valley to be realized as a result of the perfecting of the plan of improvement in the reclamation of about 1,000,000 acres of extremely fertile land, and placing it in a position of assured safety from overflow, together with direct and indirect advantages to many associated interests,

must be expressed in a moneyed valuation reaching at least a hundred million of dollars, which will assuredly justify the cost of the work required to bring about these results. It should, moreover, be considered that, while the estimated cost of all the work, if suddenly imposed on the country, would prove a burden too heavy to be borne, yet, when distributed, as it can and ought to be, over a series of years, the load, while endurable at the beginning, will continually grow lighter as the improvement progresses."

In 1906 Mr. Nurse, acting as engineer of the department of public works, prepared a report to the governor of California which contained so many points pertinent to the subject under discussion that we cannot refrain from quoting a few paragraphs:

"Importance of River Improvement.—California's development and prosperity are particularly dependent upon the systematic improvement of her navigable waterways, not alone as a protection against excessive transportation charges, for products and supplies by improved commercial facilities, but as the essential factor in the reclamation of over 1,000,000 acres of extremely fertile land and placing it in a position of assured safety from overflow.

"The great central valley of California consists of a depression between the Sierra Nevada and Coast Range mountains nearly 400 miles in length and about 35 miles in width.

"The plains land of smooth surface within this depression aggregates fully 14,000 square miles, about fifteen per cent of which was subject to overflow before operations for reclamation and drainage were begun.

"The marvellous fertility of the irrigated and reclaimed portions of these lands, built up from 'an agricultural cream washed from the bordering mountains,' has been demonstrated in long-continued and astounding productiveness.

"Nature has liberally blessed California in providing waterways for the interchange of commodities and the cheap transportation of her products from this vast area.

"The Sacramento and San Joaquin rivers, the drainage ways of this great interior valley, have navigable lengths of about 260 miles for the Sacramento from the north, and about 200 miles for the San Joaquin from the south, to a common outfall in Suisun, San Pablo and San Francisco bays.

"Skirting these great bays are navigable estuaries and rivers, as Alviso and Suisun sloughs, and Napa, San Rafael and Petaluma rivers, upon which the important commerce of rich interior valleys is conducted through the various craft adapted to their navigation.

"Bordering these inland waterways lies the highly productive land of California.

"No freight monopoly can be long sustained if these valuable water facilities be improved and maintained free from obstruction.

"Notwithstanding the vast importance of our many natural watercourses, nearly all of which need improvement in the interest of navigation and drainage, the state of California has spent less than half a million dollars in their rectification and improvement, and the national government less than one million dollars for the multifarious needs of commerce on the Sacramento and Feather rivers."

"These sums are small in comparison to the last decade of river and harbor appropriations and expenditures by European countries in the development of less important waterways and their associated interests.

"No state in the Union is more deeply concerned in the improvement of her waterways than is California.

"The national grant of over a million and a half acres of overflowed land to our state, carrying with it a legal obligation for its reclamation, was made in 1850.

"The state, in turn, shifted the responsibility for reclamation to individuals by a gift of these lands—a sort of bid or bribe for release from its assumed obligations.

"The government and state have, since shifting this responsibility to individuals, permitted and encouraged hydraulic mining to wash down mountains of material, to find lodgment in the channels below, thus interrupting (in instances almost destroying) their navigability and reducing the flood-carrying capacity of many of our rivers to such an extent that restoration and improvement must be accomplished to make further reclamation practicable.

"It is true that landowners have in certain piecemeal tracts succeeded in protecting the higher and less frequently submerged portions from overflow by continually adding to levee heights to keep pace with the ever-rising flood plane

that followed channel filling. But by far the larger area of our lowlands, embracing the great basin inside the rim of higher lands skirting the rivers, is yet open to overflow, and unless material aid be extended by the government and state in restoring, rectifying, and deepening our damaged rivers, the project of reclaiming and adding fully 1,000,000 acres of these fertile overflowed lands to the agricultural and industrial wealth of our country is certainly a doubtful, if not an impossible, task."

A Business Problem.

The arrival on the scene of the pneumatic pipe dredge having removed the greatest drawback to the successful accomplishment of the work of economical dredging and transportation of dredged material, there still remains the question of financing the proposition, and that, after, all is the point towards which all moves should center. And it should be easy. If the legislature of California can by legal enactment establish a drainage district, can authorize the trustees to issue bonds against that district and can levy and collect taxes on the land for the purpose of paying interest on the bonds and eventually retiring them, they should get busy without wasting any more precious time. The Chicago drainage canal is an object lesson of a public enterprise financed in that way. If the constitution of California does not give the legislature the power necessary, the matter is certainly of sufficient importance to justify an amendment to the constitution. Once more we repeat that it is childish folly to sit down and wait for the state and federal government to supply the funds. They won't do it. "Providence helps those who help themselves," and the same is also true of the state and the nation. But you must first help yourselves.

THE OXFORD HOTEL, DENVER, COLO.

The Oxford Hotel, Denver, Colo., an illustration of which is herewith shown, has always been a popular stopping place for Eastern tourists as well as the Western people. This hotel is headquarters for a large number of men who are interested in the development, under irrigation, of sections in Colorado, Wyoming, western Nebraska, and New Mexico, and if one is looking to find people of this class while in that beautiful city it would be well to make inquiries at "The Oxford."



The Oxford Hotel, Denver, Colo., Headquarters of Men Interested in Irrigation.

This hotel is conducted by Messrs. Hamilton and Brooks, of the Hamilton-Brooks Company, known throughout the West as high grade hotel men who are thoroughly acquainted with every detail of their business.

Our readers who are visiting Denver will find every convenience at "The Oxford," which is located only one-half block from Union station on Seventeenth street.

Along the New Coast Line
C. M. & S. P. RAILWAY



CATTLE ROPING IN NORTH DAKOTA.

Where such grass and big sage brush grow unirrigated, wheat and oats will grow and mature.

If the people in the Eastern and Central States could fully comprehend the possibilities which are being opened to homeseekers through the development of the new Pacific coast line of the Chicago, Milwaukee & St. Paul railway, thousands would be glad to get in communication with the proper officials of that system and obtain data which would enable them to intelligently go about establishing themselves in a new field. There are more acres open and a better chance for settlers on tracts adjacent to this new line than to be found in perhaps any other section of the United States today. Millions of acres of the finest lands in the west are soon to be added to the areas under cultivation between the Missouri river and the Pacific coast. One attractive feature of the possibilities along this new line is that people will now be able to penetrate virgin territory, which was impossible heretofore, owing to lack of transportation facilities which the new line of this road offers. This line is being extended at a rapid rate, and like all other work conducted by this company, is being solidly and well done, so that when completed the Chicago, Milwaukee & St. Paul

system will not rank second to any of the transcontinental lines. The management of this system has always been of a broad character. From the time of the early history of the road when Alexander Mitchell and S. S. Merrill and other pioneers first pushed westward from Milwaukee up to the present management under Mr. Earling as president, the general desire has always been apparent, to give the patrons residing along its various branches the best service possible and all the inducements compatible with good business for the development of hamlets, towns and cities, as well as the agricultural districts lying adjacent thereto. Mr. F. A. Miller, general passenger agent of this system, has prepared some very attractive literature which fully explains all of the possibilities along this new line and any of our readers who contemplate changing would do well to correspond with him and secure complete information. Literature of this kind may be had by addressing F. H. Miller, G. P. A., Chicago, Milwaukee & St. Paul Railway Company, Railway Exchange Building, Chicago, Ill.



A Homesteader's Pool Outfit Going to the Front—On the Pacific Coast Line of the C., M. & St. P. Ry.



The Old "O.X." Cattle Ranch, on Pacific Coast Line, C., M. & St. P. Ry., Marmarth, North Dakota.

We are showing in this connection photographs of scenes along this line and hope from time to time to be able to more clearly exploit the many advantageous opportunities which may present themselves. It is a big undertaking to start out and build a line from the Dakotas to the Pacific coast, owing to the fact that great mountain ranges must be either tunneled or crossed by tortuous lines, large rivers must be bridged, and it will be necessary before the completion of this line for the builders to cut their way through great forests of the heaviest timber to be found in North America. One of the first sections which this company will attempt to open will no doubt be that of the western Dakotas, and later on they will devote more or less time to the colonizing of the far famed Mussellshell valley in Montana, and from there on to the Bitter Root and Flat Head valleys and then over to the Columbia on the way to the great grain fields of Washington, then again through the coast range, and on to Seattle. This road will no doubt at some future time build many spurs into sections which are not accessible under their present plans. On each side, and at no great distance from their main line will be found many attractive valleys, all of which this new work will permit at no distant date of development in an agricultural way.

THE IRRIGATION AGE would be glad to secure for its readers such information as they may desire which is not to be obtained through other sources. Any letters addressed to us concerning this field will be submitted to the officials of the Milwaukee road and an answer promptly forwarded.

Pin-Money at Home.

Your call for articles on pin-money brings to mind the efforts of one girl who not only earned money through her own efforts to give her schooling for two years, but also helped at home during her father's illness.

During a visit to a general store, a lady was making inquiry for ferns. The dealer said he had frequent calls for ferns, but was unable to supply them, as few people cared to take the responsibility of their raising. This was the start she needed. Writing to her uncle, she explained her plan and asked the loan of twenty dollars. The answer came, full of encouragement and accompanied by the draft. Not a few hours were spent in studying fern catalogues, which resulted in an order for 150 plants at 10 cents apiece. The express on them amounted to a dollar and a half, and the remainder was invested in jars. Seventy-five plants were potted at once, the rest being left bedded in tubs. She tended them carefully, keeping sufficiently moist and occasionally added emulsion. A notice was inserted in her home paper, the same bit of information given those of the neighboring towns to the effect that she would take orders for ferns to be distributed the first of September. The best of success rewarded her first efforts, sixty-seven dollars being cleared. By this time she had had considerable experience, and on the next growth she netted even more. This particular girl went, from this small beginning, into something larger in floral culture.—From *The Girls' Own Circle of The Circle for February*.

Lining of Ditches and Reservoirs to Prevent Seepage Losses

By PROF. B. A. ETCHEVERRY

Berkeley, Cal.

RIVER BOULDERS OR COBBLES SET IN CEMENT MORTAR.

A good example of this work is a section $3\frac{1}{2}$ miles long on the main canal of the Hemet Land and Water Company. One mile of this canal has a bottom width of 4 feet, a depth of 3 feet, and a top width of 7 feet. (Fig. 2.) The remaining $2\frac{1}{2}$ miles have a bottom width of 3 feet, a top width of 6 feet, and a depth of 3 feet.

The canal was excavated with scoop scrapers and shovels. No form was used in the excavation, the cross-section being finished, ready for the lining, by the shovelers. After the excavation, the banks were well moistened by letting the water into the excavated canal and holding it by earth dams. When the banks were thoroughly wet the water was drained out and the lining put on.

The lining consists of cobbles, most of them not less than 6 inches in dimension, placed in the cement mortar. The bottom was constructed first, the cobbles being laid in the bed of cement mortar and the space between cobbles well filled in and finished smooth and

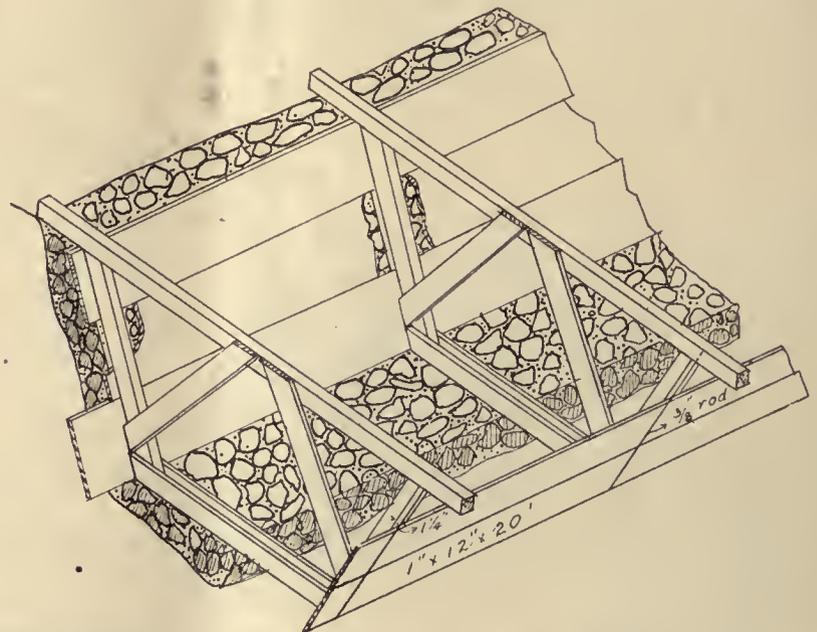


Fig. 3. Method of Lining the Hemet Land and Water Company's Canal.

to grade. This cement mortar for the bottom consisted of one part of cement to four parts of clean river sand. A little lime was added to this mortar.

Closely following the lining of the bottom came the lining of the sides. (Fig. 3.) For this, mold frames and mold boards were used. The frames were placed 5 feet apart and so constructed that the mold boards were held in place against the frames by a

$\frac{3}{8}$ -inch iron rod. The mold boards could be put in one at a time, and one section 20 feet in length was finished at one time.

The mold frames having been put in position and the lowest mold board placed on each side, a layer of cement mortar was spread on the bottom; in this mortar were embedded cobbles, another layer of mortar put on top of these cobbles, then successive layers of cobbles and mortar until the side lining was completed for the section. Mold boards were put on as the lining was built up. The mixture was also tamped during construction to assure the filling of all

CEMENT CONCRETE.

The best examples of this kind of construction are seen south of Los Angeles, near Orange, Santa Ana, and Anaheim. In this vicinity two irrigation companies, both diverting water from the Santa Ana river, afford good illustrations of this efficient lining. These two companies are the Anaheim Water Company and the Santa Ana Irrigation Company.

The Anaheim Water Company has lined its main canal and laterals with a thickness of concrete varying from 4 inches for the larger canal to 2 inches for the smaller laterals. The work of lining has been done very thoroughly and with great care. If the canal is an old earth ditch it is prepared for the lining and carefully finished as described below. If the canal is to be constructed and then lined the excavation is made with shovels, or with teams where more economical, the excavation being generally preceded by a thorough irrigation to settle and soften the ground. The excavated cross-section is made larger than the finished cross-section by the thickness of the lining. The bottom of the ditch is carefully graded and tamped so as

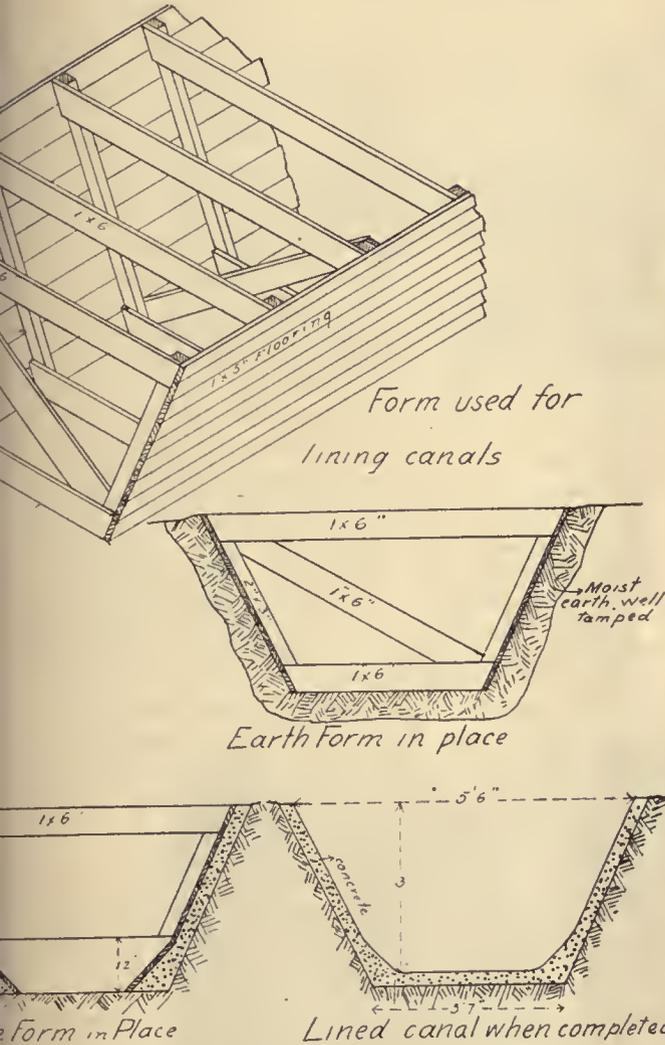


Fig. 4.—Methods of Lining the Anaheim Water Company's Canal.

spaces between cobbles. The ingredients used for the mortar in this lining of the sides were one part of cement to six parts of river sand. After the forms were removed the sides and bottoms were finished with a very thin wash of neat cement.

The cost of cement was \$3 a barrel, delivered on the grounds. The cobbles were close at hand. The cost of labor was \$1.75 for common labor per nine-hour day and \$3.50 for masons per nine-hour day. The total contract price for excavating and lining the ditch was \$25,000, or an approximate cost of 13 cents per square foot, for the lining.



Fig. 5.—Santa Ana Valley Company's Canal, Lined with Cement Concrete.

to give a solid, smooth surface. A wooden form is placed on the bottom of the excavated ditch. (Fig. 4.) This wooden form is a trapezoidal trough with no bottom, 16 to 20 feet long, depending on the size of the ditch; to make it rigid the frames on which the side mold boards are nailed are placed every two feet. The trough is placed in such a position that the axis of the ditch coincides with the axis of the form. Moist earth from the excavation is shoveled behind this form and is well tamped in successive layers; at least six inches of earth on each side is packed solidly in this manner. The earth form is now removed and before the earth has had time to dry the lining is put on. For the lining another form, smaller than the earth form, is used. For some of the laterals this form was given a peculiar shape (Fig. 4), with the idea of strengthening the lining, and giving the ditch a slightly curved form at the bottom, the corners being rounded. The form is built with the usual side slopes of $\frac{1}{2}$ on 1; the slope is made flatter for the lower eight inches, where a slope of 1 on 1 is used. The depth of the form is equal to the depth of the lined section plus the

thickness of the concrete. The form for larger canals is similar to the earth form. It is placed on the bottom of the finished earth ditch and properly aligned; the concrete, which is mixed rather wet, is now thrown in the space between the form and the earth and well tamped. The side lining having been completed, the form is removed and the bottom lining put on. Whenever possible the concrete is kept wet while setting by allowing water to run in the ditch, and retaining it by earth dams.

The concrete is made of one part of cement to seven parts of coarse gravel of varying size.

The main canal which is lined has a bottom width of 5 feet, a depth of $4\frac{1}{2}$ feet, side slopes of $\frac{1}{2}$ on 1, and the thickness of the lining is 4 inches. The cost per square foot was approximately $10\frac{1}{2}$ cents. The cost of cement was \$2.85 per barrel. The cost of gravel was 60 cents per cubic yard, and the price of labor used in finishing the ditch \$1.75 per day. The price of labor in concreting the ditch was \$2.00, foreman \$3.00 per day. For a smaller canal of $1\frac{1}{2}$ feet width, 3 feet deep, slopes of $\frac{1}{2}$ on 1, the thickness of the lining was 3 inches for the sides and 4 inches for the bottom, and curved or reinforced corners. The cost was 11.4 cents per square foot, including excavation. The cost of labor and material was higher—cement \$3.30 per barrel, gravel \$1.00 per square yard, and all labor \$2.00 per day. The approximate cost for finishing the sides and bottom and for lining (excluding the main excavation) would be 10 cents per square foot for a 4-inch lining. A corresponding cost for a 3-inch lining (including finishing and lining) would be about 8 cents per square foot.

Some of the smaller laterals are 8 inches at the bottom and 18 inches in depth, side slopes $\frac{1}{2}$ on 1. A lining 2 inches thick costs nearly 6 cents per square foot.

The Santa Ana Valley Company has lined a portion of its main canal above the town of Olive, in Orange county (Fig. 5.); the lining is a good example of this kind of work. The canal is $10\frac{1}{2}$ feet wide at the bottom, $4\frac{1}{2}$ feet deep, and 15 feet wide at the top. The lining is $2\frac{1}{2}$ to 3 inches in thickness and was constructed in very much the same manner as the work of the Anaheim Union Water Company. The cost of preparing the sides and bottom for the concrete lining and of lining was 8 cents per square foot.

(To be Continued.)

FEDERATION OF TREE GROWING CLUBS OF AMERICA.

BY H. A. GREENE, PRESIDENT, MONTEREY, CAL.

From the frequency with which we come across articles upon the subject of forestry in newspapers and magazines, it is clear that a general interest has been awakened and we are commencing to realize that we have too long neglected to conserve our natural resources in this country.

About sixty-five per cent of the standing timber of our country is on the Pacific coast, and that is fast disappearing. In twenty years our firewood has considerably more than doubled in value in most localities and promises to exceed that advance in the next two decades.

Many people have tried to grow forest trees, but mostly with indifferent success, unless we except, in so far as California is concerned, a few eucalyptus groves.

Until now there has never been a simple method suggested by which old and young alike may grow useful trees successfully without tedious labor; then, besides a place for a nursery is not always convenient to a majority of those most likely to have a desire to become silviculturists.

The method above alluded to has been given to the public through the Monterey Tree Growing Club, of Monterey, Cal., and in a few months many such clubs have been organized with a like motto as theirs, viz., "Useful Effort."

A useful association has been formed, known as the Federation of Tree Growing Clubs of America, with headquarters at 112 Dearborn street, Chicago, and the monthly magazine, THE IRRIGATION AGE of that city has been made the official organ of the federation.

Except through proper organization it is unlikely that this very easy way of growing trees would have become known to many people, nor would the aims of the original promoters, aside from their ambition to be the means of restoring our depleted timber supply, have taken root.

The further aims of the tree growing clubs is to interest our school children in arboriculture, and through it attempt to make better men and women of them. It was determined by actual experience that a marked change was noted among children who had been induced to try tree growing as a pastime.

As their seeds sent forth a little tender sprout, the event became to them of interesting importance, and was repeated with increased fervor when leaves quickly unfolded from the shoot. Other children, by example, found some acorns readily, and planted them.

After four months some of the baby oaks had four leaves, while others that had been neglected made but a poor showing.

The school children committees of clubs are expected to occasionally have lectures on forestry and kindred subjects, delivered to each of the classes in the public schools, and afterwards give instructions in tree growing. Prizes are to be offered for best showing in each class, which will start the thing going.

Arbor Day will be made what its promoters intended only when planters have grown their own trees.

Seed Gathering Day is another school holiday suggested for the fall of the year by the federation officers.

By co-operation with the school teachers these two days may be made memorable, instructive and merry.

Our children's aid is necessary if we desire to restore our wood supply before its cost shall have become prohibitive.

Let the reader plant an acorn (on its side) in a tin can with holes cut in the bottom, bury just under the surface and keep it watered. You are more than likely to become one of us unselfish souls who believe they are redeeming our children by leading them into the practice of useful effort and making their minds susceptible of ideals and sweet sentiment.

Does not that appeal to the best streak in you? Get further information from reading THE IRRIGATION AGE, or write to the president of Monterey Tree Growing Club of America, Monterey, Cal.

The Terrace Reservoir in the San Luis Valley, Colorado.

W. A. Anderson.

In the southwestern portion of the San Luis valley a great feat of hydraulic engineering is being undertaken in the construction of the Terrace reservoir. The enterprise will mean the reclamation of more than twenty thousand acres which are now virgin soil.

The reservoir is situated in the foothills about twenty-five miles southwest of Monte Vista and some eighteen miles west of Alamosa. The water is taken from the Alamosa river, or more correctly the basin is to impound the flood waters of that stream and use it for irrigation purposes. Some idea of the magnitude

of the enterprise can be had from the fact that before the dam is completed the enterprise will have cost \$650,000, about half of which has already been expended. The dam itself is to be the largest hydraulic filled dam in the world, so far as is known. When completed it will have a height of two hundred and twelve feet (or more exactly, two hundred and eleven and six tenths feet). When work was stopped in the fall of 1907 about one hundred and fifteen feet had been filled. The



View of the Gunbarrel Road from the Hotel Grand, Monte Vista.

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To return to the reservoir. Water for the hydraulic power is brought a distance of nine miles down the river, and it is not difficult to imagine the immense power which it has when it is poured through the monitor heads. This power ditch alone cost the company some \$75,000 for construction. The water directed from the monitor heads washes down the gravel and soil of the surrounding hills and directs them into a sluice whence they are forced onto the dam.

Near what will be the center of the dam when it



Dam of Terrace Reservoir When Work Was Stopped for the Winter in the Fall of 1907.

fill is being made in a deep gorge cut by the Alamosa river. In order to utilize this gorge it was necessary before any filling was done to change the course of the river. This was done by cutting a tunnel through three hundred yards of the solid rock forming the northwest wall of the gorge. In this tunnel are placed the valves which are to control the flow of water from the reservoir, for it is through the tunnel that the waters of the reservoir are to be handled. When the water has passed through the tunnel it is diverted back to the main bed of the stream and is not taken into an irriga-

tion canal until it has reached a point some miles below the reservoir. It is there that the headgates of the main ditch are located. While the headgates are well away from the foothills, the country along the main ditch is rolling for many years and has necessitated the construction of several costly flumes. Last fall the company completed negotiations for the purchase of practically all the water rights along the Alamosa river at a price of \$50,000. Thus the company has practically no priorities to fear should a scarcity of water ever occur.

is completed is a great cement core, which is set down to the solid rock on each side of the gorge. This core cost \$30,000 and when the dam is filled it will be totally covered. It is estimated that when the reservoir is completed and filled to its full capacity of 33,000 acre feet of water it will be a great lake extending back a distance of seven miles. It has been suggested, and is well within the range of possibilities, that some day on the banks of the lake formed by the impounding of the flood waters of the Alamosa, a summer resort may be located. No more picturesque or beautiful

site could be found for such a purpose. The Terrace Reservoir company is incorporated under the laws of Colorado and has headquarters at Colorado Springs. The active management in the valley is in the hands of Mr. W. O. Meier of Alamosa, W. A. Braiden of La Jara and Mr. J. Lahroy Slusher of Monte Vista.

In the hope of increasing the yield and the quality of field peas grown in the Sas Luis valley Prof. W. H. Olin, head of the department of agronomy of the State Agricultural school at Fort Collins, started in 1906 a competition among the boys and girls of the valley. The present average yield of the peas per acre is

points; Elias Gibson, of Manassa, third, with 3,989; Menlo Thomas, of Monte Vista, fourth, with 3,275; and Libbie Smith, of Manassa, fifth, with 3,271. This contest will be continued for three years, and at the end of that time the young woman or young man having the best three-year average will be awarded a gold medal costing not less than \$50.

The value of this work in breeding and improving the field pea can easily be seen in calculating the improvement possible. The yearly acreage of peas in the San Luis valley is approximately 100,000. The average yield of $22\frac{1}{2}$ bushels an acre, or a total of



Showing Monitor Heads and Excavations for Filling of Dam.

twenty-two and a half bushels, and Professor Olin feels that it should be at least thirty-five bushels. In the spring of 1907 he sent out selected seed for one hundred hills to each of the two hundred young people interested in the competition. Instructions were given to plant three feet apart each way, giving plenty of room for sun and air and note-taking during the growing period. When the plants had matured, the best one was taken by each competitor, dried in a shed and then expressed to Professor Olin at Alamosa, where the judging took place. The communities around Alamosa, La Jara, Manassa and Romeo subscribed fifty

2,250,000 bushels, is worth three cents a pound, or \$4,050,000. A gain of $12\frac{1}{2}$ bushels an acre will be worth \$2,250,000. This amount of money produced in the valley yearly in excess would mean much to the people.

There are few sections of the country where the laying out of roads has been so well and carefully planned as in the San Luis. As closely as possible the roads are made to comply with the section lines. Of course this is difficult in the foothills and near the rivers. The roads are practically all built to run directly to the points of the compass. The longest



Cement Core of the Terrace Reservoir.

dollars to a fund which was divided into four prizes of twenty, fifteen, ten and five dollars. The number of points was made up as follows: Weight of grain, 100 points given for each ounce; number of pods, 3 points given for each pod; number of peas, 1 point given for each pea; average number of peas, 100 points for each pea in average number; number of peas per ounce, 5 points given for each pea up to 70 per ounce.

The winner of the 1907 competition was Miss Hannah Heersink, of Alamosa, with a total of 8,240 points; her brother, Adolph, was second, with 4,659

road is what is known locally as the "Gunbarrel." For a distance of nearly eighty miles north and south without a turn. At the correction lines, twelve miles north and south of Monte Vista respectively, it is thrown off a few feet, but otherwise it is an absolutely straight road from Saguache to the New Mexico border line. "Straight as a gunbarrel," it is said to be, hence its name. North of the Rio Grande river in the more thickly populated farming district other roads lead at right angles to the east and to the west at every section line.



CORRESPONDENCE



Editor IRRIGATION AGE,
Chicago, Ill.

DEAR SIR:

The town of Grandfalls is located in one of the richest and most fertile spots of the Pecos valley, of Texas. The lands are a light sandy loam and when brought under irrigation and cultivation produce almost phenomenal crops of all kinds of products indigenous to this climate. The population of the town and surrounding community will aggregate about one thousand. The town has two general stores, one family grocery store, one drug store, one hotel, one blacksmith shop, one lumber yard, one barber shop, one restaurant, one livery barn, two meat markets, a telephone line and the canal office. There is a splendid two-story school house, the upper story of which is used by the Masonic lodge. A splendid school that necessitates three teachers runs for nine months in the year. At present local option is in force and in about a month a vote will be taken to place the county under the action of the prohibition law, which no doubt will be carried by a large majority. There are five religious denominations represented in the town, the Methodist, Baptist, Presbyterian, Christian or Disciples, and the Catholic. All denominations except the Catholic worship in the school house, thus giving services every Sunday. People of a higher moral and religious character cannot be found.

The canals that supply water for irrigation purposes aggregate over one hundred miles in main line and laterals. The main line is thirty feet wide and about five feet in depth, the laterals are about one-third the carrying capacity of the main line, forming one of the best and most thoroughly equipped systems in use on the Pecos river. The head of

the week. There is a new town springing up on the railroad ten miles from Monahans and to the west, from which we are soon to have an automobile line that is to make two trips a day each way. Many people are coming into this section, being attracted here by the cheap lands that are being sold by the state, but none of these lands come under any of the canal systems. What we need and what we want is men who have means sufficient to purchase forty or eighty acres of land and build up homes where they can enjoy the fruits of labor and live to a good ripe old age in this land where malarial troubles are unknown. The canal system is owned and operated by the people who possess the lands, and when one buys a home he also becomes a stockholder in the company. It is known as the Mutual Irrigation Association, the president being Jno. T. Sweatt, the secretary and treasurer, J. Decker.

S. H. PARKER.

Grandfalls, Texas, Feb. 17, 1908.

Buffalo, Wyo., Feb. 17, 1908.

Editor IRRIGATION AGE,
Chicago, Ill.

DEAR SIR:

I want to express my appreciation of your last number, and particularly of what you had to say on the leasing question. There are bound to be differences of opinion on questions of this kind, according to the point of view from which the question is considered, but the rule of "the greatest good to the greatest number" must ultimately determine the question.

The industries affected are so extensive and important, and the welfare of so many people is concerned that hasty legislation should be avoided. The west has prospered, and the great majority of its people, both new settlers and old timers, have profited by this prosperity; then why not let well enough alone, at least until some measure can be proposed less likely to invite disaster than anything thus far



Sluice Way and Hydraulic Pipe Line of Terrace Reservoir.

the main line is about thirteen miles above the town and empties back into the river seven miles below the town. The elevation of the country is about twenty-six hundred feet, making this one of the most ideal climates in the south-west, for all kinds of pulmonary and bronchial troubles. The products of the soil are alfalfa, maize, oats, barley, cotton and fruits, such as the peach, pear, apple and all varieties of California grapes. Alfalfa produces five and six crops per year, of a ton to a ton and a half per acre each cutting. Peaches pay an annual profit of one hundred to one hundred and fifty dollars an acre. Grapes pay a net profit of one hundred dollars and more per acre. Cotton produces from three-fourths to a bale and more per acre each year, and it has been recently discovered that the long staple varieties will grow in this climate to a most perfect maturity, and it rarely ever sells below 25 cents per pound. Alfalfa rarely ever sells below \$10 a ton, and at this writing it is worth \$16, with none in the market for sale.

The lands under the irrigating system can be bought for \$40 to \$75 an acre. The growth on the lands is mesquite, that costs about \$5 an acre to be grubbed off, the wood being worth the money. Land taken in the rough and prepared and seeded to alfalfa will aggregate an outlay of about \$55 an acre and every year thereafter one can safely count on a net income of \$50 for each acre that he has. The town is eighteen miles from the T. & P. Ry, and Monahans is the nearest point. We have a daily mail line for six days in

offered. Laws are supposed to aid and encourage those industries best adapted to the country, to the end that all its resources may be utilized to the fullest extent, and the greatest number of people be benefited thereby. The sheep and wool industry is pre-eminently the industry of the arid regions. It has probably produced more wealth, three times over, than the cattle business ever did, even when cattlemen held undisputed possession of the range. Cattle have ever been an easy prey to wild animals and a temptation to thieves, and the seeming and uncertain profits to their owners have been swept away by hard winters.

Sheep, on the other hand, are always under the watchful care of herders. In the early spring they are guided to the mountains, and the lambs, almost from birth to maturity, are developed and fattened on the grasses and herbage of the parks and slopes, vegetation for the most part inaccessible to other stock, and which would otherwise go to waste (and by the way, thousands of dollars have gone to waste in the forest reserves from which sheep have been needlessly excluded). As winter approaches the sheep are guided to the plains, the wether lambs and surplus stock are shipped to market and the remainder are held to graze on the distant divides, where, if the winter is favorable, the scattering snow drifts take the place of water, and enable them to thrive on the natural cured grasses till the spring storms come, when the owners drive them to distant valleys, where hay has been

(Continued on page 152)

ADDRESS OF SENATOR CLARK OF WYOMING.

Before the Public Land Convention Held at Denver, Colo.,
June, 1907.

It had not been my purpose or desire to take part in any of the deliberations of this convention. To say that I have felt a deep and a continued, aye, an almost painful interest in the results of the deliberations would not be to overstate my position, because I believe as firmly as I believe that the sun will rise in the heavens tomorrow, that upon the result of the deliberations of this convention shall depend the well-being of this inter-mountain country that we all love. (Applause.) As I look over this assembly I realize that it is an assembly composed of representative men; I realize that it is composed of honest men; I realize that it is composed of men who have one thing upon their hearts, and that is to do the best for themselves, their homes, their firesides and their state. (Applause.)

Now, Mr. Chairman, as I listened to and admired the splendid presentation of the plans given by our splendid Secretary of the Interior (applause), he almost made me forget present conditions.

It is not strange, Mr. Secretary, it is not strange, gentlemen of the convention, for it is the duty of any man charged with the responsibilities of that position, that he should study all these questions carefully and at close range. I believe that the young enthusiasm and the splendid patriotism of the splendid Secretary of the Interior will give better results than we have up to this present time attained. (Applause.) But it is not given to any man to have the supreme wisdom of all men. I yield to no man in my admiration of the splendid personality and the heaven-born patriotism of our great President, Theodore Roosevelt (applause), but it is no disrespect to him, and it would be a humiliation to me, if I should blindly follow where he or anybody else may lead without stopping to think of the possible consequences to myself and my family. (Applause.)

I think few of us, perhaps, realize the difficulties that the Secretary of the Interior has in dealing with his great department. I knew it was a great department; I knew it was the most tremendous force in the executive part of our government, but I did not dream until I was told by him last evening or yesterday that the expenditures of the Interior Department in one year now are three times the total expenditures of the whole government of the United States in 1861.

Now, Mr. President and gentlemen of the convention, it is not strange that in a machine of that magnitude some present information ought to be supplied from these quarters.

I do not believe—and I say this frankly—that it is within the province of the executive departments, Interior or otherwise, to formulate plans to govern your business and mine or your homes and mine in Colorado and Wyoming. (Applause.) I do not agree with my friend Pinchot when he said this morning that the time is surely coming when there will be government control of the ranges of the West. (Applause.) I want to say to Mr. Pinchot here and now, as I have said to him before, that he is landlord now over every acre of public land that he will ever be landlord over, if the people of these western states are to have any-

thing to say in the solution of this problem. (Great applause and cheers.)

Why, gentlemen of the convention, do we know what we are up against? We have been told by the President of the United States today in a letter that there is now and has been no idea of making commercial propositions out of this public domain. We have been told by the President of the United States in a letter that there has never been any idea of selling water from these reserves for irrigation purposes. I respectfully challenge that statement, and I do it from the record. (Producing a copy of the Congressional Record.) This is a publication that is issued by governmental authority, not much sought after, not much read, but convenient on occasion. (Laughter.) On February 18, 1907, there was some discussion in the Congress of the United States in regard to the forest reserves and their administration. At that time, as usual, Brother Pinchot, there was a bit of mild criticism (laughter), particularly as to the expense of operating these government reserves. Quite naturally, every bureau of the government wishes to conduct its operations at as little expense as possible to the general public. The government of the United States, instead of being a spendthrift, is one of the most closely carried on business concerns that I have ever had anything to do with, and I think Brother Pinchot finds it so himself. But in showing to the United States Congress what could be accomplished with these one hundred and twenty-seven million acres of land that at that time were in forest reserves, an estimate was made as to its value and as to what it would produce. It does not say in the Record that the Department of the Interior or the forester of the United States furnished this computation. I believe it was furnished by Mr. Pinchot's office. If I am mistaken, I will be glad to be corrected.

Now, it appeared that this statement was furnished by Mr. Pinchot and presented by Mr. Flint. It appeared that in the year 1906 the receipts from the forest reserves, as estimated, were \$252,527; that from grazing fees, \$514,692; total, \$767,219. That was all used or proposed to be used in the administration of the reserves. In fact, I believe that until last winter there was no account made, no general account—am I right?—no general account made to any specific fund in the treasury of the United States from the receipts for forest reserves.

Mr. Pinchott: You are mistaken, Senator; there was, but not to Congress, except in the general report of the Secretary.

Senator Clark: And am I further correct in the idea that Congress had nothing whatever to do with the expenditure of that fund when it was put into the treasury?

Mr. Pinchott: Shall I explain that?

Senator Clark: Why, yes.

Mr. Pinchot: Until last year all the money that was returned from the National forests was appropriated by a continuing appropriation of Congress in a special fund in the Treasury Department available for the expenses of the service.

Senator Clark: Subject to control and draft of the forestry bureau?

Mr. Pinchot: Of the Secretary of Agriculture.

Senator Clark: Now, having control of what might be an immense fund, having control of a mag-

nificent commonwealth of land, it was magnificent to make some showing as to the value of that land, as to the funds that might reasonably be expected to arise from its administration; so the honorable forester proceeds to capitalize the proposition. And this is from the record presented by Senator Flint of California, who was at that time presenting in a favorable manner the needs and the wants and purposes of the forestry bureau. So I say I can assume, I think, and that it will not be a violent assumption, that this tabulation was made by that bureau.

The report reads:

PRESENT CAPITALIZED VALUE OF THE FOREST RESERVES
(127,078,658 ACRES, NOVEMBER 27, 1906.)

1. Stumpage value of 330,000,000 feet of timber, at \$2 per M.....	\$ 660,000,000
2. 110,000,000 acres, capable of producing commercial forest, at \$1 per acre.....	110,000,000
3. 110,000,000 acres of range for grazing live stock, at 1½ cents per acre (capitalized at 5 per cent.).....	30,000,000
4. 83,000,000 acre-feet of water for irrigation purposes, at 10 cents per acre-foot (capitalized at 5 per cent.).....	166,000,000
5. 3,000,000 horsepower, capable of being developed from water in reserves, at \$10 per horsepower (capitalized at 5 per cent.).....	600,000,000
6. Estimated value of occupancy and use of reserve land, products, and resources additional to the above..	5,000,000
7. Permanent improvements now on the reserves (roads, trails, cabins, telephones, etc.).....	5,000,000
Total.....	\$1,576,000,000
Less 10 per cent. for private holdings...	157,600,000
	<hr/> \$1,418,400,000

If that first item doesn't mean that there is a commercial asset that could be capitalized and pay five per cent. on the investment, what under heaven's name does it mean?

Now, in view of the statement that has been made here today, and at other times during this Convention, that there never had been a purpose to interfere with or to sell the irrigating waters from these forest reserves, I want to read to you the fourth part of this estimate:

"Fourth. Eighty-three million acre-feet of water for irrigation purposes, at ten cents per acre-foot, capitalized at five per cent, \$166,000,000."

What does the forestry service capitalize it for unless they wish to derive revenue from it? Did the forestry service, when they presented that report to Congress, have the intention they express now—to impound the irrigating waters of these sovereign states that occur upon these forest reservations?

Now, we will go a little further:

"Three billion horsepower, capable of being developed from water in reserves, at \$10 per horsepower, capitalized at five per cent, six hundred million dollars."

And they are right at your doors and mine.

Mr. De Ricqlès (Colorado): Don't you think it would be a very good thing for the Government to take care of all that property for its people?

Senator Clark: I am glad you asked the question. I do not believe it is a good policy for this republican form of Government to interfere in any way with the free exercise of my rights in my home, in my business relations or in my private affairs, as long as I keep the law. (Applause.) Undoubtedly this great Government could put riches into its coffers; undoubtedly this great Government could husband its resources, Dr. Wilson, and keep them from you and me. The Government itself might wax and grow fat, but it would soon cease to be republican. (Applause.)

But perhaps you think I talk as though I were opposed to forest reserves. I am not opposed to forest reserves; I am in favor of forest reserves administered as forest reserves. (Applause.) And the Congress of the United States, in 1891, never intended to intrust any executive power with the tremendous authority that seems to be incorporated in this statement from the bureau. It intended to do what every reasonable man at that time thought it intended to do, and that was to protect the forests at the headwaters of our streams and conserve our water supply. Far has it wandered from its original conception. If the present policy is continued, if there is no halt called upon it, under the splendid guidance of Gifford Pinchot in that direction, it will reach its scientific result, and when these one hundred and twenty-seven million acres are all administered in a scientific way, it will require an army of more than a hundred thousand Federal officials to administer it. That is not my statement; it is the statement of a gentleman who today stands at the head of that service. I honor him for his enthusiasm; I honor him for trying to build up in the best possible way this great enterprise with which he has been entrusted; but I warn the people of my own state and the people of the whole Rocky mountain region of the road they may have to travel.

Now, Mr. President, it has been urged in letters, it has been urged from this platform, that all the present policies of the administration are in favor of the small holder. It seems strange that men holding views so diametrically opposite to each other should each think they are walking along the same road. But theory is one thing, practice and results are another. (Applause.) I say without fear of successful contradiction in a practical way that the creation of land into forest reserves destroys it as a place for homes. (Applause.)

It is said that the law provides that the lands shall be open for homestead entry. I want to know how many homestead entries have been made under this one hundred and fifty million acres of land within the last twelve months. The trials and difficulties from start to finish that a homesteader is up against are something that discourage him from the very start. In the first place, instead of having one department of the Government to deal with, he has two, as I understand it. Instead of being allowed to select land which he believes will furnish the foundation for a farm, he has got to select land that some other man tells him is fit for agriculture.

(Continued in April Issue.)

provided or purchased to tide them over till the time of green grass. Sheep are frequently driven fifty and seventy-five miles to feeding places, thus making a market for the farmer's hay and grain, which, before the time of the sheep man, frequently rotted in the stack. The demand for hay and grain has thus become so great that sheep men have become the chief promoters of irrigation and reclamation schemes and are seeking to establish settlers to satisfy this want. Talk about leasing and fencing laws in aid of the stock interests! You might as well talk about leasing and fencing the navigable streams and waterways of the country as an aid to navigation and commerce. We want none of it!

We believe in forestry and the conservation and utilization of natural resources to the fullest extent, but we do not believe in raising a 50 cent tree at a cost, direct and indirect, of \$5.00 or more.

The Big Horn Forest Reserve, which lies along the west border of Johnson and Sheridan counties, in Wyoming, comprises 1,151,680 acres, or an area of about 75 miles long by 25 miles wide. The town of Buffalo is situated close to this reserve, yet notwithstanding this fact and the further fact that we are 35 miles distant from the nearest railroad station, the citizens of this town and the settlers of the surrounding country draw their lumber supplies largely from the Pacific coast.

Our lath, our shingles, our flooring, siding, finishing, and much of our dimension lumber, is imported. Even fence posts from the west are beginning to be extensively used by the farmers for fencing their lands. The native trees are so stunted, knotty and cross grained that the lumber made from them can only be used for the most ordinary purposes. These are facts which cannot be denied and which should not be overlooked when the expense and sacrifice necessary for the maintenance of the reserve is considered. E. D. METCALF.

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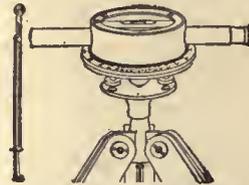
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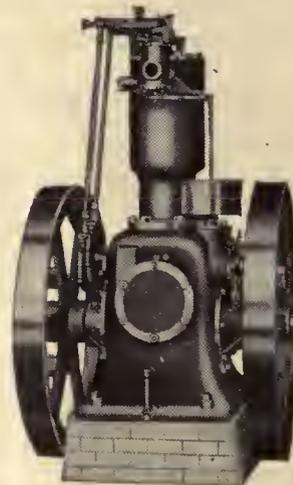


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February in the Culinary Calendar.

Candlemas-day.—February 2, although the 2d of February, is the date of the festival of the Purification of the Virgin, it is more popularly known as Candlemas-day, owing to the fact that it is at this time that the candles are blessed by the clergy of the Roman Catholic church. In France the day is sacred to the Candlemas pancake, a delicacy that is made as follows:

Put two ounces of butter in a saucepan, with two teaspoonfuls of sugar, the grated rind of one lemon, and a little less than a teacupful of water. Boil for ten minutes; then add five ounces of sifted flour, and stir vigorously. When the mixture has become smooth, add five eggs—not all together, but breaking them into the batter one at a time, with a thorough stirring after each egg has been added. Roll the dough very thin; cut in circular shape; put some fruit jam or jelly between two of the rounds; press them together around the edges, and fry them in deep fat. Serve them hot, sprinkling with powdered sugar.

St. Valentine's Day.—February 14—The celebration of Valentine's day, which, in this country, is now chiefly observed by the interchange of sentimental or jocular communications called "valentines," means a great deal more to the young people in many parts of England. There, instead of exchanging anonymous epistles, the lads and lassies of the neighborhood meet to enjoy a more or less elaborate dinner. At the close of this feast, the large heart-shaped cake that has graced the center of the table is cut, but is served to the bachelors alone, for while it in every way resembles an ordinary cake, it has been so constructed that each slice is found to contain a small wad of paper, which, upon being unfolded, discloses the name of one of the young women present at the board. In this manner each youth is provided with a partner,

for it is his duty to seek out the maiden whose name he has drawn in this novel lottery, that he may be her "valentine." Accordingly, he is assiduous in his attentions during the remainder of the evening.



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Supreme Court Decisions

Irrigation Cases

ABANDONMENT OF WATER RIGHT.—

That a water right reserved in the conveyance of a railway right of way has not been used for several years does not show that it has been extinguished or abandoned.

Norfolk & W. Ry Co. v. Obenshain. Supreme Court of Appeals of Virginia, 59 Southeastern 604.

DEFENSE TO CHANGE IN POINT OF DIVERSION.—

In a proceeding to change the point of diversion of water from an irrigation ditch, it is no defense that consumers in another district, who are not parties to the proceeding, would be injured by the change.

Lower Latham Ditch Co. v. Bijou Irrigation Co. Supreme Court of Colorado, 93 Pacific 483.

IRRIGATION LINES.—

Where plaintiff's grantors entered upon land under an invalid deed, and maintained a water course over a part thereof openly, continuously, and with defendant's knowledge for more than five years, the burden is on defendant, in order to establish her exclusive title thereto, to show that plaintiff's user was by permission, or otherwise explain it.

Knight v. Cohen. Court of Appeal, 2d Dist. California, 93 Pacific 396.

CHANGE IN PLACE OF DIVERSION.—

Sess. Laws 1899, p. 235, c. 105, relating to irrigation, provides for changes of the point of diversion where an adjudication of relative priorities has been had under the statutes enacted for that purpose, but does not contemplate the determination of the question of abandonment, and the presumption is that such rights continue in existence until a court of competent jurisdiction in an appropriate proceeding has otherwise determined.

Lower Latham Ditch Co. v. Bijou Irrigation Co. Supreme Court of Colorado, 93 Pacific 483.

RIGHTS OF USERS OF WATER.—

Where a water company, bound to supply water to land as an easement appurtenant thereto, sought to transfer its system, subject to the rights of the owners of the land as consumers and users of the water, and the transferee sought to purchase, subject to the rights of the owners which it would protect, an owner of such land could not maintain a suit to restrain the transfer on the ground that by it he would be deprived of his rights.

Graham v. Pasadena Land & Water Co. Supreme Court of California, 93 Pacific 498.

RESERVATION OF IRRIGATION RIGHTS IN CESSION TO THE UNITED STATES.—

The reservation of the waters of Milk river for irrigation purposes, implied in favor of the Indians on the Fort Belknap reservation from the agreement of May 1, 1888, in which the Indians ceded to the United States all their lands except a small tract set apart as such reservation, was not repealed by the admission of Montana into the Union by the act of February 22, 1889, on an equal footing with the original states.

Henry winters et al. v. United States. Supreme Court of the United States, 28 Sup. Ct. Rep. 207.

PERFORMANCE OF IRRIGATION CONTRACT.—

Under a contract whereby defendant was to furnish sufficient water for plaintiff's rice crop, but exempting him from liability should there be insufficient water, provided a reasonable effort was made to procure the same, and providing that defendant should be the judge of the water conditions necessary for the crop, if defendant used his best judgment as to the amount of water to be supplied, he was not liable for a breach, though his judgment may have been at fault.

Kelly v. Corrington. Court of Civil Appeals of Texas, 105 Southwestern 1155.

WATER RIGHTS.—

A corporation owning a water supply for land conveyed the land to a purchaser, and subsequently transferred the supply with its water system to a third person. The by-laws of the corporation provided that the water should be supplied to the land to be used thereon. Held, that the right to receive water for the land was an easement appurtenant thereto within Civ. Code, Secs. 552, 801, defining the rights of purchasers to use water for irrigation, etc.

Graham v. Pasadena Land & Water Co. Supreme Court of California, 93 Pacific 498.

CONSTRUCTION OF IRRIGATION CONTRACT.—

Under an agreement by which defendant sold to plaintiffs a perpetual right to use a certain amount of water from defendant's irrigation system, and plaintiffs were to have the right to raise such part of the amount of water conveyed by pump or otherwise as they might desire for the purpose of irrigating part of their land lying above the grade of defendant's main canal, plaintiffs were not entitled to water from the ditch of another company in which defendant was a stockholder for the purpose of irrigating that part of their land.

Lanham v. Wenatchee Canal Co. Supreme Court of Washington, 93 Pacific 522.

PRIORITY FOR DIRECT IRRIGATION.—

A priority to the use of water is a property right, which is the subject of purchase and sale, and in its character and method of use may be changed, provided such change does not injuriously affect the rights of others. The owner of a priority for direct irrigation is entitled to store, during the direct irrigation season, the quantity of water, measured by volume and time, which it would be entitled to divert during that period for the purpose of direct irrigation, and to use the same later in the same season for irrigating crops requiring irrigation at that time, when the direct supply would be insufficient.

Seven Lakes Reservoir Co. v. New Loveland & Greeley Irrigation & Land Co. Supreme Court of Colorado, 93 Pacific 485.

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That is the reason (there can be no other) they have earned the approval of the farmers.

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It means that, of the numberless types of harvesting machines put out in the years past, these embody the ideas that have been most successful in actual work.

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Today these machines are more popular than ever.

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In order that these machines shall continue to be the best, the International Harvester Company pays more than \$350,000 a year to more than two hundred men in its Department of Improvements.

By working together the manufacturers are able to erect and maintain Experimental Shops and Laboratories to work out every principle and detail of harvesting machines, which would be far too costly for any one single manufacturer working alone.

Thus this company is able to discover and devise better methods of operation, better principles of construction so as to make these machines more efficient, more easily operated—better for you and better for your pocketbook.

This company and the interests it represents have spent many millions for improvements, and no single manufacturer working independently could afford to pay even a fraction of the sum this company pays for the greatest inventive genius and the highest mechanical skill necessary to produce the most improved harvesting machines.

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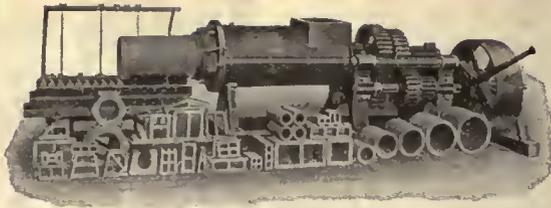
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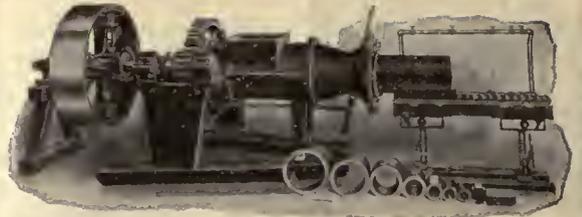
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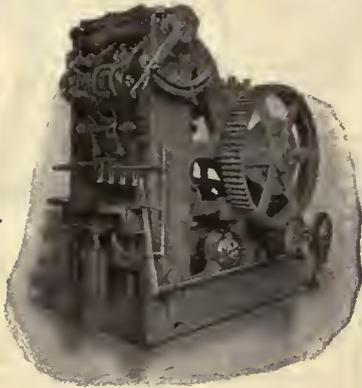
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Centennial Auger Machine



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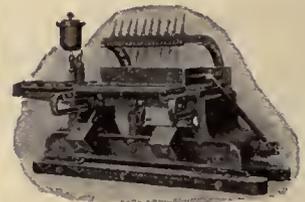
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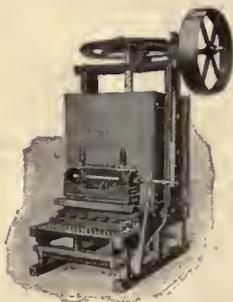
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We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

The American Clay Mch. Co...Bucyrus, Ohio



Hand and Power Cutters



Soft Mud Machines, Horse and Steam Power



Disintegrators



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Products of our Auger Machines

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In each town to ride and exhibit sample Bicycle. Write for special offer. We Ship on Approval without a cent deposit, allow 10 DAYS FREE TRIAL and prepay freight on every bicycle. **FACTORY PRICES** on bicycles, tires and sundries. Do not buy until you receive our catalogs and learn our unheard of prices and marvelous special offer.



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The
**GREAT AMERICAN
DESERT is so
DISAPPEARING**

THE great ranges are fast being taken up by individual settlers, and thousands of prosperous farmers are taking the place of the few cattle kings that were monarchs of the ranges a score of years ago.

It is the story of the magic touch of water upon the dry land.

I. H. C. Gasoline Engines in Irrigation Enterprises.

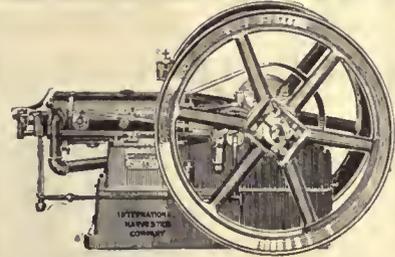
If you have not kept yourself posted on irrigating matters, you will be surprised at the important part I. H. C. gasoline engines are taking in the reclamation of these waste lands.

Hundreds of settlers and farmers have no other means of getting water upon their lands than these engines.

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They find that with an I. H. C. engine they can get water in large quantities upon their land, and that they can get it dependably and economically. They find the I. H. C. engine method of pumping more direct, more profitable and more satisfactory than any other means heretofore employed.

I. H. C. gasoline engines are simple, dependable and powerful. They pump water economically, and you will find that they run with very little attention.

If you have an irrigation problem it will pay you to investigate and see what an I. H. C. gasoline engine will do for you.

Vertical engines in 2 and 3-Horse Power. Horizontal engines (Portable and Stationary) in 4, 6, 8, 10, 12, 15 and 20-Horse Power.

Also, gasoline traction engines, pumping, sawing and spraying outfits.

Call on the International local agent, or write the nearest branch house for catalog and colored hanger.

DOUBLE POWER

\$1,000 Reward

for its equal. Wind power doubled. Two 14 ft. wheels work on same pinion; second wheel gives more power than first.

A Governor That Governs
in all winds. Develops 10 full h. p. in 20 mile wind. All power needed for farm, shop, irrigating, etc. Ask about our self-oiling, self-governed, single wheel pump—also Armaveaver Husker. Ask for book **DOUBLE POWER MILL CO. Appleton, Wis., U. S. A.**



Cows' Relief is a specific Remedy for all troubles of bag and teats. It enables dairymen, farmers and other cow owners to keep their cows in a healthy and profitable condition.

Cows' Relief is one of the most perfectly penetrating and disinfecting compounds in existence. It goes directly to the seat of the trouble, relieves the congestion and breaks up the bunches that prevent a natural flow of milk.

FOR CAKED BAG

Twelve to twenty-four hours' time is all that is required to relieve any case of Caked Bag, if applied freely at the beginning of the trouble.

For heifers with first calf Cows' Relief works in a most pleasing, prompt and successful manner. It relieves the soreness and swelling in the bag and is worth its weight in gold to every dairyman. It keeps the teats soft and flexible, and renders the animal quiet and docile.

H. C. Rice, Farmington, Conn., says: "Please send me two boxes of Cows' Relief. Enclosed find check for same. Please send at once. I wouldn't be without it in my stable."

L. F. Cuthbert, Hammond, N. Y., says: "I have used your Cows' Relief and find it a very valuable remedy for Caked Bag."

We have scores of testimonials like the above. Ask your dealer for Cows' Relief and insist on having the genuine. If he cannot supply you write direct to us, enclosing \$1 for large package prepaid, (enough for four or five ordinary cases). Your money back if you are not satisfied. Positive guarantee on every package. Or send your name and one neighbor's who keeps cows, stating how many you each have, and we will send our book concerning "Cow Troubles," also Goldine Cow Watch Charm FREE while they last.

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The Mecca**

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passed in picturesque grandeur; its climate has no parallel
and its wealth is unlimited.

**The Colorado & Southern
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will furnish those seeking data regard-
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Mother Grundy, Far-famed George-
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Dry Cement Buildings

ABSOLUTELY MOISTURE AND FROST PROOF



This is what you get when you build your buildings from blocks made on **THE SIMPLEX MACHINE**.

It makes a two piece or hollow wall, any thickness desired for cottage, church or factory building.

All blocks made with face down, and length to 24 inches. Will also make hollow blocks if so desired. **THE SIMPLEX** can be operated by one man or more.

It is light, strong and the most rapid machine on the market. **THE PRICE IS RIGHT.** Send for Catalogue D.

SIMPLEX MANUFACTURING CO.
124 W. Cortland Street, JACKSON MICH.

Galvanized Steel Irrigation Flumes AND WATER TROUGHS



Galvanized steel is rapidly taking the place of wood for fluming purposes and with The Maginnis Patent splice fluming is made easy. Any boy can put the Maginnis Steel Flume together or take it apart. Steel flumes and troughs "Ship Knock down" Third Class freight. Let me figure on your flume. All flumes guaranteed.

Write for Testimonials and Particulars of

P. Maginnis, Mfr.
Kimball, Nebraska

FAVORITE CEMENT BRICK MACHINE With Mechanical Tamper

DURABLE - PRACTICAL - ADJUSTABLE
HIGH GRADE

Normandin Concrete Block Machine—unexcelled

CONCRETE MACHINERY Very Strong

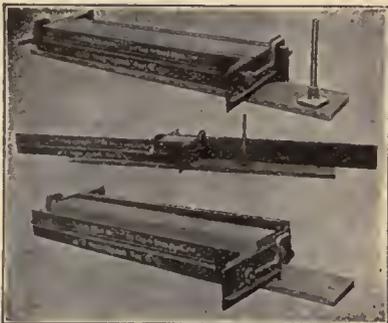
This is it.

A PROFITABLE BUSINESS

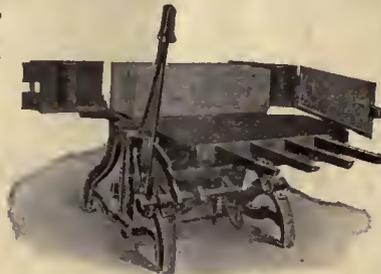
The Modern Method of Construction for Residences and Public Buildings is with Concrete Blocks and Brick

We have the largest line of Concrete Machinery in the world. Ask for information regarding our DRAIN TILE MOLDS, our SOLID CONCRETE PRODUCT MOLD for retaining walls, our CONCRETE BLOCK AND BRICK MACHINES, ALSO CEMENT POST MACHINES.

Wolverine Cement Drain Tile Molds



Practical Sill, Cap, Block and Step Mold



Normandin Concrete Block Machine

Our SYSTEMATIC MIXER has no equal. Our machines adopted twice by the United States Government. 3 Gold Medals St. Louis and Portland. Write for Catalog R.



Systematic Concrete Mixer

DON'T DODGE PROSPERITY

BIG PROFITS OUR MACHINES DO IT ALL INVESTIGATE

CEMENT MACHINERY COMPANY
JACKSON MICH. U.S.A.

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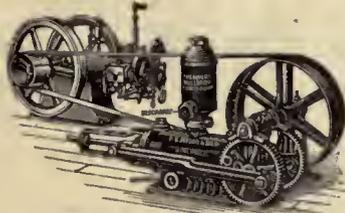
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CONCRETE MIXERS, CEMENT TILE MOLDS.

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MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

MYERS
BACK GEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

5, 7½ AND 10"
STROKE

FOR BELT,
WIND OR HAND
POWER

FIG. 1113



2½" DISCHARGE

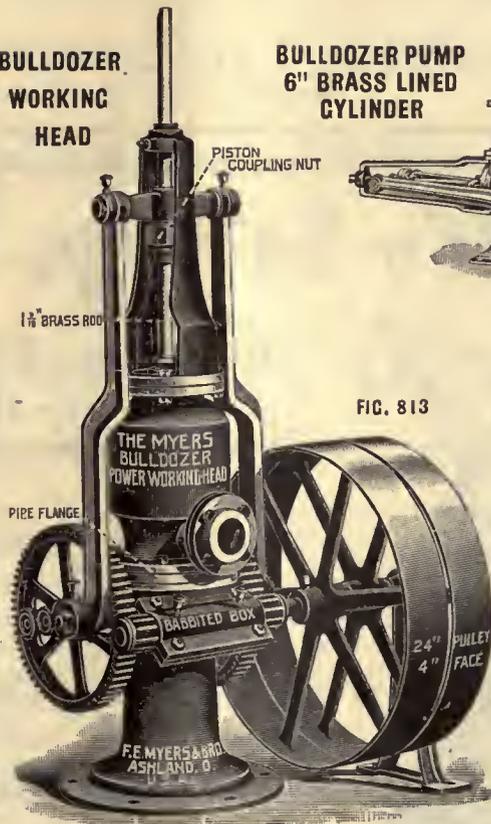
BULLDOZER
WORKING
HEAD

1½" BRASS ROD

PIPE FLANGE

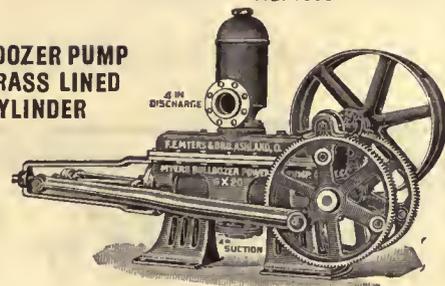
PISTON
COUPLING NUT

FIG. 813



BULLDOZER PUMP
6" BRASS LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

NO. 359

5", 7½", 10" STROKE
DISCHARGE 2½" OR 3"
SUCTION 2" TO 4"

NO. 364

12", 16", 20" STROKE
REGULARLY FITTED 4"
DISCHARGE
SUCTION 8" OR LESS

Write for descriptive Circulars and Prices. We want you to acknowledge this Ad. so that we can acquaint you in detail with the superior features of Myers Power Pumps. This is the proper season. The right time to write is right now.

F. E. MYERS & BRO., ASHLAND, OHIO, U. S. A.
PROPRIETORS OF
ASHLAND PUMP AND HAY TOOL WORKS

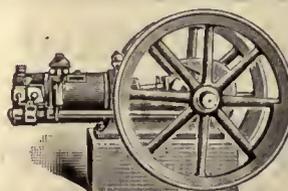
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CEMENT PIPE TOOLS



Do you want to make money? Here is your chance. Get a set or two of our pipe tools, make up a stock of pipe and do contracting of installing irrigating systems. Your neighbors are wanting something to save water and labor. Here it is. Write for further information and prices. Mention the Irrigation Age. **KELLAR & THOMASON, Covina, California.**

GOLD MEDAL AT JAMESTOWN



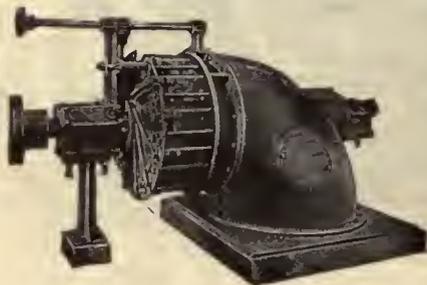
The U. S. Government paid this Company a big compliment when it selected the "OTTO" Engine for use in making the fuel tests at the Jamestown Exposition.

The Jury of Awards also proved its fitness for its task when it AWARDED the "OTTO" the Gold Medal.

The "OTTO" has won FIRST PRIZE at every large Exposition held in this country since the Centennial in '76.

THE OTTO GAS ENGINE WORKS

Philadelphia, Pa.



SAMSON TURBINE

When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

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It Makes You Save A Coin A Day or the Clock Stops

Patent No. 775058

This is a novel combination of an alarm clock and savings bank, provided with a coin chute, also automatic locking and unlocking mechanism. The clock in its normal condition is locked, and cannot be wound until a coin is deposited into the slot. Within a brief period after it is wound, the clock is automatically locked again and cannot be wound until another coin is deposited. It takes nickels, dimes and pennies, and holds over eighty dollars in dimes.

Save Your Dimes and Prepare

For

Your Next Summer's Vacation

I will make a special agency proposition to the first person in your town who orders one of these Savings Bank Clocks.

IT'S A WINNER—PRICE \$2.00

POSTAGE STAMPS ACCEPTED

R. B. FLITCRAFT, 1303 Marquette Building, Chicago



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Fortunes in Figs

————— at —————

Maywood Colony

A TEN-ACRE lot of the finest fig land of the colony can be had for a reasonable price. There are good incomes to be had also in almond and grape culture and ten-acre farms will pay big interest on your investment.

Maywood Colony is located in the upper end of the beautiful Sacramento Valley, in Tehama County. Corning, the depot and postoffice for the colony, is 110 miles north of Sacramento.

For literature relating to land in this settlement, write to

W. N. WOODSON

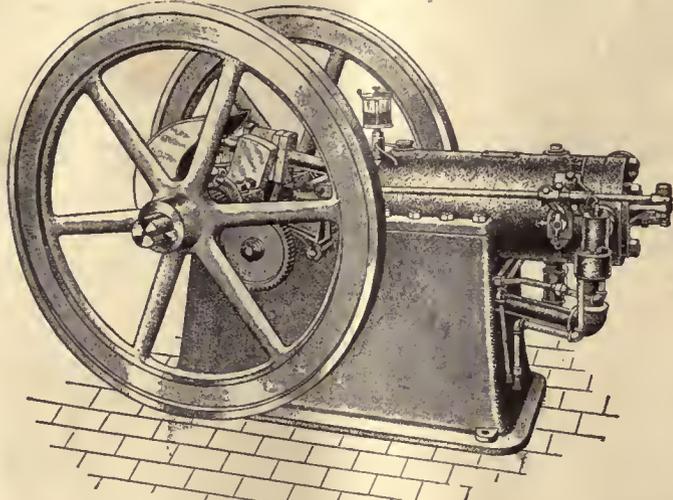
Proprietor of Maywood Colony

CORNING, CALIFORNIA

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The RELIABLE LINE

"Dempster" — That's The Name

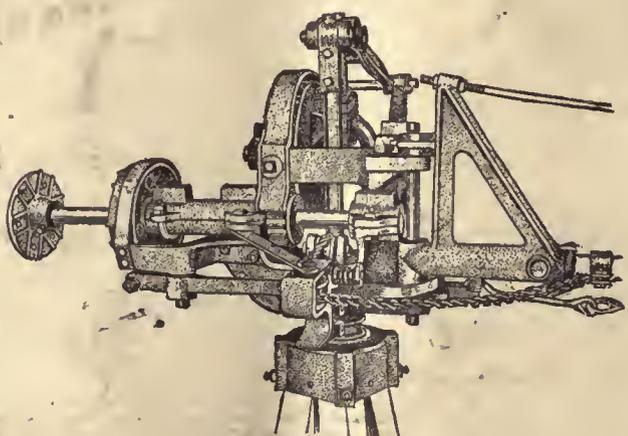
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Irrigating and Water Works Pumping Plants our Specialty

OUR LINE :

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WELL MACHINERY	GASOLINE ENGINES	CULTIVATORS
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WELL POINTS AND STRAINERS	FARM AND RANCH WATER SUPPLIES	COCKS AND VALVES

BEST TO BUY ——— BEST TO WORK

<p>Look Carefully at the Best</p> <p>Windmill Head</p> <p>Ever Made</p>		<p>See that Extra Bearing</p> <p>on the Wheel Shaft and the</p> <p>Center Lift Crank Roller Rim Gears</p> <p>and other good things</p>
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THE IRRIGATION AGE

PUBLISHED IN THE INTEREST OF IRRIGATION FARMERS,
DEALERS IN AND MANUFACTURERS OF IRRIGATION AND
GENERAL FARM MACHINERY.

VOL. XXIII.

CHICAGO, APRIL, 1908.

No. 6

AUSTIN DRAINAGE EXCAVATOR DITCHES ARE DRAINAGE DITCHES FROM START TO FINISH

In dredge dug ditches the work must be begun at the source of the ditch, because the dredge must have water in which to work. No part of the ditch is operative for drainage purposes until the whole ditch from source to mouth has been dug.

The **Austin Drainage Excavator** does not require water to float the machine. It travels on the banks either ahead of or behind the work, as desired. A ditch dug with an Austin Drainage Excavator can, therefore, be begun at the mouth and dug toward the source. The adjoining land is drained as the ditch progresses. Farming can be begun long before the ditch is completed to its source. In a word a dredge dug ditch is an elongated pond of water until completed from source to mouth, while an Austin Drainage Excavator ditch is a drainage ditch and is **operative for drainage purposes from the moment the first cut is made.** The Austin Drainage Excavator is a **ditch digging machine.** A dredge is a digging machine set to ditch work as a makeshift.



Send for our Catalogue "S," telling how to dig ditches to templet.

F. C. AUSTIN DRAINAGE EXCAVATOR CO. NEW YORK OFFICE, 90 WEST STREET.
RAILWAY EXCHANGE, CHICAGO, ILL.

Morris Machine Works

BALDWINVILLE, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need

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Have You on Your Place

If You Have, Then a Deming Hydraulic Ram Will Mean Dollars To You.

A Spring Flowing Well or Stream ?

Our Booklet, "Rural Water Systems" Will Tell You Why

With it you can have your own water works with all the city conveniences and can irrigate your land with ease. It is only necessary to install the Ram correctly in the first place and you then have a steady, tireless, water producer, 365 days in the year.

We have sold thousands of them and they all give satisfaction.

The Deming Co.
Salem = Ohio



Read This

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The booklet, "Rural Water Systems" above referred to, gives a very complete description of the different methods of installing a Ram. It will be of value to you and will be sent on application.

Let us hear from you.

Henion & Hubbell

General Western Agents
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ASPINWALL < Great Improvement for 1908

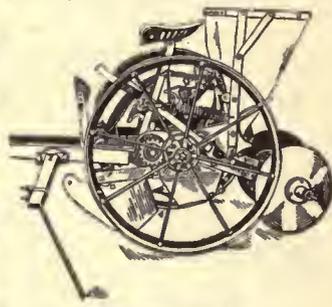
MACHINES WITH A Pedigree

POTATO < MACHINERY <

Have you seen our latest ?

Aspinwall Planter No. 3

With Sack Hopper, plants 99% good. No bridging in hopper.



Planter No. 3

The most perfect machines for the purpose in the world. With our perfection Cutters, Planters, Sprayers, Diggers and Sorters, potato culture may be made profitable. Send for our illustrated catalog. Contains valuable spraying information, tables, etc.

Booklet on "Potato Culture" Free.

Aspinwall Manufacturing Company

Jackson, Michigan



Sprayer



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"Since purchasing my Twentieth Century Grader I have reduced my force of men until I am only using one-third as many as before, and the work done by this machine is far superior than can possibly be done by hand and has a much more finished appearance. I have fifty acres in my truck farm, and can very easily manage it with one machine. I am very glad to recommend it to any one for same. I also wish to recommend it to be a first-class machine for making of good roads."

(Signed) HERMAN BLUEHER.

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CHICAGO

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Galvanized steel is rapidly taking the place of wood for fluming purposes and with The Maginnis Patent splice fluming is made easy. Any boy can put the Maginnis Steel Flume together or take it apart. Steel flumes and troughs "Ship Knock down" Third Class freight. Let me figure on your flume. All flumes guaranteed.

Write for Testimonials and Particulars of

P. Maginnis, Mfr.
Kimball, Nebraska



OLDS Engines

BEST BY TEST. I WANT YOU TO GET the most liberal proposition ever made on a gasoline engine. It will save you money. When a company like this, the oldest and biggest exclusive gasoline engine manufacturers in the country, make such a proposition, it means something. I have placed my proposition in the hands of our representatives. Write to them or to me, and you will receive it by return mail.

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To insure prompt deliveries, we carry a full line of Engines and parts with our representatives.

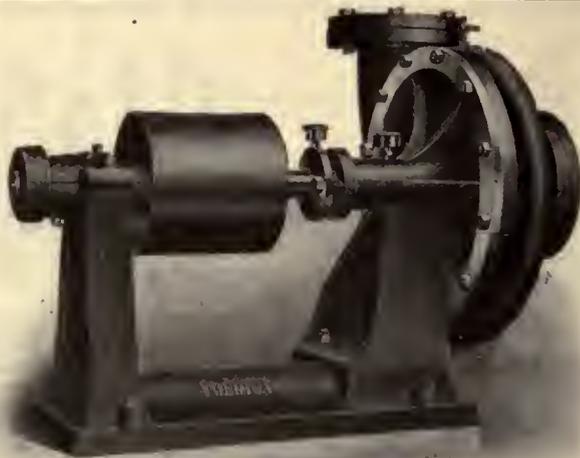


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**IRRIGATING MACHINERY
 BEST MADE**

Send for our booklet on Cost of Irrigation. Bulletin No. 104 illustrating Irrigation, Machinery and Power—guarantee 25 per cent. more water with same power or 25 per cent. smaller power plant for same quantity as older makes.

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STANDARD BLACK WROUGHT IRON PIPE

Overhauled, with screwed ends and threaded couplings, suitable for water, gas, oil, etc.
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 1½ inch. Per foot, 5c 6 inch. Per foot, 42c
 1¾ inch. Per foot, 6¾c 8 inch. Per foot, 75c
 2 inch. Per foot, 8c

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 WELDED CASING.**

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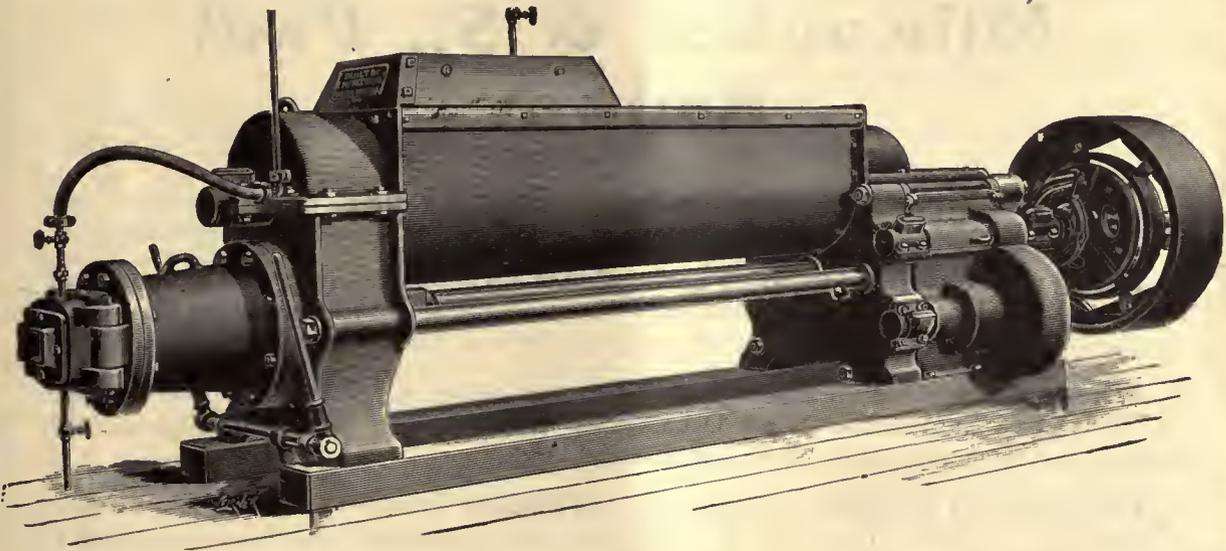
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Immigration Agent, 95 Adams Street, Chicago

THE IRRIGATION AGE

VOL. XXIII

CHICAGO, APRIL, 1908.

No. 6

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, - - CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 23 years old and is the pioneer publication of its class in the world.

Sugar Beets. We are publishing in this issue a short article by Mr. John G. Hall of Colorado on "How We Grow Sugar Beets and Market Them." Mr. Hall is at present located at Colorado Springs, where he has charge of irrigation work, and news from him is at all times interesting.

New Readers. It may interest our advertisers to know that we have added 465 new yearly subscribers to our list during the month of March. This is considered a wonderful growth in view of the fact that many other publications in the agricultural field are complaining of a falling off in subscriptions, it moreover verifies a statement made by the IRRIGATION AGE some years ago that the irrigated sections of the west would show marked activity and healthfulness during times when the eastern and central states were feeling uncertain in a financial way.

Orland Project. We have in course of preparation an article on the Orland project, Orland, California. This article will be finely illustrated and will be followed by others of interest to those who are studying the possibilities of that country. It was our intention to use this article in our April issue, but lack of space prevented.

Supreme Court Decisions. We are offering in this issue another installment of Supreme Court decisions on irrigation cases, and in this connection would suggest to our readers that any inquiries which they care to make concerning legal features in irrigation affairs will be closely investigated by us, and a reply printed in this department. There are, no doubt, times when difficulties arise concerning the division of water, water quantities, prior rights, etc., where we would be in position to assist our readers, and we will be very glad, indeed, to do so if they will communicate with us. Where the editor is not sufficiently posted personally to answer the inquiries they will be referred to well known authorities on these subjects, and their answer, together with the inquiry, will be printed in this department.

We trust that our readers will take advantage of this offer and feel at liberty to send us data at any time concerning their particular needs.

Thoughts on Irrigation Congress. It may not be out of place to suggest to those who are preparing the program for the next irrigation congress that the delegates will not tolerate packing of committees by members of the Reclamation and other bureaus in Washington. This has occurred during the past two congresses, namely, that of Boise and Sacramento, and is evidently planned to forestall any critical expression or resolutions which would be offered concerning either the Reclamation or Forestry bureaus.

The IRRIGATION AGE is informed that when Mr. Newell was on his way home from Sacramento last year he was asked how the Congress went off. Our informant states that he smiled blandly and stated that everything was satisfactory and that there were no unfavorable resolutions put through concerning the Reclamation service. This would lead one to suppose that their whole aim is to preclude the passage of any resolutions which would give publicity to the work of the Reclamation service other than that desired by the head of that bureau. Perhaps it would be well to suggest to Mr. Newell that this matter has been gone over thoroughly by people who are interested in this subject of western development, men who are equally as good friends to development under the Reclamation law as is the gentleman himself, and it has been decided that a move will be made at the coming congress to air the views of those who have grievances to present. Opposition by bureau heads or assistants of the different bureaus will not be tolerated. There will also be an effort made to learn how the price has been raised for water on many of the different projects, in many cases doubled. There may possibly be some inquiry as to the methods of conducting work under the different projects. It would be just as well for the public generally to understand something of the workings of this bureau other than through channels manipulated and engineered by the heads of that bureau. There will also, no doubt, be many in attendance at the coming congress who will have grievances to present concerning what they consider oppressive use of power on the part of the Forestry bureau. All of those men will surely be at the Albuquerque congress, and, as above stated, no packing of committees will be tolerated.

The subject of who authorizes the expenditure of such vast sums of money to pay expenses of different members of the Reclamation and Forestry bureaus may also be inquired into.

There is no inclination on the part of the public to criticize any movement made by either of these bureaus which tends to public good, but it is questionable if the heads of these bureaus should be permitted to bring men from remote parts of the country whose object apparently is to look out for the interests of and curb opposition to any move which may be made to investigate these two departments.

Do Messrs. Newell and Pinchot consider that their departments are beyond criticism? Is it possible that they feel so strongly entrenched in their positions that they may sneer at the public or the individual who inquires into the workings of their respective bureaus. We think not, and that impression is shared by very many leading men throughout the west who are as vitally interested in the subject of Reclamation and Forestry as are either of these paid employes of the United States Government.

There should be some effort made at the coming congress to demonstrate to these bureau heads that they are servants of the public and not masters of an empire. All of these things will unquestionably be threshed out at the coming congress, and while these gentlemen may not be inclined to favor that sort of a movement, they may rest assured that these questions will come up and should be prepared to meet them.

On the other hand, they have no right to spend money which is apparently at their disposal to bring their representatives and assistants and henchmen from various sections of the country to attend the congress with the sole view of protecting them from what the public considers its right, criticism. If these two departments are wholly above and beyond the control of the public and an unusual power is vested in the heads of these departments through strong combinations in Washington backed up by individuals in power who may have been misled by them, the public should know it, and know it quickly. It is presumed that they may attempt to again foist their attorney, Geo. H. Maxwell, upon the forthcoming congress. If so, he may rest assured of a warm reception. Maxwell did all in his power to kill the Irrigation Congress and has used every effort to belittle that body since he was compelled to pull away from it.

The gentlemen who have charge of the Irrigation Congress which is to be held in Albuquerque, New Mexico, in September of this year, are doing very creditable work along the line of advertising, and it is to be hoped that their efforts will induce a large attendance and that they may be able to present to the delegates as interesting a program as those offered by the congresses of the past.

We hope to be in position to inform our readers, not later than our issue of May, something about the formation of the program and also give a list, so far as is obtainable, of the speakers.

Those who contemplate visiting the congress and who have not secured accommodations in Albuquerque will do well to correspond at once with the local committee as appearances indicate that there will be a shortage of hotel accommodations. There is, in fact, only one high grade hotel in Albuquerque, which usually runs fairly full at any time of the year, and while all of the space will, no doubt, be given over to delegates to the congress, if anything like the number who attended in Sacramento and Boise, should present themselves in Albuquerque it would be necessary for all of the people in that city to open their doors and make room. It therefore behooves those who expect to attend to arrange in advance for hotel accommodations.

The IRRIGATION AGE has secured accommodations at The Alvarado Hotel, room 16. Our friends will kindly keep this in mind so that they may know where to locate us.

GOVERNMENT CONTROL.

BY LOU BLAKESLEY, BASIN, WYO.
(Supt. Water Div. No. 3.)

A great majority of cases which appear to be of a public nature, when analyzed, are found to be purely local. The locality may sometimes cover several states, but seldom the entire country. This is true of the public range leasing and the control of our forests.

These questions are local to a few of our western states, the range question in no way affecting any eastern state. The forest question does not effect the east except to a limited degree.

The conditions and control of these two questions here in the west are a farce, except that they are becoming too serious to be longer considered so.

In my official capacity, I have traveled over the entire northwest portion of this state and I have yet to find more than a bare half-dozen persons who are in favor of timber reserves or public range leasing. To begin with, Wyoming has but little timber of marketable value. What little there may be, is hard to get at, so that the preservation of the forests of Wyoming, from a government point of view, is a farce, is not needed, and is absolutely uncalled for. Under present conditions it is almost impossible for the farmer to get building material for a rough log house or barn or for fence posts. It is true that the "Use" book says you can have a certain amount free, by hunting up a ranger and having him show you where you may get what timber you need. This is one of the big jokes of the present system. You are compelled to hunt a ranger who may tell you that you may get the timber you desire, over on a certain slope, when you may want to get it on another slope, easier to reach or with timber more to your liking. So far as the actual value to the forests is concerned, that ranger does not know of a certainty where you should get the timber. Possibly the place you desired to get it is the one, where, for the good of the forest you should get it and where he says you "may" get it, is just where you should not get it. I hold that the average ranger does not know where you should get the timber, and, in truth, cares less, but to make a good appearance must tell you to get it some place. Not only the ranger does not know, but the supervisor does not know, neither does the chief forester, and I firmly believe, so far as the actual value to the forests of the future are concerned, do not care whether you get timber on this hillside or some other one.

A great cry is made that our forests are being destroyed and the American people robbed of a rightful inheritance. All timber that is in use or ever will be in use is not destroyed. None of it is destroyed except that which is burned or otherwise lost to the use of mankind, and that amount which has been used for fuel is not destroyed, in that it has served its purpose. While we may be clearing many acres of valuable timber, it is not destroyed, because we need it in our business. A future generation may need timber, but so does the present one. We can lookout for ourselves as the future ones will have to do. When we run out of timber we can use something else.

We have had a splendid example of timber reserve in Wyoming and I venture the assertion that no one can point to a single valuable result thereof. There is

but one thing a forest service can do and that is to prevent fires, and if their efforts were limited to that one object, together with the propagating and growing of trees in a country where there was some likelihood of growth and development, the people would give it hearty support. The petty annoyance of having to hunt up an irresponsible ranger to ask him for something that already belongs to you is something that the average American citizen with good red blood in his veins is not going to stand for. In speaking of "irresponsible rangers," I do not mean that they are an "undesirable" class of citizens, but that they have no direct interest in their work and as a matter of course are not responsible to the American people.

In a country like Wyoming, where difficulties are many and hard to overcome, the people should be helped rather than hindered. All the people in Wyoming or that will be here in the next century will not affect the timber supply so far as they need it for improvements on their own places, and, if they do, they need the material and must have it. It is a crime to in any manner prohibit the settlers from obtaining all timber from the public domain that they can use and they never want more than they can use.

It is impossible to settle this mountainous country without that much help and instead of restricting them, every effort should be made to help them. The average man, trying to build up a home in this desert country, usually has nothing more than a team and a very few dollars and often a large and dependent family. He comes to the new country hoping to build a home. The only building material is the timber on the mountains. All he wants is a few pine logs—dry—to build a house and possibly a barn—many times they get along without that improvement.

Anyone who has ever had the experience of hauling from the mountains knows that it costs all that it is worth and often more, but that is the only source of supply.

One who has not had that experience knows nothing of the hardships and trials one has to undergo and no person who has not had that experience or the necessity for it, or been intimately associated with it—even if he be the president of the United States or this man Pinchot, has any right, moral, intellectual or otherwise, to have anything to say about the disposition of these resources, much less anything to do with their disposition.

Never having the same point of view as the settler, they assume a knowledge they do not possess, and in their official duties assume a dictatorship that is utterly abhorrent to the American people. If the President, Pinchot, Garfield or any others of that class were compelled, by force of circumstances, to take up one of these desert claims, live on it, improve it, have nothing but a cayuse team—possibly not that; a very few dollars—possibly none, with no chance to get any except by their daily labor at one or two dollars a day, their families to have nothing but the bare necessities of life, with no luxuries and absolutely no immediate hope of any, a one room log cabin—providing they had hunted up a ranger to ask his permission to get that many logs, a dirt roof and floor, the wife compelled to make butter, if they were fortunate enough to own a cow, save up a few eggs and ride in a lumber wagon, say, twenty-five miles, and peddle them out, make a few purchases of

thread, calico, sugar and possibly a pair of coarse, heavy shoes, my opinion is that they would change their views on the timber question rapidly and decidedly. "It is a condition and not a theory" that confronts the average early settler. I firmly believe that if the President or his man Pinchot, under conditions as above described, should be compelled to take their team and go 100 miles or more away from home to work on a railroad grade, to get a few dollars, leaving their families at home, unprovided for, only as they can eke out their own existence, all this with winter coming on, in mid-winter, perhaps, when they are so far from home that the wife or child could take sick and die—and they often do—before the husband can reach them, these men might come to the conclusion that other people aside from those holding high political positions know some things, especially of their own local conditions. This picture is not overdrawn. Hundreds of people have gone through and are going through that very experience today. Not so many, perhaps, as a few years ago, but nine-tenths of the people of Wyoming outside of the towns, are going through a part of it, even today, and will continue to do so for many years to come.

The question comes like this: Why does the President or Mr. Pinchot want to do these things that so harass the settlers? What do they expect to gain? The timber that the settler wants is the dry down timber. No farmer hauls green timber and would not haul it if you gave it to him, if he could get the dry timber, which is absolutely worthless to forest preservation. So far all the green timber that has been cut has been by big tie companies and they seem to have no trouble in getting all the timber required for their needs.

A great majority of the western people believe there is an ulterior motive back of all this work. Not many years ago there was a move on foot to establish a game preserve in that country south and east of the Yellowstone park. There was a decided cry against such a proposition, however, and the idea was dropped—temporarily. Now we hear of another effort to establish that same country in a game preserve and that seems to be the African concealed in the woodpile. The cry is that the stock is taking up the place that rightfully belongs to the game. The idea is silly, even if true. Wild game has no place on this continent that domestic stock can use, hence can not usurp its place. I think I am safe in saying that not one in any one hundred citizens of Wyoming go out hunting big game, and, if they do, it is for the sport and not the necessity or value. The people who have to hustle for a living have no time to hunt.

Of course, it may be great sport for some fellow from the east to come out here in a private car, and with brass band and perfect press agency, go out hunting, while a waiting people eagerly scan the daily papers to see whether it was a grizzly or a cotton-tail that falls before the mighty Nimrod. This high and mighty one, with a crew of guides and scouts and a pack of dogs to scare up and surround the poor, frightened animal so that it can not get away, may call it great sport to shoot it, but the western man calls it rot. One band of sheep or cattle that helps to make a living for some settler is worth more than all the game in the world, and must eventually give way to settlers and progress. We don't want game preserves, neither do we want timber reserves that harass the settler. If the government wants

to start a nursery and use ground that will grow something and actually make trees grow, we might see our way clear to give them help, but until they do that they are standing in front of the wheels of civilization and progression.

The officials of forestry now claim that their system is becoming self-supporting. It is not and it never will be. They may collect fees enough to pay their salaries, but isn't it the most absurd idea in the world to pay some irresponsible person a fee to tell you what to do with your own goods? Some ranger or chief forester, with absolutely no interest at stake, tells you that you can run your sheep or cattle on a certain hillside, or may get a load of logs from a certain place, and you pay him for the privilege—delightful idea, isn't it? The people are paying all of this great expense and receiving nothing of value in return.

Why is it that some one from Washington takes up this idea of saving the forests and leasing bad lands for pasture? The people in this section whose very existence depends upon their own work, have never asked for this supervision; on the contrary, indeed, they have always opposed it and do now. Should the time ever come when these forests are destroyed the people most dependent upon them will find other means of taking care of themselves.

The idea so carefully advanced that the timber conserves water, is fully exploded by this time. No one believes that who has made a study of the question. All the water needed for late irrigation comes from the snow that lies far above timber line, and the snow that lays in the timber is always the first to go in the spring. The men who use water late in the season, and whose very lives depend upon it, are quite as apt to take of the forest if it is necessary to conserve water as is someone who knows nothing of those questions and who are in no way affected by the water, whether high or low. The one who is interested will, as a rule, look after his own interest as well as the one who has no direct interest at all. The idea that they are worrying and laboring for a future and suffering humanity is one we look at with a large question mark.

Many of the conditions, as above stated, refer as well to the range leasing proposition as to the timber. Why does the government want to get into the matter at all? From the landing of the first people on Plymouth rock, the commons have been public, and were used in common by all the people until such time as they went into private ownership. At that time and for all time until within the last few years, all ideas, thoughts, rules and laws have been to get the lands into private ownership with as little delay and friction as possible. Large grants of land were given for small services, and for the building of railroads and canals and in every other way has the effort been to get the lands into private ownership. All this has been done until within the last few years, when a system of spying and harassment has been carried out, with charges of theft and insinuations of conspiracies that has been equaled by no other government on earth.

Without that system of common usage, a system that every person on the frontier has taken advantage of, this country could never have been settled as it is today. It is reported that there was a time when our present president ran a few cattle on the range as a side issue, or for the fun of it or for some reason other

than that the life of himself and family depended on its success. I have never heard that he has offered to reimburse the government for the grass his cattle consumed, or pay for the logs his cabin may have been built of. It is clear, from our present knowledge of him, that he would have been "dead on the fight" had such a preposterous suggestion been made at that time.

Nine-tenths of the people who are farmers in this state have no considerable number of stock to run on the range. They have possibly a work team and a few milk cows. They cannot afford to lease, could not afford to fence if they did lease, and yet it is just such people as this as will settle up Wyoming. The attempt is made to give some sort of assistance to those living within a distance of 15 miles, by allowing him to run his stock on the present reserves, while the unfortunate one living 15½ miles away cannot run his cattle there. To date I have yet to hear of a single sensible argument advanced upholding this 15-mile or any other limit. What can be fair about a system that will allow one man 15 miles from a reserve line to run his stock there, when his brother, who owns the adjoining ranch, but 15½ miles away, cannot do likewise? It is the height of absurdity and is advanced by people who have no direct interest in the reserves or ranges, and who have no sympathy with western conditions. That such a view would be sure to find favor among those who happened to live within those prescribed limits is admitted, but even most of those people so situated acknowledge the injustice of it, though taking advantage of the situation. From the beginning of time, stock has run on the open range of all countries, and no reason, good or bad, can be advanced for making any change at the present time.

The very fact that leasing gives exclusive control over a certain tract of land is the most telling argument why it should not be leased, but left free so that settlers may have the opportunity of taking such of it as they may want. The range should be free to all parties, as all are jointly interested in it. If those who cannot use the range were losing anything by reason of those using it who can, there might be some cause for complaint, but whether one cow or one million run on the range in no way affects the interests of those who cannot use it.

If the fees proposed to be collected went direct to those who claim to be losers, the idea might have some standing, but they do not. The fees collected will never be more than enough to pay the wages of those who attempt to look after the matter, wages paid for a service absolutely useless and non-beneficial, tending to build up a class of citizens who would produce nothing—unless it would be strife and turmoil and a growing disgust for a bureaucratic government, a government that is growing narrow and contracted and egotistic, taking to itself an importance never granted by the constitution nor contemplated by the founders or their successors.

Government control is wrong. It was conceived in egotism and cannot thrive in the light of publicity.

MEETING OF AGRICULTURAL ENGINEERS.

On December 27 and 28 last there occurred at Madison, Wis., a meeting of the instructors in farm mechanics and agricultural engineering from the leading agricultural colleges of the United States and Canada.

The gathering resulted in the formation of a permanent organization to be known as the American Society of Agricultural Engineers, which will hold annual meetings to hear papers on and discuss such phases of engineering as are vital to the success of the modern farmer.

Prof. J. B. Davidson, of Iowa, was elected president; Professors F. R. Crane, of Illinois, and C. A. Ocock, of Wisconsin, vice-presidents; Prof. L. W. Chase, of Nebraska, secretary; and Prof. W. M. Nye, of Purdue, treasurer. Besides the above officers, there is a counsel of five members, the two vice-presidents and three electives, which decides on place and time of meeting, makes proposals for membership and transacts the other necessary business of the society.

There are three classes of members, honorary members, active members and associates.

The terms of membership are very reasonable and anyone especially interested in forwarding the science of agricultural engineering will find access to the privileges of the society under one of the above classes.

The program of this meeting had to do largely with the teaching of agricultural engineering in the colleges of today. As Dean Russell, of Wisconsin, said in his address of welcome to the convention, "The teaching of agricultural engineering is so new and there is so little data, literature, etc., on the subject suited to class room presentation that many mistakes are made and many needless steps taken in this field of knowledge before it is simmered down in the best possible form for instructional purposes."

The best of harmony prevailed, the papers and discussions were direct and to the point. The convention will help to systematize, unify and broaden the courses of agricultural engineering offered by the various colleges represented.

The following is the program as presented:

FRIDAY MORNING, DEC. 27.

Meeting called by Fred R. Crane, of the University of Illinois. (Professor Crane selected by the committee.)

Address of welcome by Dean Russell, of Wisconsin.
Response by Professor Crane.

Temporary organization, appointment of committees.

Paper, "The Courses in Agricultural Engineering That Should Be Offered," by Howard W. Riley, Cornell University.

Discussion led by L. A. Moorhouse, Oklahoma Agricultural and Mechanical College.

Paper, "Need of Research Work in Agricultural Engineering," by H. M. Bainer, Colorado Agricultural College.

General discussion.

Address, "Importance of Traction Engineers Having the Proper Education," by B. B. Clarke, American Thresherman.

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

Lining of Ditches and Reservoirs to Prevent Seepage Losses

By **PROF. B. A. ETCHEVERRY**
Berkeley, Cal.

(Continued.)

CEMENT MORTAR.

This method is probably used more extensively in southern California than all the other methods combined. It has proven very efficient and its cost is small. Examples of this class of lining are numerous all

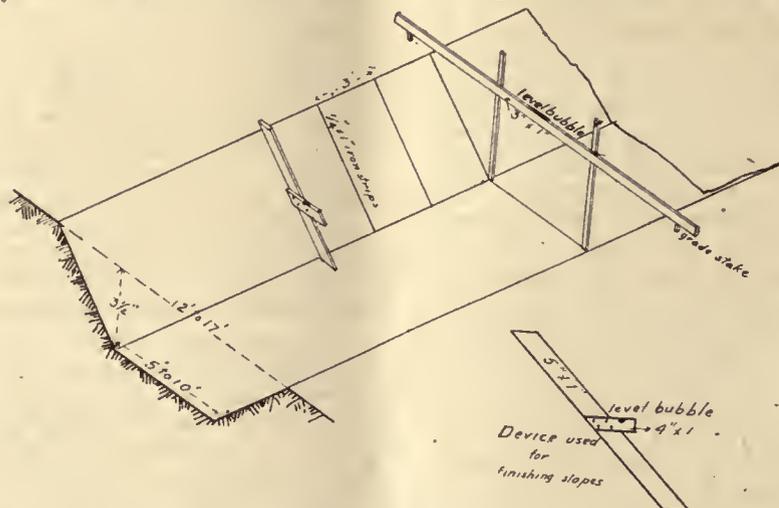
ment of the ground and because of the holes dug in the banks by burrowing animals.

2. Rapid growth of weeds, which decreased the velocity of flow of the water, thus diminishing the carrying capacity.

3. Large losses of water due to seepage.

In 1890 it was decided to remedy these conditions by making an experiment in canal lining by applying a cement mortar plaster on the sides and bottoms of the canals. The method used as described by Mr. Irving and supplemented by information given by Mr. Mylne, the present engineer of the company, is as follows:

Method of Cutting and Preparing the Water Channel for the Lining (Fig. 6).—The grade stakes were located on the banks at a given distance from the top of the sloping sides, usually 1 foot. These grade stakes



6 a—Method of lining canals used by Gage Canal Co.

through the irrigated districts of southern California. Some of the best types are in the vicinity of Riverside, where the three irrigation companies—the Gage Canal Company, the Riverside Water Company, and the Jurupa Company—have used it extensively. The lining usually consists of a cement mortar plaster, varying from $\frac{1}{2}$ to 1 inch in thickness. Various methods are used in preparing the canal for the lining and in applying the lining.

The Gage Canal Company began making improvements on its main canal in 1886; from 1886 to 1890 this was reconstructed, the total length being 20 miles. In 1890 the control of the Gage Canal Company

were spaced at intervals of 20 feet. A level rod or cross-section rod of sufficient length to reach from one bank to the other was held at right angles to the ditch, with one end on the grade stake and the corresponding stake set on the other bank. The location of the bottom stakes was obtained by measuring from this rod, by which means they were placed in alignment and to grade every 20 feet. A line was stretched at the bottom between the 20 feet grade stakes, and the bottom was then cut to grade. Strips of iron, 1 inch wide and $\frac{1}{4}$ inch thick, and about equal in length to the length of the sloping sides, were placed on the sides every 3 feet, extending up and down the slope, the slope given them being the



6 b—Gage canal in cut and in fill.

passed to the Riverside Trust Company. The conditions prevailing at that time are fully discussed by Mr. Irving, the engineer of the company, in the report of Irrigation Investigations for 1901 (part 2), prepared by the Office of Experiment Stations. The conditions were those usually encountered by other systems where the canals are not lined, viz:

1. Serious breaks in the canal, causing large waste of water and inconvenience to irrigators. Large fills were always in danger of breaking, because of settle-

slope of the finished ditch. They were set in position by the use of a specially constructed device as illustrated, which gives the correct slope, the grade line giving the proper position for the lower end of the iron rod.

These iron strips were set every 3 feet along the slopes. A sharp iron straight edge, a little over 3 feet in length, was used to shave off the irregularities between them; or if below the alignment, the depression was filled in and well tamped. Usually there were two gangs of men; the rough finishers came first and re-

moved the larger irregularities, tamping the sides and bottom; then the smooth finishers brought the surface exactly true.

Method of Lining.—The cement men usually followed the finishers, about a half day later. If the earth had dried, it was usually well sprinkled. Wooden strips $1\frac{1}{2}$ inches in width, $\frac{3}{4}$ inch thick, and equal in length to the width of the sloping sides, were placed flatwise on the slopes. They were placed 3 feet apart, and

The cost of this class of work, including preparation of the slopes and bottom, and their lining, varies from $3\frac{3}{4}$ to 4 cents per square foot.

The Riverside Water Company has plastered a large portion of its water channels in a very similar manner, the cost being nearly the same.

The Jurupa canal is lined with cement plaster; the thickness of the lining, however, is only $\frac{1}{4}$ to $\frac{1}{2}$ inch. (Fig. 8.) The earth ditch was not brought to grade



Fig. 7—Gage Canal, lined with cement mortar.

served as guides to a straight edge which assured a uniform thickness of $\frac{3}{4}$ -inch mortar.

The mortar was mixed on top of the bank in galvanized iron portable mixing boxes, and spread uniformly between the wooden strips on the slopes. With the straight edge as a guide, all irregularities were removed, and the mortar was finally compacted with the trowel. After the slopes had been lined the bottom lining was put on. A good lining $\frac{3}{4}$ inch in thickness was

as accurately, nor the sides finished as smoothly, as for the Gage Canal Company. The water channel was trimmed approximately with shovels; the sides and bottom were then sprinkled and the mortar spread with trowels to a uniform thickness as nearly as possible. The cost of this lining was not obtainable, but very similar work used by the Escondido Irrigation District for some of its channels cost from 15 to 20 cents per square yard, or from 1.66 to 2.22 cents per square foot.



Fig. 8—Jurupa canal, lined with cement mortar.

thus obtained. The bottom width of the canal varies from 5 to 10 feet, and the side slopes are 1 on 1, the depth being $3\frac{1}{2}$ to 4 feet. (Fig. 7.) The lining is extended on each side of the top of the slope to a distance of 5 inches.

The plaster is composed of one part of good Portland cement to four parts of clean sharp sand.

A smaller ditch near Hemet, the Little Valley ditch, 2 feet wide at the bottom, $1\frac{1}{2}$ feet deep, with side slopes of 1 on 1, was lined with cement mortar plaster 1 inch thick on the bottom, and $\frac{1}{2}$ inch thick at the sides. The composition of the mortar for the bottom was one part of California cement to four parts of sand; for the sides it was one part of cement to six

parts of sand. The cost of preparing the channel and lining was 18 cents per lineal foot, or 2.88 cents per square foot.

The San Jacinto Water Company, also in Riverside county, has its canal lined in the same manner as the Gage canal; the length of the canal is 11 miles, the bottom width is 3 feet, the depth $2\frac{1}{2}$ feet, and the side slopes 1 on 1.

That this type of lining has been successful there is no doubt. Mr. Irving, former engineer for the Gage

with masonry of the type "a" or "b," previously described. The Gage canal has used masonry very similar to class "a" for the lining of canals when in fill or made ground. This masonry is about 6 inches in thickness and is composed of building stone laid in mortar whose ingredients are one part of Portland cement, three parts of fat lime, and twenty parts of sharp sand. All external surfaces exposed to the action of the water are coated with $\frac{3}{8}$ inch of cement mortar, composed of one part of cement to three parts of sand. The cost



Fig. 9—Unlined canal near Lemoore, showing vegetation.

Canal Company, states in his report that after a test of ten years the lining more than justified their expectations. The cost of repairs after four years' use was very small, less than $\frac{1}{2}$ of 1 per cent of the capital cost in four years.

That there are conditions under which this lining will not be entirely satisfactory has also been demonstrated as follows:

1. For water channels constructed in heavy adobe soil, subject to heaving, it has cracked badly. This is noticeable in parts of the canal of the San Jacinto Water Company.

of this class of work, which is very similar to class "a," but not so thick, is about $11\frac{1}{2}$ cents per square foot.

The thin plaster lining is subject to rupture where gophers or squirrels burrow behind it, or under it, as the lining has not sufficient strength; also if storm water washes out some of the back filling.

It is probable that this kind of lining would not resist the climate of a country subject to very cold weather, in which case the stronger lining with proper drainage to prevent the accumulation of water behind the lining would be needed.



Fig. 10—Unlined canal near Lemoore, showing vegetation.

2. For water channels built in fills, where the ground is subject to settlement.

A better construction in this case is to line the canal

HEAVY ROAD OIL.

The instances where road oil has been used for canal or reservoir lining are few. The only example

of its use for canal lining in California known by the writer, is at Lemoore, in Kings county, on the Madison branch of the Lemoore Canal & Irrigation Company.

In this locality the canals are shallow, the velocity of water is small, and the growth of weeds and aquatic plants in the canals is abundant. (Figs. 9 and 10.) A large resistance is offered to the flow of water, which makes it of small carrying capacity, and a large loss due to seepage and evaporation. It is necessary for the irrigator to clean these frequently, sometimes as often as once every two weeks. The labor and cost are considerable.

Mr. McLaughlin, secretary of the Lemoore Irrigation Company, tried as an experiment the use of heavy road oil to prevent the growth of vegetation. The oil was applied in November, 1905, on a length of 1½ miles of the main canal. The canal is about 20 feet wide and about 1 foot in depth. (Fig. 11.)



Fig. 11. Canal near Lemoore lined with oil.

WHAT MAY BE DONE BY PUMPING PLANT.

The Olds Gas Power Company, Lansing, Installs Plant in Colorado.

A plant was recently installed by the Olds Gas Power Company for Dr. W. E. Fenton, Rockyford, Colorado, consisting of two 35 h.p. Olds gas engines with Olds suction gas producer, and belted through counter-shaft to a No. 12 centrifugal pump. The pump discharges an average amount of 4,000 gallons per minute on three different lifts. The total heads on the three lifts are 16 feet, 22 feet and 35 feet. The amount of coal used in twenty-four hours, averaging through a ninety-day run during the irrigating season, was 1,800 pounds. Coal used, Colorado pea anthracite, costing \$6 per ton. The amount of land irrigated in the season of 1907 was 1,850 acres, and the crops were divided as follows:

Acreage.	Price rec'd.	Yield.
Wheat—400 acres.....	.95c per bu..	12 tons per acre.
Alfalfa—300 acres....	\$.8 per ton..	20 bu. per acre.
Cantaloupes—450 acres.	.90c per crate.	3 tons per acre.
Beets—600 acres.....	\$.5 per ton..	110 cr. per acre.

Originally the land cost from \$1.25 to \$5 per acre; same land is selling now for from \$65 to \$125 per acre.

Total cost of installation of plant with ditches, \$6,500.

PINCHOT AGAIN.

The illegality of charging grazing fees on forest reserve is being threshed out in Washington by our congressman-at-large, George W. Cook, who is reaching up for Pinchot in a way that is likely to put that man over the ropes. General Cook proposes to bring Pinchot before the committee on agriculture for cross-examination. He will ask by what authority the bureau of forestry has been collecting a grazing fee for use of land belonging to the people, by what right a fee is collected for the cutting of timber from the miner, the stockman, the millman and the farmer, when no authority is vested in the forestry bureau, except an opinion of the attorney general. Pinchot has been promising to make a test case in the courts regarding the validity of these fees, but as yet nothing has been done, for he is evidently afraid to tackle the question in a court of

equity. Meanwhile he is inducing cattlemen to build so-called drift fences in order to cop out his own domain and keep off the cattle of those men who do not propose to pay the tax. The whole question is a constitutional one and we are trying to find out if some bureaucrat in Washington can usurp the business of congress in authorizing taxation.—*Denver Field and Farm.*

IT PAYS TO ADVERTISE.

IRRIGATION AGE,
114 Dearborn street,
Chicago, Ill.

Gentlemen:—We received a letter dated January 28, 1908, from Mr. J. Espinasse, A. M. I. C. G., from Cape Town, Africa, stating that he saw our advertisement in your journal relative to a booklet which we publish entitled, "The Uses of Press Clippings," and requesting further information regarding our business. We are writing you this in order to show the lasting benefit of judicious advertising in journals that have a wide-spread circulation. The fact is more remarkable as we have not had an advertisement of that character in your publication for over three years.

Wishing you every success, we remain,

Very truly yours,

F. T. VON ALBADE,
President The Consolidated Press Clipping Co.

Best Methods of Irrigating.

Corrugation Method Preferable to Flooding--Amount of Water Controls Character of Root Growth--Soil Should Have Plenty of Moisture at Planting Time.

By A. McPherson, Idaho.

Mr. McPherson's lecture on irrigation at the farmers' institute at Aberdcen, Idaho, was probably the most helpful of the series, inasmuch as it dealt with the fundamental principles of irrigation. Irrigation, he said, meant the supplying of water in the right amount at the right time. Water is the one element necessary to plant life which is under the control of man, and the good irrigator can control plant growth with as much certainty, almost, as he can the shape of his buildings. The man who does not understand something of plant growth can never become a good irrigator. Water must be applied in a scientific and rational manner, because it is the lever which controls production. Moisture, air, heat and plant food are the elements which control plant growth. Water is the vehicle which carries food to the plant. Descending into the soil it dissolves the chemical food elements, and rising by capillary attraction, carries that food to the plants. Bear in mind that it is not the water going into the soil, but that coming up which feeds the plant.

Plants should grow continuously from the time the seed sprouts until they mature. If they are supplied with moisture in the right quantity and in the right way, they will do so. If the soil is saturated with water to such an extent as to expel the air, the growth of the plant is checked. This is one reason why irrigation by the corrugation method, or in small trenches, is preferable to flooding. Bear in mind never to keep the soil saturated. Water in the soil forms in thin layers around the soil particles. If these particles are cubes, with inch surfaces, there would be a film of water on all sides of the cubes. If this cube were pulverized, or changed to a powder, there would be as many films as there are soil particles. Therefore a fine soil will hold more moisture than a coarse soil, because there are more interstices to be filled. Ten per cent of moisture in these interstices and the balance air is about the ideal proportion.

Thus good cultivation, in having the soil well pulverized, is an aid to good irrigation.

The roots of a plant are always larger than its top. That is, the roots extend further into the ground than its top does above it. The roots may run along near the surface or may be made to penetrate deep into the soil. If the soil is kept wet when the plants begin to grow, their roots will keep near the surface. But if moisture is withheld, the plants will hunt for it, the same as an animal, and send their roots deep after it. The deeper the roots go the larger the feeding ground of the plant, and the thriftier the plant will be.

Thus, by the application of water, the irrigator may benefit or injure plant growth. A plant with roots near the surface will require frequent irrigation. One deep-rooted requires much less water. Thus by starting right the irrigator may either make or save himself work.

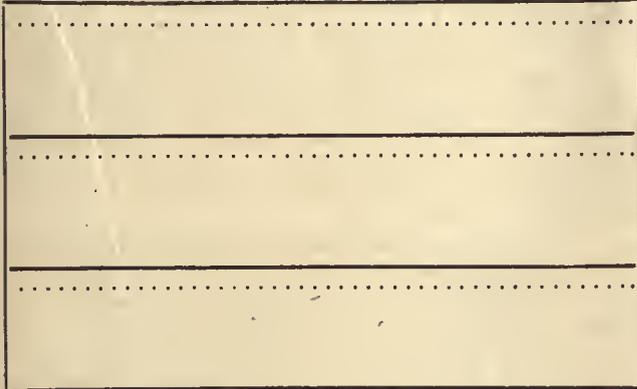
As between the corrugating or flooding methods, he preferred the former, for two reasons: a better and quicker distribution of water, and less liability of checking plant growth. In the corrugation or furrow method,

furrows three or four inches deep, and two feet apart, should be made in the field immediately after planting, before the seeds sprout. These furrows readily conduct the water, carrying it across a field in much less time than when flooding is resorted to, and distribute the water more evenly. The rise of an inch or two in a few square rods of ground is scarcely noticeable. Yet water cannot be forced upon such ground without impounding it by dams and making the low places too wet while the high ones are getting moisture enough to make the plants grow. Where a furrow four inches deep is made through such high places the water flows without interruption, and soaks in about twelve hours from one corrugation to another, leaving the surface generally dry, and supplying the water to the roots where it is needed.

The best results are obtained, in permanent ditches, by placing spouts made by nailing lath together, in the sides of the ditches to take the water from the ditch to the corrugations. One spout will supply two corrugations. These spouts should be placed in the side of the ditch, about one inch or so below the water level when the gates are closed. For instance, say the fall is two feet to the half mile, and your ditch eighteen inches deep. If a gate were put in at the lower end of the ditch it would back water up only three-fourths along or across the field. But begin about two hundred yards from the upper end of the ditch, and put in a gate that can be raised and lowered, but not quite so high as the banks of the ditch, so that water will run over the head-gate instead of the embankments. By closing this gate, it will back the water up, and leave a water line, showing where to place the spouts. Further down, put in another gate, or as many as are required. The greater the fall, the more gates required. When you want water, close the gates and raise the water above the spouts. When through, raise the gates, the water level falls, and the water passes harmlessly away. When ditches are constructed this way it is a pleasure to irrigate and requires little time.

In preparing your ground for irrigation (for permanent fields) do it right. Made right once, it is always right. If no more than ten acres can be prepared in one year, do it right, because it will pay in the long run. Have your land level. By level is meant free from knolls, with a slope. Water cannot be made to run up hill. If the slope is too great, run the corrugations around the slope in steep places, or parallel with the ditch as near as may be necessary, instead of from it. A fall of an inch to a rod makes a good flow for corrugations. When the land is quite level, do not flow the water too far, but catch up in other ditches and begin quite anew, because the upper part of the field will become too wet before the lower part has water enough. If the land has a good fall it will run a quarter of a mile without injury. If it is very level it is advisable to have cross, or catch ditches, every 400 or 500 feet. To illustrate, suppose your land is quite level and has a gradual fall to the southeast, with the water coming upon the land at the highest point, the

northeast corner. Construct a ditch clear around the tract, with gates so that the water can be flowed westward and fed through spouts to the northern part of the field, the surplus water passing away in the ditch on the west. The surplus water on the field will be



The dots indicate spouts to convey water from the ditches to the land. Spouts may also be used to drain water from the tract above, into the cross ditches, but should be placed a little higher than the spouts on the lower side. With a field arranged like the diagram irrigation consists in raising and lowering headgates.

caught up in a cross ditch, a third of the way down the field, and may be used to water the central part of the field, or allowed to waste in the ditch on the west, or if it is desired to water the middle or lower parts of the field the water can be turned down the ditch to the east, and forced into either cross ditch as desired, and the water confined to the land intended to be watered.

If a field cannot be properly laid out without the services of an engineer it will be much cheaper to get one than to try to get along in a slipshod manner by attempting to drive the water where you want it with a shovel. Irrigating is easy where the ditches are properly laid out. Where they are not, it is slavery.

Unless the soil has moisture sufficient to bring grain up and keep it thriving until it is in the milky stage, irrigate before planting. Irrigate again in the milky stage, and with ordinary soil this should be sufficient to mature the crop. When the soil five or six inches below the surface will remain in a ball when squeezed in the hand, it does not need water. If not, it is time to irrigate.



One of the Alluring Features of Settlement in a New Country—"Two Fawns Just Discovered." Photo Taken on Line of Great Northern Railway.

**Address of Senator Clark Before
Public Land Convention**

Held at Denver, Colo., June, 1907

(Concluded.)

Instead of going out freely upon the public domain and selecting that portion that he thinks will make a good farm and that in his judgment is agricultural land, his judgment counts for nothing and the inspector sent to look at it is the man who tells this farmer whether or not that land is good farming land. Then if he has good luck, he can get a favorable report on it and possibly in time he can acquire a patent. I believe there have been none acquired yet. But suppose he acquires his patent. Gentlemen, man is a social animal. The hermit is the exception. Men only enjoy themselves and grow when they are associated with others. Is there a man in this house that would go out fifty miles from the nearest settlement and build a home if he thought he could not have neighbors? Is there a man, a good citizen of the United States, with a family to rear, that would rear that family in a place where it was impossible for him to have schools? Now, the practical effect of forest reserves is to isolate man and to isolate the home. But there is something about this that I do not really understand. The law says, as I understand it, that these reserves shall be open for homestead settlement, and I suppose they are; but there is something in every proclamation creating these forest reserves, the recent ones, that seems at least to determine the attitude of the forestry service toward these lands, and this is in plain language in the proclamation itself:

"Warning is hereby given to all persons not to make settlement upon the lands reserved by this proclamation." (Laughter.)

Now, Mr. Chairman, I ought not to have talked this long. (Requested by many delegates to proceed.) I have been led by the interest which I feel in this matter. That alone has led me to appear here. The greater part of my life has been passed in the Rocky mountain country. God willing, when my time comes I shall die here, and poor, scantily inhabited and barren as she may be, I am as fond and as proud of Wyoming as our Secretary of the Interior is of the grand old state of Ohio. I do not believe the general Government of the United States, whatever right it may have in law—and I am not here to discuss law—has any right in morals to put a repressive hand upon a single prospective industry in my state. (Applause.) It is not my purpose to discuss the wisdom of the coal land withdrawals. It would take me too long if I should give my views upon that matter. They are somewhat radical. But we from the very foundation in the state of Wyoming have built largely our hope of future development upon the individual ownership and production of our magnificent coal fields. It goes a little hard where men, in toil and sweat, aye, almost in blood, have been trying to lay the foundation of a new state, to see its foundation so rudely shaken by one act of an administrative pen. We believe that our magnificent public domain should be administered not in the interests of the general Government, but in the interests of the people of the state of Wyoming.

I am getting somewhat gray, and I have some old-fashioned ideas. I cannot agree with some ideas that have been expressed in this city within the last three days, that the constitution of the United States must be interpreted according to the actual needs of the hour. I cannot agree that the Constitution of the United States can be amended by an act of Congress or by an executive or administrative order. (Applause.) I learned in my boyhood days when at school that the only way to amend the Constitution of the United States was in the way specified in that great document itself. Now, Mr. President, I believe that, constitutionally, and under the law, and under the compact between the original colonies organized into the Federal Union, the lands within a state can only be held by the general Government as a sort of trust until they can be passed into private ownership or otherwise disposed of and made available for the support of that sovereign commonwealth. (Applause.) I would not complain so much of this forestry service, because it has at the foundation of it something good, and I believe that great good can be worked out of it, but what I fear is what the President in his Jamestown speech said should be persisted in, and what the forester of the United States said today was bound to come—the Government control of our unoccupied arid lands. I have had occasion before to say that this really meant. I had occasion to say that if this one hundred and thirty-seven million acres of land were stretched out over our country it would form a strip of land two hundred miles wide extending from New York to Chicago. I take occasion now to say that if the proposed policy of the Government is enforced it will take a strip of land extending nearly two hundred miles wide from New York city clear across the continent to the Golden Gate.

Now, that is a tremendous statement, but it is true. And that is the magnificent domain, capitalized upon the basis which is given here, which you are asked to entrust into the hands of one human being. Why, gentlemen, it is appalling. One human being to control the destinies, at his arbitrary will, of a piece of land of those magnificent dimensions, enough to cover great states and territories and commonwealths, to be worked upon; if you have business upon or within this territory you will carry it on under his direction; if you run cattle you will run them under his rules and regulations; if you want four thousand head of sheep he tells you whether you shall have them or not. In other words, in every little detail of your business and domestic life the ruler of this great domain is the final arbitrator. I confess I do not like the prospect. (Applause.)

And while Mr. Pinchot says upon this platform that that thing has got to be, he is no more a representative of the people than I am (great applause), and I say to him that as long as the Rocky mountain region produces the men and women it produces now, by the Eternal, it never shall be done. (Great cheering and prolonged applause.)

But there is this about it all, another thing I do not like,—I am afraid in my old age I am getting cranky. I am afraid I am beginning to see things. But I do have some sober periods, and I do have this idea, that the more this Government is administered by rules and regulations instead of by definite law, the worse it is for the welfare and the prosperity of its people.

(Applause.)

An eminent gentleman has within a few days pointed with pride to that experiment of departmental government that we have in the Indian Territory. If there ever was, my friend—and I know there are some Indian Territory people here and they may not agree with me—if there ever was a monumental failure in human government in the Republic, that some failure is found in the Indian Territory. I am not overstating it. The business interests of that territory have been paralyzed. It has largely been the fault of Congress, but it has also largely been the fault of the Government by red tape methods and rules and regulations at long range.

Now, this is true: I believe that that government is best which governs least, and I believe that that government is the best that interferes the least in the domestic and individual affairs of the citizen.

Now, we are told that there is a remedy for all these things. We are told that if a cabinet officer or a bureau chief gets a little enthusiastic, works a little overtime, that if he wrong any man, that man has his remedy. It is true that you cannot sue the Government of the United States, but you can sue a cabinet officer, and I will hazard the assertion that there are very few days that the Secretary of the Interior is not sued.

Secretary Garfield: Above five or six times a day.

Senator Clark: About five or six times a day.

That is a good record. Nobody questions—and I hope I am not so understood—the desire of the officials of this government to render good service. Nobody questions the desire of every government official to give every man his due. But government officials often err, and we are calmly told that if they err the man has a remedy by suing the Government official and bringing him into court. Well, I can see that fellow's finish. (Laughter.) The government of the United States retains a great many eminent gentlemen for the express purpose of defending these acts of its departmental officers. Unfortunately, very few of the poor devils that are thrown out by a forest ranger have an eminent attorney retained by the year. So that the remedy is absolutely ineffectual; and, Mr. Secretary, I have only to express the hope that I have in my heart. I have the confidence in my heart that this meeting will bear good fruit. I believe this meeting will bring about a better understanding between the people of this region and the officers of the Government of the United States. Mr. Secretary of the Interior, this people asks nothing but what it thinks is right—you must not grant less than that.



There Are Majestic Mountains Near Flathead Lake, Montana.

FEDERATION OF TREE-GROWING CLUBS.

Work in California.

Monterey, Cal., March, 1908.

To the Tree Growing Clubs of America—Greeting.

Your president has a great deal to write about, of things which he hopes will interest you, but will have to give it to you in brief chapters, one at a time.

An account of one celebration of Arbor Day, by a community in California, presents features which you might like to know of.

You must know that the officers of the Federation of Tree Growing Clubs of America are changing the



A Hunting Party on Flathead Lake, in Montana.

date of Arbor Day in states where climatic conditions require it, instead of adhering to April 11th.

In California, after due consideration, February 22d is to be Arbor Day hereafter.

Across the Golden Gate, on the western shore of the magnificent bay of San Francisco, Cal., is located one of the prettiest residence villages in the world, Sausalito.

Built on the terraced hillsides there, among native oaks, laurels and madronas, are some of the quaintest homes to be found anywhere.

Above the town, towards the Pacific ocean, there rises steep hills several hundred feet in height.

On a portion of these hills a few thrifty owners planted out groves of trees a few years back which have now attained a considerable growth, adding further beauty to the village beneath, as well as modifying the winds which sweep in from the ocean during the summer months.

Now, the good people of Sausalito want to cover all of the hills completely with trees and they are encouraged to do so by the further consideration to increase the water supply of the town, which is taken from tunnels driven into the hills.

It seems proper to record here, in our official organ, the names of the worthy citizens of Sausalito who managed the tree planting there on February 22d and tell how the thing was done.

The matter was taken up by the South Sausalito Improvement and Good Government Club. They appointed a Tree Planting Committee, who proceeded to collect funds. About \$300 was soon procured, the Sausalito Arbor Society aiding.

G. W. Smith, a drayman, volunteered to do all hauling free of charge.

A sub-committee under the able management of A. S. Hinz provided a bountiful and delicious luncheon for the workers, the good things having been donated by the merchants of the town.

A band furnished music, which seemed to add a zest to the planting.

Not only did the children work with a will, but many gray haired men and women cavorted over the steep hillside and, placing the trees in holes which had been dug at a cost of two and a half cents each, by contract.

These holes were one foot in diameter and one foot deep, with earth loosened six inches deeper.

The trees planted were principally Monterey pines, Monterey cypresses, Acacias and Eucalyptus.

The several owners of the land gladly gave consent to have the trees planted, besides contributing liberally toward the expense.

The committee have succeeded in planting 3,200 trees, but intend to set out many more.

It was demonstrated that children can be made to do tree planting properly and have a jolly good time doing it.

Had the children been drilled and taught something on lines of military discipline they would have done better.

The mischievous spirit was evidenced by finding as many as eight trees planted in one hole.

I recommended that a tree planting brigade be organized about a month previous to a planting day.

Have the teachers appoint a captain, lieutenants, sergeants and corporals, holding them responsible for the conduct of the rank and file.

The names of the Sausalito Tree Planting Committee are as follows: Chairman, S. P. Holden; secretary, O. F. Meldon; W. A. Coulter, H. R. Bloomer, R. P. Greer, Manuel Flores, A. J. Hinz, Frank C. Pistolesi, George W. Smith, Joseph Lowder and C. L. Benton.



Lumbering as Carried On Along Line of Great Northern Railway.

Mrs. George A. Story of the Arbor Society deserves special mention as a booster and collector.

At a subsequent meeting of the Improvement club, which was largely attended, your president had the honor of addressing these civic pride citizens.

The "get-busy-and-do" spirit of the club brought the town mayor, three town trustees and a number of prominent citizens to ask that they be elected members.

Long live the S. S. I. and G. G. Club!

H. A. GREENE,
President F. of T. G. C. of A.

RECLAMATION SERVICE NEWS.

RECENT INFORMATION CONCERNING GOVERNMENT WORK.

Bids recently opened in Chicago for furnishing 12,000 barrels of cement for various irrigation projects now under construction by the Government indicate a noticeable decrease in the price of that commodity.

The Reclamation Service has twenty-seven big irrigation projects under construction requiring thousands of barrels of cement. The unprecedented demand for cement all over the west for the past two years so overtaxed the capacity of the mills that many of the Government's requests for bids were turned down and those that were received were at prices that materially increased the cost of construction.

Nine bids were received for furnishing the cement above referred to, the prices given being for delivery freight on board cars at the works. The lowest was from Kansas at 90 cents per barrel. One was received from Chicago at 95 cents per barrel, and one at 98 cents a barrel. The other prices ranged from \$1.05 to as high as \$1.60 in California.

Approximately 32,000 acres of land lying in Townships 24, 25 and 26 N., Ranges 61 to 65 W., 6th P. M., which were withdrawn in connection with the North Platte irrigation project, Wyoming-Nebraska, have been restored to the public domain, and will become subject to settlement and entry on such dates and after such notice by publication as the Secretary of the Interior may prescribe.

The Secretary of the Interior has awarded contract to the Marquette Cement Manufacturing Company, of Chicago,

The Secretary of the Interior has awarded the following contracts for furnishing electrical apparatus:

To the Northern Electrical Manufacturing Company, of Madison, Wis., a ten K.W. generator and switchboard to be used in the operation of gates at the Pathfinder dam, North Platte irrigation project, Wyoming-Nebraska, contract price, \$400.

To the General Electric Company, of Schenectady, N. Y., at 75 K.W. generator and switchboard to be used in the operation of the gates at Laguna dam, Yuma irrigation project, California-Arizona, contract price, \$1,783.

During January 700 head of stock and 280 men were employed in the construction of the Yuma levees, Yuma irrigation project, California-Arizona. About 165,000 cubic yards of material were moved. An additional force of men were employed and started work about the middle of the month on Laguna dam. It is the intention between now and the high water period to complete the dam to the level of the new levee on the Arizona side of the Colorado river, and to the line of the old levee on the California side, getting ready to cross the river during low water next spring.

An extension of time of eleven months has been granted to Mr. Charles Herrman, of Conconully, in which to complete his contract for clearing Conconully reservoir site, Okanagon irrigation project, Washington. The contractor was unavoidably delayed in the prosecution of his work by reason of the stringency in the labor market, making it impossible to maintain an adequate force, and the impossibility of burning material during the remaining part of the season on account of rain and snow. The Secretary of the Interior there-



A Winter Scene on the Flathead Reservation, Montana, on the Great Northern Railway.

Ill., for furnishing 12,000 barrels of Portland cement for use in the construction of reclamation works in Wyoming, Montana, North Dakota and Nebraska. The contract price is \$1.35 per barrel f. o. b. cars at La Salle, Ill.

The Secretary of the Interior granted an extension of time to the Billings Construction Company, of Billings, Mont., to February 29, 1908, for the completion of their contract to construct the Corbett dam, Shoshone Irrigation project, Wyoming. This work is now completed with the exception of installing the headgates for the Corbett tunnel and the sluice gates for Corbett dam.

The following described lands under the Okanogan irrigation project, Washington, which have been segregated from any form of disposition whatever under the public land laws, have been restored to homestead entry in accordance with the terms of the Reclamation Act:

WILLAMETTE PRINCIPAL MERIDIAN.

T.34 N., R.26 E., all Secs. 1, 10, 11, 12, 13, 14, 15, 21 to 28 incl.; E $\frac{1}{2}$ Sec. 29; all Secs. 31 and 32; E $\frac{1}{2}$, E $\frac{1}{2}$, NW $\frac{1}{4}$, E $\frac{1}{2}$, SW $\frac{1}{4}$ and SW $\frac{1}{4}$ SW $\frac{1}{4}$, Sec. 33; all Sec. 34; and W $\frac{1}{2}$ Sec. 35.

fore advanced the date of completion from December 1, 1907, to November 1, 1908.

An extension of three months and a half has been granted to Mr. Henry C. DeLaney, of Williston, N. D., for the completion of his contract. The contractor was delayed in his work by the scarcity of laborers, the unusually severe weather, and the encountering of unexpected quantities of wet material and other materials difficult to handle. This extension advances the date of completion to June 1, 1908.

Contract has been awarded to Fairbanks, Morse & Co., of Chicago, Ill., for furnishing two 50 horse power producer gas engines to operate the large wheel pump which is to be installed under the Yuma irrigation project, California-Arizona.

Contract has also been awarded by the Secretary of the Interior to the Western American Gas Company, of Phoenix, Ariz., for furnishing a plant for producing gas to operate these engines. This plant will use crude oil as a fuel, the gas being similar to producer gas made from bituminous coals.

Supreme Court Decisions

Irrigation Cases

NONUSER OF WATER RIGHTS.—

Mere nonuser of a water right does not show abandonment thereof. Facts and circumstances showing an intention to abandon must appear.

In re Daly, Commissioner. Supreme Court of New York, Appellate Division, 108 N. Y. Supp. 635.

DISSENTING STOCKHOLDERS IN WATER COMPANY.—

A stockholder of a quasi public corporation, engaged in supplying water for public use, is bound by the action of the holders of two-thirds of the stock and the directors consenting to a transfer of the property, franchise, and business of the corporation.

Graham v. Pasadena Land & Water Co. Supreme Court of California, 93 Pacific 498.

REVOKING LICENSE TO TAKE WATER.—

The fact that plaintiffs were permitted to take water from the ditch owned by the other company until they could arrange to pump water from defendant's canal would not prevent defendant from revoking the permission, which was

ACTION TO ESTABLISH WATER RIGHTS—JUDGMENT.—

Where one only claimed a right to use 20 inches of water of a stream for domestic purposes and to irrigate his land, a judgment awarding him that amount, but not showing the purpose for which it might be used, did not entitle him nor his successor to transport water beyond the watershed for other uses.

Pomona Land & Water Co. v. San Antonio Water Co. Supreme Court of California, 93 Pacific 881.

IRRIGATION STATUTE REMEDIAL.—

Sess. Laws 1899, p. 235, c. 105, providing for a change of the point of diversion of water from an irrigation ditch, is purely remedial, and one of its objects is to prevent a multiplicity of suits, and not to allow a change to be made until all persons who might be affected thereby are notified and given an opportunity to be heard.

Lower Latham Ditch Co. v. Bijou Irrigation Co. Supreme Court of Colorado, 93 Pacific 483.

ACQUISITION OF WATER RIGHTS BY PRESCRIPTION.—

Where plaintiff and defendant water companies agreed upon a division of the natural flow of a stream at a dam, subject to the right of another to use 20 inches for a specific purpose, and defendant acquired such right, though it did not have a right to use water thereunder for another purpose, where for a long time it openly, notoriously and under a



Hunting Is Fine Sport in the Flathead Country—On Line of Great Northern Railway.

granted as a mere accommodation, even if it amounted to a parlor license.

Lanham v. Wenatchee Canal Co. Supreme Court of Washington, 93 Pacific 522.

DIVERSION OF WATER—JURISDICTION OF COURT.—

Unless Sess. Laws 1899, p. 235, c. 105, providing for a change of the point of diversion of water from an irrigation ditch, the district court has jurisdiction to render a decree permitting a change in the point of diversion from one water district to another.

Lower Latham Ditch Co. v. Bijou Irrigation Co. Supreme Court of Colorado, 93 Pacific 483.

RIGHT TO CHANGE POINT OF DIVERSION.—

The right to change the point of diversion or place of use water, which has been obtained as the result of an appropriation, is one of the incidents of ownership, independent of statute, and the only limitation upon it is that the rights of others be not infringed.

Lower Latham Ditch Co. v. Bijou Irrigation Co. Supreme Court of Colorado, 93 Pacific 483.

claim of right diverted the water for another purpose to a point near the dam and did not allow it to flow over it for diversion, it acquired a prescriptive title to the quantity used.

Pomona Land & Water Co. v. San Antonio Water Co. Supreme Court of California, 93 Pacific 881.

RECORD OF WATER CONTRACT.—

A contract by which a water company agrees to furnish through its canal to the owner of certain land, water to irrigate it, for a term of years, he to make certain yearly payments therefor, is not to be recorded in the book in which County Government Act, § 120, subd. 1 (St. 1897, p. 484, c. 277) provides that "deeds, grants, transfers and mortgages" of real estate shall be recorded; but the book provided by subdivision 12 for recording "such other writings as are required or permitted by law to be recorded," and in which it has been the custom to record water contracts and other agreements of like character, is the proper book in which to record it, so as to give constructive notice thereof.

Stanislaus Water Co. v. Bachman. Supreme Court of California, 93 Pacific 858.

IRRIGATION—SALVAGE AND DEVELOPED WATER.—

Where, under a contract with defendant, plaintiffs were only entitled to one-half of the natural flow of a stream as it reached a dam, any water defendant saved by impounding the water above and bringing it to the dam by pipe line, thus saving the water otherwise lost by seepage, etc., above the dam, and any water developed from the bed of the stream, are essentially new waters, and the right to use and distribute them belongs to defendant, under the principle that, where one is entitled to use a given amount of water at a given point, he may not complain of any prior use made of the water not impairing the quantity or quality to which he is entitled, and that he may not claim any excess of water over the amount to which he is entitled however it may be produced.

Pomona Land & Water Co. v. San Antonia Water Co. Supreme Court of California, 93 Pacific 881.

IRRIGATION—CONSTITUTIONAL PROVISIONS.—

Const. 1879, art. 14, declaring the use of waters appropriated for sale, rental, or distribution to be a public use subject to the regulation of the state as shall be prescribed by law, and that the right to collect compensation for water supplied to any county, city or town, or the inhabitants thereof, cannot be exercised except by authority of and in the manner prescribed by law, does not prevent a landowner acquiring and attaching to his land a right to the permanent use of water; and, in the absence of exercise of the power, delegated by statute to county boards of supervisors, of control and regulation of waters outside of cities, the terms of a contract for furnishing water for irrigation, for a term of years, at a fixed yearly rental, remain in full force, and constitute the measure of the rights of the parties.

Stanislaus Water Co. v. Bachman. Supreme Court of California, 82 Pacific 858.



Big Fork, Flathead Lake, on Line of Great Northern Railway.

BREACH OF IRRIGATION CONTRACT.—

A paragraph of a charge, in an action for breach of a contract, whereby defendant was to furnish sufficient water for plaintiff's rice crop, but exempting him from liability should there be insufficient water, provided a reasonable effort was made to procure the same, that under the contract defendant obligated himself to use his best judgment and all reasonable effort to furnish such an amount of water as according his judgment was sufficient, was not subject to the objection that it made defendant the sole judge as to the effort necessary to procure the water supply, where the court expressly informed the jury that defendant obligated himself to use all efforts reasonably at his command, and further charged that, if defendant did not use reasonable efforts to furnish the water, to find for plaintiff.

Kelly v. Corrington. Court of Civil Appeals of Texas, 105 Southwestern 1155.

ADVERSE POSSESSION OF WATER COURSE.—

An irrigation company let a water power and gin site to plaintiff for 10 years, reserving the right to use or dispose of the surplus water over the amount necessary to operate a gin. Plaintiff leased the premises to D. from year to year until the gin burned, after which defendant obtained a conveyance from the irrigation company of the "surplus water," and later obtained a transfer of D.'s rights. Both convey-

ances recited the conveyance under which plaintiff claimed, and defendant testified that at the time he bought D.'s interest D. informed him that he had arrangements with plaintiff to use the site and water power for 10 years, and that he was to gin 10 bales of plaintiff's cotton as rental, etc., and also stated that he intended to pay plaintiff for the use of the premises and water power, but that plaintiff tendered him no cotton to gin. *Held*, that defendant's occupation of the site and water power was not adverse to plaintiff.

Briggs v. Avary. Court of Civil Appeals of Texas, 106 Southwestern 904.

MECHANICS' LIEN ON IRRIGATION WORKS.—

Under Act. Cong. June 11, 1896, c. 420, 29 Stat. 434, 6 Fed. St. Ann. p. 398 [U. S. Comp. St. 1901, p. 1556], which is supplementary to Carey Act. Aug. 4, 1894, c. 208, 28 Stat. 226, 6 Fed. St. Ann. pp. 396-398 [U. S. Comp. St. 1901, p. 1552], Act Aug. 18, 1894, c. 301, 28 Stat. 422 [U. S. Comp. St. 1901, p. 1554], and the act of the Legislature of the state of Idaho of March 2, 1899 (Sess. Laws 1899, p. 282), accepting the provisions of the Carey act, and providing for the reclamation, occupation and disposal of lands thereunder, a lien is granted in favor of the person, company, or association contracting for the construction of canals and reclamation works for the irrigation of arid lands thereunder, and such lien extends to all lands in the segregation that can be irrigated by such system, to the full extent of the price per acre for which such persons, company or association contracts and agrees to sell water rights, and the contractor or subcontractor performing work under such person, company or association is entitled to the benefit of the lien laws to secure the payment to him for such work to the full extent of the title, interests, rights and claims of the company having the contract from the state, and to the full extent of, and commensurate with, the lien rights of such company.

Nelson Bennett Co. v. Twin Falls Land & Water Co. Supreme Court of Idaho, 93 Pacific 789.

OPPORTUNITIES IN WEST.

In an article written for an eastern magazine, Mr. L. A. Huffman, a well known writer of Miles City, Mont., gives a lot of good information concerning the new line of the Chicago, Milwaukee & St. Paul railway and its numerous feeders in the Dakotas and other western states. Mr. Huffman says that "nowhere in the United States, under like conditions, upon a solid area of plowable, black loam, in a like space of time, will so vast a number of home seekers be accommodated, yet I dare say, first hand, having just finished a drive of three hundred miles or more along the extension of the Chicago, Milwaukee & St. Paul railway between Marmarth, N. D., on the Little Missouri and the Musselshell River, in the heart of northern Montana, that there remain within five to twenty miles of this new line to the Pacific Coast, thousands of homesteads well worth your while to look at, and which will be occupied within the coming twelvemonth."

Continuing, Mr. Huffman says: "Miles of prairie across which steam plows must soon be striking furrows and traction engines hauling grain to the elevators at Marmarth, which is the first division point on the St. Paul road east of Miles City, and, in the writer's opinion, to become the county seat of the new county of Hamilton, and within two years the most important shipping point for grain and live stock between the Dakota line and the Yellowstone. All the roads on the Little Beaver, Box Elder, and in the Little Missouri Valley point naturally toward Marmarth. The Milwaukee Land Company will hold auction sales of lots in Marmarth in the spring of 1908, and everything indicates that this will be one of the red letter sales of the West, both as to maximum bid for first choice and for aggregate sales."

Track laying on the Pacific Coast extension of the Chicago, Milwaukee & St. Paul railway goes on at both the east and west ends. Only fifty miles remain to be laid, which means that the track-laying gangs will meet somewhere on the Yellowstone by March 1st. May will probably see the first homeseekers' excursions headed this way. The high priced irrigated valley lands will be used for specialized crops, by the truck farmer, fruit grower, etc. The cost of grubbing sage brush since the advent of the four and six-horse grubbers doing custom work at the rate of six to ten acres a day is now \$1.25 to \$1.50 per acre.

NOW READY—THE AMERICAN GOVERNMENT.

We have just published a work entitled "The American Government," edited by H. C. Gauss, Esq. Mr. Gauss is a trained journalist at present occupying the responsible position of Private Secretary to Attorney General Bonaparte.

This book not only gives a list of all offices of sufficient importance to be filled by Presidential appointment and subject to confirmation by the Senate, but a complete statement of the powers and duties pertaining to each office and the salary attached thereto. How many Americans are there who could tell precisely what the powers and responsibilities of the United States District Attorney or the Collector of the Port are, and the extent of power vested in the hands of Bank Examiners and the Comptroller of the Currency, and to what work of reference could they turn for full information upon these subjects?

This book contains information upon points of law, procedure and custom not known to many of even the best informed citizens. Not many know that the terms of the Postmaster General and the Comptroller of the Currency extend a month beyond the term of the President who appointed them, and that the Postmaster General, unlike other Cabinet officers, can be removed by the President only with the consent of the Senate. Few know that the United States Senators and Representatives have a right to select, subject to the passing of examinations, cadets in the Naval Academy, but have no such right with reference to the Military Academy, for which their selections are merely advisory, the President having the sole power of appointment. These and many hundreds of other facts as little familiar are brought out in this useful volume.

What American traveling abroad or contemplating going abroad but would gladly know the duties and powers of the American Ambassador and Minister, the Consul General and the American Consul; what their duties are not only to the Government they represent, but to American citizens who visit the countries to which they are accredited as well. Not long since a famous New Yorker lost a suit in the United States Circuit Court involving more than \$100,000. He desired to appeal it to the Supreme Court of the United States, but was astounded at being told by his lawyers that they were not sure that he could appeal it, and to his astonishment the Supreme Court refused to hear the case. Now this book tells just what cases can be heard in United States Courts and the jurisdiction of each court; and also covers all points likely to come up about the Government and its officials in all their relations at home and abroad.

The book makes a volume of nine hundred pages, bound in half morocco, and the price is \$5. It is a book of reference for American citizens and for foreigners who desire full and authentic information as to the organization of the United States Government.

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Will pay for the IRRIGATION AGE
\$2.50 one year and the PRIMER OF
IRRIGATION.

HOW WE GROW SUGAR BEETS AND MARKET THEM.

BY JNO. T. HALL.

Northern Colorado is noted for the vast amount of sugar it produces. The writer, being fortunate enough to own an eighty-acre farm in this vicinity, can count smoke stacks from five sugar factories, each factory representing an outlay of a million dollars or more.

In March or the first part of April the ground is plowed to a depth of ten inches, thoroughly harrowed and leveled. This is absolutely necessary to pulverize the lumps, cut the elevations and fill the depressions, to make a perfect seed bed for the small seeds, and assist in a perfect and thorough irrigation.

As early as possible when danger of hard freezing is over, plant the seeds by means of a four-row beet planter manufactured for the purpose. Plant seeds to a depth of one inch after press wheels have passed over the seeds. When seeds have germinated and are beginning to break the crust, they should be harrowed lightly lengthwise of the rows, to assist the tender plants to break through the crust if any has formed.

When the fourth leaf appears they are then ready to be thinned by chopping out with hoe and thinning to a single plant, leaving them from twelve to fourteen inches apart in the row.

Cultivate with a four-row cultivator, traveling upon the same four rows planted by the drill. Knives or discs should be the first tools used on the cultivator, to destroy the first crop of weeds. Thorough hoeing and cultivating is absolutely necessary until the leaves cover the ground, when they should be furrowed and irrigated at this stage of the crop. About the first of August is the right time to give the beets this first irrigation, to be followed by an irrigation weekly thereafter until the first of September, when the water should be discontinued and the beets left to ripen.

Harvesting is begun from September 15 to October 1. A beet puller is the first tool used in the harvesting. This implement loosens the beet, as it takes only one row at a time, and leaves the beet sitting where it grew.

They are then thrown into windrows of six rows in each windrow, followed by toppers, who cut the tops off and throw them into piles. They are then ready for the wagon to draw them to dumping stations or factory, as the case may be.

A beet rack six feet wide and eight feet long is what is generally used. This has sideboard hinged and the load is dumped from the side by means of what is called the Carroll dump. This is a structure built above the cars on a grade so a team can pull a loaded wagon up. The wagon is stopped at the extreme top on a pivoted platform, which uplifts on one side and tips the wagon until the beets run out at the other side. The load is weighed over sugar company's scales and a ticket given for the weight of each load. About thirteen to fifteen tons per acre is an average crop in this locality, and a flat rate of \$5 per ton is the price paid. Enclose stamp for answers to questions upon practical irrigation subject. Jno. G. Hall, 820 Second Street, Irvywild, Colorado Springs, Colo.

RECLAMATION AND IRRIGATION IN THE SACRAMENTO VALLEY.

The snowball keeps rolling and growing as it rolls. Our modest efforts in stirring up interest in this all-absorbing proposition have already been crowned with considerable success. The most progressive journals of California are now devoting columns to the subject where formerly they grudgingly doled out an occasional paragraph only. Even conservative publications like the Sacramento Bee, Sacramento Union and Sacramento News have considered the pneumatic pipe dredge of sufficient importance to the ever present reclamation problem of Central California to give considerable space to accounts of the work that has already been done by this ingenious device in the Sacramento City park, and to speak of it in the most friendly ways. But to us the pneumatic pipe dredge is only a means towards accomplishing a greatly to be desired end—a means that we favor because we see through it the possibility of economically producing results of permanent reclamation of the 1,500,000 acres of low lying valley lands now subject to overflow, that must be accomplished before the other 2,000,000 acres of higher land in the Sacramento valley which is suffering equally, though not from a surplus of water, but rather from a lack of it, can by irrigation be brought into profitable cultivation.

The following letter from one of our subscribers, with the pamphlets that accomplished it, has been read by us with much pleasure:

Calusa, Cal., March 25, 1908.

D. H. Anderson Pub. Co.,

Chicago, Ill.

Gentlemen: I have read with interest your article on the reclamation of lands adjacent to the Sacramento River, and have also read most all matters published during my residence here of 30 years on that subject. I am led to believe that you are not aware of the data gathered by the Hydrographic Bureau, assisted by the state for many years, of which the main excerpts are given in a pamphlet containing the speeches made at the 'Red Bluff Banquet.' I am forwarding you this pamphlet, which will no doubt be read with much interest, and also inclose herewith my views as expressed under date of June 1, 1907, on the matter of correcting the evils now and always existing on our river. I might have included the Iron Canyon reservoir site, but I picked out what promise the largest results, as that should be the starter, which then could be followed up by the others. The Red Bluff people are now agitating the Iron Canyon project and trust that they may succeed in furthering the scheme. The Orland project now about to be started is too small to deserve mention, as you will note from the pamphlet, that its contents are small. But after some of the large reservoirs are built, and the flow of the river regulated thereby, let us use the increased flow during the ordinarily low stages of the river to correct the course of the same, and in that way use nature to do what it has undone before, i. e., to straighten the channel wherever necessary, by the aid of wingdams, the same as has been done in Europe for over 100 years. As the river invariably takes the dirt from one side, forms an eddy opposite and deposits that dirt just opposite that wash or excavation, it shows us that, by directing the current against that "point," "projection," or quarter or half-moon or horse-shoe bend, that it will take that dirt and put it back again to the place where it took it from. It is that straightening on the other hand which will cause an increased flow in the river and consequently deepen the channel, when that time comes. And at that time, when the reservoirs shall be operating, there will also not be the amount of silt in the water which the river carries now, to again fill any excavating done now, by dredger or otherwise, because the reservoirs will act as settling basins, and stream regulators both.

I do not think that my treatise would do for publication now, because it is unwise to do anything that might be antagonistic to any enterprise started, having in mind the Iron Canyon movement of the Red Bluff people at present. But I do believe that my argument is only a plain exhibit of the facts, and along strictly business lines,

and will, if carried out, save many millions of dollars, that is bound to be frittered away by going at it in a roundabout way, to get finally the same results. Everybody would save money, the city of San Francisco, the state, and the land owners all along the river, and we may include all the larger cities north of San Francisco, as their growth will soon cause a shortage of water for them also, only they cannot as yet see it. I am one of your subscribers, and it is the interest I take in your publication as well as the valley which causes me to write this.

Very truly,

JOHN C. MOGK.

Mr. Mogk's letter is a sample of many we are receiving, showing the intense interest that exists among the land owners in California, who of course have the most at stake, and through whom, as we stated in a former article, must come the action that will start the good work going. We can take no exception to the views expressed by him in the pamphlet enclosed with his letter, though our understanding is that the government engineers who have most thoroughly investigated this whole subject have decided that the Sacramento River must first be restored to its original level before any permanent reclamation and irrigation of lands should be undertaken. It goes without question that the main sewer must be cleaned before any work is done on the laterals. Hence we feel it the part of wisdom to concentrate all efforts on that part of the work and with that once done thoroughly and for all time, the second section will naturally be the utilization of the water to bring about the cultivation through irrigation of the largest possible acreage of arable lands.

We have also received a number of inquiries for detailed descriptions of the pneumatic pipe dredge, and have endeavored to supply the information, for this dredge promises to work marvels in the reclaiming of land, since its low cost of construction and its efficiency make it possible for one or two property owners to club together to reclaim their own land.

The dredges ordinarily used in reclamation projects cost from \$75,000 to \$150,000 to build. This is too great an outlay for the average property owner, and consequently the dredging is usually carried on by dredging companies who charge a high price for their services, so that very little independent reclamation work is carried on by small property owners.

It is to the small property owners, therefore, that the pneumatic dredge will appeal, for a dredge that will handle from 1,000 to 2,500 cubic yards of soil per day can be built in a few weeks for from \$5,000 to \$10,000, and when its work is finished the machinery, which is all standard machinery, can be sold for a large percentage of the original cost. Of course, if the state and federal governments should take up reclamation on a large scale, say in the Sacramento Valley, large pneumatic dredges will do the work with greater dispatch than any other type of dredge and small independent reclamation projects would not have to be undertaken, but reclamation on so large a scale is not a project that is likely to be undertaken immediately. The pneumatic dredge, therefore, seems to have come as the poor man's friend, for with the expenditure of a few thousand dollars, and under low operating expense, a property owner can reclaim and protect his land without the necessity of waiting for concerted action on the part of his neighbors. It is this feature of the pneumatic dredge that appealed strongly to us the first time we saw it in operation, and its importance to the welfare of districts that require reclamation and protection from flood waters cannot be over-estimated.

Next month we will endeavor to procure cuts and photographs that will give a good idea of the operations of this remarkable device.

WHAT IS A WATER RIGHT?

JNO. G. HALL.

The question, What is a water right? cannot be answered specifically, so in the explanation I shall call attention to certain existing conditions:

First, a water right belonging to a canal is an appropriation of the waters of the river after prior appropriations or rights of earlier ditches have been satisfied. This appropriation is decreed by court. Following is an illustration of an appropriated water right: A certain ditch is drawing three hundred feet of water at the head of the canal. If the stipulated number of rights in this canal is four hundred, then the three hundred feet of water must be divided into four hundred equal parts, each part being a water right containing a given number of inches. A farmer with a specified tract of land can own one or more rights if he chooses. Each right has a market value and is transferable like a horse, cow or any other piece of personal property. The owner of ten rights in the canal has a right to draw ten times as much water as the owner of one right. The division is always made on a basis of a single water right. River supplies of water generally fluctuate from day to day. This causes the amount per water right to fluctuate also. However, a water right is the pro rata share of the water in the canal as it fluctuates from day to day.

Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation

BOOKS ON
Irrigation and Drainage

The Irrigation Age has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded postpaid on receipt of price:

Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation in the United States, F. H. Newell.....	2.00
Irrigation Engineering, Herbert M. Wilson.....	4.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
Irrigating the Farm, Wilcox.....	2.00
The Primer of Irrigation, cloth, 300 pages.....	2.00
Practical Farm Drainage, Charles G. Elliott.....	1.00
Drainage for Profit and Health, Waring.....	1.00
Farm Drainage, French.....	1.00
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Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

Second—Although weighing about one-half the weight of a single cylinder engine of same rated capacity, vibrations are practically overcome, demonstrating conclusively that in proportion to strain the double cylinder "Master Workman" is the stronger engine.

Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

Fifth—Lubrication in our engine is absolutely perfect. There is no forced lubrication, lubrication being by gravity. Certainty of lubrication is of vital importance in the steady running and operation of a gasoline engine.

Sixth—All mechanism is in full view, which will enable you to thoroughly understand the operation of a gasoline engine. The worst kind of complexity is concealed mechanism.

THE TEMPLE PUMP CO. Factory, 15th St. and 15th Place, near Canal St. Chicago, Ill., U. S. A.

A GREAT LAND OPENING.

WASHINGTON, D. C., March 11, 1908.

Special to THE IRRIGATION AGE.

A number of exceptional opportunities will be offered this spring by the government for enterprising and intelligent farmers to secure choice farms on a dozen or more large irrigation projects which are now nearing completion.

Owing to the rapid narrowing of the limits of the unoccupied public domain, it is doubtful if these opportunities will ever occur again. It is probable, therefore, that the West will see one of the greatest influxes of homeseekers in 1908 that has been witnessed in many years.

The great fertility and wonderful crop yields from irrigated lands, and the favorable terms the government offers settlers, warrants the belief that before the year closes not a single farm will be without its entryman. These farms are located in North Dakota, Montana, Wyoming and Nevada.

A letter addressed to the Statistician, U. S. Reclamation Service, Washington, D. C., will secure full information concerning the location, soil, climate, crop possibilities, and terms of disposal.

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At the OXFORD HOTEL, Denver, Colorado, you will find all the leading men interested in irrigation and all of its branches. Denver is the logical irrigation center of the United States. You will find nearly everyone engaged in or interested in irrigation projects stopping at the Oxford Located half a block from the Union Depot: Fire Proof, Modern, European Plan and Popular Prices

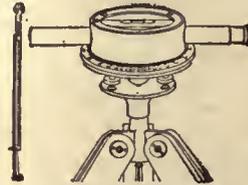
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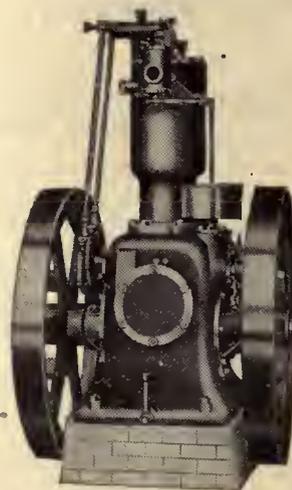
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Agriculture

The Potato Special train sent out by the Denver & Rio Grande Railroad under the auspices of the Colorado Agricultural College, is making history and is daily adding to the popularity of the Great Scenic line whose management not only encourages but lends most valuable aid in carrying to the farmers along their line in Colorado the men of science and practice who have made a success of potato growing. This feature of extension work, which is conducted by Prof. H. M. Cottrell and his associates, is meeting with the enthusiastic and cordial approval of the farmers. Crowds travel miles to greet these zealous workers for Colorado's welfare. The best possible demonstration that the work is being well done is shown in the results produced. The farmers are not only receiving instruction in seed selection, cultivation, marketing, etc., but by means of modern machinery carried along for the purpose, practical demonstrations are given and methods explained by specialists who have devoted the best part of their lives to the study. Some of the most successful farmers in the state are giving freely of their time and experience to the growers of the western slope who are anxious to profit by the work offered by the College.

LOW PRICES ON HIGH-GRADE VEHICLES AND HARNESS.

There are few business concerns in this country that have a stronger hold upon the public than the Elkhart Carriage and Harness Manufacturing Company. For over thirty-five years—over a third of a century—they have been manufacturing vehicles and harness and selling them, not to jobbers, wholesalers and dealers, but always direct to the people who use them.

Direct dealing would not alone have given them the hold they have upon the public. But they have dealt honorably. They have been manufacturing high-class goods and selling them direct on narrow margins of profit. People all over this country have learned to know this and the result is that the Elkhart Carriage and Harness Manufacturing Company now enjoys the proud distinction of being the largest manufacturers in the world doing business direct with the people.

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PUMPS WATER

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For Digging Irrigation Ditches, Canals, etc.

10 Standard Sizes

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GASOLENE
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No. 315. Light Extension Top Surrey with Double Fenders. Price complete, \$78.00. As good as sells for \$85 more.

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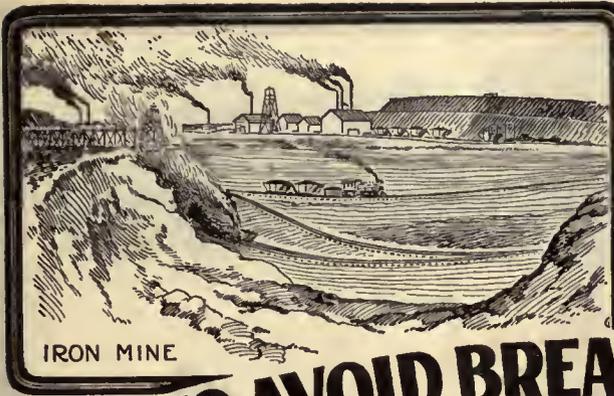
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I have secured title to 12,000 acres of wonderfully productive land in Sweetgrass County, Montana, within six miles of a trans-continental railway. Eight thousand acres of this body are under ditch with an abundance of water. This land will readily command from one to two hundred dollars per acre when cultivated to sugar beets and other high grade crops.

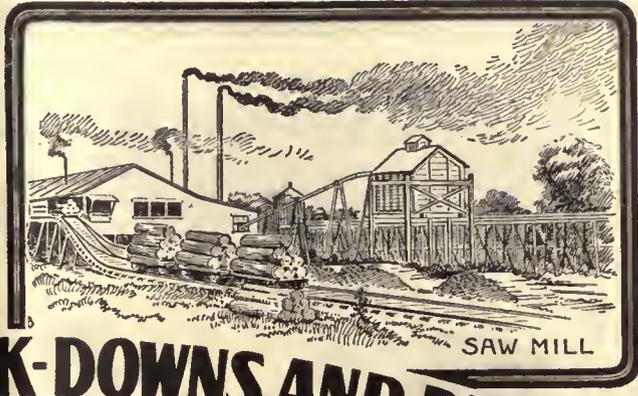
The additional four thousand acres are susceptible of farming under the "dry farming" system.

This entire tract may be purchased at an exceedingly low price and it can be exploited and colonized, and will readily show a profit of four to six hundred per cent. I would like to show this ranch to possible purchasers. Address

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IRON MINE



SAW MILL

HOW TO AVOID BREAK-DOWNS AND DELAYS AT HARVEST TIME

Every break-down at harvest time means time lost. Every minute lost may mean grain lost. Every bit of grain lost means profit lost. You cannot afford to take chances on break-downs and delays with harvesting machines built of doubtful materials.

You don't have to. Because the International Harvester Company has bought mines to get the best ore—built its own mills to produce the best iron and steel, bought timber lands and built its own saw mills—to give you material in your harvesting machines that you can always depend upon.

An individual manufacturing concern could not afford to take such precautions to protect you against poor materials, but the manufacturers of the

**Champion, McCormick, Osborne,
Deering, Milwaukee, Plano,
Harvesting Machines**

save you many dollars by putting always-dependable material into their machines.

The modern harvester is essentially a structure of iron and steel, and even as far back as the Mexican War time, the founder of one of the company's plants, with only one factory turning out his machines, was compelled to join with two other manufacturers, in the erection of their own iron foundry so that they could give the farmers machines built of good iron.

Today, in order to give you the best materials in your harvesting machines, the International Harvester Company is compelled to own, in addition to its fourteen complete manufacturing plants:

- 22,459 acres of coking coal lands in Kentucky.
- 100,000 acres of trees in Arkansas, Mississippi and Missouri, with a twelve-mile canal system, logging railroads, saw mills and other buildings.
- 40,000,000 tons of ore in Wisconsin and in the Mesaba Range, with six standard gauge locomotives and steam shovels that strip the surface and heap a fifty-ton railroad car in ten swings.
- A complete 93-acre steel plant with three blast furnaces, Bessemer steel mill, Blooming mill and Merchant bar mills, having a capacity of 500,000 tons of steel and 360,000 tons of iron every year.

The consumption of every natural product of the country is so far in excess of the supply that the cost of raw material is increasing annually, but by owning these properties and purchasing all other supplies in large quantities, this Company secures every advantage of highest quality.

Every bit of material—wood, steel, iron, malleables, paint, etc., is subjected to the most rigid tests in special testing departments before being used, so the farmer buying an International machine may be sure that the material is always the best.

Only large capital and a strong organization make these advantages possible, because an individual manufacturer would be compelled to take what he could get and pay whatever price was demanded.

In shipping, as well, the magnitude of this Company's operations insures a great saving of cost.

Steel, iron and lumber are shipped to the various plants in train-loads, while copper, rivets, tacks, buckles, canvas, etc., are received in carloads.

In July, 1907, the lumber yards at one of the plants contained 56,500,000 feet of lumber of the following woods: Ash, birch, bass-wood, cypress, cotton-wood, fir, gum, hemlock, hickory, locust, maple, oak, pine, pecan, poplar, elm, spruce, sycamore and yellow pine.

About seventy-five per cent of the lumber is air-dried, which insures a very tough material.

These are but a few of the many advantages which mean the best quality in every International machine you buy.

The several plants have also been able to improve the principles of construction, to improve workmanship, and to employ every means that will increase the machines' efficiency and durability.

You get the benefit in the end.

Call on the International dealer and get a catalog.

If you don't know an International dealer write us, and we will be glad to give you the address of the one nearest to you.

Equal in importance with a perfect machine is perfect twine. The most perfect twine made may be had in Champion, McCormick, Osborne, Deering, Milwaukee, and Plano, sisal, standard, manila and pure manila brands.

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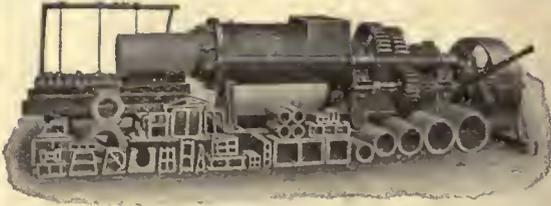
INTERNATIONAL HARVESTER COMPANY OF AMERICA

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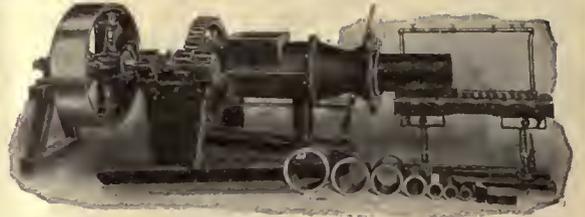
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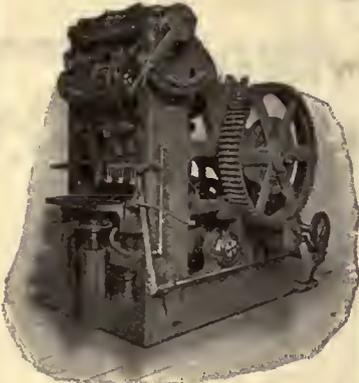




Centennial Auger Machine



Mascot Auger Machine



Dry Press, 5 styles



Wheelbarrows and Trucks



Eagle Repress

Clay Working Machinery

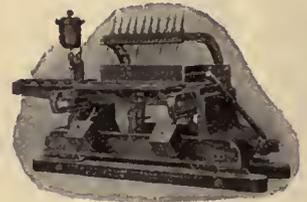
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We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

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Products of our Auger Machines

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Tree Planting—Spring or Fall.

BY W. PADDOCK.

State Agricultural College, Colorado.

The question of tree planting is beginning to be considered by many people who have recently come to the state, if one may judge by the number of inquiries which are being received at the Colorado Agricultural College, at Fort Collins.

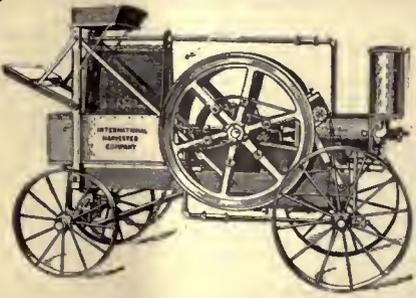
In many of the eastern states, fall planting of both large and small fruits is much in favor. There are several reasons for this preference, the most important being that there is little or no danger of either trees or soil becoming dried out during the winter. Then, in many locations, spring rains prevent early working of the soil, so that it is often late before planting can be begun. But if the planting is done in the fall, some of the plants may become partially established, and, as the wet weather in spring is favorable to growth, the fall planted trees have a great advantage.

Under Colorado conditions quite the reverse is usually true. A few people have success with fall planting, but they are the exception.

Our fall weather is usually very dry, and many of the ditches do not supply late water, consequently fall planted trees usually experience adverse conditions from the start. Then the following winter weather is equally trying. The prevailing weather is dry, with occasional drying winds. The cold nights, with a rise of temperature of 40 degrees or more the following noon, is equally trying to newly planted trees.

In the colder fruit section many trees are killed by "freezing dry," as it is termed. This occurs with established trees when the ground freezes to such a depth that root action is practically stopped. Moisture is given off by the tree tops during winter as well as in summer, though not to such an extent. When the ground is frozen, no water can be taken in by roots and the tops become so dry that many of the plant cells are killed. Such trees may appear all right in the spring and may bloom and the leaves may grow to nearly normal size. If the trees reach this stage, they usually die suddenly, seemingly in a day.

Fall planted trees do not have the advantage of an established root system to supply the moisture lost by evaporation, consequently they are much more susceptible to injury during winter. It is not necessary for the ground to become frozen in order to bring about this condition in fall set plants, so freezing dry may occur in any locality.



I.H.C.

GASOLINE

ENGINES

Are solving the hired help problem for hundreds of farmers.

Vertical Engines made in 2 and 3-Horse Power.
Horizontal Engines (Portable and Stationary) made in 4, 6, 8, 10, 12, 15 and 20-Horse Power.
Air Cooled Engines, 1-Horse Power.
Traction Engines, 10, 12, 15 and 20-Horse Power.
 Also sawing, spraying and pumping outfits.

YOU offer high wages, and still find it difficult to get hired men. Why not do as other progressive farmers are doing—let one of the dependable and ever ready I. H. C. gasoline engines be your hired man?

Suppose you want to grind feed, pump water, operate the churn, grindstone, fanning mill, separator, bone cutter, or saw wood. With an I. H. C. engine you will need no extra help. You can run the engine and attend to the machine yourself.

In the same way it can be used too for irrigating—pumping from wells, lakes, ponds and running streams. The operator can handle the head of water in the field and also attend to the engine.

The engine will work for you indoors or out, in wet or dry, hot or cold weather. You will have no difficulty in operating or controlling it.

Only a few cents per hour is required for fuel. All I. H. C. engines use either gas, gasoline or denatured alcohol.

Please notice in the above list of styles and sizes that there is an I. H. C. gasoline engine adapted to practically every farm requirement.

You can have a small engine which you can easily move from place to place, as your work requires, or you can have a larger engine for stationary use. The efficiency of all I. H. C. engines is well known. You cannot possibly have any better guarantee of a dependable engine than one of these engines affords.

Call on the International local agent for catalogs, and inspect these engines. Write nearest branch house for colored hanger and booklet on "Development of Power."

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SEALED PROPOSALS

Will be received at the office of the Bitter Root Valley Irrigation Company, Hamilton, Montana, until noon Friday, April 15th, 1908, for furnishing all or part of the material and performing all necessary labor involved in the construction of about thirty-five (35) miles of irrigation canal, located in Ravalli County, Montana, consisting of approximately eight hundred thousand (800,000) cubic yards of excavation; five million (5,000,000) feet, board measure, of timber; eight thousand (8,000) lineal feet of pile driving; also the construction of an earth dam, with the necessary reinforced concrete, outlet conduit gates, gate walls, etc., with approximately four hundred eighty thousand (480,000) cubic yards of puddled embankment.

The canal construction may be let as a whole or in sections, as may seem advisable to the Company.

Each proposal must be accompanied by a certified check for one thousand dollars (\$1,000.00), payable to the Company, on canal construction, and five thousand dollars (\$5,000.00) on dam, as an evidence of good faith on the part of the bidder.

Plans, specifications, estimates and bidding blanks will be on file in the office at Hamilton, Montana, after April 1st, 1908.

For further information, address

L. E. WOLGEMUTH, Gen'l Mgr.,
Hamilton, Montana.

Send \$2.50 for The Irrigation

Age one year and

The Primer of Irrigation

Homeseekers Opportunities

in the West.

IRRIGATION

In the States on and tributary to the UNION PACIFIC bears evidence of profitable financial returns.

THOUSANDS OF ACRES

of land under irrigation are still for sale in this territory. No other part of the world has greater or more valuable opportunities to offer to industrious seekers for homes. Why not go out and see for yourself the openings that await you?

Homeseekers rates in effect to the west every first and third Tuesdays of each month during 1908

VIA THE

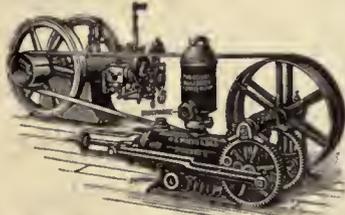
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MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

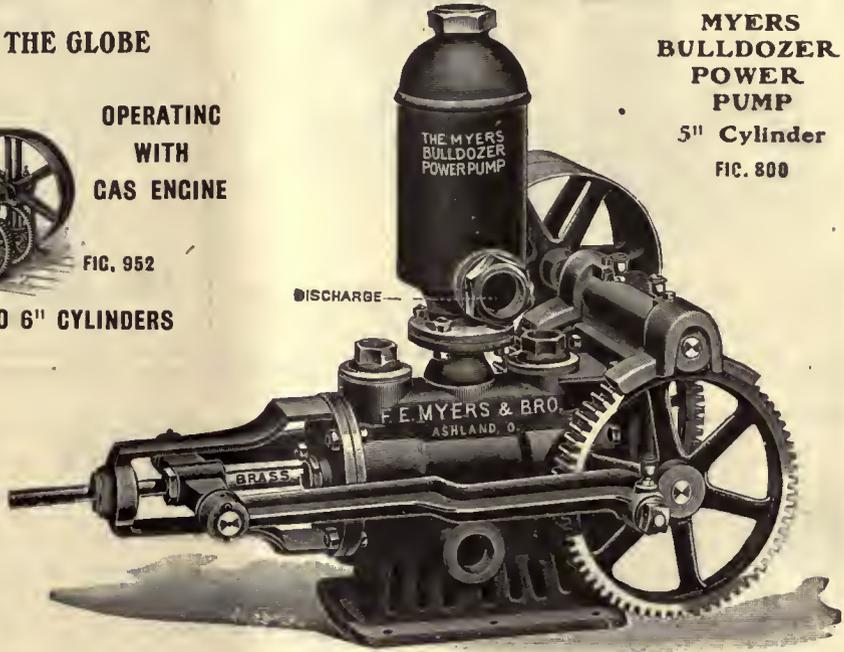
MYERS
BACK CEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

5, 7½ AND 10"
STROKE

FOR BELT,
WIND DR HAND
POWER

FIG. 1113



MYERS
BULLDOZER
POWER
PUMP

5" Cylinder
FIG. 800

BULLDOZER
WORKING
HEAD

BULLDOZER PUMP
6" BRASS LINED
CYLINDER

FIG. 1079

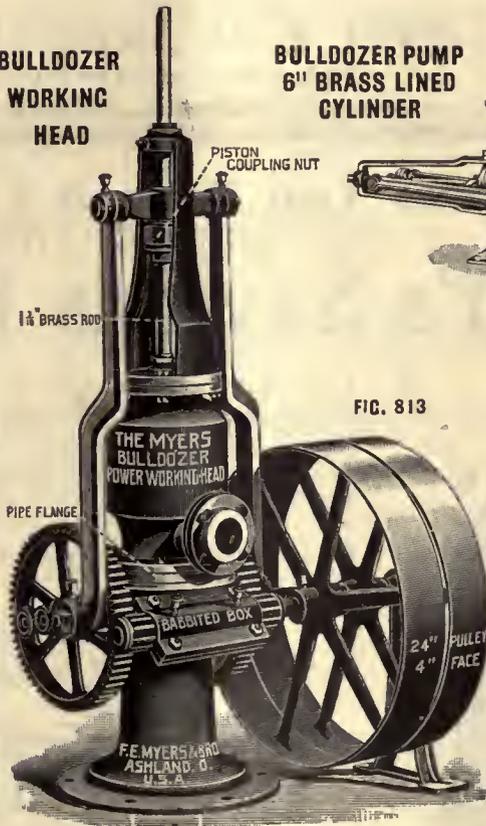


FIG. 813

MYERS BULLDOZER
WORKING HEADS

NO. 359

5", 7½", 10" STROKE
DISCHARGE 2½" OR 3"
SUCTION 2" TD 4"

NO. 364

12", 16", 20" STROKE
REGULARLY FITTED 4"
DISCHARGE
SUCTION 8" OR LESS

Write for descriptive Circulars and Prices. We want you to acknowledge this Ad. so that we can acquaint you in detail with the superior features of Myers Power Pumps. This is the proper season. The right time to write is right now.

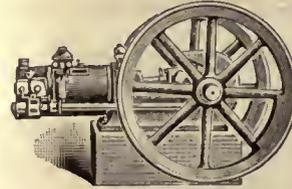
F. E. MYERS & BRO., ASHLAND, OHIO, U. S. A.
PROPRIETORS OF
ASHLAND PUMP AND HAY TOOL WORKS

CEMENT PIPE TOOLS



Do you want to make money? Here is your chance. Get a set or two of our pipe tools, make up a stock of pipe and do contracting of installing irrigating systems. Your neighbors are wanting something to save water and labor. Here it is. Write for further information and prices. Mention the Irrigation Age. **KELLAR & THOMASON, Covina, California.**

GOLD MEDAL AT JAMESTOWN



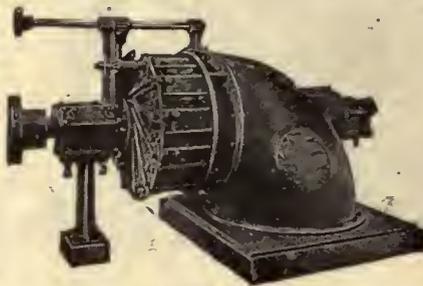
The U. S. Government paid this Company a big compliment when it selected the "OTTO" Engine for use in making the fuel tests at the Jamestown Exposition.

The Jury of Awards also proved its fitness for its task when it AWARDED the "OTTO" the Gold Medal.

The "OTTO" has won FIRST PRIZE at every large Exposition held in this country since the Centennial in '76.

THE OTTO GAS ENGINE WORKS

Philadelphia, Pa.



SAMSON TURBINE

When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

JAMES LEFFEL & CO., Springfield, Ohio, U. S. A.

Write Department K-2 for Catalog.

It Makes You Save A Coin A Day OR THE CLOCK STOPS
Flitcraft's Savings Bank Clock



See that Slot

This is a novel combination of an alarm clock and a savings bank, provided with a coin chute, also automatic locking and unlocking mechanism. The clock in its normal condition is locked, and cannot be wound until a coin is deposited into the slot. Within a brief period after it is wound, the clock is automatically locked again and cannot be wound until another coin is deposited. It takes nickels, dimes and pennies, and holds over eighty dollars in dimes.

The bank is made of sheet steel, beautifully enameled in black, with nickel-plated combination lock. It is ten inches high, seven inches wide and weighs about two pounds.

A SPLENDID PREMIUM

For Purchasers of Irrigation Lands on Easy Payments

Are You Selling Town Lots? This Will Help You. Try It.

SINGLE BANK CLOCK \$2.00.

(Postage stamps accepted.)

Special Prices for Quantities.

PATENT No. 7750-58

R. B. FLITCRAFT, 1303 Marquette Building, Chicago

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Fortunes in Figs

— at —

Maywood Colony

A TEN-ACRE lot of the finest fig land of the colony can be had for a reasonable price. There are good incomes to be had also in almond and grape culture and ten-acre farms will pay big interest on your investment.

Maywood Colony is located in the upper end of the beautiful Sacramento Valley, in Tehama County. Corning, the depot and postoffice for the colony, is 110 miles north of Sacramento.

For literature relating to land in this settlement, write to

W. N. WOODSON

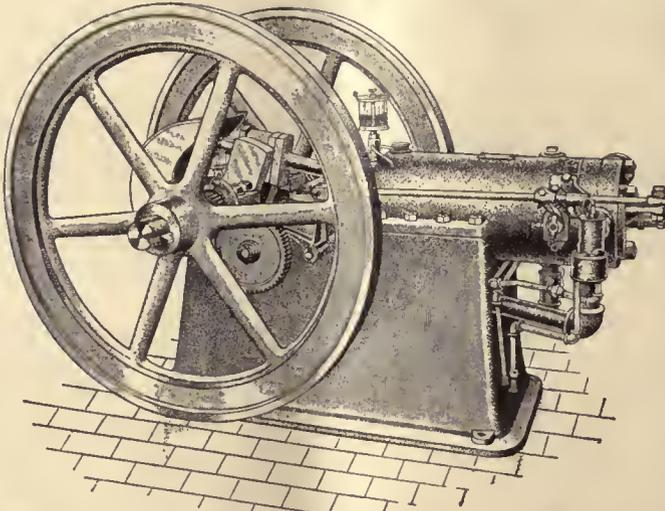
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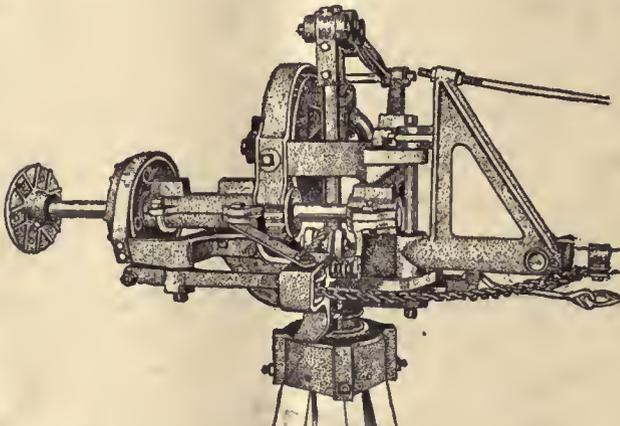
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DEALERS IN AND MANUFACTURERS OF IRRIGATION AND
GENERAL FARM MACHINERY.

VOL. XXIII.

CHICAGO, MAY, 1908.

No. 7

Ditches Dug To Dimensions



A dredge-dug ditch must be dug one or two feet deeper and several feet wider than specified dimensions to provide for caving banks. "Let Nature do the trimming," says the dredge man. Well, every engineer knows that "Nature does the trimming" in dredge-dug ditches, and she does it in her own sweet way by washing the soft parts of the banks down onto the bottom and leaving the harder parts standing out between like teeth on a rake. One of these "nature trimmed" ditches bears about as much resemblance to the engineer's cross-section as a cow-path does to a park boulevard.

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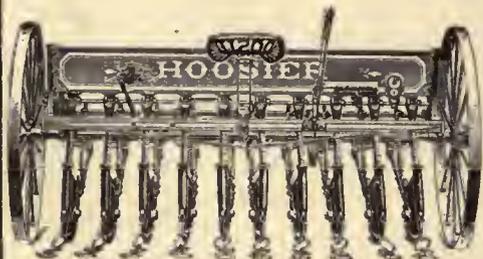
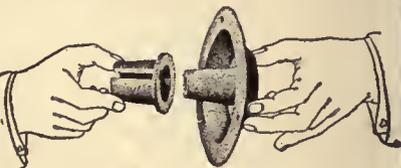
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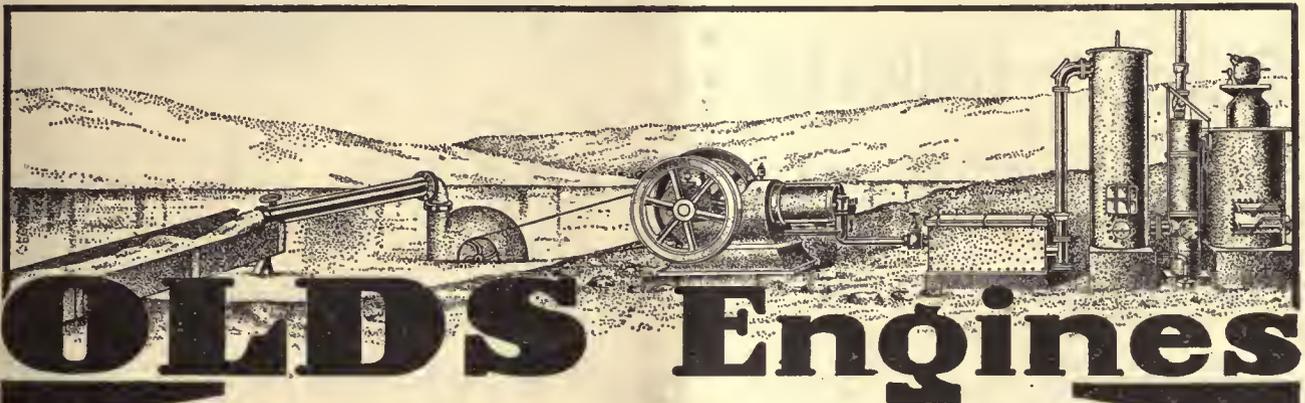
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4¼ inch.	4½ inch.	6½ lbs.	20c
5½ inch.	6 inch.	10¾ lbs.	34c
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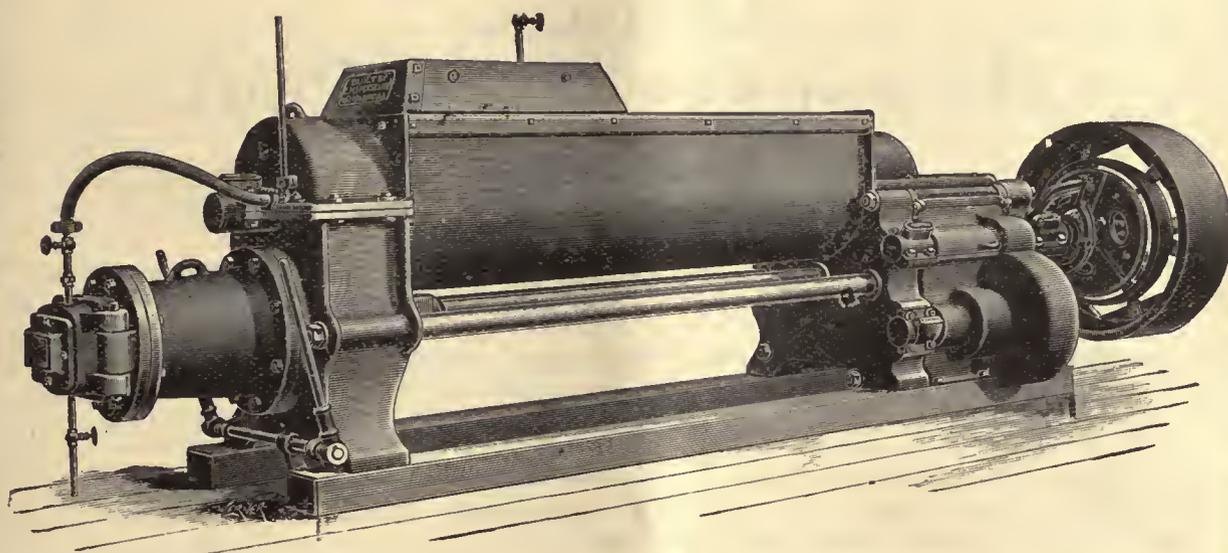
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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, MAY, 1908.

No. 7

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, - - CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

Forest Service Appropriation.

As reported elsewhere in this number, practically all of the new provisions contained in the paragraph carrying Forestry appropriation were stricken out in the debate on the agricultural appropriation bill led by Mr. Mondell and other champions of the rights of the western settlers. Though unable to cut down the extravagant appropriation the western representatives prevented the grants of practically unlimited powers to the man who heads the Forestry Service.

Irrigation Congress.

Preparations are going forward in a satisfactory manner for the National Irrigation Congress, which is to be held at Albuquerque, New Mexico, September 29-30, October 1-2-3.

The energetic citizens of New Mexico will, no doubt, make this one of the banner meetings in the history of this organization. Some criticism is made of the method of exploiting the congress, and the general impression is that there is a dearth of literature going out. This will, no doubt, be remedied by the local board of managers in a short time, and all those who are interested in the organization and the meeting will receive information and general data concerning the proposed transactions of this Congress.

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Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 23 years old and is the pioneer publication of its class in the world.

Union League Club Misled.

As an illustration of how a large and intelligent organization may be misled by one or more individuals who have axes to grind, we wish to call attention to the action of the Union League Club of Chicago at a meeting held some two or three weeks ago in which strong resolutions were adopted concerning the matter of Forestry affairs and the general policy of the Forestry Service.

It is safe to say that not one out of fifty of the members of the Union League Club fully comprehends the subject of Forest Reserves, and if the members of that organization could be properly enlightened as to the methods employed and the personnel of the individuals who brought about this meeting which resulted in so strenuous a resolution, it is our impression that they would be more cautious in the future. There is no doubt in the minds of those who are acquainted with the situation that George H. Maxwell, who is, so far as we know, not a member of the organization, engineered the entire movement and secured the endorsement of one of the strongest organizations in the West for a policy which is little understood by its members.

If the gentlemen who were instrumental in the formation of the resolution had been acquainted with the history of George H. Maxwell and his work along these and similar lines it is doubtful if they would have been so precipitate in their action. It is a fact perhaps not well known by members of the Union

League Club that Mr. Maxwell was repudiated by the National Irrigation Congress held at Portland, Oregon, and a resolution was passed by that body that neither his organization, the National Irrigation Association nor any other allied organization was authorized to collect money in the name of the National Irrigation Congress. Since that time Mr. Maxwell has never appeared at any of the Irrigation Congresses. It is also a well known fact that this gentleman tried to kill the National Irrigation Congress by having it merged with another organization known as the Trans-Mississippi Congress.

If all of these facts had been made public so that the members of the Union League Club could have understood his position it is doubtful if they would have acted so hastily.

Another question which naturally arises in the minds of those who are acquainted with the situation is, where does George H. Maxwell secure his support, and from whom is money gotten to pay for all of the time and expense incident to work of this character. Is it possible that he is on the pay-roll of the Forestry or Reclamation Service? It may not be a bad idea to find out if Mr. Maxwell is employed by one or both of these organizations, and an effort will be made to learn why he takes so active a part in forestry affairs when he has had no direct interest in the subject heretofore. It is well known that some of Mr. Maxwell's relatives have been on the pay-roll of the Reclamation Service and no doubt some of his friends are on the pay-roll of the Forestry Bureau, and there could be no serious objection made to this provided their whole time is spent in carrying out work which may be classed as legitimate in connection with one or both of these bureaus.

It is doubtful, however, if the law contemplates paying a salary to an individual who is going around the country inducing commercial and other organizations to pass resolutions supporting some particular propaganda favored by the heads of the Forestry or Reclamation Bureaus.

It is the impression of the IRRIGATION AGE that this matter should be looked into and the relationship between Mr. Maxwell and the Messrs. Pinchot and Newell be clearly explained.

This subject may be taken up later on after we have had time to investigate it more thoroughly.

Won't Quit
Yet.

After all that has been said one way and another concerning Edward H. Harriman, the head of the Union and Southern Pacific Systems, it is gratifying to learn that he has no intention of retiring from the railroad business as was suggested by some of the newspapers a few months ago.

On his birthday a year ago he thought that another twelve months would find him ready to quit the railroad business, but he has recently stated that there are still too many moves to be made before his final retirement, and he will not stop to consider the subject of retirement until complications in the industrial development of the West have been sufficiently evned up to enable him to establish a clear track ahead for his successors, and until then Mr. Harriman thinks he owes it to the forty thousand stockholders and one hundred and fifty thousand employees of this great system to remain in the harness.

Whenever unfair criticisms have appeared in the newspapers concerning Mr. Harriman it has always brought to mind the heroic work done by him at the time of the San Francisco earthquake and fire. To one who was in touch with the conditions as was the writer, and who clearly comprehended the tremendous responsibility resting on his shoulders at that time it is difficult to understand how a man with a great property in apparent jeopardy could devote time to relieve the suffering of the thousands who were unable to help themselves.

Mr. Manson, of a well known banking concern in Chicago, mentioned something of Mr. Harriman's work in a short talk made before the National Irrigation Congress at Sacramento, California, last September. The writer traveled eastward on the same train with Mr. Manson immediately after the earthquake and both had a good opportunity to study the results of Mr. Harriman's kindness and generosity. Train after train passed us going westward loaded with provisions for the suffering on the coast, and every car was hauled free of cost from whatever point it reached the Harriman system to its destination through the kindness and generosity of E. H. Harriman. This is only one instance of the many which are quoted by the employees and friends of Mr. Harriman.

There is no doubt that many throughout the West criticize him as they think justly, but to thousands who know the man and the difficulties he has encountered in the upbuilding of a system which was in almost ruinous shape when he took it over, it is easy to understand how some of his methods may have been misunderstood. The general trend of his work, however, has been toward the welfare of the west and the thousands of people who are more or less dependent upon his great system. That Mr. Harri-

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\$2.50 one year and the PRIMER OF
IRRIGATION.

man has been unkindly and unfairly criticized by individuals high in power is admitted by everyone who knows the man and his work. To our mind, no single individual has done more toward the clean development of the West than E. H. Harriman, all statements from those in high or low positions to the contrary notwithstanding.

It is moreover well known by those who closely study the conditions and development of the west that the antagonism shown toward Mr. Harriman and his work has led to a slower development in recent times. It could not be expected that he or his associates would expend large sums of money in building branch lines into remote sections of the west without a clear knowledge of the unqualified support of individuals high in federal or commercial positions. It is hoped that affairs may so shape themselves before Mr. Harriman's retirement that he may be able to carry out plans which were, no doubt made a year or more ago to more fully develop remote sections of the West where there is a growing need of better transportation facilities.

In a recent interview Mr. Harriman stated as follows:

"I believe that things will right themselves when people have had a chance to understand the situation, provided we eliminate the self seeker. What we have got to have in political and business life is the man who is willing to work for others and does not undertake to move the men on the chess board solely with a view to what he thinks to be his own interest. If you ask me when I think the equilibrium will be reached and confidence restored, I say, frankly, that I do not know."

**Ship Siberian
Timber
Eight
Thousand
Miles.** An Australian corporation has just received a concession from the Russian Government to take out thirty million feet of timber a year from a forest in Siberia, nine hundred miles from Vladivostok, to be delivered in Melbourne, Australia, approximately eight thousand miles away, and nearly three times the distance from New York to San Francisco.

It is likely that no lumbering operation of recent years more strongly illustrates the pinch in the timber supply in all parts of the world. In the news of the concession, told in an American lumber journal, is the suggestion of the difficulty that all countries may have to encounter in getting the wood which they need in the future. Every year timber cruisers are going further and further afield and cutting trees which, in former times of abundance, they passed because of the inaccessibility of the forest.

In taking out the Siberian timber the Melbourne lumbermen will have to ship the entire year's cut in July, August, September and October, for during

the remainder of the year there is no open water at the point of shipment. What makes this unusual feature of transporting bulky logs 8,000 miles quite feasible is that such unmanufactured stock is admitted free, while there is a heavy duty on all manufactured wood brought into Australia, the duty on lumber, for instance, being nearly \$5.00 a thousand board feet. At Melbourne, a new mill is being erected to manufacture these logs into dressed stock, such as flooring, ceiling and other products, as well as into lumber.

These Siberian operations differ from the lumbering methods in the United States, in that in this country it is possible and customary to have new mills conveniently near the place of production, though, with the continually decreasing supply, the larger mills often find it profitable to haul their timber by trams and railroads many miles away from their saws. Forest experts in this country say that the hope of the United States for a steady supply of timber lies in the application of forestry to all timber lands, private and public, and the careful study of the economical and better utilization of product. Even so, a severe shortage in twenty to twenty-five years must be expected.

A SUBSCRIBER FOR TWENTY YEARS.

LAREDO, TEXAS, April 25, 1908.

IRRIGATION AGE COMPANY, Chicago:

Dear Sirs—Enclosed please find postoffice order for \$1 to renew my subscription for another year to your valuable magazine. I believe this is my twentieth year.

ALLAN MACDONELL.

If the proof of the pudding is in the eating thereof, Mr. Macdonell should be qualified to testify to the interest and value of THE IRRIGATION AGE. Its publishers are gratified at having been of service to an individual subscriber for so many years, and hope that Mr. Macdonell will live long and prosper, and perhaps round out another score of years as a subscriber to THE IRRIGATION AGE.

IOWA DRAINAGE REPORT

The report of the 1908 annual meeting of the Iowa State Drainage Association has just been issued by Prof. W. H. Stevenson, Ames, Iowa, secretary of the association.

Many papers and addresses of great interest and value are contained in the report. The following subjects constitute about one-half of the full report: "Dredge Ditches"; "Some Unsolved Problems in Drainage Engineering"; "The Manufacture and Use of Cement Tile"; "Some Legal Phases of the Drainage Problem"; "Road Drainage," and "The Duties of the Board of Supervisors as a Drainage Commission."

The report is a handsomely illustrated pamphlet of over 100 pages and will be sent to any address for 25 cents.

An American consular officer in the Far East reports that an inquiry has been received at his office for circulars and catalogues on the subject of methods, machinery, etc., for irrigation, dredging, and canal-cutting purposes. A commission which has been working for some time to improve the depth and general availability for shipping purposes of a river in that region, now proposes to buy its own machinery for the continuance of the work. Manufacturers of machinery will be given the name and address on application to Bureau of Manufactures, Washington, D. C., referring to File No. 2213.

DEBATE ON APPROPRIATION FOR THE FOREST SERVICE.

The consideration of the agricultural appropriation bill in the House of Representatives, which began on March 25, invoked much discussion and lively debate, but the feature of the debate which attracted most attention and was unquestionably the most important and interesting—at least from the western standpoint—was that had on March 30 and 31 on the item in the bill providing for the Forestry Service, and which was participated in by Messrs. Mondell, of Wyoming, Mann and Madden of Illinois, Crumpacker of Indiana, Olmstead of Pennsylvania, Cushman of Washington, Smith of California, and Bonyng of Colorado, against various provisions of the Forestry appropriation, and by Chairman Scott, Mr. Pollard of Nebraska, and others in defense of this item.

Mr. Mondell first called attention to a provision in the paragraph that would authorize the expenditure of the appropriation anywhere in the jurisdiction of the United States. While he did not insist upon the point of order against the provision, Chairman Scott finally agreed that an amendment would be inserted under which the expenditure of any part of the appropriation in Hawaii or the Philippines would be prohibited.

The next provision in the paragraph to go out was one which would have very largely widened the authority of the Forestry Bureau, and under which it was proposed to allow the Bureau to "assist" owners of woodlands in the proper care of the same. Mr. Mondell called attention to the fact that under this provision the appropriation could be used to enable the Forester to become "the caretaker, the gardener and the park director of all timber land in the United States in private ownership."

The next provision to go out on a point of order was one which would allow the appropriation to be used for extensions of forest reserves "by the purchase of lands or rights." Mr. Mondell, Mr. Madden and Mr. Bonyng called attention to the fact that under this provision there would be practically no limit to the authority of the Forestry Bureau to purchase lands for the extension of Forest Reserves even in those states where Congress had prohibited the creation of reserves except by Congressional action, and it was suggested that under this provision the purchase of lands might be made in other than public land states for the creation and extension of reserves.

Protest Against Extension of Reserve Over Owens River Valley.

While this provision of the paragraph was under consideration Mr. Smith of California, made a very vigorous speech against the attitude of the Forestry Service in a contemplated extension of a reserve over the Owen's River Valley in California, and he declared that the purpose of such extension was to get control of the water rights on that stream and parcel them out to those whom the Forest Service thought ought to have them, in utter disregard of the laws of the State of California. He denounced their attitude as an outrage, and stated that it was notorious in the Forestry Bureau, "from the women stenographers up, that this extension was not for forestry purposes, but for the purposes he had mentioned."

In answer to a question by Mr. Mondell, he said that the land which it was proposed to include in this extension of the reserve contained no timber at all, except a few scattering cottonwood and willow trees which have sprung up in damp places under irrigation.

The provision in the paragraph authorizing the Forestry Bureau to co-operate with other Federal Bureaus in the performance of the duties imposed upon them by law, after some discussion, was allowed to remain in; Mr. Mondell not making a point of order, because he stated he had no desire to in any way hamper or embarrass the work of the Forestry Bureau, but he was anxious to assist in doing anything and everything that was right in the preservation of the national forests, and inasmuch as there were opportunities for co-operation, stated that he did not desire to prevent friendly co-operation and trusted the authority so granted would not lead to a duplication of work. It was suggested, however, during the discussion, that this provision might lead to a duplication of work, and therefore an amendment was offered tending to prevent such duplication so far as possible.

The next provision to go out on a point of order was that which authorized the Secretary of Agriculture to "Divide and designate lands heretofore or hereafter reserved for national forests as he may deem best for administrative purposes." Discussion of this provision was participated in by Mr. Mondell, Mr. Madden and others, and indicated a fear on the part of several gentlemen that this was an indirect way of endeavoring to secure authority for a further extension of reserves.

The next provision to go out on a point of order was that which provided for the issuance by the Forestry Bureau of irrevocable permits, under certain conditions, for power plants within reserves. This provision was objected to both by those who objected to the issuance of long-time permits for this purpose and those who objected to any provision whereby the Forest Service should have complete control over all of the industries established within forest reserves. Later in the debate in offering an amendment, Mr. Mondell called attention to the fact that the Forestry Bureau had supplanted the Interior Department in its control of lands in the reserves by issuing hundreds of revocable permits to parties who were entitled under the law to permanent rights of way. It was explained that these entitled to permanent rights of way for ditches, etc., for agricultural and mining purposes would not readily accept temporary, revocable permits unless such obstacles were placed in the way of obtaining these rights of way by the Forestry Bureau that they were compelled to either take revocable permits placing them in the power of the Forest Service or get nothing.

The next provision to go out on a point of order, was that which authorized the Secretary of Agriculture to exchange lands or stumpage for the purpose of consolidating National Forests. The point of order against this provision was insisted upon so emphatically that not much time was given for its discussion. Evidently the House had in mind the scandal which had arisen under a former law under which so-called forest reserves lieu scrip was obtained, and under which valuable timber lands owned by the Government were exchanged for comparatively worthless lands owned by private individuals. Attention was also called to the

fact that under the language of the provision in question the Secretary of Agriculture was not confined to making an equal exchange of acreage. The provision was considered very dangerous.

The provision for continuing special fund for co-operative work was also objected to, and following this the provision whereby it was intended to make advances of money to chiefs of field parties which they could expend for fighting fire and improving forests in emergency cases was stricken out.

Excessive Traveling Expenses of Forestry Officials.

At the conclusion of the discussion on the points of order against the paragraph, Mr. Mondell offered the following amendment: "That no part of the money herein appropriated shall be used to pay the transportation or traveling expenses of any forestry officer or agent except he be traveling on business directly connected with the Forestry Service, and in furtherance of the work, aims and objects specified and authorized in and by this appropriation." In support of this amendment Mr. Mondell called attention to the fact that the Forestry appropriation was a very large one, and over and above the demand for all salaries in all branches of the service there was a balance of over \$1,760,000, which could be used at the discretion of the Forester for almost any purpose within the very wide discretion granted under the language of the paragraph. He also called attention to the fact that very large sums of money had been used by this Bureau for traveling expenses; that in the detailed estimates of appropriation before the Committee there were single items for traveling expenses amounting to many thousands of dollars, and that the aggregate of traveling expenses run into the hundreds of thousands of dollars.

Meetings Packed by Forestry Officials.

Mr. Mondell stated that it was a matter of common report throughout all the western states that no public gathering could be held without the presence of a large number of Forestry Officers from Washington and elsewhere. He stated that they were "delightful gentlemen; the people of the west are glad to see them; within reason they ought to travel about and become acquainted with conditions, but it is sometimes felt that these gentlemen appear in such numbers as to very largely control the sentiment of meetings held for an expression of the public opinion of the region." He called attention, in this connection, to a meeting held last June in Denver, to a meeting of the National Irrigation Congress at Sacramento and to other meetings which he said were largely attended by officers of the Forestry Bureau apparently with the idea of controlling the action and resolutions of such meetings. After considerable debate this amendment was carried.

Mr. Mondell then offered the following amendment: "Provided that no part of this appropriation shall be paid or used for the purpose of paying for, in whole or in part, the preparation of any newspaper or magazine articles." A point of order was made against this amendment, as it was made against the other, but it was promptly overruled by the Chair.

Discussing this amendment Mr. Mondell said: "That it is popularly believed that a considerable portion of this appropriation is used for the purpose of

paying, in whole or in part, for paper and magazine articles that appear under the names of contributors who contribute to such newspapers or magazines. Now my purpose is, so far as possible, to prevent that kind of use of the people's money. I believe in the Bureaus advertising their work widely. I am in favor of proper publicity in every important Bureau of the government. I know of several Bureaus whose work of disseminating information through the newspapers and otherwise is most helpful. I approve of a proper Bureau of publicity to give the public knowledge of what the Departments are doing. But if I am correctly informed this Bureau has been doing a work beyond that. It has, directly and indirectly, been encouraging and paying for the preparation of newspaper and magazine articles placing an exaggerated value on its work, and particularly in encouraging people who saw fit to impugn the motives of or criticise Members of Congress and Senators and other men in public life who do not agree with some of the acts and some of the policies of the Bureau."

After some considerable discussion in which Mr. Mondell insisted that his amendment would not prevent the dissemination of proper information by the Bureau the amendment was adopted.

Mr. Mondell then offered an amendment which was intended to compel the Bureau to exclude large areas of nontimbered lands from the reserves. Discussing the amendment he called attention to the fact that it was notorious that large areas of nontimbered land and land not needed for the conservation of water were included in reserves, and in this connection he referred to part of a reserve in his state in which he claimed that half of the land was in private ownership, and of the remaining 50 per cent not over 20 per cent was timbered, and though the people in the vicinity of the reserve had petitioned to have these lands excluded from the reserve, the Forestry Bureau had refused to do it. After some discussion it appearing to some of the Members that there was some doubt as to whether the language of the amendment would not work to prevent the exclusion from the reserves of some heavily timbered lands, the amendment was disagreed to.

Government Monopoly of Available Timber.

Mr. Mondell then offered the following amendment:

"That no part of this appropriation shall be used for the negotiation of any sale of timber in any National Forest at a price above what would constitute a fair and reasonable price for such timber were it sold in competition with timber of a like character in the same locality on land in private ownership."

In the discussion of this amendment Mr. Mondell reviewed the practice of the Department in many of its sales of timber from the reserve and stated that the creation of reserves in his state had tended to steadily increase the price of timber and had, in certain localities, raised it as much as \$6 per thousand. He explained that by the creation of great reserves containing practically all of the timber in a given region, a Government monopoly has been established, and that taking advantage of this condition the Forestry Bureau had arbitrarily raised the price of stumpage to a price far beyond what private parties owning stumpage of the

same character in other portions of the Rocky Mountain region were willing to sell it for.

He said that he did not make his complaint on behalf of the lumberman who purchased this timber because they had no complaint to make nor had they reason to complain of the price they had to pay because conditions were such that they had no difficulty in reimbursing themselves by raising the price of lumber, and he said: "Such sales mean that our people are compelled to pay all the way from \$4 to \$6 a thousand more for their lumber than they have been paying for it," and further discussing this matter he said that all the purposes for which the reserves are established can, and will, be best served by a policy which lightens rather than adds to the burdens of the people living in their vicinity. Under such a policy National Forests will have the support of the people, but as soon as it is generally understood that the policy pursued is one under which additional burdens are laid rather than benefits secured, the public sentiment of the country, east and west, will no longer support reserves."

After a thorough discussion of the timber sale policy Mr. Mondell stated that the amendment having served the purpose for which he had offered it—that of affording an opportunity for discussion—he would withdraw it because while it outlined the proper policy which should be pursued in the sale of the products of the reserves, to wit: to equalize rather than increase the prices, he would withdraw it because in practice it might be difficult to adapt its provisions to conditions.

Mr. Mondell then offered amendments first reducing the appropriations for salaries and general expenses by \$100,000, and next striking out the \$500,000 special fund for administration, protection and development of the reserves. In offering these amendments to reduce the appropriation he disclaimed any desire to in any way hamper the legitimate work of the Forest Service or reduce its appropriation below a sum that was not only adequate but liberal for the service, and he called attention to the rapidity with which this appropriation had grown, beginning with \$1,000,000 in 1897, and increasing to \$3,796,100 carried in the bill. He called attention to the fact that all of the salaries and estimates of specific expenditures contained in the book of estimate only amounted to \$2,032,022, leaving a balance of \$1,764,088, which could be used for any one or all of the large number of general purposes referred to in the appropriation.

He stated that the Forest Service was conducted in an extravagant manner; that the vast and rapidly increasing appropriations were a temptation to extravagance and useless expenditure. In reply to the statement that the Forest Service was producing a large revenue from the reserves, he said that while it was true that the revenues from the reserves were increasing, it was also true that a large portion of this revenue was derived from the sale of the matured timber, a crop which could not be replaced in a hundred years or more, and that the Forest Service was thus disposing of the permanent assets of the reserves and then using such sales as an argument for an increase of their appropriation, but that even taking this view of it the appropriation carried in the bill was \$1,300,000 more than the estimated revenues, and that such appropriation was proposed to be made in face of the

fact that the Forestry Bureau had widely advertised that it was keeping its expenditures within its income from the reserves.

The showing made of the enormous increase of the appropriation was a very strong one, but the Committee on Agriculture rallied its forces and was able to limit debate, and thus prevent a full discussion of the question of the appropriation, and the amendment to reduce the appropriation was lost.

THE MONTANA LAND OPENING

Uncle Sam has 412 choice 40-acre farms in Montana which he offers today, on very easy terms, to practical farmers who are citizens of the United States. These farms are in eastern Montana, in the beautiful valley of the Yellowstone river, one of the richest agricultural sections of the Northwest. Each is located within three miles of a railroad, and each is irrigated by one of the best irrigation systems in the world.

The lands lie at an elevation of 3,000 feet above sea level. The climate is delightful, the soil of exceptional fertility, producing abundant crops when watered. Wheat, oats, rye, barley and alfalfa are the principal crops grown. Alfalfa yields five tons per acre and is selling today at \$5 per ton in the stack. Apples, small fruits, and vegetables do well here. An especially profitable crop is sugar beets, which last year in the valley yielded nearly \$50 per acre net when properly cultivated.

A letter addressed to the Statistician, U. S. Reclamation Service, Washington, D. C., will secure full information concerning the location, soil, climate, crop possibilities, and terms of disposal.

HOMES FOR HUNDREDS.

In a Land Where Water Is Wealth Droughts and Failures Impossible.

The phenomenal growth of the Turlock district of Stanislaus County, California, is perhaps without parallel in the United States, and the settlement and colonization of this district can be traced almost directly to the efforts and enterprise of Messers. Hultberg and Lane of the Central California Land Agency.

The advertisement of this firm appears upon another page and to the prospective buyer who contemplates purchasing in Northern California it would be worth his while to carefully read this advertisement and to place himself in direct communication with the firm.

They have recently placed upon the market the Tully Tract of 3,000 acres which is within the Turlock Irrigation District. This tract lies between two great trunk railroad lines. There are four railroad stations which can be reached from any part of the property within from one to three miles.

Water for irrigation purposes is conveyed to each forty acres at the nominal tax of 50 cents per acre per year.

The irrigation system of this district, it is said by irrigationists of wide knowledge, to nearer approach perfection than any other irrigation system in the United States, and the thousand of families who have purchased homes in tracts of from five to forty acres within the last seven years in the Turlock Irrigation District are living manifestations of its wonderful possibilities and its future growth.

Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation

THE ORLAND PROJECT.

The Orland Project, the smallest undertaken by the United States Reclamation Service, is unquestionably the one fraught with the greatest possibilities, for the area to be irrigated (about 15,000 acres), is a part of that great Central Valley of California, the Valley of the Sacramento and the San Joaquin Rivers, which presents, as has been pointed out by an engineer high in the Government Service, the greatest possibilities for development through irrigation "to be found in arid

an admirable reservoir site, it was neither the lack of water, nor the impossibility of storing it that limited the size of the project, but simply a question of the amount of money that could be spared at this time for the purpose.

In November, 1906, Mr. Hitchcock, then Secretary of the Interior, apportioned \$650,000 for this project upon certain conditions, one of which was that the land should be bonded to be sold and held in farms of forty acres or less. In December, 1907, Secretary Garfield announced that the conditions had been



A Summer Scene on Stony Creek, Orland Project, California.

America, if not in the world." Here is the possibility for the installation of a system for the irrigation of nine million acres, and at the same time relieve one million acres from the danger of overflow.

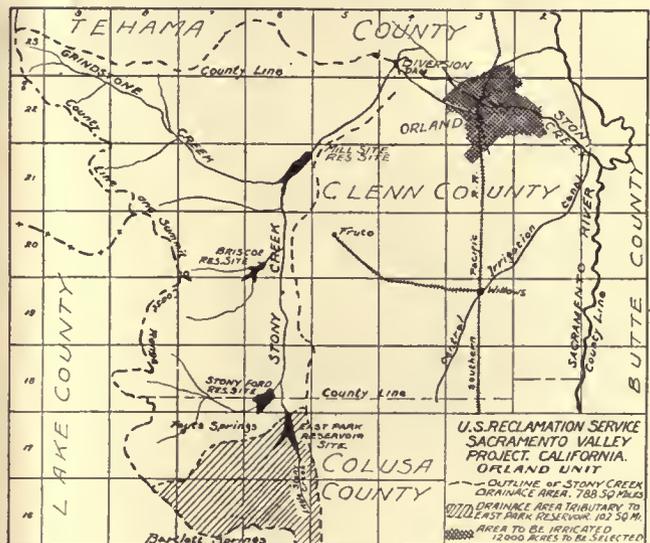
The importance then of the Orland Project is not to be measured alone by the benefits to be brought to the acres irrigated by it, great though they will be; but its chief value will rather be as a positive demonstration to the landowners of the Valley of the unparalleled advantages of the Government system, and with that end in view it is planned to make the Orland Project the model irrigation system, or rather, the Orland Unit was selected because it has all the essential elements of such a model system.

This is by no means an untried section, for a small acreage has long been irrigated from private ditches, and the community has already established a reputation for the finest of alfalfa hay, the best of almonds and the sweetest of oranges. Owing, however, to the small flow of the creek during the irrigating season, but a small acreage has been devoted to these products.

Stony Creek, whose waters are to be used, rises in the Coast Range Mountains, far south of Orland, and while all other streams flow south or southeast this is forced sixty miles to the north before it breaks through the last of the ranges of hills which parallel the mountains. During this long journey "uphill" it is continually gathering the water which drains from the eastern mountain slope until it becomes an actual river, ten times larger than many a stream accorded the dignity of being so called. The photograph reproduced herewith shows a summer scene on Stony Creek. As every range of hills broken through offers

satisfactorily fulfilled and the appropriation made permanent. Since then all preliminary work has been done and the engineer states that all is ready to vigorously prosecute the actual construction as soon as all danger of high water is past for this season.

The area to be irrigated lies about the thriving town of Orland in northern Glenn County, on the west



Map of Orland, Stony Creek and Reservoirs, Orland Project, California.

side of the valley, about eighty miles north of Sacramento. Stony Creek furnishes sufficient water for the spring and early summer. The water to supplement this flow will be stored in a pretty little valley known as East Park about thirty miles south and twenty miles west of Orland, as shown in the map herewith.

DESCRIPTION OF THE PNEUMATIC PIPE DREDGE.

The interest that has been aroused in the pneumatic pipe Dredge through the several mentions of it in the AGE has led to numerous inquiries concerning the dredge and its principles of operation. Accordingly, through the kindness of the Black Sand & Gold Recovery Company of Chicago, which controls the American rights for the dredge, we are able to produce several cuts of the dredge and a comprehensible description of its method of operation. What has interested us most in this dredge is its simplicity, its adaptability and its low cost of construction, operation and maintenance when compared with its great capacity and with other dredges of like capacity, thus making it available for reclamation work by small land owners and for mining purposes by small mining companies that have not been

dled and from there forces the material upward through a discharge pipe by the use of water and compressed air mixed under high pressure. It is not a suction or centrifugal dredge; it is a hydro-pneumatic ram.

From one to four or even more pipes can be operated from the same scow; one pump and one air compressor serving for all. Or with a central power plant from one to a dozen pipes can be operated independently at long distances apart and at a great distance from the power plant.

In dredging swift streams the pipe can be suspended from a cable running between high banks or it can be operated from the end of a crane or boom. It requires only air and water under pressure to operate it, and as these can be carried long distances through iron pipes without appreciable loss, and the connection between the transmission pipes and the pipe dredge itself can be made with flexible tubing, it will be seen that the



The Bed Rock Pneumatic or Compressed Air-Pipe Dredge.

This shows the pipe lifting the heavy black sand out of one of nature's bed rock riffles. The precious minerals like gold and platinum have been trapped in these pockets or riffles for untold ages, but no method to recover these stored up treasures had been devised before the advent of the Pipe Dredge. This dredge will enter these pockets and recover the values they contain.

able to raise the capital necessary to install an expensive bucket dredge.

The pneumatic pipe dredge is the invention of an experienced hydraulic engineer and was originally devised for mining purposes with a view to recovering deep-seated mineral values from the bed rock of rivers and streams without the necessity of moving the worthless superficial layers of sand. However, when it was put into actual operation on a full sized scale it was found to be the most efficient and cheapest dredging device in existence for handling silt, sand, gravel, muck or any other material that could be rapidly disintegrated by the use of a hydraulic jet.

The novelty in the dredge rests in the peculiar construction of the "pipe head" which is so ingeniously built that after being fitted to standard piping it jets itself and the pipe deeply into the material to be han-

adaptiveness of the pneumatic dredge is almost without limitation and its simple construction reduces its repairs and stoppages to a minimum, for it has no working parts liable to get out of order, being a system of continuous pipes with no valves. The depth to which it can be sunk to recover material is unlimited. It can deliver its material farther than any other type of dredge, and since a smaller crew is required to operate it than is required by other dredges, the operating expenses are considerably reduced.

The capacity of the dredge is enormous. One pipe with a 6-inch discharge will deliver at least 50 cubic yards of sand per hour. A dredge with four 6-inch pipes will deliver 4,000 cubic yards in twenty-four hours, while one with four 10-inch pipes will deliver over 15,000 cubic yards in twenty-four hours, for it delivers steadily from 40 to 60 per

cent solid matter. The vital machinery consists only of an air compressor and a force pump with sufficient power to operate them, so that the cost of equipping a pneumatic dredge is from 60 to 80 per cent less than any other type of dredge of similar capacity adapted to work under similar conditions.

The fields for dredging in which it is said the pneumatic pipe dredge has no peer are, for deepening or clearing the channels of rivers and harbors, for reclaiming low lands in river valleys or elsewhere, for the building of levees or restraining banks along rivers that overflow their banks annually, for the recovering of sand or gravel for building and construction purposes, and for placer mining where the bed rock lies under deep beds of sand or gravel. Another important consideration is that everything used in constructing the dredge, excepting the patented "pipe head," is of standard make and can be obtained almost anywhere at a moment's



Hydro-Pneumatic Ram of Pneumatic Pipe Dredge.

notice, so that one of these dredges can be installed and be operating anywhere within a few weeks after an order is placed, while the building of the ordinary dredges requires from nine months to one year after ordering.

James D. Schuyler, of Los Angeles, the prominent hydraulic engineer, has achieved the distinction of being the first member of the profession to twice receive one of the principal honors bestowed by the American Society of Civil Engineers. This is the Thomas Fitch Rowland "Prize" given annually to the member or any engineer who contributes the most worthy paper describing in detail accomplished work on construction. Mr. Schuyler, who is the author of a standard work on dams, has been advised that he has received the 1907 award for his paper entitled "Recent Practice in Hydraulic-Fill Dam Construction," a contribution to science which has created a stir among engineers throughout the world. He had previously won the prize for his paper, "The Construction of the Sweetwater Dam."

WILL ALFALFA STAND WET FEET?

It is a common saying among alfalfa growers that this plant will not thrive with its roots within less than four feet of standing water. Last August we took an ordinary flower pot holding some three pints of common Iowa soil, planted some alfalfa seed in it,



"Head" of Pneumatic Pipe Dredge About to Enter Water on Its Way to Bed Rock.

and set it in another pot containing ordinary hydrant water, the water reaching above the bottom of the flower pot. The water is replenished about every other day, hence is fresh.

The alfalfa germinated, and in a few days the roots began to make their way down through the hole in the bottom of the flower pot and reached down into the water. They have been growing in the water ever



Pneumatic Pipe Dredge, Operating by Electricity, with Four Ten-Inch Discharge Pipes. Capacity Over 15,000 Cubic Yards Per Day.

since, until now (April 15), they are by actual measurement more than four feet long coiled up in the bottom of the lower pot. The plants have been cut back twice, and were thrifty until attacked by the little red spider. After these were killed by drowning the plants resumed their former thrifty appearance, and of late have grown very rapidly.

GOVERNMENT HOMESTEADS AND HOW TO SECURE THEM.

Millions of Acres of Good Farming Land Open for Homestead Entry.

CHARLES S. YOUNG.

If I were a young man or woman looking for a good start on the highway to independence today, I would investigate the opportunities in the Dakotas, Montana, Idaho and Washington. There are four separate propositions that are well worth the careful study of those who would separate themselves from their landlords and from those who own land of such high value that a reasonable return is almost impossible. The propositions I would suggest are as follows:

1. Government homesteads in South Dakota and

perous growth. Less than six months ago the sites of these towns were open prairies. A man who bought some town lots at Bowman last October for \$250 each has just sold them for \$500 each. Since then the new line has pushed steadily westward and the following towns will be opened during the month of May: Reeder, N. D., May 14; Ismay, Mont., May 15; Haynes, N. D., May 21; and Scranton, N. D., May 22.

The opinion prevails to a certain extent that the homestead law has ceased to operate because so little agricultural land is now owned by the Government. This opinion is erroneous. There yet remain millions of acres of good farming land open for homestead entry, but until recently this land was useless for farming, owing to its great distance from a railroad. So far as certain portions of western Dakota and Eastern Montana are concerned, this condition has changed. The Pacific Coast extension of the Chicago, Milwaukee & St. Paul Railway opens to settlement thousands of acres



Farm Scene in Hettinger County, N. D., on Line of Pacific Extension of C., M. & St. P. Ry.

Montana and the early opening to settlement of four Indian reservations, Standing Rock in South Dakota, Flathead in Montana, Rosebud in South Dakota, Cœur d'Alene in Idaho.

2. The purchase of low-priced farm land in these States, just made accessible to the great central markets by the construction of the Pacific Coast extension of the Chicago, Milwaukee & St. Paul Railway.

3. An investment in the fruit lands of the State of Washington, where fifty thousand acres of irrigated and sub-irrigated land is being made tributary to the new transcontinental line, and 80,000 acres more adjacent are capable of irrigation.

4. For the workingman, for the merchant, for the professional man, for the investor, there are excellent opportunities in the new towns that will be opened this year and next along the new Transcontinental Railway. At Lemmon, Hettinger and Bowman, N. D., there are over 500 people each today and everything shows a pros-

perous growth. When patented this land is worth from \$10 to \$18 per acre, and will constantly increase in value.

HOMESTEAD LANDS IN SOUTH DAKOTA.

In Butte County, South Dakota, south of the towns of Lemmon, Hettinger and Bowman, are thousands of acres awaiting the enterprising homesteader. The country is rapidly being settled by a good class of farmers. The soil is a chocolate-colored loam of great fertility, with a clay sub-soil. The rainfall is sufficient to raise crops, and the drinking water is good.

CLIMATE AND CROPS.

The climate is most healthful, and settlers suffering from any nose, throat or lung trouble are invariably benefited. Although corn is raised, this section is primarily a small-grain country. Spring wheat, oats, barley and speltz are raised to perfection. The grain

is heavy and full and the yields are large and bring good prices. Flax and potatoes are also raised extensively. Dakota potatoes can not be excelled, being large, smooth and white, and when cooked are mealy and delicious. A yield of two hundred bushels of potatoes per acre is not uncommon. Alfalfa makes a good stand. Cattle fatten on the rich native grasses without being fed with grain. This section is particularly adapted to diversified farming. There will be plenty of cheap pasturage for a number of years, and the man who will start a dairy herd will become independent in a few years. Chickens do well. Spring chickens and eggs bring excellent prices. All sorts of garden truck grow exceptionally well. Along the streams different varieties of wild fruit and wild berries are common.

HOMESTEAD LANDS IN MONTANA.

Custer County.

In Custer County, Montana, are several million acres of Government land open for homestead entry, much of it near the railroad. This country is well grassed and has been one of the greatest stock-raising

rainfall varies annually from fifteen to twenty inches. For five years considerable farming has been carried on without irrigation with the greatest success. Last season thirty-five bushels of hard winter wheat were produced on the average in the entire district between Lewistown and Garneill. The drinking water in Fergus County is unsurpassed and is found everywhere at moderate depth. Coal underlies almost the entire Judith Basin and sells at the mines at about \$3.00 per ton. The mountains are covered with timber, and, although in the Forest Reserve, the Government permits it to be cut by actual settlers for domestic use. The climate is extremely healthful and good. The winters are not as cold as farther east, being tempered by the famous Chinook wind. The summers are delightful, the heat being tempered by the altitude, which is about 3,000 feet.

Indian Reservations.

In addition to the above lands, which may be entered upon at once, there are, contiguous to the lines of the Chicago, Milwaukee & St. Paul Railway, four In-



Home of F. W. Fletcher, Near Reliance, a Town on the Pacific Extension of the C., M. & St. P. Ry.

ranges in the West. It is now to turn from stock-raising to farming, and thousands of settlers will gain a comfortable home and independence, where heretofore there has been a handful of ranchers and herders. Lignite coal is found everywhere. It can be dug by the settlers themselves where it outcrops, or it may be purchased at a low price from those engaged in that business.

Yellowstone and Rosebud Counties.

In Yellowstone and Rosebud Counties, Montana, there are large areas of Government land, and at different points, notably at Forsyth and Broadview, south of Lavina on the Musselshell, experimental farms have proven that with proper methods of cultivation the soil yields abundantly without irrigation.

Fergus County.

Fergus County, Montana, contains about 1,000,000 acres of farm land open for homestead entry. Like most of eastern Montana, the soil is fertile to an extraordinary degree, and the land lies well for farming. The

Indian reservations, already named. These reservation lands differ from the other lands open for entry in that they are adjacent to developed farm lands, the prices of which range from \$25 to \$40 per acre. The Government has therefore decided to allot them to the public under conditions slightly different from those governing the main body of free lands. With the possible exception of the Standing Rock reservation, these Indian lands are expected to be opened for settlement in the spring of 1909. Full information regarding dates and points of registration will be announced later by the General Land Commissioner of the Government at Washington.

WHO MAY SECURE A HOMESTEAD.

Under the homestead laws of the United States, a person who is not the owner of more than 160 acres of land in any State or Territory, who is a native-born citizen of the United States, or who has been naturalized or declared his intention to become a naturalized citizen of the United States, who is over the age of twenty-one years or the head of a family, may make a homestead

entry of not exceeding 160 acres of any of the unoccupied public lands of the United States. A single woman of twenty-one years of age or over has the right to make a homestead entry. Marriage after filing does not invalidate her claim, provided she continues to reside on it and make proper improvements. A widow may make entry, but a married woman can not make entry unless she has been deserted by her husband. Soldiers and sailors, or if dead, their widows and orphans, have the privilege of filing through an agent. All other applicants must make their filings in person. The period of service in the army up to four years is deducted from the required five years' residence.

LOCATION OF LAND OFFICES.

United States land offices are located at Rapid City, S. D., Dickinson, N. D., Miles City, Mont., Lewistown, Mont., and Missoula, Mont. United States commissioners, empowered to transact all Government business connected with the securing of homesteads, are located at Lemmon, S. D., Hettinger and Bowman, N. D., and at Terry, Mont. Commissioners will probably be appointed in a number of other towns on the new transcontinental line.

WHAT IT COSTS TO HOMESTEAD.

Fee for filing on 160-acre tract:

In the Dakotas—If outside land grant limit.....	\$14
In the Dakotas—If inside land grant limits.....	18
In Montana—If outside land grant limit.....	16
In Montana—If inside land grant limit.....	22

Add to this a fee of about \$3.00, if the filing is made before a United States commissioner.

Fee for final proof on 160-acre tract:

In the Dakotas—If outside land grant limit.....	\$ 4
In the Dakotas—If inside land grant limit.....	8
In Montana—If inside land grant limit.....	12
In Montana—If outside land grant limit.....	6
Advertising same	8

In case it is desired to commute at the end of fourteen months' residence, an additional charge of from 50 cents to \$2.50 per acre is made, depending upon the district in which the land is located. In the greater part of Butte County, South Dakota, the charge is 50 cents per acre.

HOW TO GET INFORMATION SHOWING HOMESTEAD LANDS.

Information as to the vacant land in any land district can be obtained by writing to the Land Office for that district. There are, however, no maps or plats showing the exact location of quarter sections open for entry available for general distribution. Township diagrams showing land still open for entry may be secured from the Register of the district Land Office for a fee of \$1.00 each.

HINTS FOR THE INTENDING HOMESTEADER.

Agricultural implements, wagons, harness, hardware and general merchandise may be bought in the new towns along the Pacific Coast extension at Chicago prices, plus the freight rate. There will be no difficulty in finding everything necessary at reasonable prices. Good farm horses in this western country bring good prices, and it will therefore be advisable in most cases to ship your horses with your household goods direct from your home town. Lumber in western Dakota sells for \$40 per thousand feet. It is somewhat cheaper in Montana. The settlers generally build their first house

of sod, with frame roof, floor, doors and window-casing. These houses are whitewashed, look well and are comfortable. They can be built by contract for \$151, including labor and material. Since the time when the more adventurous of the early settlers struggled over the Alleghany Mountains there has never been a better opportunity for the ambitious young American than is now offered in the West by the building of this latest transcontinental railway, the Pacific Coast extension of the Chicago, Milwaukee & St. Paul Railway.

PLOWING FOR AND SEEDING ALFALFA.

BY JNO. G. HALL.

Great care must be taken in plowing up land to be irrigated so as not to leave elevations and depressions in the fields which will cause difficulty in getting water over the field uniformly and evenly.

The best method I know is to begin in the center of the field and plow to the outside all in one land. This leaves no dead furrows to fill up and only a very short back furrow unless the field be long; and if so, the plow can be set more shallow until the back furrow is made (say two or three rounds). Then the plow can be set to its uniform depth by turning to the right. With a right-handed plow no ground will be trampled out and made hard on the corners; no dead furrows will be left in the field and a smooth, pulverized field will be the result.

The smoothing harrow should follow the plow closely to prevent the penetration of sun and wind from drying out the soil. To prevent the ground from baking, to pack the soil, to level the surface and to make a perfect seed bed for the small seeds about to be sown, go over the field once or twice more with the smoothing harrow.

Barley is a very good grain with which to seed alfalfa. Sow about forty pounds of barley and ten pounds of alfalfa seed to the acre. A hoe or press drill may be used allowing the barley to go down the spouts and sowing the alfalfa seed broadcast on the surface because the alfalfa seed is so small it should not be covered deeply. The barley sown thinly makes a shade for the young alfalfa while small and on account of the barley being ready to cut about fifteen days earlier than wheat or oats it is gotten off the ground and a better opportunity is given the young alfalfa. After the seed has been sown, go once more over the field with the smoothing harrow to cover the alfalfa seed as shallow as possible.

The first irrigation should be begun when the alfalfa is an inch high and the barley stooled and shading the ground well. If the field is level one way and has a gradual slope in one direction, plow your ditches for irrigation through the the field about one hundred feet apart, leaving a space at the lower end of the field not ploughed which will irrigate from the end of ditch. After the barley has been taken off the field irrigate the young alfalfa again and secure a cutting of hay from the new seeding the first year.

Send \$2.50 for The Irrigation Age
I year, and the Primer of Irrigation

Lining of Ditches and Reservoirs to Prevent Seepage Losses.

By Prof. B. A. Etcheverry, Berkeley, Cal.

(Continued.)

The oil used was crude petroleum from the Sunset District southwest of Bakersfield and contains a large percentage of asphaltum. Its specific gravity is $1\frac{1}{2}$ on the Beaumè scale. This oil when cold will not run

When examined in May, 1906, about seven months after the application of the oil, there was no vegetation in this part of the canal, while other parts of this same canal which had received no oil and had been cleaned two weeks previously showed a growth of vegetation. The contrast is very striking and clearly shows the value of oil in preventing the growth of aquatic plants. Not only was this part of the canal free from vegetation, but it was only about one-third full, while the



Fig. 12. Ivanhoe Reservoir (Near Los Angeles), Lined with Oil.

freely. It was used hot and sprinkled with an ordinary road sprinkler. The ditch had been previously cleaned of all vegetation and allowed to dry. The road sprinkler was driven first on the bottom of the ditch and then on the banks. The oil was applied at the rate of $1\frac{1}{2}$ gallons per square yard. The oil was then thoroughly harrowed in until it was well mixed with the soil, which was very sandy.

canal full of weeds had to be full to carry the same amount of water.

An objection might be made to the use of oil for canal lining because of the fear that the oil might be carried to the fields in sufficient quantity to injure the crops. Mr. McLaughlin states that in this case they had no trouble from this source.

An example of the use of oil for lining reservoirs

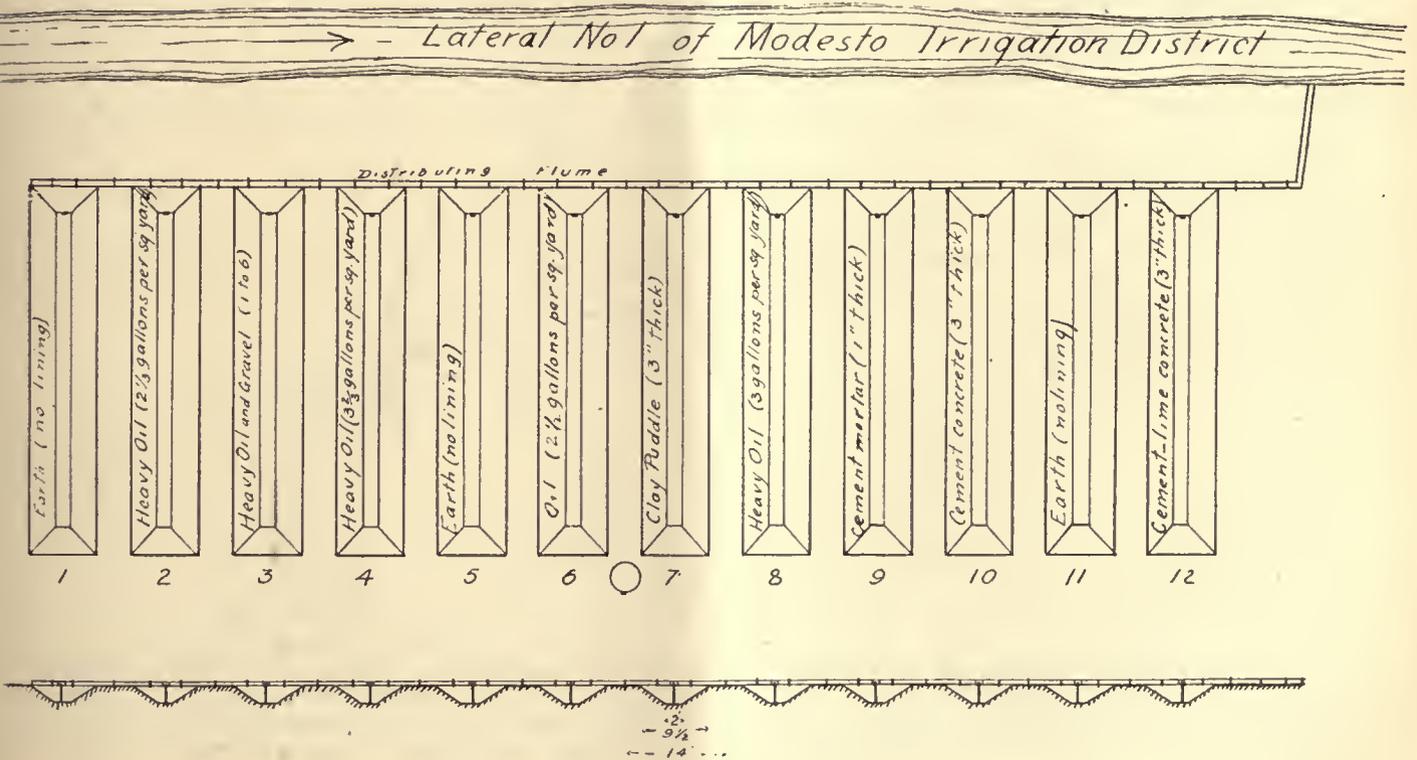


Fig. 13. Position of Experimental Trenches at Modesto.

is found near Bakersfield, where a small reservoir 275 feet long and 75 feet wide is built in almost pure, coarse sand. A centrifugal pump delivered to the reservoir 2,250 gallons of water per minute for twelve hours, and

While for the Lemoore Ditch the oil was harrowed into the soil, in this case the oil was poured on the surface and allowed to soak in. This formed a tough asphaltum crust of about 3 or 4 inches in thickness.



Fig. 15. Method of Using Templet to Finish Trenches.

it would leak out as fast as poured in. It was then decided to use road oil to prevent this excessively large seepage. One hundred and eighty-five barrels of heavy

The seepage was greatly reduced and now the reservoir can be rapidly filled with the same pump. Another example of the use of oil for lining a

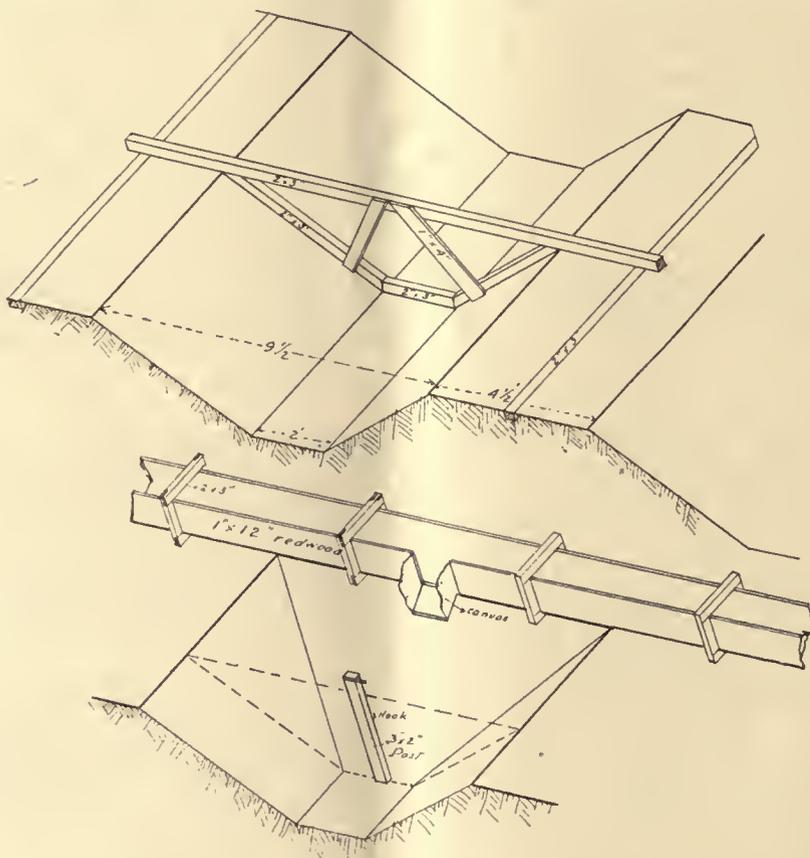


Fig. 14A. Method of Using Templet.

Fig. 14B. Distributing Flume—Gate—Measuring Post.

oil (11 specific gravity Beaumè scale) were poured while hot on the bottom of the reservoir. Since one barrel of oil contains 42 gallons, the rate at which the oil was applied was 3.31 gallons per square yard.

reservoir is near Los Angeles—the Ivanhoe Reservoir, (Fig. 12.) Here it was found necessary to protect the sloping banks from the erosive action of the waves. On the slopes were spread 3 inches of river sand, fairly

clean, and thin oil (16° to 18° Beaumè scale) was sprinkled on the sand and raked in. The amount of oil used was 2.3 gallons per square yard, or 13.35 per cent of the volume of the sand. The slopes of the reservoir were 4 on 1 and 2½ on 1. This lining was being completed when the writer examined it. It has so far answered in a satisfactory manner the purpose for which it was intended. A letter was addressed to Mr. William Mulholland, superintendent of the water department of the city of Los Angeles, inquiring as to its behavior, and his reply, under date of December 20, is as follows:

"The oil lining of the Ivanhoe reservoir has proven a success with the exception of the southern embankment, on which the work was poorly and hastily done. We had a very severe northern gale about a month ago that raised waves at sufficient height to spray clear over the bank, although at that time there was fully 4 feet of clearance. The continued action of this storm for twenty-four hours or more cut many holes in the slope, but an examination of the broken places showed that the oil had penetrated but an inch or two and was hence insufficient to withstand such violence." Mr. Mulholland further states that with properly executed work the method would prove a complete success.

It will be noted that in this case comparatively light oil was used. It is the writer's belief that heavy road oil would be more efficient in resisting wave action, erosion, or scouring due to water.

From observations of the behavior of oil on roads or streets in resisting the erosive force of running water during heavy rainfall it would seem that an oil lining for canals would allow a very high velocity. Many oiled streets having a steep grade have been constructed with the gutters built of exactly the same materials as the street. These gutters during heavy rain storms have had to carry a large volume of water and the velocity was high, still the gutters were not in the least cut up.

A statement from Mr. Theo. White, of Los Angeles, who has made a special study of oiled roads, gives us an idea of what might be expected of oil lining for ditches: "The whole country was flooded and it gave us a good test of our oiled roads. There is a road running into San Bernardino on a grade of about 6 per cent, about 300 or 400 feet from a bench down into a creek bottom. The road had been oiled a second season and there was a good oiled surface. The water rushed down the middle of that road, because the ditches could not carry such a great volume of it, and it did not make a scratch on the road, but a half mile south there was a road of about the same grade which was so badly washed that it could not be used until it was repaired—a road that was not oiled. Between Pomona and Freeman there was a great quantity of water came from a canyon and struck the oiled road at right angles at one point. It came from the west, and on the east side of that road there was a margin of 6 or 8 inches of the surfacing material that the oil had not touched. The rain passed over the oiled surface, and when it came to that which was not oiled it cut it right out. Upon the same road within the city limits of Pomona the road was surfaced with decomposed granite, packed down hard, and a very nice road during the summer, but it had not been oiled. The same storm cut it all to pieces. On one stretch of a quarter of a mile the road material was fairly washed out into the fields alongside of the road."

[To be Continued.]

SUGGESTIONS FOR CITIZENS OF THE SALINAS VALLEY.

Tree Planting, Gravity Irrigation and Concerted Action.

BY MONTEREYAN.

Let the people of the Salinas Valley keep constantly in mind that they must, sooner or later, abandon their present method of working their lands. We know what the valley is capable of producing. We know the high values brought for lands whereon intensified farming is practiced and what it does for towns within or near such territory.

Two things are absolutely necessary to make the Salinas Valley one of the most famous producing sections in the world, where the climate is good for comfort all the year round. Planting trees along the roads and division fences, besides lines of windbreaks across the valley at intervals, is one requirement, and the other is to establish a gravity irrigation system.

Organization only can bring about what is needed to provide for the support of 100,000 people in happy homes in the Salinas Valley. You had a very good earnest boomer devoting his time and money to organizing your land owners. Had those differing from him in his methods taken an active interest in the irrigation organization, all differences might have been explained, and by their aid other plans along the lines of promotion and educational work agreed upon.

Now is the time to act. If my reader is one who is convinced that Mr. Vivian, of King City, was all wrong let him join with others of a like mind and become members of the Irrigation Association to make things right.

The writer is aware of unfairness, to say the least, towards Mr. Vivian. All the people alluded to are good men and intend to be just, but they have a fault, so common among us all, to "knock" a man who is trying to do something, only because they do not happen to agree with his plans, or because of some trivial reason.

Concerted action is necessary and there is a way to bring it about. Discuss this matter with your neighbor without delay, and from each section forward names for membership in the Salinas Valley Irrigation Association. Reorganize and come to an agreement on all matters.

While not a land owner in your section, the writer is giving his time and money monthly to keep alive the movement to establish an irrigation system in the Salinas Valley. Both Mr. Vivian and myself have been working to force you into doing your duty to your country and your heirs.

A meeting of the California Inland Waterways Committee will shortly be held at Monterey, and every land owner in the Salinas Valley is invited to attend their meeting. It would be an opportune time for you all to get together and place the Irrigation Association on a solid footing.

The next issue of the AGE will give you other points to enable you to see yourself as other see you. It depends upon yourself whether or not you will have a string of canneries and fruit-packing establishments through the valley in a few years.

Supreme Court Decisions

Irrigation Cases

ADJUDICATION OF PRIORITIES.—

A statutory decree establishing priorities to the use of water for irrigation confers no new rights, but is merely evidence of pre-existing rights, which may be lost by subsequent abandonment.—*Alamosa Creek Canal Co. v. Nelson*. Supreme Court of Colorado. 93 Pacific 1112.

CONTRACT FOR IRRIGATION—NATURE OF PROPERTY RIGHT.—

The right conferred on a landowner by his contract with a water company to have water flow from its canal, through a lateral ditch, to his land, for its irrigation, for a term of years, is a servitude on the ditch and canal, and an appurtenance to the land, and so is real property.—*Stanislaus Water Co. v. Bachman*. Supreme Court of California. 93 Pacific 858.

COLORADO DISTRICT COURTS HAVE JURISDICTION TO DETERMINE PRIORITY.—

Const. art. 6, sec. 11, giving the district court jurisdiction of all causes both at law and equity, gives jurisdiction to determine claims to priorities in the appropriation of water from public streams, and that jurisdiction is not affected by the statutes dividing the state into water districts, and providing for the adjudication of priorities in those districts.—*Kerr v. Burns*. Supreme Court of Colorado. 93 Pacific 1120.

MORTGAGE—SUBSEQUENTLY ACQUIRED WATER RIGHTS.—

Though a mortgage of land is made prior to the contract of the landowner with a water company, by which the company agrees to furnish through its canal to him, his heirs or assigns, water to irrigate the land for a term of years, he to make certain yearly payments therefor, the water right, when acquired, having become an easement appurtenant to the land, passed with it under the foreclosure of the mortgage.—*Stanislaus Water Co. v. Bachman*. Supreme Court of California. 93 Pacific 858.

MANDAMUS TO DELIVER WATER FOR PAST SEASON.—

In mandamus to compel a ditch company to transfer shares of stock to petitioner, and to deliver to him during the irrigation season of a designated year the quantity of water to which such shares entitle the owner, a judgment awarding the writ rendered after the expiration of the irrigation season for the designated year is erroneous, under the rule that courts do not order performance of impossible acts. The action was dismissed without prejudice to petitioner.—*Agricultural Ditch Co. v. Rollins*. Supreme Court of Colorado. 93 Pacific 1125.

PROCEEDING TO CHANGE POINT OF DIVERSION.—

Before the passage of Sess. Laws 1899, p. 235, c. 105, providing for a change of the point of diversion of water from an irrigation ditch, the owner of a right to use water from any of the streams of the state for irrigation might in equity sue one respondent alone, and have determined as against him the right to change the point of diversion, and the right was not limited to any particular territory, or confined to any arbitrary diversion of the stream.—*Lower Latham Ditch Co. v. Bijou Irrigation Co.* Supreme Court of Colorado. 93 Pacific 483.

LIABILITY UNDER CONTRACT TO FURNISH WATER.—

Where an irrigation company having contracted to furnish plaintiffs' landlords with water for the irrigation of the rented premises, the landlords agreed to furnish sufficient water to plaintiffs to irrigate their crops, but were unable to do so because of the irrigation company's breach of its contract, whereupon plaintiffs sued their landlords for damages, plaintiffs' recovery afforded the landlords no right to recover over against the irrigation company the amount thereof.—*Stockton v. Brown*. Court of Civil Appeals of Texas. 106 Southwestern 423.

STREAM'S RUNNING DRY DOES NOT DESTROY CONTINUITY OF USE.—

In an action to enjoin the diversion of water from a stream, where the evidence showed that plaintiffs had, when the supply permitted, irrigated by means of water taken from the stream, the fact that for several years the stream had been dry for a longer time each year than usual, and that they had not been able to get as much water as theretofore, did not destroy the continuity of their use, or deprive them of the right to use the amount formerly diverted if the stream should again furnish that amount.—*Huffner v. Sawday*. Supreme Court of California. 94 Pacific 424.

TOWN'S RIGHT TO STREAM NOT SUPERIOR TO THAT OF FARMING COMMUNITY.—

Mills' Ann. St. sec. 4403, subd. 73, authorizing a town to take water from any stream or spring for domestic purposes, and providing that, when the taking shall interfere with the vested rights of any person, the town shall first obtain his consent or acquire the right by condemnation, does not give a right to a town to divert water for the use of its inhabitants superior to the right of an individual or a farming community to divert water for domestic or other purposes, in the sense that the town may take the water for that purpose from those who have previously appropriated it for the same or some other beneficial use without compensation.—*Town of Sterling v. Pawnee Ditch Extension Co.* Supreme Court of Colorado. 94 Pacific 339.

APPROPRIATION OF WATER—EVIDENCE.—

Though evidence of nonuser and similar acts before a decree establishing priorities to the use of water by the owner of an irrigation ditch is improper for the purpose of proving his right to use a less volume of water than that decreed to him, as well as for the purpose of showing the element of nonuser in a subsequent abandonment relied on by another appropriator suing for diversion of the water, but where there is sufficient legal evidence as to the element of nonuser subsequent to the decree, evidence of nonuser and similar acts by such owner before the decree, for the purpose of showing his intent in not using what was awarded to him, is proper and not prejudicial.—*Alamosa Creek Canal Co. v. Nelson*. Supreme Court of Colorado. 93 Pacific 1112.

MORTGAGE ON WATER SYSTEM.—

If a mortgage given by a water company on its water system was such as to make it paramount to the rights of a landowner under the contract thereafter made with him by the company to furnish through its canal water to irrigate his land for a term of years, he to make certain yearly payments therefor, yet, he not having been made a party to the foreclosure, though his contract was recorded prior to commencement of the foreclosure suit, the purchaser under the foreclosure holds the canal system and the waters thereof subject to the rights of such landowner, at least till those rights are terminated by foreclosure proceedings to which he is a party.—*Stanislaus Water Co. v. Bachman*. Supreme Court of California. 93 Pacific 858.

CONTRACT TO SELL WATER FOR IRRIGATION.—

The agreement of a water company to sell water for a certain price for irrigation of certain land for a term of years is sufficiently certain, the water being described as water from a certain river, to be carried through the company's canal, and it being shown that it had but one canal leading from that river, though the lateral ditch was not described, except by the statement that the company was to deliver the water on the land by means of such head gates, weirs, and devices as it should construct for that purpose, a ditch through which water was conducted to the land having thereafter been constructed by the company, and the contract in this respect having thus been made definite.—*Stanislaus Water Co. v. Bachman*. Supreme Court of California. 93 Pacific 858.

IRRIGATION—DETERMINATION OF RIGHTS.—

Plaintiffs and defendant being tenants in common of the rights in an underground water flow, defendant sank a well on his own land, and erected a pump and a distributing system to irrigate his own land. Held, in proceedings to determine the several rights in the water, that defendant could not urge that plaintiffs were guilty of laches in permitting his expenditure without complaint, since there was nothing in the

mere erection of the water plant which would invade plaintiffs' rights and call for protest from plaintiffs; such invasion being committed only by the pumping of an excessive amount of water, and since after the commencement of the pumping plaintiffs had done nothing to induce defendant to believe plaintiffs assented to defendant's act.—*Verdugo Canyon Water Co. v. Verdugo*. Supreme Court of California. 93 Pacific 1021.

CONTRACT FOR SALE OF WATER.—

An agreement of a water company with the owner of land to furnish through its canal from a certain river to the landowner, his heirs or assigns, to irrigate the land, a flow of water sufficient to irrigate it each year for a certain number of years, the devices through which the water shall be drawn from the land to be constructed by the company and the landowner to pay a certain amount yearly therefor, the contract to have the force and effect of a covenant running to and with the land and the canal, is not a mere personal covenant of the company, but, while not a lien on the canal, is an agreement for sale of real property of the company, binding on the successor in title of the company's plant, taking with notice of the agreement.—*Stanislaus Water Co. v. Bachman*. Supreme Court of California. 93 Pacific 858.

IRRIGATION—RIGHT TO SUPPLY.—

Defendant, an irrigation company, agreed to furnish a land company or its assigns water for its land on condition that a rental to be fixed by defendant was paid annually in advance, and in case of failure for two successive years to pay the rental its right to water should end and the contract be forfeited. The payments were allowed to lapse for several years, and then a grantee of the land company gave a note for the arrearages, and water was furnished him. Later plaintiffs became owners, and made an agreement whereby they were to receive water by paying the rental in advance, but such agreement was not to prejudice defendants in their rights in regard to the unpaid notes for water rents. *Held*, that defendant waived the right to enforce the forfeiture.—*Kimball v. Northern Colorado Irrigation Co.* Supreme Court of Colorado. 94 Pacific 333.

WATER RIGHTS—WAIVER OF OBJECTIONS.—

The district court having had jurisdiction of the subject-matter of a suit to award priorities in the appropriation of waters from a stream, a defendant therein is estopped to assert for the first time in a suit brought nine years later that the court in the first suit was without jurisdiction on the ground that the adjudication should, under the statutes, have covered all the priorities in the district, and not merely priorities for water from such stream, where defendant voluntarily submitted himself to the jurisdiction of the court in the first suit, and fully participated in the proceedings, excepted to the findings and decree proposed by the referee, appealed from a judgment approving such decree, which judgment was affirmed, and received water according to the award.—*Kerr v. Burns*. Supreme Court of Colorado. 93 Pacific 1120.

"IRRIGATING SEASON."—

Under a contract entered into between an irrigation company and a water consumer providing that the consumer shall pay certain water rents per acre annually for the use of water to irrigate his land, and containing a clause that "water shall be delivered free of all charges during the first irrigating season that water is delivered to said purchaser," *held*, that the words "irrigating season" signify and are equivalent to the entire irrigating period embraced in one year's time, and that it was the intention of the contracting parties to thereby exempt the consumer from payment of water rents for the period of one year, and that the settler is entitled to receive the free use of the water during the irrigating period for one year from the date on which water was delivered to him, and that at the expiration of one year his pay period will begin.—*Twin Falls Land & Water Co. v. Lind*. Supreme Court of Idaho. 94 Pacific 164.

WHAT THE NAME "ELKHART" SIGNIFIES TO VEHICLE AND HARNESS BUYERS.

The man who cannot pick out a buggy or other vehicle to his liking from the great catalog of the Elkhart Carriage and Harness Manufacturing Company of Elkhart, Ind., is a hard man to please.

Their 1908 book is an eye opener—a handsome book of over 250 pages, every one of which contains a fine illustration and accurate description of some of their numberless styles of sterling vehicles and harness. You will find in it about every kind of rig you ever saw. The same is true of harness. The pictures are so large and the description so full that you will know very nearly as much about the purchase you are about to make as if you actually saw it.

But the wonder comes when you look at the prices. Anyone who is not acquainted with "the Elkhart Way" must be amazed at the bargains. He cannot understand how high grade vehicles and harness can be made and sold for so little money.

But the Elkhart people have been doing business this way for 35 years. Making and selling direct to the people is an old story with them. That's the secret of it all. They build and they sell direct to the user. No jobber, no dealer, no agent, no traveling expense, no commissions, no storage. If you say such prices are impossible, the answer is, they have been making them for over a third of a century.

The Elkhart Carriage and Harness Manufacturing Company is the kind of institution we like to recommend to our readers. A great big concern, thoroughly reliable and dealing in high class goods. We can say unhesitatingly that anyone who has need for a vehicle or harness should send for the great catalog, see the prices and then judge for themselves.

TRY THE COLUMNS OF THE IRRIGATION AGE. IT WILL PAY YOU.

As an illustration of what THE IRRIGATION AGE is doing for our advertisers we are reproducing herewith a letter recently received from Mr. C. D. Butchart, a prominent manufacturer of Denver, Colo. This is in line with many other communications recently received which indicate that advertising in the columns of THE IRRIGATION AGE is paying well, and we are anxious to emphasize this fact in the hope that other advertisers who are not at present patrons of our columns may be induced to place business with us.

DENVER, COLO., April 28, 1908.

THE IRRIGATION AGE COMPANY,
112 Dearborn Street, Chicago.

Gentlemen:—Your letter of April 25th enclosing copy of inquiry regarding sluice gates is received, and I thank you for your courtesy in the matter.

It would appear that I should have renewed my advertising in your publication some time ago, as I intended. That IRRIGATION AGE has not carried an advertisement of mine this season is emphatically *not* because your paper was not a profitable medium. Quite the contrary; in fact, as a number of the large orders completed this spring are directly traceable to previous advertising with you. You may expect to hear from me just as soon as my new catalogue is issued.

Yours truly,

C. D. BUTCHART.

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

MODESTO AND TURLOCK IRRIGATION DISTRICTS OF STANISLAUS COUNTY, CALIFORNIA.

The County of Stanislaus presents the homeseeker's opportunity. Situated in the center of California, comprising the outlet of the San Joaquin Valley, Stanislaus possess exceptional advantages of location and climate. Modesto, her county seat, is but 115 miles southeast of San Francisco, 92 miles north of Fresno, 77 miles south of Sacramento (the state capital), and 30 miles south of Stockton, the figures denoting distance by rail. Her area is 800,000 acres, nearly seven-eighths of which is arable lands. The Southern Pacific and the Santa Fe transcontinental railroads traverse the center of the county. A branch of the Southern Pacific skirts her eastern and another her western foothills. The Sierra Railway, starting from the eastern branch, at Oakdale, places the markets of the rich mining Counties of Tuolumne and Mariposa; and a portion of Calaveras and the wonders of the famed Yosemite Valley, at her door.

The Stanislaus, Tuolumne and San Joaquin Rivers, the two latter navigable for six months of the year, run through her acres, affording irrigation and drainage and serving to regulate transportation charges. Stanislaus presents the typical California climate, about the same weight of clothes being comfortable all the year. The climate is at all seasons of the year pleasant, healthful and invigorating, and is especially suitable to the advantageous cultivation and rapid growth of the varied products of its soil. The winter is short and mild. Snow unknown, frost infrequent and rarely damaging even to tender plants and the susceptible orange blossom. Roses bloom in the open air as late as December and January and in March resume blooming.

In this gem of California counties a completed irrigation system owned by the land embraces 258,000 acres of immensely fertile and productive soil. The system has now been in successful operation but three or four years and over 75,000 acres have already been sold in small lots, most of it within the past two years. probably 45,000 to 50,000 acres of this land is now cultivated to alfalfa, fruits, vines and garden products. No one can foresee possibilities of this section of California, under its present successful public system of irrigation.

The soil in these districts is a sandy loam, varying in density, but all rich and especially adapted to irrigation. It is highly productive, and as it varies in density is adapted to almost every crop that can be produced in the temperate and semi-tropic zones. This naturally causes diversified crops and every man can be suited. The man who prefers the dairy business, or the man who prefers the tree and the vine, the berry, sweet potato or the cantaloupe, can take his choice with the assurance of splendid returns. Here the oranges, choice fruit that to see is to covet, are ready for the Thanksgiving market; here lemons leave nothing to be desired: olives, almonds, prunes, vines and figs yield prolifically; pomelos (grape fruit), and pomegranate attain perfection; choice peaches, apricots and nectarines afford profitable crops; table and wine grapes meet every desire; while apples, pears and, in fact, all the deciduous fruits and garden and field products of

every description are prolific in yield and from excellent to choice in quality.

The demonstrated profits of the products enumerated, and of dairying, alfalfa under irrigation, affording green feed all the year around, led the land owners of the central portion of the county to cooperate to render irrigation available to all. Two hundred and fifty-eight thousand acres lying between the Stanislaus and the San Joaquin Rivers, and bisected by the Tuolumne River, comprise one great paradise of beauty and comfort.

The Tuolumne River is the source of water supply for both the Modesto and Turlock Irrigation Districts. This stream has a watershed second only to that of one other river of the state, carries a vast volume of water and is never failing, being fed by the perennial snows of the Sierra. The water rights of the districts take precedence over all others, save that of a mining company, possessing a very limited appropriation. Here, under legislative enactment, the water inalienably belongs to the land. The water belongs to the people as does a public highway or school house. People who do not understand ask "What does a water right cost?" To which answer is made, "No more than you pay for the right to use the county road, the court house or the district school house." The districts were bonded to raise the money necessary to construct the irrigation works, and a valuation is each year placed upon the land for the purpose of levying a sufficient assessment to pay the cost of the maintenance of the system, the cost of the distribution of the water, and to pay the yearly accruing interest on outstanding bonds. This method of raising money is practically the same as that employed in counties to raise money to conduct county affairs.

The sandy loam of which the greater portion of the great body of 258,000 acres of land is composed affords every advantage for diversified farming.

Alfalfa, the king of forage plants, finds its home here, yielding five crops of one and one-half tons to the acre annually, and affording pasturage after the curing season.

Dairying has become a very prominent industry, because of the favorable conditions and excellent profits. Each acre will support a cow, and one man at \$40 per month will milk and care for thirty cows. Butter fat has been bringing at the creameries this year from \$7 to \$15 a month per cow, according to the grade of the cows. The skimmed milk fed to calves and hogs will afford an income sufficient to meet expenses, leaving the returns from the creamery net profit.

Poultry is also becoming general and has already proven very profitable in these districts. This results from the mildness of the climate, the prevalence of green feed at all times, and the good local and San Francisco markets, eggs averaging about 20 cents the year around.

The grape industry in a short time will probably lead all other industries, even dairying, which has become and is now so profitable. Over ten thousand acres have been planted to vines since the completion of the irrigation systems, a portion of which came into bearing last year, producing from seven to ten tons to the acre and bringing prices ranging from \$14 to \$18 per ton.

Schools have had a phenomenal growth in the last

three years. This is especially noticeable in the Modesto and Turlock Irrigation Districts, where settlement and development have made the most rapid progress. The county has four high-schools, one being at Turlock, in the Turlock Irrigation District, one at Modesto, in the Modesto Irrigation District, one at Oakdale, and one at Newman; and grammar schools at convenient places throughout the county. In the Modesto and Turlock Districts there are twenty-three grammar schools properly and conveniently located.

Modesto, the county seat of the county, is a modern city, with municipal waterworks, sewer system, electric light and power, with large and well-ordered hotels, six banks, two daily and weekly newspapers. It has 4,000 population, and is keeping pace with the improvement and development of the country adjacent thereto and surrounding it. The streets are wide and made of asphalt. The business part of the city is built of brick, many of the buildings being ornate as well as substantial. It lies near the banks of the Tuolumne River, which is spanned at this point by a model county bridge of steel and cement. The assessed valuation of the real estate and personal property in Modesto is over \$1,850,000.

Turlock is near the geographical center of the Turlock Irrigation District, and at the present time is rapidly growing.

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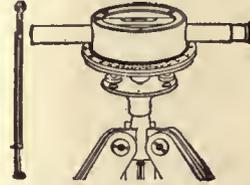
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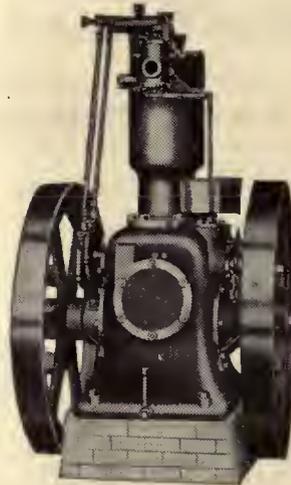


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STUDYING POISONOUS PLANTS

The students of the Veterinary Science Course of the Colorado Agricultural College, accompanied by Dr. Geo. H. Glover, head of the Department; Dr. I. E. Newsom, associate professor, and Prof. B. O. Longyear, associate professor of Botany and Forestry, visited Rist Canon, ten miles west of Fort Collins, recently for the purpose of studying poisonous plants on the range. An important part of the work of the Veterinarian, especially in the arid regions of the West, is poisonous plants and their effects upon domestic animals. The foremost veterinarian of the future must possess a wide knowledge of his chosen profession. He must not only know the nature of the active principles of plants which are used as remedies in the practice of medicine, but he must also be thoroughly posted on the active poisons in plants which are dangerous to life, and which are of great economic importance to stock men and farmers everywhere.

In the vegetable kingdom all the way from large trees down to bacteria, we have plants possessing various toxic principles. Every year there is a heavy loss of animals from having eaten of musty or moldy food, poisonous fungi, and of certain shrubs and fruit of certain trees.

The loss of animals on account of poisonous herbage every year no doubt far exceeds one hundred thousand dollars in this state alone. This loss could no doubt be greatly lessened if there were a better knowledge of these dangerous plants. The several species of loco weeds take first rank in the damage done, next, the several species of larkspur. These two probably cause more than 90 per cent of the total mortality of animals under range conditions.

The wild parsnip, lupine, camas, monk's blood, kafircorn, sorghum, wild cherry leaves, horse tail, molds, and many more come in for their share of the remaining 10 per cent of loss. The study of poisonous plants is a difficult matter. Plants that are poisonous at one time are not so at other times. Some are poisonous only at certain stages of growth, some are poisonous in one part of the plant and not in another. There is certainly a great opportunity for scientific research in the realm of toxic herbage. The scientific veterinarian should be a leader in this work.

IRRIGATION OF POTATOES.

By W. PADDOCK.

State Agricultural College, Colorado.

The details of irrigation, manner of laying out the rows, etc., do not need to be described. But there are a few simple points which are essential to success. First, do not irrigate potatoes up if it can possibly be avoided. Wetting the land at this time is very likely to bring on attacks of disease which will result in a poor stand and serious injury to the plants throughout the growing season.

Ordinarily the first irrigation should not be given until the tubers are set. If the tubers have a chance to form in a comparatively dry soil, the majority of

them will be formed at one time; then when water is applied all will have an equal chance to develop; the result should be a crop of even sized potatoes.

The water should always run shallow in the furrows, never deep enough to stand around the tubers, but a sufficient amount applied so that the moisture may seep up into the ridges. In this way the soil about the growing tubers may be kept damp but not soggy. This is the ideal condition for the potato plant, but unfavorable for the growth of potato diseases.

An effort should be made to keep the soil moisture uniform by frequent light irrigations. If the ground is allowed to become dry, the growth of the tubers is checked; then when water is again applied, second growth starts in, which results in knobs and irregular growths. The tubers of some varieties crack badly under this treatment.

It is essential that the potatoes should mature in comparatively dry soil. If the

soil is kept wet until harvest time, the tubers contain an excess of moisture and this necessarily results in poor quality. Then, too, potatoes dug when the soil is wet present a poor appearance on the market, because of the quantity of soil which is bound to stick to them.

In order to have the soil in proper condition at digging time, and the potatoes of the best quality, it is necessary to stop irrigation three or four weeks before the usual time for frost.

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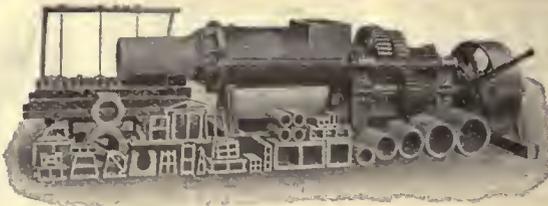
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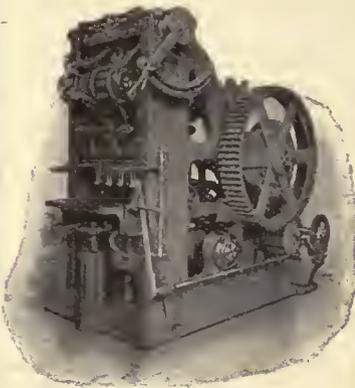
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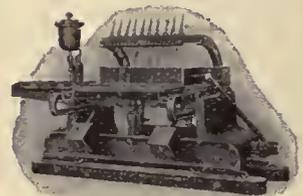
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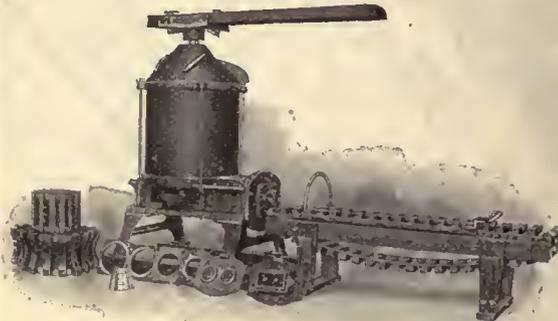
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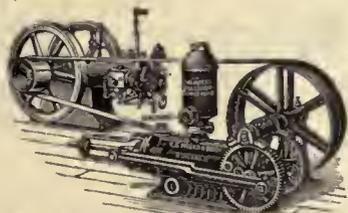
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FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

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BACK CEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

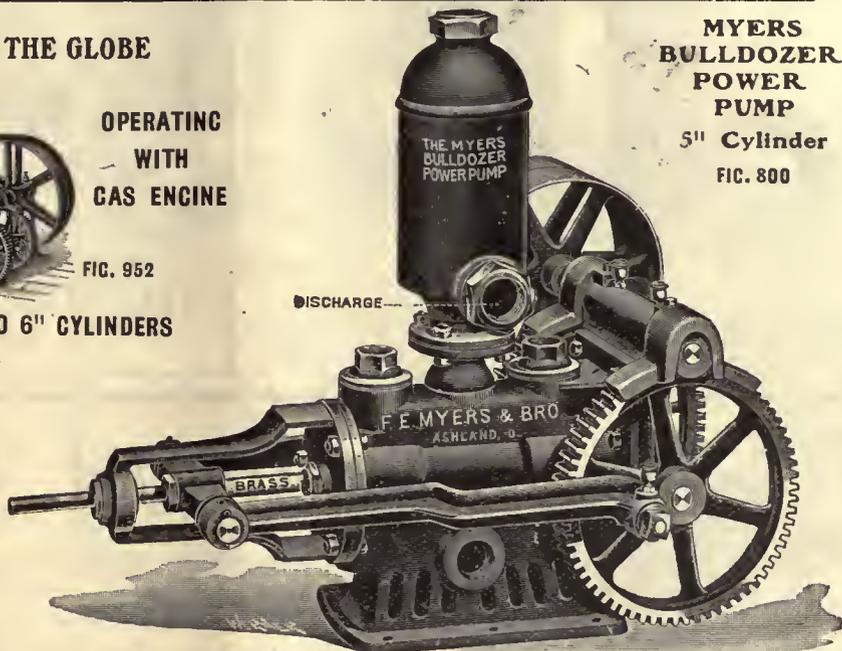
5, 7½ AND 10"
STROKE

FOR BELT,
WIND OR HAND
POWER

FIG. 1113



2½" DISCHARGE



MYERS
BULLDOZER
POWER
PUMP
5" Cylinder
FIG. 800

DISCHARGE

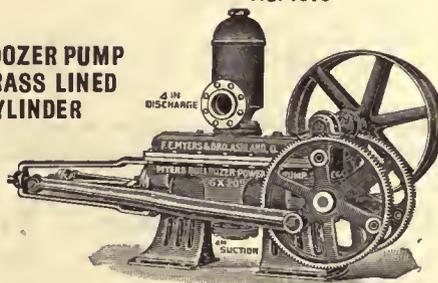
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BRASS

FIG. 1079

BULLDOZER
WORKING
HEAD

BULLDOZER PUMP
6" BRASS LINED
CYLINDER



4" DISCHARGE

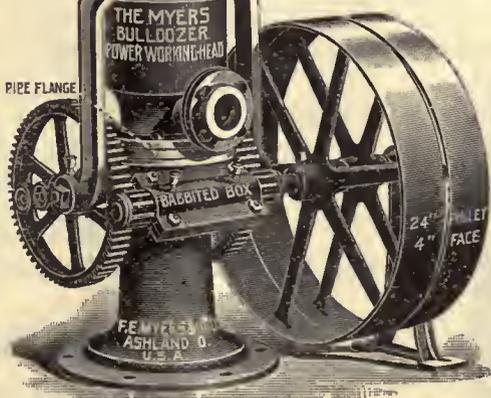
4" SUCTION

1½" BRASS ROD

PISTON
COUPLING NUT

FIG. 813

PIPE FLANGE



THE MYERS
BULLDOZER
POWER WORKING HEAD

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DISCHARGE
SUCTION 8" OR LESS

Write for descriptive Circulars and Prices. We want you to acknowledge this Ad. so that we can acquaint you in detail with the superior features of Myers Power Pumps. This is the proper season. The right time to write is right now.

F. E. MYERS & BRO., ASHLAND, OHIO, U. S. A.

PROPRIETORS OF

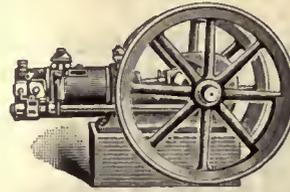
ASHLAND PUMP AND HAY TOOL WORKS

CEMENT PIPE TOOLS



Do you want to make money? Here is your chance. Get a set or two of our pipe tools, make up a stock of pipe and do contracting of installing irrigating systems. Your neighbors are wanting something to save water and labor. Here it is. Write for further information and prices. Mention the Irrigation Age. **KELLAR & THOMASON, Covina, California.**

GOLD MEDAL AT JAMESTOWN

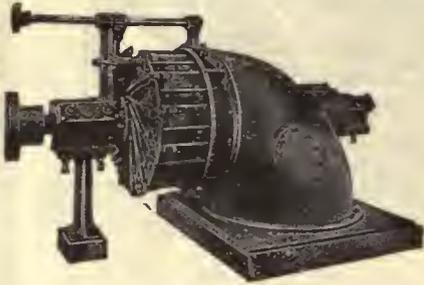


The U. S. Government paid this Company a big compliment when it selected the "OTTO" Engine for use in making the fuel tests at the Jamestown Exposition.

The Jury of Awards also proved its fitness for its task when it AWARDED the "OTTO" the Gold Medal.

The "OTTO" has won FIRST PRIZE at every large Exposition held in this country since the Centennial in '76.

THE OTTO GAS ENGINE WORKS
Philadelphia, Pa.



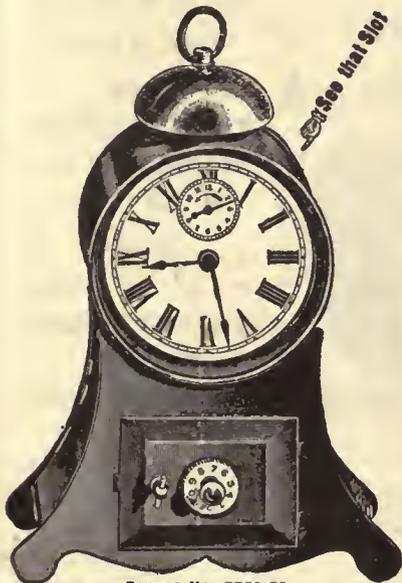
SAMSON TURBINE

When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

JAMES LEFFEL & CO., Springfield, Ohio, U. S. A.

Write Department K-2 for Catalog.

It Makes You Save A Coin A Day
OR THE CLOCK STOPS
Flitcraft's Savings Bank Clock



This is a novel combination of an alarm clock and a savings bank, provided with a coin chute, also automatic locking and unlocking mechanism. The clock in its normal condition is locked, and cannot be wound until a coin is deposited into the slot. Within a brief period after it is wound, the clock is automatically locked again and cannot be wound until another coin is deposited. It takes nickels, dimes and pennies, and holds over eighty dollars in dimes.

The bank is made of sheet steel, beautifully enameled in black, with nickel-plated combination lock. It is ten inches high, seven inches wide and weighs about two pounds.

A SPLENDID PREMIUM

For Purchasers of Irrigation Lands on Easy Payments

Are You Selling Town Lots?
This Will Help You. Try It.

SINGLE BANK CLOCK \$2.00.

(Postage stamps accepted.)

Special Prices for Quantities.

PATENT NO. 7750-58

R. B. FLITCRAFT, 1303 Marquette Building, Chicago

Cream Separator Facts

The country is being flooded this month with large colored circulars making great claims for certain cream separators. As far as we have been able to find none of these houses who are resorting to such flaring styles of advertising and making such great claims actually build their own separators, but have them made in other factories under contract. If you will read between the lines of these glaring colored circulars you will notice how slyly they have tried to make you think they are real manufacturers. But you will also notice that they have not dared to come out openly and say so. We believe the Albaugh-Dover Company are the only mail-order house selling cream separators today direct to the farmer, who actually own all of the patents on their machine, and make it in their own factory.

The New Butterfly Cream Separator is little less than marvelous in ease of running, convenience, and ability to get all the cream. The one great feature of this machine is the Aluminum Corrugated Skimming Device which is such an improvement over all other forms of skimming parts in thoroughness of work, ease of cleaning, and sanitary construction, that the Albaugh-Dover Company has found it advisable to print a special 24-page book telling all about this new invention. Any farmer or dairyman who has ever thought of buying a Cream Separator ought to send for the book called "The Difference," published by the Albaugh-Dover Company. What you want is FACTS and this little book is certainly full of them from cover to cover, and when you have finished reading you will be better posted than ever on the advantages and disadvantages of every style of Cream Separator being advertised today.

The Albaugh-Dover Company has always conducted a campaign against trusts and high prices, and probably many of the readers of the "Irrigation Age" will remember their fight last fall against the thread trust when prices went up to as high as 10 cents a spool, while the Albaugh-Dover Company continued to sell this article at 45 cents per dozen. In seven years they have built the largest co-operative institution in America, and the third largest exclusive mail-order house in the United States. The secret of their success has been

THE PRICE.

In marketing their New Butterfly Cream Separator, they are not taking advantage of the fact that they have an improvement that



MORE MONEY

From Your Cows and
Much Less Work
In Getting It.

If you could see the Real "DIFFERENCE" between the NEW BUTTERFLY CREAM SEPARATOR

If you could see how to make easily \$10 to \$15 more a year on each and every cow you keep, and still do it with less work for your wife and yourself, you'd say: "I'll get a Cream Separator."

OUR PATENTED ALUMINUM CORRUGATED SKIMMING DEVICE

makes the New Butterfly Cream Separator different and 8 times as efficient as any other machine. Every drop of milk that enters the bowl of the New Butterfly Cream Separator is actually put through the skimming process 8 times. This guarantees complete separation, and you can't fail to get ALL THE CREAM. New Butterfly Cream Separators are sold as they ought to be. Not by agents, but direct from our factory to your farm. Freight paid and on 365 days' trial. Send today for illust'd catalog.

For average use, we recommend No. 44, capacity 450 to 500 lbs. of milk per hour.

Difference in amount of the cream you get; Difference in the quality of cream; Difference in the way the machine runs. Difference in the number of times a minute you have to turn the crank; Difference in the way the milk is separated and purified while being separated; Difference in the time and trouble it takes to clean the skimming device—you would say, as hundreds of others are saying today—

PRICE \$39.80

delivered at your town—

ALBAUGH-DOVER CO. Capital \$1,000,000

925-938 Marshall Boulevard, CHICAGO, ILL.



Right here is "The Difference"

"I'll get the NEW BUTTERFLY CREAM SEPARATOR."

A Complaint

from one of the largest buggy manufacturers in America.

In a private letter recently addressed to the Albaugh-Dover Company he makes this complaint, and appeals to us to raise our buggy prices.

"Your prices are too low. We do not believe there is any other catalogue in existence (and surely no retail dealer or agent) selling a buggy as well made as your 14D-116, for instance, for less than \$80.00, while your price is \$50.00."

We call that a pretty convincing argument, and one that should mean more to you if you are going to buy a buggy, than all the extravagant claims made in the most beautiful colored catalog ever written. This letter proves that when it comes to buggies, we are acknowledged privately by other manufacturers themselves to be leaders in price and quality. Why shouldn't we tell you about it? You ought to know it, too.

We Make a Specialty of the Best Low-Priced Buggies in America

as well as the higher grades. No matter what kind of a buggy you want to buy, if you haven't gotten our catalog and price list you haven't struck "rock-bottom" in buggy buying yet. Our rigs are stylish, up-to-date, strong, and built right from top to tire. Above all, the price in every instance is as low as the quality of the job and our small profit will permit. Send today for our catalog and see for yourself why other manufacturers are complaining about our low "Factory-to-User" prices. Runabouts \$21.50 to \$82.00. Top buggies \$28.50 to \$110. Surreys \$58.50 to \$110. We have 35 styles of Top Buggies priced from \$40 to \$60. Among these you are sure to find just the rig you want at a price much less than you have expected to pay. Every buggy is covered by our "Iron-Clad Guarantee." Write for catalog.

ALBAUGH-DOVER CO., CAPITAL \$1,000,000

915-938 MARSHALL BOULEVARD

CHICAGO, ILL.



14D-116

can not be had in other separators, and using it as an excuse for asking twice what the machine is worth, but instead they offer to place on your farm on trial, all freight charges paid, the size of Cream Separator you need and ask less for the New Butterfly Separator than others require you to pay for cheaply constructed, out-of-date, make-shift machines. You ought to send today for their two books:

1. The catalogue of their New Butterfly Separator.

2. "The Difference" booklet. A full explanation of the improvement on which broad patents have been granted to the Albaugh-Dover Company by the United States and foreign governments.

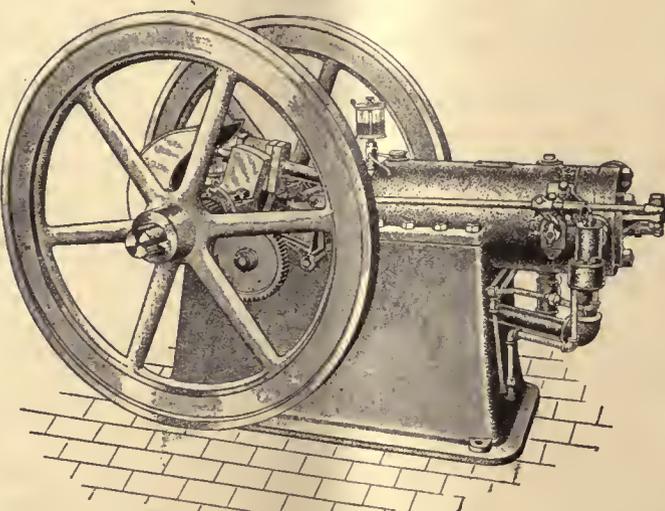
Other articles much in demand in irrigated districts at exceedingly low prices

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- End Gate Broadcast Seeders

ALBAUGH-DOVER CO.
938 Marshall Blvd. CHICAGO

The RELIABLE LINE

“Dempster” — That’s The Name

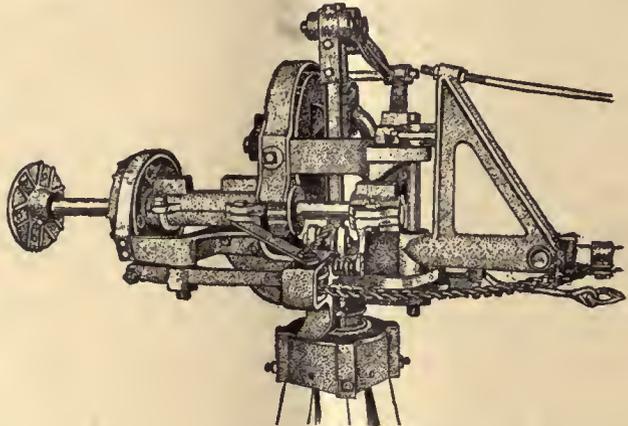
<p>High Class Gasoline Engines</p> <hr/> <p>2 to 12 Horse Power</p> <hr/> <p>For Gasoline Kerosene and Alcohol</p>		<p>Four Cycle Economical Powerful</p> <hr/> <p>Will Run Anything Anywhere</p>
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Irrigating and Water Works Pumping Plants our Specialty

OUR LINE :

WIND MILLS	ALL KINDS OF PUMPS	WOOD AND STEEL TANKS
WELL MACHINERY	GASOLINE ENGINES	CULTIVATORS
GRAIN DRILLS	IRON PIPE AND CASING	FEED MILLS
WELL POINTS AND STRAINERS		COCKS AND VALVES
		FARM AND RANCH WATER SUPPLIES

BEST TO BUY ——— BEST TO WORK

<p>Look Carefully at the Best</p> <p>Windmill Head</p> <p>Ever Made</p>		<p>See that Extra Bearing</p> <p>on the Wheel Shaft and the</p> <p>Center Lift Crank Roller Rim Gears</p> <p>and other good things</p>
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FACTORY: BEATRICE, NEBRASKA

Branch Houses: **Omaha, Neb. Kansas City, Mo. Sioux Falls, S. D.**

Mention Department "A" when you write

THE IRRIGATION AGE

PUBLISHED IN THE INTEREST OF IRRIGATION FARMERS,
DEALERS IN AND MANUFACTURERS OF IRRIGATION AND
GENERAL FARM MACHINERY.

VOL. XXIII.

CHICAGO, JUNE, 1908.

No. 8

It Works Both Ways, Continuously and to Templet



With an **AUSTIN DRAINAGE EXCAVATOR** the removal of the earth is accomplished by two scraper buckets, which travel back and forth across the ditch, one taking on load while the other is discharging. There is no waste time or motion. **Each stroke of the bucket-carrying mechanism accomplishes paying work.**

In a word, the Austin Drainage Excavator **does continuous work.** The scraper buckets are guided in their motion by a steel guide frame constructed to the exact cross section of the ditch—the buckets cannot depart from this guide. This means that the ditch is dug to exact cross section and grade—it is dug to templet.

This excavating and guiding mechanism with its motive power is mounted on a frame on wheels wide enough apart to straddle the ditch. By means of **portable track, which the excavator itself handles and virtually lays,** the Austin Drainage Excavator moves along the ditch in either direction by its own power. It will travel across country from ditch to ditch in the same way.

The Austin Drainage Excavator is the most perfectly worked out ditching machine available today to drainage and irrigation contractors. We prove this statement by records of work done.

Send for our Catalogue S, showing Austin Drainage Excavator Work.

F. C. Austin Drainage Excavator Company

New York Office, 90 West Street

Main Office, Railway Exchange, Chicago, Ill.

Morris Machine Works

BALDWINVILLE, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need

New York Office, 39-41 Cortlandt Street
Houston Office, Cor. Wood & Willow Sts., Texas
Hendon & Hubbell, Agents, 61 N. Jefferson St.,
Chicago, Ill.

Harron, Rickard & McComb, Agents,
21 Fremont Street, San Francisco, Cal.



Have You on Your Place

If You Have, Then a Deming Hydraulic Ram Will Mean Dollars To You.

A Spring Flowing Well ? or Stream

Our Booklet, "Rural Water Systems" Will Tell You Why

With it you can have your own water works with all the city conveniences and can irrigate your land with ease. It is only necessary to install the Ram correctly in the first place and you then have a steady, tireless, water producer, 365 days in the year.

We have sold thousands of them and they all give satisfaction.



As conditions governing installations differ somewhat, we prefer to give information that will apply to each individual case and in this manner a perfect installation is secured.

The booklet, "Rural Water Systems" above referred to, gives a very complete description of the different methods of installing a Ram. It will be of value to you and will be sent on application.

Let us hear from you.

The Deming Co.
Salem = Ohio

Read This

Henion & Hubbell

General Western Agents
Chicago - Ill.
Other Agencies in Principal Cities



Plain (Riding) 5-Disk, with Shafts

One Horse Wheat Drills

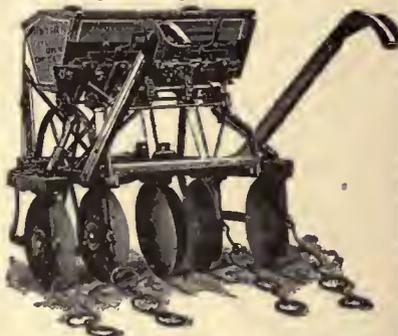
FOR USE BETWEEN ROWS OF STANDING CORN

HOOSIER DRILL COMPANY

Division, The American Seeding Machine Co., Inc.
Richmond, Ind., U. S. A.

MADE
WITH
HOSE
OR
DISKS,
PLAIN
OR
FERTILIZER
STYLES

WRITE
FOR
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5-Disk (Walking) with Fertilizer Attachment



THE 1908 IMPROVED DE LAVAL CREAM SEPARATORS

Ten years ahead of all others in every feature of separator practicability.

Ten New Styles--Ten New Capacities--Ten New Prices
A size for every dairy, from the smallest to the largest.

**BEAUTIFUL IN DESIGN
PERFECT IN CONSTRUCTION
EVERLASTING IN DAILY USE**

The result of thirty years experience in building separators.

Send for handsome new catalogue illustrating and describing machines in detail and to be had for the asking.

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General Offices: 165-167 Broadway, NEW YORK

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SAN FRANCISCO

173-177 William Street
MONTREAL

14 and 16 Princess Street
WINNIPEG

107 First Street
PORTLAND, OREG.

Make Your Own Drain Tile

IT'S VERY SIMPLE
COSTS LITTLE

Many land owners are not only making their own drain tile, but are going into the business. Send for THE CEMENT ERA, which will serve as a catalogue of all concerns who manufacture CEMENT DRAIN TILE MACHINES, with which you can make tile of any size.

This paper will also give you valuable information in regard to making your own CEMENT FENCE POSTS, CEMENT SIDEWALKS, even your own CEMENT HOUSES, etc., etc.

Send 10 cents for sample copy, or one dollar for one year's subscription.

The Cement Era

840 Monadnock Blk.

CHICAGO

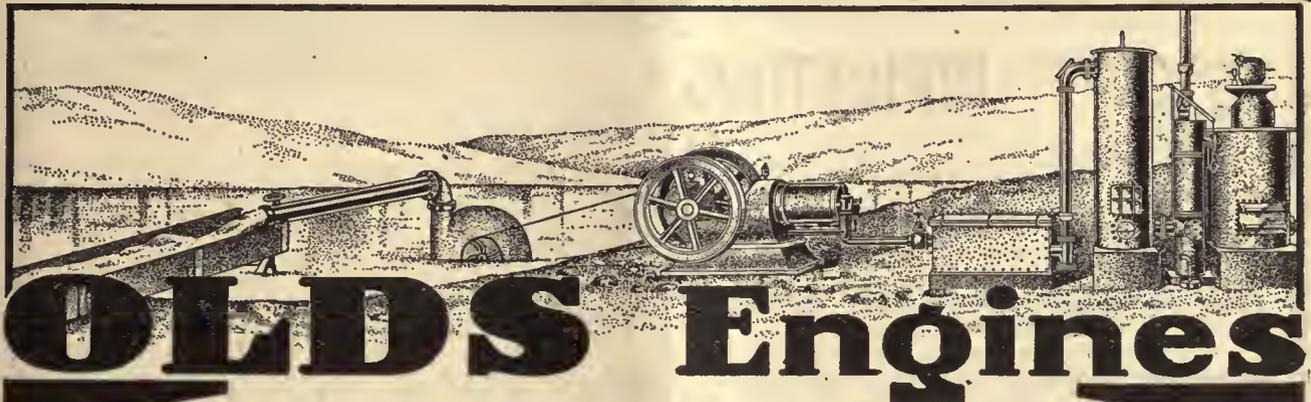
Galvanized Steel Irrigation Flumes AND WATER TROUGHS



Galvanized steel is rapidly taking the place of wood for fluming purposes and with The Maginnis Patent splice fluming is made easy. Any boy can put the Maginnis Steel Flume together or take it apart. Steel flumes and troughs "Ship Knock down" Third Class freight. Let me figure on your flume. All flumes guaranteed.

Write for Testimonials and Particulars to

P. Maginnis, Mfr.
Kimball, Nebraska



OLDS Engines

BEST BY TEST. I WANT YOU TO GET the most liberal proposition ever made on a gasoline engine. It will save you money. When a company like this, the oldest and biggest exclusive gasoline engine manufacturers in the country, make such a proposition, it means something. I have placed my proposition in the hands of our representatives. Write to them or to me, and you will receive it by return mail. JAS. B. SEAGER, Gen. Mgr. Olds Gas Power Co.

The Olds Engine is the best and cheapest Engine you can buy. It is the simplest in construction, most economical to run, will do your work at the smallest expense, and does not get out of order. This company has been making engines—and nothing else—for thirty years. We are engine specialists.

It stands to reason that a big, successful concern like this, that makes one thing, must make that one thing well. Our new factory is the most complete and up-to-date engine factory in the United States. Because of its complete equipment we can build engines of the highest efficiency at the very lowest cost. That is why we can give you a durable, simple, strong, highest-grade, perfect-working, long-lived engine at a low price. This liberal proposition is the crowning reason on top of a lot of good common sense ones, why you should buy an Olds Engine and none other.

WE HAVE ANY KIND OF AN ENGINE YOU WANT

Our new catalogue tells about them in detail. I especially want to call your attention to our Hopper Jacket Engine on skids or wheels, 3 to 12 h. p., which is ready to run when you get it. Fill it with gasoline, throw on the switch, turn the wheel—that's all. No piping to connect, nothing to set up, always ready, can be moved anywhere.

All Olds Engines run properly, are easy to start winter and summer. The U. S. Government uses them. **DON'T FAIL TO WRITE** for our new catalogue and the liberal proposition at once. Address the home office or any representative. Do not buy any other engine until you have got my liberal proposition. It is something unusual. You certainly want to know about it.

OLDS GAS POWER CO.

- Home Office, Lansing, Mich., 957 Seager Street
- Boston, 69-75 Washington St. N.
- San Francisco, Cor. Jessie and Ecker Sts.
- Kansas City, 1226 W. Eleventh St.
- Omaha, 1018 Farnum Street
- Binghamton, N. Y., 23 Washington St.
- Minneapolis, 313 S. Third St.
- Portland, Ore., 80 7th St.
- Elgin, Ill., 28-34 River St.
- Kempton, Pa.
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- Norfolk, Va.
- Miami, Fla., C & 13th St.
- Philadelphia, 1816 Market St.

To insure prompt deliveries, we carry a full line of Engines and parts with our representatives.

SUPERIOR
THE NAME TELLS A TRUE STORY

SUPERIOR DRILLS are Used and Appreciated by Good Farmers the World Over

SEND FOR CATALOGUE NOW

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 Kingman Implement Co., Omaha, Neb.
 Parlin & Orendorff Imp. Co., Portland, Ore
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Eastern Farmers please write direct to the Manufacturers
SUPERIOR DRILL CO., Springfield, Ohio
 Division of the American Seeding Mach. Co., Inc.

GRAIN DRILLS

25% SAVED OF THE EXPENSE OF IRRIGATION

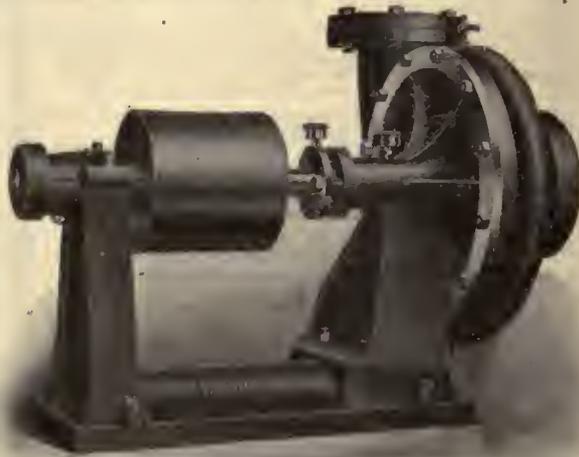
Send for our booklet, "COST OF IRRIGATION." It will save you money in irrigating.

We guarantee 25% more water with the same power, or the same amount of water with 25% less power than other make of pumping machinery. We have proved this greater efficiency by hundreds of tests and we are ready to prove it again.

Bulletin No. 104 illustrates and describes irrigation machinery

THE AMERICAN WELL WORKS

AURORA, ILLINOIS, U. S. A.
 Chicago Office, First National Bank Building.
 Morse Bros. Machinery & Supply Co., Denver, Colo.
 Zimmerman-Wells Brown Company, Portland, Ore.
 Cal. Hydraulic, Engineering & Supply Co., San Francisco, Calif.



Machinery and Irrigating Supplies

AT

HALF PRICE GASOLINE ENGINES

50—Gasoline Engines, 2 H. P. to 30 H. P. Some brand new. Nearly every make. Send for list.

CENTRIFUGAL PUMPS

10—Centrifugal Pumps, sizes 2 in. to 12 in. Have been thoroughly overhauled and are as good as new. We can save you from 40 to 60% on complete pumping outfits. Write for estimate.

STANDARD WROUGHT IRON PIPE

Carefully overhauled, with screwed ends and threaded couplings.

1 in., per ft.....4c	2½ in., per ft.....14c
1¼ in., per ft.....5c	3 in., per ft.....17c
1½ in., per ft.....6¾c	6 in., per ft.....42c
2 in., per ft.....9c	8 in., per ft.....75c

Prices on larger sizes on application. Send for special bargain list No. 803.

WROUGHT IRON LAP-WELDED CASING

Just as good as new. Will stand higher pressure than standard black pipe and is lighter weight. Just the thing for irrigating purposes. Special prices on large quantities.

Inside Diameter.	Outside Diameter.	Weight per foot.	Price per foot.
1¾ inch.	2 inch.	2 lbs.	6½c
2¾ inch.	3 inch.	3½ lbs.	12c
3¼ inch.	3½ inch.	4½ lbs.	14c
3¾ inch.	4 inch.	5½ lbs.	16½c
4¼ inch.	4½ inch.	6½ lbs.	20c
5½ inch.	6 inch.	10¾ lbs.	34c
6¼ inch.	6½ inch.	13 lbs.	40c
6¾ inch.	7 inch.	15 lbs.	48c
8¼ inch.	8½ inch.	18 lbs.	60c

WRITE FOR OUR LOW PRICES ON

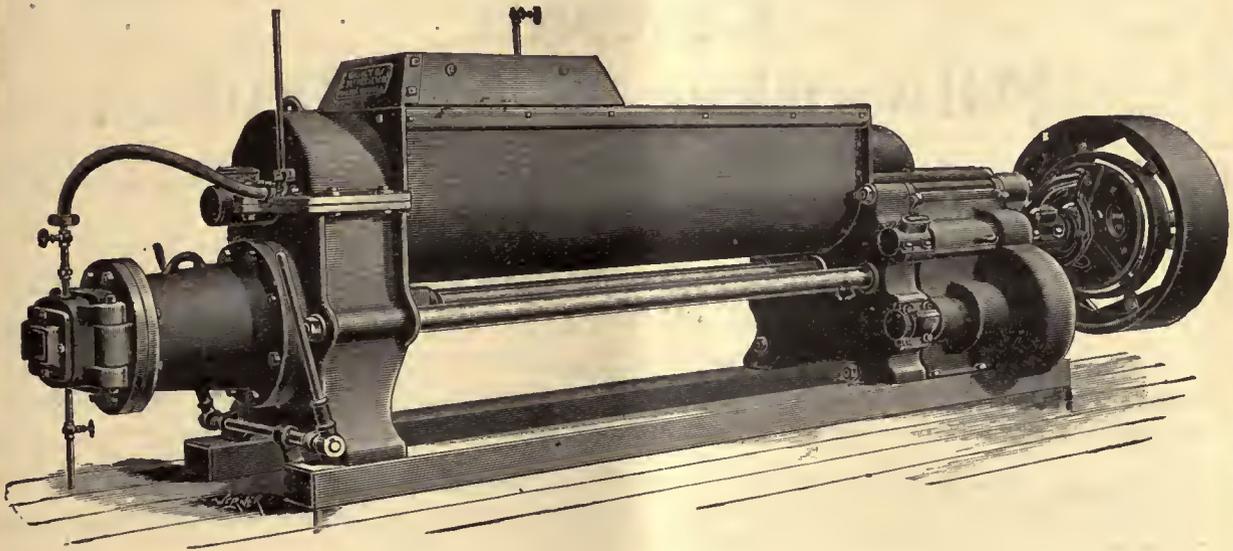
- Roofing,
- Linoleum,
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- Electrical Supplies,
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- Hose,
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- Tools,
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- Carpets,
- Plumbing Goods,
- Rugs,
- Heating Plants.

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This wonderful book is sent free if you mention this paper. Every shrewd buyer should have a copy. Send us your name and address plainly. Tell us just what you are in the market for.

Chicago House Wrecking Co.
 35th and Iron Streets, CHICAGO, ILL.

UNION MACHINES WITH PUG MILLS COMBINED



FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
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If interested write us for particulars and estimates.

E. M. FREESE & CO.

GALION, OHIO

When writing to advertisers please mention The Irrigation Age.

FREE PUBLICATIONS

About the

Pacific Coast Extension

of the

Chicago Milwaukee & St. Paul Railway

The Account of a Trip along the Pacific Coast Extension—A leaflet describing the opportunities offered in the country through which the Pacific Coast Extension is being built.

Along the New Line to the Pacific Coast—A folder containing accurate maps of the Pacific Coast Extension from Mobridge, S. D., to Seattle and Tacoma, Wash.; also copies of letters received from successful settlers in South Dakota, North Dakota and Montana.

Where Things Move Fast—A leaflet containing the story of a 300-mile drive along the Pacific Coast Extension in North Dakota and Montana. This leaflet contains many illustrations and valuable data regarding homestead lands.

Government Homesteads and How to Secure Them—A leaflet giving detailed information as to how homesteads may be acquired, where land which may be homesteaded is located, location of land offices, cost of homesteading and numerous hints of value to the intending homesteader.

Montana—An illustrated folder containing accurate map of Montana on a large scale; also shows where the Pacific Coast Extension passes through Montana and Idaho. This folder also contains valuable information in regard to climate, soil, crops, homestead lands and general information of value to prospective settlers.

Fergus County, Montana—A booklet well illustrated and containing map and general information in regard to Fergus County and the famous Judith Basin; statistics of products, lands available for homestead, climate, soil and reports of actual yield of crops in 1907. Also other facts in regard to the wonderful resources of the Judith Basin.

South Dakota—A book descriptive of the opportunities in agricultural, stock raising and mercantile lines. Contains 1907 crop reports and other valuable statistics.

ANY OF THE ABOVE SENT FREE ON REQUEST

For further particulars, write to either of the undersigned, asking specific questions, and reply will be made at once.

F. A. MILLER
General Passenger Agent, CHICAGO

GEO. B. HAYNES
Immigration Agent, 95 ADAMS STREET, CHICAGO

THE IRRIGATION AGE

VOL. XXIII

CHICAGO, JUNE, 1908.

No. 8

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

SUBSCRIPTION PRICE.

To United States Subscribers, Postage Paid, \$1.00
To Canada and Mexico, 1.50
All Other Foreign Countries, 1.50
In forwarding remittances please do not send checks on local banks.
Send either postoffice or express money order or Chicago or New York draft.

Official organ Federation of Tree Growing Clubs of America.

Official organ of the American Irrigation Federation.
Office of the Secretary, 309 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 23 years old and is the pioneer publication of its class in the world.

Van Dyke, "The Art of Irrigation." The series of articles by Van Dyke which begin with this our June issue will be found to be the most comprehensive and instructive irrigation literature ever put in type. We feel highly pleased to have secured the co-operation of so able a man as Mr. Van Dyke in our effort to teach the public the details of irrigation farming.

Mr. Van Dyke informs us that this matter will be quite different from anything that has appeared in *THE AGE* before, and he states further that up to seven years ago his experience was confined to the semi-arid lands, and that contact with the real article of desert irrigation has since taught him that a great deal more of detail and explanation is necessary to be of value to the settler, and that his information will be equally interesting to those who are farming where there is considerable rainfall.

Mr. Van Dyke prepared an article along irrigation lines which appeared in *THE IRRIGATION AGE* some eight or ten years ago, but the whole matter has been entirely brought up to date and deals more clearly and emphatically with the difficulties which are to be encountered in irrigation farming than with the possible success which may be obtained.

We would suggest to our readers that they do not miss any of these articles, and that they keep a copy of the paper on file for reference. This work will be

brought out in book form later, but not until the whole series of some twenty-seven chapters covering that number of months have appeared in the columns of this journal, hence it will be seen that those who would wait for the matter in complete book form will need patience, and for this reason we advise keeping a file of *THE AGE* for reference.

A representative of *THE IRRIGATION AGE* will leave early in June to study conditions at some of the Government Reclamation projects. His first stop will probably be at Belle Fourche, South Dakota. It is our intention now to have an article of some seven or eight pages prepared, descriptive of this project. This article will be finely illustrated and will give full information as to the work as carried on under government control, with the possibilities for home building on the land served by this canal.

All reports concerning this particular locality so far are favorable, and we are receiving many inquiries asking for detailed information from prospective settlers. This has led us to put a representative in the field so that all these inquiries may be answered intelligently.

The Belle Fourche article will appear in our July number, which will appear about June 30. Those wishing extra copies of this number will kindly notify us in advance so as to insure their delivery.

Appointment of Commissions. The friends of Reclamation and Forestry throughout the West are wondering how long a time will elapse before the appointment of commissions to control the actions of the heads of these two bureaus.

They want to know why such unlimited power is given the two gentlemen who head these departments.

To illustrate the power possessed by the head of the Forestry Bureau, they cite the fact that Mr. Pinchot absolutely controls twenty-seven per cent of the area of the State of Idaho. No citizen of Idaho, no matter what his station or record for faithful work in the up-building of the state, has anything to say concerning the vast territory embraced in the limits of the Forest Reserves.

That immense area is absolutely dominated by one man in Washington, D. C., who, a few years ago, was an employe of the Vanderbilts, and assisting in the development of their vast estate, Biltmore.

This man is assisted by many able men who are making a life work of Forestry, but the majority of the employes of the Bureau, the men with whom the settler or any other citizen of the state is compelled to come in contact, are individuals who are open for engagement for sixty dollars a month.

We wonder if Mr. Pinchot realizes that his system is bound to bring discredit on this Bureau. Does he not realize that the free-born, liberty-loving people of the great West will not long tolerate dictation from his department through an overbearing, sometimes arrogant, ranger?

Does he not read the signs sufficiently well to see that the only solution of the problem is the appointment of a competent commission to whom residents with grievances may present them?

At the present time a citizen or settler who makes complaint to a local representative or direct to Washington receives scant recognition, if indeed they get any attention at all.

This state of affairs cannot continue, and the sooner it is corrected the better for all concerned.

THE IRRIGATION AGE has repeatedly urged appointment of a commission to supervise the work and expenditures of the Reclamation Bureau. This is a crying need, as the public secures scant information of the inner workings of that great Bureau, the Director of which has almost absolute control of the vast Reclamation fund, amounting at present to approximately Forty Millions of dollars.

What private corporation would succeed if its affairs were conducted under such a system? Would not a commission composed of men of known integrity which would give to the public full information concern-

ing the working of this great organization, be infinitely more businesslike and satisfactory?

THE IRRIGATION AGE does not question the integrity of Mr. Newell of the Reclamation Service. It does, however, question his ability to conduct the work as clearly and satisfactorily as could be done under the supervision of a carefully selected board of commissioners.

Rapid Growth.

As an illustration of the rapid growth of the circulation of THE IRRIGATION AGE, we will call the attention of our advertisers to one day's addition to our list. On May 21 there were received in this office one hundred and seventy-two yearly, paid in advance subscriptions. This is second to the largest day's receipts from that source and illustrates the growing interest in irrigation affairs. These readers are all prospective buyers of machinery, wagons, land, etc.

Big Horn Basin.

The Burlington Route has issued a finely illustrated twenty-four-page folder, which presents valuable information concerning the Big Horn Basin, Wyoming. This folder will give prospective settlers and homeseekers more good information than may be obtained from any other source. A copy may be obtained by addressing the General Passenger Department of the Chicago, Burlington & Quincy Railway, Chicago, Ill., or local agents of that company.

Irrigation Congress.

Preparations are well under way at Albuquerque for the entertainment of the sixteenth National Irrigation Congress, which is to be held in that city the last days of September and the first days of October of this year. The Atchison, Topeka & Santa Fe Railway, on whose line Albuquerque is situated, is doing good work in the way of advertising the Congress and the local committees are now in full working order, and are putting out large quantities of printed matter which will, no doubt, attract a heavy attendance.

It is expected that matters of more than ordinary importance will be brought to the attention of this Congress, and active irrigators, promoters of private irrigation projects, and state and federal officials will attend in goodly numbers, and, no doubt, present a very interesting program. We have not been able to secure an outline of the program for the Congress. We will, no doubt, do so within a short time, when it will be duly presented to our readers.

"Halo"
or
"Lemon." It is a question in the minds of many who will attend the sixteenth National Irrigation Congress what will be offered the officers of the Reclamation and Forestry Service. That there will not be as many "sunbursts" in attendance as at former meetings is fairly well assured, owing to the recent laws passed by Congress which restrict the expenditure of funds in either department to the actual expenses incurred in the legitimate transactions of business connected therewith.

It is possible that a few "experts" may be shipped in and their expenses charged up to "hay and grain" accounts. For explanation see report before Congress on Agricultural Appropriation bill of May 5, 1908, page 5,910.

DEMONSTRATION FARMS UPON RECLAMATION PROJECTS.

The government, through the Department of the Interior, is spending about \$40,000,000 in the construction of irrigation works intended for the reclamation of immense bodies of land in all the states of the arid West. It is a part of the plan that this money be returned to the treasury by the farmers who settle upon these lands and who use the water supplied by the works.

In view of the fact that a very large majority of the farmers who settle upon the reclamation projects are likely to be unacquainted with the peculiar conditions of agriculture under irrigation, it is realized that it will be hard for them to establish homes and meet their payments to the government if they are compelled to work out for themselves the methods of a type of agriculture which is entirely new to them. Therefore, the Department of Agriculture has been asked to establish demonstration farms on the reclamation projects so the new settlers may learn correct methods of irrigation and if possible avoid those serious losses due to unsuitable irrigation practice. Such farms have already been established at Bellefourche, S. D., and at Minidoka, Idaho, and will be established on the other projects as they are completed.

The demonstrating of correct methods is not, however, confined to reclamation projects, as it is a part of the plan of the work of the department in Utah to furnish such aid to settlers in the former Uintah Indian Reservation in the eastern part of the state. Similar work is being done in the recently opened Wind River Reservation in central Wyoming, which is largely being settled by farmers from the humid sections.

In some localities where water has become scarce through the extension of the irrigated area, the prevention of losses, which in other sections are not so important, is practically the only means of further extension. This is especially true in southern California, although the same condition is approaching in many other states. This has led to investigations of means of preventing seepage losses from canals in California and Oregon, and to measurements of losses of water by evaporation from the soil of fields, together with experiments to determine the effectiveness of different methods of cultivation in preventing these losses.

THE IRRIGATOR.

BY ROBERT V. CARR.

From Cowboy Lyrics. (Copyright, 1908, by Robert V. Carr.)

Was ridin' down a-past his place
An' then I thinks I'll 'low
To sort o' pass the time o' day
An' speak a friendly "how."

He's mussin' 'round there in the mud,
A little dam he's got;
He 'lows to make a cacti flat
Into a garden spot.

I says to him the land's no good
Fer farmin' she don't win,
But all he does is slop around
An' kind o' funny grin.

I says the land's jes' useful fer
Some cows to raise an' range,
But he jes' grins an' hollers back,
"There's goin' to be a change."

He's mussin' 'round there in the mud,
A little dam he's got;
He 'lows to make a cacti flat
Into a garden spot.

LOSS OF DITCH RIGHTS BY ABANDONMENT.

THE IRRIGATION AGE:—

Will some reader of THE IRRIGATION AGE please state in its columns what the Supreme court decisions have been on the following questions: How many years does it take for an abandoned ditch to lose its recognition on the river, and for the right of way to revert back to the owners of the land?

The page in your magazine devoted to Supreme Court Decisions is very much appreciated by me and others in this locality interested in irrigation. I am making a file of the Supreme Court Decisions as I get them from THE IRRIGATION AGE.

Yours very truly,
JOHN G. HALL.

Profit in Spraying.—The Nebraska Experiment Station has just issued a bulletin giving the results of spraying operations conducted in two Nebraska apple orchards in 1907. Detailed records are given of the cost of spraying, and of the yield and value of sprayed and unsprayed fruit. It is shown that spraying not only controls many apple pests, but also that it is profitable to control them. Suggestions are given in regard to the preparation and application of spray mixtures. The bulletin is free to residents of Nebraska. Address the Agricultural Experiment Station, Lincoln, Neb., asking for Bulletin No. 106.

We are in receipt of a copy of "The Romance of the Reaper," by Herbert N. Casson, which is a reprint from a recent issue of Everybody's Magazine. This is a work which has been mentioned in a previous issue of this journal and contains 184 pages, and is finely illustrated. This book gives the first inside history of one of the greatest American businesses, which has spread all over the world. It is a truly wonderful story and will be found highly interesting. It contains 26 illustrations from photographs. Doubleday, Page & Co., New York City, are the publishers. Price, \$1, net.

PROPER HANDLING OF WATER ESSENTIAL TO SUCCESS.

BY T. S. VAN DYKE.

[Mr. Van Dyke has a deserved reputation as the highest authority on the art of irrigation. The value of the vast fund of information accumulated by keen observation during many years of practical experience as an irrigator is enhanced by the happy faculty of expression Mr. Van Dyke possesses in making his articles both instructive and entertaining. Below is the introduction to a series of some twenty-seven articles Mr. Van Dyke will contribute to the IRRIGATION AGE.]

It is now over fifteen years since irrigation was carefully tried east of the Mississippi. The results showed a doubling of many crops in years even of good rainfall and explained why Italy, with about the same rainfall in most places, builds such expensive irrigation works. Years of short, or even medium, rainfall proved that in no case can any tiller of the soil afford to rely on it if he can apply water cheaply enough. The question of cost is all there is. Many farms are too rough to apply water economically to low-grade crops, and on many smooth ones it is too hard to get in reliable quantity even for high-grade products. But there are few where some water cannot be had for some smooth land, and if it is only five acres out of a hundred-acre farm it may mean the difference between success and failure. On thousands of farms west of the Mississippi five irrigated acres enable one to live in comfort on one hundred and sixty acres which one would otherwise have to leave. The other hundred and fifty-five can be managed with summer fallowing and cultivation almost to the point of a living. But the results are just a little short and after years of struggle the farmer gives up. Five acres properly handled with water turn the scale.

So great have been the results that irrigation is now practiced, to some extent, in about every state in the Union. No matter how great the rainfall even the market gardener cannot afford to rely on it for full crops of cucumbers, strawberries and many other things. No matter what you can do by scientific work with high-grade fertilizers and cultivation, the control of the water is not only needful to keep your fertilizers from burning the crop in dry weather, but you positively cannot take from any soil so many pounds of produce without so many pounds of water. The more you increase the one the more imperative the demand for the other.

The idea is quite universal that in order to irrigate you have only to irrigate. There is the water, the promoter, the lawyer, the financier and the engineer have built you a perfect ditch with good title and all. There is nothing left for them to do, and now comes your turn, Mr. Bone-and-sinew-of-the-land. You will therefore proceed to irrigate.

Few not familiar with the early struggles of the Mormons in Utah, and of the settlers of Southern California can have any conception of what a puzzling thing it is to apply water even to the smoothest looking land. Water companies have failed and first-rate land and water projects have been laid on the shelf for years because hard working settlers were ignorant of the *modus operandi* of handling the water on the ground, and there was no one in the company to show them.

No man ever worked out this problem alone. It is solved only by the combined experience of many, com-

paring notes, traveling about to see what others are doing and experimenting at constant loss for a time, or else it is learned by imitating those who have been through the torment. And even then one must be careful or he will imitate the faults that remain as well as the wisdom that has been learned.

As almost any irrigation is better than none, absolute failures are rare outside of the desert. I am now farming under a ditch on which nearly half a million was squandered, and on which the first nine settlers assisted with money, teams and even provisions, by the company, all failed and left, and the ditch lay abandoned for several years with water running through it, although alfalfa hay was worth twelve to sixteen dollars a ton. Such failures are rare, but have the advantage of being speedy and leaving the victim time, if not money, to go where he can do something. The more common failures are of two kinds.

First making just enough to keep one staying and going through all kinds of torment for years.

Second making it pay ten to twenty-five dollars an acre when it should be paying fifty or a hundred or over.

Third making the farm pay the hundred, but requiring twice or thrice the water and work it should require, yet be paying so well that you cannot afford to tear it up and lay it out again as it should be. And this is about the most maddening of all.

These troubles come generally from trying to work out your own experience alone just as if you were the first man bright enough to think of artificial watering. One should by all means travel in those irrigating sections that have made the greatest success of it and keep on traveling. He should also lay aside all notions about book farming and read every book written on the subject. For it is a vast one and cannot be embraced in one volume of readable size. Next to that he should learn to handle the shovel himself, and not depend on sitting around and bossing cheap labor.

When properly done irrigation is kid glove farming with this important difference, that the nearer it comes to kid glove farming the better it pays. A writer sent out by an eastern magazine to write up the subject says you must learn to wear rubber boots. On the contrary, you must lay out the ground and manage the water so that you can irrigate in slippers. The same difference runs through the whole subject so that when it is well done it is the easiest and most profitable work in the world of equal certainty in results. There is positively no chance in the game. That is why you never find the alleged funny man in the west cracking any jokes on the irrigating hayseed. He has too much respect for him, because he keeps a robust balance in bank and has plenty of time to play. That is probably why farming was respectable among the Romans and others of the olden days. And what can relieve the congestion of our cities, which is now our danger point, except something that will make farming respectable by making it profitable and easy? The cradle of civilization of philosophy, art, music and literature was not rocked in the rainy lands, but beside the irrigating ditch. Irrigation has supported the world's largest and richest populations. Our ancestors came from the cold and murky woods of Europe and knew nothing but to hew down forests, dig out stumps

and depend on the direct influence of the capricious clouds. Had they come from the sunlands and landed on the Pacific Coast and worked eastward the greater part of the population and wealth of our country today might be west of the Mississippi and the Indian question confined to the Atlantic Coast.

The law and engineering of irrigation as well as agricultural chemistry have been so well handled in other books that I confine myself to the actual handling of the water on the ground—a subject so large in itself that it leaves no room for any other in a book of readable size. This will call for an amount of detail that some may think needless. But beware how you think any of the advice I give is overnice. There is no business in which good work pays better and few in which it takes so long to discover the loss from bad work, for the loss is generally in time, labor and water as well as in the quality or quantity of the crop. If you are raising fruit it is the percentage of the first grade that counts and the rest had better go to the pigpen than be put on the market to injure the reputation of your locality.

CALIFORNIA PROMOTION COMMITTEE STATEMENT.

The California Promotion Committee issues the following statement:

A remarkable condition as regards population is shown by statistics gathered by the California Promotion Committee within fifty mile radius of the two largest cities of the state, as compared with the balance of the state. In securing the data the committee has used the figures of city clerks, postmasters, commercial organizations and county assessors. According to the best estimates California had on January 1, 1907, a population of 2,217,897. Of this 1,217,064 reside within fifty miles of San Francisco and Los Angeles.

Within fifty miles of San Francisco is a population of 875,687, and within the same radius of Los Angeles is a population of 341,377. These figures show that for all the interior towns and cities and on all the farms of the great state there are 1,000,893 people.

According to the records of the postmasters in the same areas the receipts for the year, 1906, in all the postoffices within fifty miles of San Francisco amounted to \$2,257,481, and for the same area tributary to Los Angeles the receipts amounted \$1,101,712.

The business done near the two centers, as shown by the banking business, is also remarkable. The bank deposits of the San Francisco fifty mile radius amount to \$373,234,742, and those in the same area adjacent to Los Angeles amount to \$106,613,908. The bank clearings for 1906 amount to \$2,134,254,146 in the San Francisco area, and \$576,689,367 in the Los Angeles area.

There are 2,857 factories doing business within fifty miles of San Francisco, and 1,631 within fifty miles of Los Angeles. To assist the people in transacting their business there are 58,297 telephones in use in the San Francisco area, with one company, and within the Los Angeles area there are 45,551, with two companies doing business.

From these figures it will be seen that the tendency of population is too great toward the urban centers,

resulting in a congestion which would materially develop the state were it scattered. The California Promotion Committee is bending its energies toward the settling of the interior of the State, and to this end has been and is successfully inducing large land holders to subdivide their lands in order that new settlers may find homes.

TWIN FALLS COMPANY MAY TAKE OVER WOOD RIVER PROJECT.

The most wonderful success in the line of private irrigation projects in the world is undoubtedly that of the Twin Falls Company, Twin Falls, Idaho, Chicago, Ill., and Pittsburgh, Penn.

Along about 1902, J. B. Perrine of Blue Lakes, Idaho, conceived the idea of irrigating the large tract of land south of the Snake River, and enlisted the support of engineers who pronounced the scheme feasible.

Mr. Perrine was laughed at by many of his friends and associates, but after many months of hard work he was able to interest capitalists in Salt Lake City, who in turn secured the support of heavier capitalists in the East, and finally Mr. Buell, the father of the Twin Falls tract, came forward and advanced the money for the development of a project which would irrigate some 270,000 acres of land. This was accomplished by building what is known as the Milner Dam, one of the best structures of its kind in the country. During all of this time Mr. Perrine worked faithfully to see that the original plans were carried out, and while he encountered many obstacles, even after the money had been secured, he has stood by the project and enlisted the support of some of the strongest financial people in the United States, so that today his company stands at the head in acreage and financial support of all private irrigation projects in the United States, if not in the world.

Great credit is due to Messrs. Perrine, Hollister, Milner, Hurtt, Hayes, McCullom and Reed, and many others who have stood by the proposition during all of the vicissitudes of its development. This company has recently opened up a large tract of land on the north side of the Snake River and has established a power house at Shoshone Falls, and are now preparing to open up what is known as the Salmon River project, lying south of and adjacent to the South Side Twin Falls tract. It is rumored also that this great company will take over the Idaho irrigation project which embraces a large acreage along the Little Wood River, from which water for this project will be taken.

This land extends from the foot hills of the Saw Tooth Mountains up near Hailey, Idaho, down to and around the town of Gooding, on the Oregon Short Line.

It was first brought to the attention of investors by Messrs. Harnsheim and others. If this tract is taken over it will increase the holdings of the Twin Falls people to something considerably over 750,000 acres.

Additional information concerning the Wood River project will be given our readers in some future issue of THE IRRIGATION AGE.

SAN LUIS VALLEY, COLORADO.

Our readers will, no doubt, remember that we recently published some articles on the San Luis Valley, Colorado, descriptive of that country as a stock raising section, wherein also was exploited many of the attractive features of that delightful state.

We were recently permitted to examine a letter written by a gentleman who has spent more or less time in that country, and the matter contained therein is so honest a presentation of the possibilities for home building that we reproduce it herewith. The letter is published without the permission of the writer, but with full consent of the gentleman who received it.

May 15, 1908.

Mr. ———,
Chicago, Ill.

Dear Sir:

Your letter received, and as you seemed in no special hurry, and I was, indeed, very busy, I have delayed answering a little longer than I had expected to.

I was glad to hear from you personally, and also because at this time we are making quite a campaign for the sale of some lands in both Utah and Colorado. I will try and give you the information as fully as possible, and would also appreciate it if you would write me whether the party referred to is one who merely wants a small tract upon which to live, or whether he would be interested in the matter in a larger way from an investment point of view, if the proposition suited him.

It is not our policy, nor, indeed, do we think it is good policy in western countries to depend upon rainfall for farming. The so-called dry farmer will make a good crop occasionally, but it is a method of farming not to be depended upon, and one which is practiced mostly in irrigated countries by the shiftless element who are not thrifty enough to get possession of good lands and good water rights. The question of good water rights is of first importance to any one interested in irrigating lands and, in this connection, will say that we own stock in two irrigating ditches, one of which ditches (The Centennial) gets its full appropriation of water when the Rio Grande River has about 300 cubic feet of water per second, and the other of which (The Empire), gets its full appropriation of water when the Rio Grande has about 3,000 cubic feet of water per second.

The latter of these ditches is made to sell land with, and the first named is made to farm with, but it is a sad commentary upon the intelligence of the ordinary buyer of irrigated lands, that the lands with paper water are bought almost as readily as those with real wet water. We have sold all of our Empire water in connection with the less valuable and less favorably located of our lands, and what we now still own is the choicest of our lands, together with the very best of water rights in the San Luis Valley.

The priorities of the Centennial Canal date back to about 1876, and it furnishes literally a never failing supply of water.

Improved lands in the San Luis Valley sell from \$45 to \$100 per acre, the latter being the choicest of lands adjacent to town. We just closed a sale, a few days ago, of a 75-acre tract at \$45, and have quite an acreage of very choice land in cultivation that could be sold at that price.

There is a loading switch on the D. & R. G. within one-half mile of our land, which can be used for shipping grain, potatoes, or anything that the farmer markets in cars.

Our land is all top irrigated, that being, we think, the more practical and effective method of applying water to the soil, although there is a great deal of sub-irrigation done in the San Luis Valley.

Regarding winter temperature, the noting of the thermometer registration will not give a fair idea of same; 20 to 25 degrees below zero at sunrise is not an exceptional figure for the San Luis Valley, yet the winter in that country is practically free from cloudy or windy days, and it is a fact that the thermometer may register 20 degrees below zero at sunrise, yet at 10 o'clock the temperature will reach 15 or 20 degrees above zero and by noon will be thawing freely in the sunshine. The snow in the valley is very light, so much so that it is practical to feed peas on the field during winter.

I have had the experience of seeing friends of ours visit here from the San Luis Valley, when the temperature here was 20 to 30 degrees above zero, complain extremely as to how the cold was affecting them. In fact, all of our Illinois friends of the valley have expressed themselves to the effect that the winters they have spent in the San Luis Valley have been the most pleasant they have ever experienced.

In the summer time the sunshine is very powerful in that country, on account of the high altitude (7,500 feet above sea level), and the very clear air. It, therefore, gets quite hot in the sunshine, yet the shade is always cool and pleasant, even if it is only the shade of a board roof. In fact, the difference between sunshine and shade is greater by far in that country than here. The nights are always cool in summer, in fact, any one with a delicate constitution usually finds it convenient to take an overcoat even in the summer time when making a night drive.

The spring is probably the least pleasant season of the year in that country as it is rather slow in developing, and inclined to be more or less windy during April and May. If one will visit in the San Luis Valley on April 1st he will probably find vegetation as far advanced as in Illinois. If he will visit the valley on June 1st he may be disappointed in the progress made during these two months, but if he again visits it on August 1st his astonishment will be greater than was his disappointment on June 1st on account of the wonderful growth during these two months, which are really the best growing season of the San Luis Valley.

Alfalfa is grown very successfully, and while it does not produce as heavily on account of the shorter and cooler summer as will be the experience in lower altitudes and warmer climates, yet it is more valuable on account of the better combination of other feeds to go with it, regarding which I will mention a little more later when I speak of hogs.

San Luis Valley lands in good cultivation should produce 60 bushels of oats to the acre, 40 to 50 bushels of wheat may also be expected, in fact, 60 bushels have been produced in the past. Barley should produce 40 to 50 bushels under favorable circumstances. To produce these yields the land, of course, must be in a good state of cultivation and fertilization, which can be easily accomplished by the raising of peas and alfalfa, both of which deposit large quantities of nitrogen in the soil, and enrich it very rapidly. In fact, it is deemed impractical to raise more than about three successive crops of peas in the San Luis Valley as the ground becomes so rich that the peas grow almost altogether into vine if peas are grown continually for a longer period.

Regarding fruits will say, any kind of berry can be successfully cultivated if a person is inclined to give them the necessary attention, but in order to grow them successfully they must be laid down and covered in winter time. This is not so much on account of the extreme cold, but on account of the large variation in day and night temperature, as the warm sunshine in the winter time will draw the sap into the berry vines and the cold nights freeze them to such an extent that it kills the plant if they are exposed to this continual exchange of temperature during the entire winter. Those farmers who wish a small berry patch for home consumption find no difficulty in protecting the same by covering up the vines during the winter season.

Hardy variety of apples are grown successfully in the valley.

While general farming (except corn), with wheat, oats, barley, etc., is very successfully conducted in the San Luis Valley, my ideal of farming in that country is the hog or sheep farm, but more particularly the hog farm as I think that country is just a little better adapted to raising hogs than any other place on earth, and that for many reasons, the first of which is that hog cholera and similar diseases are unknown in that country, and the fine, invigorating and dry climate keeps the hogs in such perfect state of health that they not only grow rapidly, but produce the very finest grade of meat.

As stated earlier in this letter alfalfa is grown successfully in the San Luis Valley, and as is known by all advanced in the question, it is one of the best feeds known for frame-building in hogs. In fact, they can be successfully prepared for the fattening rations with little other feed than alfalfa which they glean themselves from the field, thereby eliminating any cost of harvesting. After the hogs have spent the

summer on alfalfa they are turned, about November 1st, into the pea field where they again glean their feed direct from the field without any harvesting expense, and peas are admitted to be the finest feed known for fattening any kind of stock, particularly hogs and sheep. In fact, the buyers on the Chicago Stock Yards will always pay a better price for pea-fed hogs than they do for corn-fed hogs.

As stated earlier in this letter I think the hog proposition is the ideal farming method for the San Luis Valley. An acre of alfalfa pasture will furnish feed for about 15 pigs from the time they are weaned in the spring until they weigh, say 100 pounds, in the fall, and no other feed is necessary, except possibly a small amount right at the time of weaning. About November 1st the pigs are turned into the pea field for fattening, and an acre of peas will fatten at least four hogs and should bring them from 100 pounds weight on November 1st to about 200 pounds by March 1st, when they will be ready for marketing. Of course, it would not be the proper idea to turn the hogs into the entire field at first as that would result in their taking away the easiest found first, and later when they are supposed to put on the finishing touches of fattening up, they would be skirmishing around too much in picking up the remnants of feed. The proper method is to allow the herd to have a certain new acreage every week or two, and to reserve an ample acreage for them to feed over freely when finishing up in the spring, and this can be more thoroughly cleaned up, after the fat hogs are sold, by the brood sows. I believe this to be the cheapest method of producing hog flesh that can be practiced in any part of the country.

Now, regarding the cost of producing these crops, it is not necessary to say anything to you regarding the cost of producing alfalfa, as you are thoroughly familiar with that. Peas are sometimes spoken of as being a substitute for corn, but San Luis Valley farmers would consider corn a rather poor substitute for peas, because peas produce more food per acre at a small fraction of the cost of producing corn, and at the same time are enriching the soil, which cannot be said of corn. The cost of raising peas is estimated at from \$1.50 to \$3.00 per acre. I have known of cases where peas were raised five years in succession without plowing the ground, and in some kinds of soil this method seems to be even more successful than more thorough cultivation would be. In all heavier soil, however, and those inclined to pack solid, plowing at least every second year is necessary, and plowing every year can be done to still better advantage. Our method has usually been to plow the ground in the fall at a cost of about 75c per acre. In the spring we would take the drill into the field without any further cultivation, and the sowing costs about 20c per acre. It takes about thirty pounds of seed per acre, and 2c per pound is about the average price, making the seed cost 60c. In ordinary seasons the peas should be irrigated twice, which will add a further labor cost of probably 40c.

I think I have now given you all the figures necessary upon which to base calculations as to the advantage of farming in this territory. I have given you a lengthy epistle on this subject, and I trust have given you the desired information. If any further questions arise, however, would be pleased to give further information along any line.

Yours truly,

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Spokane Chronicle—Project Engineer Robbins, of the Fort Shaw, Mont., irrigation scheme, says that the lands will be open this fall and that they will be allotted by drawings to be held in October. All of the surveys for this land have been completed and forwarded to Washington, where they must be approved by the surveyor general's office and then filed in the local land office for a certain length of time. This was one of the matters taken up by Engineer Robbins with Secretary of the Interior, James R. Garfield, during his recent consultation with that official, and after representing the case to Mr. Garfield, the latter promised to make an order giving the Fort Shaw surveys precedence, so that they may be taken up immediately with the department and not be compelled to await their turn. By this, all formalities can be gone through in time to allow of the opening of the land to entry this fall.

MERITS OF THE ORLAND PROJECT.

The Reclamation Service, in undertaking the Orland Project, has seemingly made a slight departure from its usual practice, inasmuch as there is no Government land under this project, but every acre is in private ownership; however, closer investigation shows that the irrigation of this area is in the highest degree consistent with the policy of the Government, for the motive actuating it in all its reclamation work is not the sale of its land, nor is it the irrigation of so many acres, but it is the establishment of self-sustaining homes.

If, then, as has already been amply demonstrated, a few acres of irrigated land at Orland will serve to



Scene on Irrigation Ditch. Orland, Glenn County, California.

support an industrious family in comfort approaching luxury, it can readily be seen that from the standpoint of the Government this is one of the cheapest projects with which the Service has to deal, for while in proportion to money expended, the number of acres irrigated may not be so large as in some other projects, the number of homes established will easily place it in the lead.

Orland enjoys a practical immunity from frost which permits a wide range of products. Indeed, this is so marked that it early attracted the attention of that authority on irrigation topics, William H. Smythe, who in 1901 visited the town and carefully listed the products, measuring the ground devoted to each, of that single acre on which, for years, the owner and his wife had lived in comfort, annually adding a substantial sum to their savings. Through the notice he gave it in his writings and lectures, this has become the most noted acre in California. This fitness for a diversity of products later excited the enthusiasm of the experts of the Reclamation Service, who freely prophesied that when this land has been devoted to its highest use, but few farms will be of more than ten acres in extent.

Now that the engineers are actively at work and promise that by the Spring of 1910 water in abundance will be ready for each of the fifteen thousand acres to be admitted to this privilege it becomes certain that within two years this area, from a grain growing section requiring for the support of a family a square mile or more of land valued at from fifteen to forty dollars per acre, will be changed to a region of fields of alfalfa, interspersed with orchards of the various deciduous fruits and groves of lemons, olives and oranges, whose value per acre is reckoned by hundreds, or even thousands, of dollars.

THE SANTA MARIA OIL FIELDS.

BY A. T. TAYLOR.

Nestling among trees and flowers near the hills of the Coast Range in Santa Barbara County, California, is one of the busiest and prettiest little towns on the Pacific Coast—Santa Maria.

North, east and south of the town, the mountains rise as if by nature's wise provision, guarding from the winds and forming an unfailling watershed for the tender vegetation in the valley below. A girdle of green embraces the town and from every point of view an inspiring landscape meets the eye. It is the principal distributing point for, and is encircled by, what are probably destined to become the greatest oil fields the world has ever known, and back of all this it has the wealth of productiveness of the Santa Maria Valley. Yet with its wonderful advantages and its exceptional charm of climate, its people have made no particular effort toward inviting the outside world to share in their beneficence. Therefore, it has been only since the discovery of its vast oil deposits that the town and valley have begun to expand and prosper in proportion to their merits. Judging from the thousands of people who are coming to California every year in quest of home, health and investment, it may not be optimistic to predict that here within the next few years will rise one of the greatest commonwealths of the West.

Santa Maria has just begun to dress up, in other words, she is taking on the appearance of a city in the bud. There is no other town of its size in the state today that can boast of so many modern business structures. Three banks, two of which are built respectively of sand lime and terra cotta bricks, would be architectural adornments to any city, and its handsome public schools are evidences of the civic pride of her citizens. It has a good commercial hotel, a number of hotels which are run upon the European plan, several good restaurants, a splendid water system, an efficient electric lighting plant, a modern up-to-date electric railway connecting the town with Guadalupe, a station on the coast line of the Southern Pacific System.

It needs but a glance at the display windows of any of the stores to convince one that her merchants are "live ones" in everything that the term implies. Its streets are broad and well oiled, and the life and bustle upon them, the incessant oil talk and the "no time to lose" spirit is so forcibly impressed upon the mind of the visitor, that his sleep is likely to be disturbed by visions of derricks, oil wells and gushers.

The Santa Maria Valley, from which the town takes its name, is really prodigal in its diversified products. While sugar beets, beans and barley predominate, it produces an abundance of fruits, vegetables, and, besides the one mentioned, many other kinds of cereals. The Union Sugar Company has a large refinery at Betteravia with an approximate output of 300,000 sacks of sugar annually.

As this is but one of a series of articles upon the Santa Maria Valley which will be published in THE IRRIGATION AGE, greater details of its soil products will be given in a future number, therefore the remainder of this article will be devoted to the oil situation, in which many irrigation farmers are interested.

The oil development while yet in its infancy records the most phenomenal results produced in the West. The present yield is upwards of nine hundred thousand barrels per month, and the very near future will mark the enormous production of over one million barrels. Recent drillings have shown fuel oils in the eastern part of the valley and immense quantities of light oil in the main fields. In oil parlance, the wells are known as the "deep well" type, the oil sand being very thick, which is an indisputable evidence of the permanency of the wells.

The present demand for the product is so great that storage reserves are unnecessary. As an evidence of this fact a contract has been made by one of the companies in the field with Japan for the delivery of two million barrels per annum.

The Union Oil Company is the largest producer. It has one six-inch and one eight-inch pipe line conveying oil to Port Harford, at tidewater, a distance of thirty-five miles

Here it has its own tank steamers and commands shipping facilities to different parts of the coast and abroad.

The Standard Oil Company while not a producer in this field is a purchaser from several of the operating companies and gravitates or pumps its oil through an eight-inch pipe line from the fields near Orcutt to Port Harford into its line of tank steamers. It has a contract for one and one-half million barrels annually for three years at advanced prices over former contracts with the Pinal and Brookshire Companies, and it has also a smaller contract with the Pennsylvania Company. Together with the Associated Oil Company, the Standard has a contract with the Western Union Oil Company for an extended period for the delivery of two million barrels yearly.

The Associated Oil Company has an eight-inch pipe line from the field in a southerly direction to Gaviota, on the Santa Barbara Channel.

The Graciosa Oil Company has a pipe line in connection with Casmalia, a station on the Southern Pacific Railway. It also has a large refining plant at Oil Port on Port Harford Bay which is known as the California Oil Refineries Company, Limited.

The Brookshire and Pinal Companies have a pipe line to the Union Sugar Company's plant at Betteravia, which also connects them with the Southern Pacific cars.

Several companies have pipe lines connecting them with the narrow gauge railroad which runs to San Luis Obispo and Port Harford.

Over two hundred miles of pipe lines convey the oil in every direction, ninety-five per cent of which have direct connection with tidewater, making the field practically independent of railroad transportation, a feature so objectionable to the fields of the Standard Oil Company.

The Union Oil Company has a contract for delivering oil to the Panama Canal Company and has laid a pipe line across the Isthmus for shipping oil to points on the Atlantic seaboard, whenever there is a demand and there is sufficient oil to spare. Much credit is due the Union Oil Company for this stroke of enterprise, for it was during the years of 1905 and 1906 when the Standard Oil Company had so depressed the prices throughout the state by their large storage holdings in the San Joaquin fields, that the operating companies in the Santa Maria fields were compelled to cap their surplus wells to avoid the necessity of storing their excess product and accepting low prices, that this masterly stroke was accomplished, which caused the Standard to sit up and take notice of its rival in the West. The Union Oil Company has a small but effective refining plant near Port Harford, the bulk of its product, however, is refined at Oleum, on San Francisco Bay. The great thirty-five hundred barrel per day gusher is the property of this company, and after five months of continuous flow it still maintains these remarkable figures. The gravity of the oil from this well is twenty-six degrees.

The average gravity of the oils of the Santa Maria fields range from twenty-three to twenty-seven degrees except in a few shallow wells where it is heavier. J. F. Goodwin, superintendent of the Pinal and Dome Oil Companies, has had several tests made of the twenty-five and twenty-seven gravity oils and there are no wells known where the oils are free from impurities with an asphalt base. The Graciosa Company's wells are of about the same gravity.

Upon first distillation six grades of oil are obtained besides gasoline and distillates: two grades of kerosene, benzine, naphtha, engine oil and the residue which is still an eighteen gravity ideal fuel oil. A very large percentage of the distillable product is gasoline. By further distillation other valuable products are obtained and a still heavier fuel oil is left.

Within the last year a great deal of attention has been centered on the eastern Santa Maria field, especially since the Palmer Oil Company brought in a well penetrating a similar oil formation to that of the main field, with even a greater depth of oil bearing sand. It is putting down another test well two and a quarter miles due east of Palmer well number one on the Stendel-Triplett lease and they have passed through over three hundred and fifty feet of rich oil sand. They are now at a depth of twenty-two hundred feet which proves the productiveness of the field beyond a doubt. The depth of Palmer well number one is thirty-one hundred and fifty feet and it shows over twelve

hundred feet of oil bearing formation. Lack of pipe line facilities has prevented it from showing its full capacity. It is pumping now at the rate of two hundred and fifty barrels daily and when it is opened up through the casing head flows several times this amount.

The Old Mission Oil Company is putting down a well on the adjoining property, a half mile north of Palmer well number one.

A mile north of the Palmer oil field, a new company, known as the Ideal Oil Company, has just spudded in, in the same easterly field.

The Sisquoc Oil Company is about three miles east of the Ideal and is down several hundred feet exploiting the more northerly part of the eastern field.

The Foxen Company is several miles farther east, near Foxen Canyon, on the land of G. Muscio. They have passed the twenty-two hundred foot depth and are in the shale formation.

Santa Maria has an active Chamber of Commerce whose members are all more or less interested in the oil development. Following is a list of the officers and the business in which each is respectively engaged: T. R. Finley, president, attorney at law; Paul Tietzen, vice-president, manager of the three banks of Santa Maria; M. Fliasher, treasurer, merchant; W. A. Haslam, director, merchant; Charles Bradley, director, capitalist; Ruben Hart, director, proprietor water and electrical works; L. E. Blochman, secretary. Detailed information regarding the oil fields will be furnished by the secretary upon application.

The world will watch the further development of these wonderful oil fields with intense interest, and no doubt large capital will find profitable investment here.

WARNING TO HOMESEEEKERS.

Numerous warnings have been issued from time to time by the Reclamation Service to intending settlers in the West, cautioning them, before purchasing lands which are advertised as being included in a Reclamation project, to be fully informed as to the exact limits of the irrigable areas.

Notwithstanding these warnings, many innocent persons have been swindled by false representations of land agents. One of the commonest forms of swindling is to claim that certain lands are embraced within a Government irrigation project, and on the strength of this statement to sell the lands to non-residents at fancy prices. It frequently occurs that these lands are embraced within an irrigation district, but cannot be furnished with water from the Government project, which fact, of course, is very carefully suppressed by the land agent. The innocent purchaser discovers too late that he has paid an excessive price for land of little value and unsuited for a home.

A case in point has recently been reported to the Service by several investors, in which a company offering lands for sale states that the tracts are within the limits of lands withdrawn for a project under the Reclamation Act. Investigation shows that this is undoubtedly true, but the company fails to state that these lands cannot be watered from it because the area irrigated by the canal system was limited, and these particular lands could not for several years, if ever, be included within the area irrigated.

Before making investments under such advertisements, investors should write to the office of the Reclamation Service on the project, or the Water Users' Association established there, and obtain full information as to the condition of the lands and the possibility of furnishing water to them. If the proper local addresses are not known, a letter to the Reclamation Service at Washington, D. C., containing a full description of the land, will receive prompt attention.

TO THE POINT.

Lute Wilcox, editor of the Denver Field and Farm, frequently publishes matter concerning the Forestry Bureau and affairs in the west which is pat and directly to the point. We append hereto clipping from a recent issue of the Field and Farm which explains itself:

"It was refreshing to read the report of how Congressman George Cook tanned Pinchot's hide the other day. Our good old congressman-at-large got up in open meeting and challenged the statement recently published by Baron Pinchot that the receipts of his forestry bureau are in excess of the expenditures. He cited the testimony of Mr. Pinchot before the agricultural committee that expenses of his bureau for the year ending June 30, 1907, were \$64,000 in excess of the receipts. He predicted that the receipts for the current year would not show an increase as estimated by Pinchot, but on the contrary would show a decrease on account of the inactivity in the mines usually requiring large quantities of timber. Mr. Cook said further that the price placed on mining timber by the bureau, \$5 a thousand, is unreasonable and excessive. He called attention to the arbitrary ruling of the bureau requiring mining companies purchasing their timber to cut and remove it from the forests within a year and added: 'Now, what we want in Colorado in the management of the forest bureau is less sentiment and more practicability, fewer Harvard graduates and rough riders and some practical lumber and millmen who know something about the business from experience, and that the forestry bureau shall comply strictly with the law.'"

PALOUSE ORCHARDS TO BE PUT UNDER IRRIGATION.

Four thousand acres of land near Hooper, Whitman County, Wash., south of Spokane, to be known as Palouse Orchards, owned by the Palouse Irrigation & Power Company, headed by H. C. Peters, president, and L. H. Marsh, secretary, will be put under irrigation within the next twelve months, and it is expected that 500 acres of this will be ready for this year's crop.

Water for the new district will be taken from the Palouse River, which will be tapped by a canal four miles above Hooper, and brought down one mile below the town, whence a wooden flume, 24 by 30 inches, will carry the water one mile further down the river to the tract of 500 acres that is to be watered at once. Later a large flume will tap the canal at the same place, as the small one and will be led across to the north bank of the river to carry water down to the other tracts that are to be put under the ditch.

Palouse Orchards is unlike any other irrigation project in the northwest. Instead of one large and continuous tract on one or both sides of the river it is a series of tracts lying between the river and the high hills on either sides, no one tract containing more than 500 acres. The land extends down the river ten miles, and is close to the base of steep hills and almost surrounded in patches by the ragged arms of the cliffs that jut out into the valley. The land is volcanic ash and the climate is similar to that of Wenatchee, the home of the big red apple.

DRY FARMING.

The greatest agricultural expansion in the United States at the present time is in the so-called dry-farm belt on the Great Plains. The settler has invaded this belt before only to be driven back, but there is now a general belief that improved methods of cultivation and the introduction of drouth-resistant crops will bring success where there has been repeated failure. The United States Department of Agriculture and other agencies have done much that will help in this new attack upon the semi-arid region, and all have great hopes for the success of dry farming, but notwithstanding this, two facts must be clearly recognized: First, that with the greatest success now anticipated, the dry farm will be devoid of many of these beauties and comforts which go with a water supply; that is, trees, fruits, and vegetables; and, second, that there will be years when even with the best of cultivation and the most drouth-resistant plants, crops cannot be matured. In spite of the comparatively favorable weather conditions of the past two or three years it is to be expected that there will succeed a period of very dry years, for weather observers long ago established the fact that weather moves in cycles. How soon the dry seasons will return cannot be foretold, but to insure success provision should be made by the dry farmer to tide over the lean years with a garden in which he can grow the vegetables required for household use and a small patch of hay land with which he can provide winter forage for his stock. To do this he must develop a small water supply either storing in a reservoir the flood waters of some torrential stream or he must irrigate wherever possible, winter or summer, with the floods produced in adjacent gullies by the infrequent rains. Finally, he may tap the underflow, which can be found quite generally over the entire region at depths varying from 20 to 200 feet, and secure water by erecting a windmill or gasoline engine pumping plant. In this way he will be able to maintain his home during the dry years and depend upon the wet years for his profits. All these precautionary measures are new to the majority of settlers upon these lands, and under the present favorable weather conditions their ultimate necessity is not appreciated or is overlooked by all except the most conservative and far-sighted.

With a view of educating the settlers to a true realization of the conditions which confront them and to determine the possibilities of development along the lines suggested the Department of Agriculture has established three farms on the Great Plains, where experiments are being conducted to determine the best methods and cost of preparing land for irrigation and best kind of power and pumps, and the use and cost of operation; the best methods of storing and using water, and the best methods of storing water after it is applied to the soil. The most notable of these farms and the one attracting most attention at present is that near Cheyenne, Wyo. Here a tract of a little over seventy acres of formerly barren soil has been secured, of which thirty acres is dry farmed; that is, no moisture whatever is supplied beyond that received as rain. Of this area about fifteen acres is left fallow alternate years, but is rolled and compacted after every rain in order to conserve the soil moisture, a system of culture considered most effective under these conditions. An area of ap-

proximately thirty acres is irrigated during the winter and spring by the flood waters of a nearby creek, while a small area is irrigated during the summer by water pumped by windmills and stored in a reservoir commanding five or six acres.

The underground water supply at this farm is developed by pumping from wells in the valley of the creek, which is usually dry but which has a considerable underflow reached at a depth of less than fifteen feet. This underflow is being developed by windmills, and to determine the type of windmill best suited to the conditions there existing, seven mills, contributed by as many manufacturers, have been erected, all of them discharging water into the small reservoir. Each mill is provided with devices arranged to measure the quantity of water pumped, the velocity of the wind, and the speed of the wheel, from which data will be obtained that will make the capabilities of the wind-mills for the services of the dry farmer much better known than before.

The crops grown upon this farm consist of drouth-resistant grains on the unirrigated area and garden vegetables, such as potatoes, beets, etc., on the area receiving water. While an unusually large annual rainfall may have had a considerable influence in bringing about the favorable results obtained during the previous season, it is a fact that this is the first successful attempt at agriculture, irrigated or otherwise, in the vicinity of Cheyenne, and this city, according to the daily press, "hailed with delight the first load of farm produce ever brought into the city."

The second farm is being established at Eads, Colo., where water will be pumped from a well which has been driven to a depth of 110 feet after many difficulties because of the nature of the material penetrated. At this depth a flow of water was secured which probably will be ample for the irrigation of a considerable portion of the farm. A deep-well pump outfit of the two-stroke type has been installed, driven by an alcohol engine. The latter was contributed by a well-known manufacturer and the results secured by the use of alcohol fuel should be of much interest to those contemplating the substitution of alcohol for gasoline.

The department has already made experiments with alcohol engines under laboratory conditions and in the hands of experts, but information is desired as to the value of alcohol as a fuel in the hands of farmers and under ordinary field conditions.

A third farm is at Newcastle, Wyo., where a flow of water was encountered at a depth of twenty feet, and an open well has been dug in the bottom of which a perforated boiler shell has been sunk to a depth of ten feet to act as a strainer. A vertical, submerged centrifugal pump will be used at that place, and while the amount of the water supply which can be developed is somewhat uncertain, probably sufficient will be secured for the purposes of demonstration. A gasoline engine of the same type as that used at Eads will be employed for power, the intention being to secure some data as to the relative costs of gasoline and alcohol in pumping.

At Wichita Falls, Tex., a farm has been established upon which various methods of conserving and utilizing soil moisture and the possibilities of irrigation are being demonstrated. In a tornado which recently occurred in that section a great deal of damage was done to the farm buildings but the cultural operations are being carried on as before.

Upon all these farms careful records are being kept as to the cost and profits and it is thought that the work at the three stations will form a valuable object lesson to thousands of farmers who are settling upon the semi-arid lands of Wyoming, Colorado, Nebraska, and other states. The practical value of this class of work cannot be overestimated, aiming as it does at the utilization of a vast body of land which can never, by the very nature of things, be included under any of the reclamation projects. If a method of tillage and a system of utilization of the underground waters and storage of flood waters can be devised, by which it will be possible to make the farming of these new western lands reasonably certain and profitable, great wealth will be added to the several states interested.

RECLAMATION SERVICE NEWS.

Water is now ready on a portion of the South Side canal north of the river, as well as on the Inlet canal of the Belle Fourche irrigation project, South Dakota, for 12,000 acres of land.

The Gunnison tunnel in Colorado was advanced about 329 feet during the month of March. The work was very seriously interfered with by the heavy flow of water in both headings.

The Highland Water Company has conveyed to the United States the Highland canal, together with all water rights, etc., for use in connection with the Salt river irrigation project, Arizona.

In connection with the irrigation of the Blackfeet reservation for Indian Service, surveys are to be immediately started on the final location of the canal either from Two Medicine river or Badger creek.

Water is now being furnished over the entire canal system of the Carlsbad irrigation project, New Mexico. At the present time 8,443 acres have been qualified for water and the area is being rapidly increased.

The Pathfinder dam, North Platte irrigation project, Nebraska-Wyoming, is now 81 feet above foundation and rising at the rate of 15 feet per month. Three thousand cubic yards of masonry were laid during March.

A decision has been reached to resume active operations in the lower Milk river valley. Plans for the construction of the Dodson flood diversion canal are under discussion, for the irrigation of 21,000 acres in the vicinity of Malta.

The Secretary of the Interior has given public notice that water will be furnished, beginning with the season 1908, to lands under the Truckee-Carson irrigation project, Nevada, lying in Township 18 N., R. 30 E., and T. 19 N., R. 30 E., M. D. M.

The March report from the engineer in charge of the Truckee-Carson irrigation project, Nevada, shows that 335 homestead filings, covering 28,000 acres, have been made up to date. This is exclusive of a number of new settlers who have purchased private holdings.

Contract has been awarded to Maney Brothers, of Winnemucca, Nevada, for the construction of the South Branch canal, Klamath irrigation project, Oregon-California. The work involves the excavation of about 300,000 cubic yards of material. The contract amounts to \$78,996.70.

About 300,000 acres of land near the Minidoka irrigation project in southern Idaho have been withdrawn from all forms of disposition under the public land laws, pending a thorough examination to determine whether it will be possible to irrigate the tract or any portion of it by a pumping system operated by power generated at Minidoka dam.

The following public lands in New Mexico have been temporarily withdrawn from all forms of disposition under the public land laws, in connection with the Rio Grande irrigation project: New Mexico Principal Meridian. T. 13 S., R. 2 W., all Secs. 1 to 26 and 28 to 32 incl. and Secs. 35 and 36; T. 14 S., R. 2 W., all Secs. 1, 2 and 5 to 36 incl.; T. 14 S., R. 3 W.; T. 13 S., R. 4 W.; T. 14 S., R. 4 W. This withdrawal embraces 112,000 acres.

On the Payette-Boise project the first contracts have been let, providing for the construction of twenty-four miles of laterals, involving 100,000 cubic yards, and a part of this work has been taken over by the farmers. On the Minidoka project, Idaho, contracts are now being advertised by the water users' association.

Contract has been awarded to J. E. Hilton, of Vale, South Dakota, for constructing a portion of the South canal, Belle Fourche irrigation project, South Dakota. The contract involves the excavation of approximately 160,000 cubic yards of material, and according to the terms of the contract it is to be completed by March 1, 1909. The price quoted is \$28,241.50.



Allan Macdonell, Laredo, Texas.

A Reader of the IRRIGATION AGE for Twenty Years, Whose Letter Renewing His Subscription Was Published in Last Number.

From recent investigations in connection with the Cheyenne river irrigation project, South Dakota, it has become apparent that certain lands withdrawn from the public domain are no longer necessary, and the Secretary of the Interior has therefore restored approximately 148,000 acres lying in Townships 5 to 10 S., Ranges 1 to 9 E., Black Hills Principal Meridian.

The following lands have been withdrawn from any form of disposition under the public land laws in connection with the Grand valley irrigation project, Colorado: Ute Principal Meridian. All Townships 1 S., Ranges 1 and 2 E. Sixth Principal Meridian. All Township 10 S., Range 98 W.; all Township 11 S., Range 98 W. This tract embraces about 92,000 acres.

The railroad to Laguna dam is now completed and in use, the first shipment, consisting of four cars of cement, having gone over the line on March 17. Prior to the completion of this road all supplies and material required in the work of building the dam had to be hauled from Yuma, and it is estimated that the saving in freight rates effected by the building of this railroad will greatly exceed the expense incurred by the United States in its construction. Heroic efforts will be made to close the Colorado river during the next low stage, and the new railroad will be of great service in this connection.

A message from the project engineer states that the Garden City pumping plant, Kansas, was put in operation April 1. The pumps are working smoothly and water is running the entire length of the Farmers' canal. As the Arkansas river could not be depended upon to supply water to gravity canals, the engineers devised a scheme to utilize the underflow. About 300 wells were sunk, the combined length of which exceeds four miles. These wells are in groups of ten each and vary from 12 to 15 inches in diameter. Each group will be operated by its own pumping plant, and all pumps will be operated by electricity generated in a central power station. The water from the wells will be lifted into a concrete lined conduit which discharges into the main canal. During the irrigation season this leviathan pumping plant will lift 30,000 acre feet, or about 11,000,000,000 gallons.

LINING OF DITCHES AND RESERVOIRS TO PREVENT SEEPAGE LOSSES.

BY PROF. B. A. ETCHEVERRY, BERKELEY, CAL.

(Continued.)

PUDDLED CLAY LINING.

This method of lining had not been used to any extent in the irrigated districts investigated, and the writer could not learn of any systematic work of the kind.

The cost of this lining would depend on the distance the clay would have to be hauled and the ease with which it can be loaded, and on the way the clay is applied.

Under the best conditions, clay being close at hand, easily loaded and applied cheaply, would be very satisfactory and efficient in stopping seepage. Probably the cheapest method of applying the clay would be to spread it on the bottom and slopes when the clay is soft and moist, or if it can not be obtained in that condition, to spread it after the ditch has been wetted thoroughly by damming up the water and then draining it out; or to spread it dry and then fill the canal and drain the water out. After the clay has been spread as uniformly as practicable, the canal could be fenced in, and cattle or, better, sheep could be driven in the fenced area; they could be fed along the ditch and in this way would tramp the puddle thoroughly.

The cost of such a lining would be mainly the cost of the clay; for a lining 4 to 6 inches thick this cost would probably not exceed 1 to 1¼ cents per square foot.

EXPERIMENTS TO DETERMINE RELATIVE EFFICIENCY OF CANAL LININGS AS REGARDS SEEPAGE.

The purpose of these experiments was to determine the relative efficiency of canal linings, as regards seepage only, and not to compare the resistance of the lining to the cutting or erosive force of running water.

For this purpose twelve ditches closed at both ends were excavated in earth of uniform texture, that they might all be under the same conditions. These ditches were lined with the different materials used in California for the lining of irrigating canals. After the ditches were excavated and lined daily measurements were taken to determine the rate of seepage, and from these the relative efficiency was obtained.

LOCATION AND POSITION OF DITCHES.

The site chosen for the experiments is in Stanislaus County, near Modesto, on the University experimental farm, about 3¾ miles east of the town. Lateral No. 1 of the Modesto Irrigation District ran near the south end of the ditches and was the source of water supply for the experiments.

The soil is a fine sandy loam and is very homogeneous to a depth of 2 feet; below this some hardpan was found in the north end of the ditches. This hardpan only occurred in small quantities and was in a soft condition. It could be plowed and removed with scrapers. It is to be regretted that a site with a more sandy soil was not available, as the results might have been more conclusive.

The ditches were parallel and ran north and south, at right angles to Lateral No. 1. (Fig. 13.) The south ends of the ditches were at approximately the same dis-

tance from this lateral, so that the seepage from it, if any, would affect each ditch equally.

A wooden flume built with 1x12-inch redwood lumber, running parallel to the lateral and along the south end of the ditches, carried the water from the lateral to the ditches; a gate in the flume was provided for each ditch.

The ditches were at the same elevation, that the effect of underground water might be equal, and were all 2½ feet deep, with side slopes of 1½ on 1, and a bottom width of 2 feet. A side slope of 1½ on 1 was used because the wet earth in the unlined ditches and the puddle in the puddled ditch would not stand on a steeper slope, and mainly because of the difficulty of oiling the slopes if they had been steeper. The length of the ditches at the top was 50 feet, the ends having also a slope of 1½ on 1; the bottom length was 42½ feet. The top bank width was 4½ feet, making a depth of 14 feet between the ditches, center to center.

METHOD OF CONSTRUCTION.

The site was not exactly level. It was thought best to make it so, that the ditches might be more nearly under the same conditions. The land was irrigated and plowed and the earth from the higher part of the plot was removed with Fresno scrapers and carried off the site. The ditches were all in cut. After the surface was made level, the grade stakes were located and the excavation of the ditches begun. Each ditch was plowed deeply and the earth removed at first with Fresno scrapers, but as the bottom was reached the smaller scrapers (scoop scrapers) were used. In this manner the ditches were excavated roughly to the required cross-section. The total volume of excavation was approximately 500 cubic yards and the total cost was \$95, or at the rate of 19 cents per cubic yard.

LININGS TO BE USED.

The linings which it was thought advisable to try in the experiment were:

1. Cement concrete similar to that used by the Santa Ana Water Company and the Anaheim Water Company.

2. Cement mortar and cement plaster 1 inch thick, as used around Riverside by the water companies (Jurupa, Gage, and Riverside) and in several other localities in southern California.

3. Cement lime concrete. It was thought that the addition of some lime to take the place of part of the cement in the concrete similar to No. 1 would perhaps make the concrete more water tight and also slightly cheaper in some localities.

4. Puddle.

5. Road oil in various proportions per square yard of surface and also as a mixture of oil and gravel. The extensive use of oil and its success in road oiling when properly used, especially in southern California, where in many cases the oiled streets are almost as good and even in a few cases better than asphaltum, made it advisable to try oil in several ways.

For a good oiled road, a good foundation and a well-rolled wearing surface are necessary. The quantity of heavy road oil necessary should not exceed 1½ gallons to the square yard.

For canal lining, the conditions are somewhat different from those found in road construction. A good foundation is not necessary. It is impracticable to roll

the slopes and beds, and even if practicable, the cost might not justify it. The lack of rolling must be made up by using more oil, and in these experiments a greater quantity of oil was used per square yard than is ordinarily used on roads. Mixtures of oil and gravel were also used in the experiments, and while they were costly, they were at the same time unsatisfactory, proving very poor linings for stopping seepage, as will be shown later.

The order in which the ditches were planned at first is as follows, the ditches being numbered from east to west:

No. 1. Lined with a mixture of heavy road oil and gravel in the proportion of one part of oil to eight parts of gravel. The lining was $3\frac{1}{2}$ inches thick.

No. 2. Earth (no lining).

No. 3. Lined with a mixture of heavy road oil and gravel in the proportion of one part of oil to six parts of gravel. The lining was $2\frac{1}{2}$ inches thick.

No. 4. Heavy road oil sprinkled, using $3\frac{2}{3}$ gallons per square yard.

No. 5. Earth (no lining).

No. 6. Thin oil sprinkled, using $2\frac{1}{2}$ gallons per square yard.

No. 7. Clay puddle, $3\frac{1}{2}$ inches thick.

No. 8. Earth (no lining).

No. 9. Cement mortar, 1 inch thick.

No. 10. Cement concrete, $2\frac{1}{2}$ inches thick.

No. 11. Earth (no lining).

No. 12. Cement lime concrete, $2\frac{1}{2}$ inches thick.

It will be noticed that arranging the ditches as above, there are eight ditches lined and four earth ditches with no lining. Each earth ditch has an adjacent lined ditch on each side, so that in case the seepage from the four earth ditches was unequal, the seepage in the lined ditches could be compared with the seepage from the adjacent (or nearest) earth ditch. The lined ditches would also be affected more nearly equally by the seepage from the earth ditch.

METHOD OF FINISHING DITCHES.

After the excavation with teams the ditches were finished by hand in the following manner (Fig. 14): Pieces of timber, 2 inches by 3 inches, were placed at the center of the banks between ditches, and extending parallel to them from one end of the ditch to the other; these pieces of timber were placed in the banks and made level. The tops of these timbers were at the same level as the banks. Frames or templets were built, as illustrated, of the same size as the finished ditch, ready for the lining. Four of these frames were used, the same one being used for the four earth ditches and for ditches where the oil was sprinkled on the slopes and bottom. A second form was used for the cement mortar lined ditch; this form was larger than the previous one, allowing 1 inch for the lining. The third form was made large enough so that the ditch finished with this form, after being lined with a $2\frac{1}{2}$ -inch lining, would be of the same cross-section as the earth ditch. The fourth form was used where the ditch was to be lined with a $3\frac{1}{2}$ -inch lining.

These frames were used in the following manner (Fig. 15): Beginning at one end of the frame was placed in the ditch and the side slopes and bed were cut down until the top piece of the frame would rest on the two pieces of timber on the banks. The frame was then moved forward on these guides and the cross-

section was cut down with spades to the proper size. The slopes were finished first and the earth cut from the slopes was removed with a scoop scraper. The cost of finishing was about 1 cent per square foot.

METHOD OF LINING.

No. 1. The oil was heated to a temperature of about 180° Fahr., at which temperature it would flow easily. This heated oil was mixed with the gravel in the proportion of one part of oil to eight parts of gravel by volume. The mixing was done with rakes and the mixture was very uniform. The sides were lined first.

Pieces of timber $3\frac{1}{2}$ inches thick were placed on the slopes at right angles to the axis of the ditch, about every 10 feet. The oil-gravel mixture was carried in wheelbarrows and dumped on the slopes between these timbers. A straight edge about 12 feet long, extending from one timber to the other and worked up and down the slope, regulated the thickness of the lining to $3\frac{1}{2}$ inches. The mixture was tamped while being placed in position.

No. 3. This ditch was lined in exactly the same manner. The mixture used contained one part of heavy Bakersfield oil to six parts of gravel. The thickness of the lining was only $2\frac{1}{2}$ inches; the slope timbers being therefore $2\frac{1}{2}$ inches thick instead of $3\frac{1}{2}$ inches thick, as for No. 1.

No. 4. This ditch was lined with the same heavy oil. The oil was heated to a temperature of 180° Fahr., and was sprinkled or poured on the slopes with a 3-gallon watering pot, with the rose sprinkler flattened so as to throw a flat stream or sheet of oil on the side of the ditch. The oil was applied mostly on the top of the slope, and as it ran down the slope it was gradually absorbed by the ground—some of it reaching the bottom. An excess of oil accumulating at the bottom was dragged up the slopes by using a stick about 8 feet in length to which a 2-foot piece of timber was nailed, at right angles, at one end, and to this piece was nailed a couple of sacks to be used as a mop. If the oil is not applied in large quantities at once, but instead several successive light applications are made, it will not be found necessary to use this mop.

The oil was not raked in; the object sought for was to have the oil form a thoroughly saturated crust; while if it was raked or plowed in, the oil may have been disseminated through too thick a layer to form a water tight crust.

No. 6. The sixth ditch was sprinkled with lighter oil in exactly the same manner as the fourth ditch, using $2\frac{1}{2}$ gallons per square yard.

No. 7. The seventh ditch was lined with clay puddle. The clay was difficult to obtain, having to be hauled about three miles, which made it very costly. The clay contained fine silt and sand. It was sprinkled with water, and when soft was hauled in wheelbarrows and applied in the same manner as the oil-gravel mixture. The thickness of the lining was $3\frac{1}{2}$ inches.

No. 9. The ninth ditch was lined with cement mortar, composed of one part of cement to five parts of gravel. The lining being 1 inch thick, the scantlings or guides placed on the slopes were only 1 inch thick.

No. 10. This ditch was lined with cement concrete $2\frac{1}{2}$ inches thick, composed of one part of cement to seven parts of gravel and crushed rock, in equal quantities.

No. 12. The twelfth ditch was lined with cement lime concrete $2\frac{1}{2}$ inches thick, composed of $\frac{2}{3}$ part of cement, $\frac{1}{3}$ part of lime, and seven parts of gravel and crushed rock in equal quantities.

Before lining with cement mortar, cement concrete and cement lime concrete, the slopes and bed of the ditches were well wetted by sprinkling. These three linings were also kept wet for several days after the construction.

The oil ditches had been finished about ten days before the water was turned into them. This was necessary for the oil to soak in well and also for the lighter volatile parts of the oil to evaporate. The water was first turned in on July 23, 1906, and observations were then started.

(To be continued.)

THE TROUBLES OF A NEW IRRIGATOR.

The people who go out onto the plains to settle on the light sandy soils under some of the great reservoir systems have been told that they will have a good deal of trouble in irrigating successfully. Because the soil is so loose and light it has been thought by many that irrigation would be found impracticable on account of excessive seepage and washing of the surface. This difficulty has been experienced in some instances, but only for the first season or two. After the soil has been thoroughly wet and has been irrigated and cultivated for two or three seasons it naturally becomes heavier and has more of the appearance of a clay soil. While the ground never bakes as it does in many other sections and clods are unknown, it loses some of the lightness and looseness that have been looked upon with disfavor by the newcomers floating in from the heavy black soils of the alluvial Mississippi Valley back in the central states.

Experience has shown that when irrigation ditches have been in use for two or three seasons, grass and weeds such as sunflowers grow along the banks, the roots forming a network that hold the soil in a solid mass, thus preventing breaks. During the first year of the operation of a large ditch occasional trouble has occurred on account of breaks, but after two or three seasons when the banks become compacted no difficulty of consequence is so likely to occur, although a big waterspout may come along at any time to create a good deal of damage.

Many of the settlers have begun improvements with no very definite conception of the work that must be done. They generally have their minds set upon alfalfa and try at the very outset to get a crop started, without first thoroughly preparing their fields. Later, they will have trouble, because the land is not even enough and the water can not run without interruption or puddling. The better practice is to seed annual crops for a year or two, plowing and leveling each year. The leveling process is not difficult, but to do properly in one season is expensive. By cultivating the ground a few seasons it can be brought to even grade and then when alfalfa is sown and a good stand has been secured, water turned into the ditches at one end of the field will run clear to the other without much trouble. Greater and more even crops will thus be secured.

The newcomer who has had no experience with irrigation can profitably spend a large part of his

first season working for older ranchers who understand the business for by this means he can get many valuable lessons that will enable him to avoid costly mistakes in laying out his fields and running his ditches. Irrigation farming is different in many respects from agriculture in sections where moisture is supplied by rainfall.—*Denver Field and Farm.*

POTATO GROWING AT GREELEY, COLO.

BY JOHN G. HALL.

At the present time Greeley puts upon the market each year about 12,000 cars of potatoes, with about 600 bushels to the carload. These have a world-wide reputation for quality and are marketed west as far as California, east as far as New York, to Canada on the north, and hundreds of carloads are shipped to Texas.

Greeley is located 52 miles north of Denver, is considered to be as attractive a farming locality as can be found in the United States, and is watered by the Big and Little Thompson creeks, by the Cache-la-Poudre river, and the South Platte. Some of the early appropriations from the stream date back into the early '60's. Greeley was settled by a colony in the early '70's, and the colonists in planting potatoes in their gardens discovered that the country was particularly adapted to the growing of the tuber.

Since we have found that alfalfa plowed up is such a wonderful fertilizer, each farmer endeavors to plow alfalfa that has stood for two or three years for his potato ground, reseeding enough each year to take its place. So, late in April or early in May, with a good strong riding plow drawn out sharp by the blacksmith, the work is begun. With four or five heavy horses hitched, the plow set down to a depth of eight or ten inches, the new growth of alfalfa, whatever it may be, is turned under for additional fertilizer, and as the plowing progresses the newly plowed land is leveled off twice each day, or harrowed to prevent wind and sun from drying out the soil.

Experience has taught us that from May 25 to June 1 is the best time to plant, as this brings us into August, when the nights are getting cool for the potatoes to set on the vines. Seed raised by rainfall is most desirable for planting, because seed grown by irrigation loses a part of its vitality on account of its forced growth.

The Aspinwall and Evans planters are considered the best, and with these, with either two or four horses attached, considerable ground can be planted in a day, or about five acres for two horses, and seven for four. These are picker planters. After the seed has been cut and put into the hopper the machine plants one piece at a time any desired distance apart, as the pickers are adjustable to suit the different varieties of potatoes as well as the various ideas of growers. These planters open the furrow for the seed, plant it and cover it over at one operation; by so doing prevent the land drying out. When the planting is done the cultivator is put to work throwing as much dirt as possible on the row. When the tubers are first appearing through the ground a plank or harrow is used to knock off the ridge. This removes all small weeds that have germinated and leaves the row free from weeds. Three cultivations are usually given.

About August 1 the potatoes are furrowed out for the first irrigation, followed by weekly irrigations until September 10 to September 15, when irrigation should cease and the tubers left to ripen.

Four-horse diggers are used in the harvesting, taking one row at a time. The potatoes are separated from the dirt by a chain which allows the dirt to drop through the chain while the potatoes are carried over and laid in rows on the surface of the ground. They are then picked up by a gang of pickers who pick into baskets and afterward put into sacks and either drawn to market or sacks filled half full and drawn to potato cellar. Potato sorters are used in cellar as well as field to sort the potatoes for market. These pass over a screen, shaken by the operator, large ones passing over and going into sack, small ones going through. In this way sorting is done better than by hand, as the mesh in screen measures size of each potato.

One crop of potatoes and two crops of beets, or two crops of potatoes and one crop of beets, are usually taken off the land before putting it back into alfalfa.

THE ENGINE QUESTION—A TIP.

It is no longer a question of whether or not the farmer needs an engine—he has already been assured of the many advantages of having a good engine handy for almost any kind of work. But there seems to be a growing tendency on the part of some of the manufacturers to make engines to *sell* rather than to give good service. This naturally puts the farmer on his guard, but most of them are dealing with the old reliable concern—the International Harvester Company of America.

The engines this company is distributing are manufactured on correct mechanical lines. They are required to be of the highest order. That implies not only correct

principles, but materials best adapted to uses, and workmanship that cannot be surpassed.

The principles were carefully worked out and tested before manufacture began. The record of service of the engines at work has abundantly established their correctness, as well as the excellence of materials and workmanship.

One of the greatest things that has been accomplished is dependability, a positive response of the engine whenever called upon. An engine that cannot be depended upon to start quickly and positively is of little value anywhere, especially to the farmer whose power jobs require frequent stopping and starting.

Smooth, even running and generation of the full rating of power are other features that are next in importance to dependable starting. Then comes the simplicity and ease of control for which these engines are noted. And, lastly, economy. The engines are adapted to the use of gas, gasoline or denatured alcohol for fuel. Well-posted power men agree that whatever the fuel, the minimum is consumed for the power delivered.

The engines are made in several styles and range in size from 1 to 25 horse power. A letter direct to the International Harvester Company of America will secure catalogue and the information you desire promptly.

CENTRIFUGAL PUMP AND GASOLINE ENGINE IRRIGATION OUTFIT.

Herewith is an illustration of an irrigation outfit including a centrifugal pump and double cylinder gasoline engine, manufactured by the Temple Pump Company of Chicago, Ill.

The Temple Pump Company has a world-wide reputation as manufacturers of power and pumping machinery for irrigation and drainage purposes, their engines and pumps being used in Japan, South America, South Africa, Australia, New Zealand, England, France, Russia, Spain and this country. This is their fifty-fifth year.



Centrifugal Pump and Double-Cylinder Gasoline Engine.

Supreme Court Decisions

Irrigation Cases

APPROPRIATION OF SUBTERRANEAN WATERS.—

One may sink on his own land such wells as he needs, though in so doing he may dry up his neighbor's well, provided he does not act maliciously, or use the water unnecessarily.—*Long v. Louisville & N. R. Co.* Court of Appeals of Kentucky, 107 Southwestern 203.

RIGHTS IN ARTIFICIAL WATERCOURSE.—

The mere fact that a watercourse was artificially dug did not necessarily prevent the existence of rights in it, after a long time, like those pertaining to a natural watercourse.—*Stimson v. Inhabitants of Brookline.* Supreme Judicial Court of Massachusetts, 83 Northeastern 893.

DECREE ESTABLISHING PRIORITY CANNOT BE ATTACKED.—

A statutory decree establishing priorities to the use of water for irrigation is res adjudicata as to the volume of water awarded to a particular ditch and cannot be attacked collaterally.—*Alamosa Creek Canal Co. v. Nelson.* Supreme Court of Colorado, 93 Pacific 1112.

IRRIGATION BONDS.—

The legality of the formation of an irrigation district, and the proposed issue of bonds of said district for the construction or purchase of a canal system, are not affected by the fact that the canal system of said district may water lands outside of said district.—*Settlers Irr. Dist. v. Settlers Canal Co.* Supreme Court of Idaho, 94 Pacific 829.

CONDEMNATION FOR IRRIGATION.—

Under Const., Art. 3, Sec. 15, the flooding of land by a dam erected for the purpose of supplying electric power to mines and smelters and to the public generally, and for supplying water for irrigation purposes, is for a public use, authorizing condemnation of such land.—*Spratt v. Helena Power Transmission Co.* Supreme Court of Montana, 94 Pacific 631.

DEFENSE TO DIVERSION.—

Where a senior seeks to enjoin a junior appropriator of water from diverting the same by an irrigation ditch, and defendant seeks to avoid the same on the ground that if the diversion is restrained the plaintiff will derive no benefit, such defense must be established by clear and satisfactory evidence.—*Alamosa Creek Canal Co. v. Nelson.* Supreme Court of Colorado, 93 Pacific 1112.

PRESCRIPTIVE RIGHTS TO WATER.—

Satisfactory proof of a continuous, open, notorious, and uninterrupted use of waters on lands for irrigation for five years, when the use is of such a character as to indicate that the same is being exercised in hostility to the right of any person to interfere with the exercise, is sufficient proof of a claim of right to use it, sufficient to ripen into a right by prescription.—*Anaheim Union Water Co. v. Ashcroft.* Supreme Court of California, 94 Pacific 613.

PARTITION OF WATER RIGHTS.—

Tenants in common of land bordering on a stream and severally in possession of particular tracts thereof, subsequently allotted to them by a partition decree, jointly constructed a ditch from the stream across one of the tracts, and diverted water on their tracts for irrigation. The partition decree did not mention the ditch nor refer to water rights. Held, that under Civ. Code, Sec. 1104, providing that a transfer of real property passes all easements attached thereto, etc., an easement in the tract over which the ditch was constructed for the benefit of the other tracts passed under the decree as appurtenant to the latter tracts to the extent that the ditch was at the time of the decree obviously and permanently used to irrigate the tracts, and to such part of the tracts as had been actually irrigated from it.—*Anaheim Union Water Co. v. Ashcroft.* Supreme Court of California, 94 Pacific 613.

ORGANIZATION OF IRRIGATION DISTRICT.—

Where an irrigation district has been organized in accordance with the irrigation law of this state, and has voted to issue bonds for the construction or purchase of a canal system, the fact that said system will supply and water lands outside of the district does not render said district or the proposed issue of the bonds invalid.—*Settlers Irr. Dist. v. Settlers Canal Co.* Supreme Court of Idaho, 94 Pacific 829.

SUIT TO ESTABLISH PRIORITIES.—

In a suit between the appropriators of the waters of a stream involving the rights and priorities of the several appropriators, the users and consumers of water under a canal that has appropriated water for the purpose of sale, rental, or distribution are not necessary and indispensable parties to the action, and a decree in such case is valid and binding as between all the parties to the action.—*Farmers Co-operative Ditch Co. v. Riverside Irr. Dist.* Supreme Court of Idaho, 94 Pacific 761.

APPROPRIATION OF WATER.—

Interference by defendants, prior appropriators of water, with the dam of plaintiffs, junior appropriators, by which water was diverted to plaintiffs' lands for irrigation, held properly enjoined, the evidence sustaining findings that plaintiffs had not diverted any water to which defendants were entitled as prior appropriators, even if a prior decree was res judicata, or showing that, as the dam was allowed to be maintained, as much water would reach defendants' land as though there were no dam.—*Fuller v. Sharp.* Supreme Court of Utah, 94 Pacific 813.

IRRIGATING OUTSIDE OF DISTRICT.—

Where bonds of an irrigation district have been authorized by vote of the qualified electors of said district, and the benefits accruing from such works and the costs of such works are apportioned and distributed to the lands in said district, and said district and its officers have acted in said matter wholly with reference to the land within the boundaries of said district, the fact that the canal system or the works supply water to irrigate lands outside of the irrigation district does not affect the validity of the proposed issue of bonds.—*Settlers Irr. Dist. v. Settlers Canal Co.* Supreme Court of Idaho, 94 Pacific 829.

INJURY FROM DIVERSION.—

Where the evidence, in an action to enjoin a diversion of water from a stream from which plaintiffs irrigated their land, showed that the stream was dry part of the year, and that when the water began to flow it took several weeks to reach plaintiffs' land, owing to the sandy bottom of the bed which must necessarily become saturated before any water would flow over it, a diversion by defendants would postpone the time required to reach plaintiffs, and result in their injury, since they were entitled to have the stream maintained in its natural state.—*Huffner v. Sawday.* Supreme Court of California, 94 Pacific 424.

RIGHT OF WAY FOR IRRIGATION CANALS.—

Under the provisions of Sundry Civil Appropriation Act Cong. Aug. 30, 1890, c. 837, 26 Stat. 391 [U. S. Comp. St. 1901, p. 1570], which provides "that in all patents for lands hereafter taken up under any of the land laws of the United States, or on entries or claims validated by this act, west of the one hundredth meridian, it shall be expressed that there is reserved from the land in said patent described a right of way thereon for ditches or canals constructed by the authority of the United States," the word "constructed," as there used, has a general reference and application to ditches or canals constructed by the authority of the United States, without reference to the time of such construction. Under the provisions of the act above quoted, it was the evident intention of Congress to reserve perpetually to the government an easement and right of way through and over any and all lands west of the one hundredth meridian that the government might grant to settlers and purchasers subsequent to the passage of the act, and to thereby reserve the easement and right of way for the construction, maintenance, and operation of any ditches and canals the government may construct at any time in the future for the irrigation and reclamation of arid lands.—*Green v. Wilhite.* Supreme Court of Idaho. 93 Pacific 971.

RIGHTS OF USERS TO WATER OF CORPORATION.—

A water company or corporation may appropriate and divert the waters of a stream for the purpose of sale, rental, or distribution for any beneficial use or purpose, and in such the case the appropriation belongs to the ditch company, with a perpetual right of use vested in the users and consumers to whom the water has once been delivered, and such perpetual right so vested in the user or consumer can only be defeated by failure to pay the annual water rents and comply with lawful requirements in relation to the use.—*Farmers Co-operative Ditch Co. v. Riverside Irr. Dist.* Supreme Court of Idaho, 94 Pacific 761.

IRRIGATION OF PUBLIC LANDS.—

Where a contract between plaintiff, the state of Oregon, and defendants, for the reclamation of certain desert lands, depended for its validity on Act. Cong. Aug. 18, 1894, c. 301, 28 Stat. 422 [U. S. Comp. St. 1901, p. 1554], as amended by Act July 11, 1896, c. 420, 29 Stat. 413 [U. S. Comp. St. 1901, p. 1556], and Act March 3, 1901, c. 853, 31 Stat. 1188 [U. S. Comp. St. 1901, p. 1557], providing for the reclamation and irrigation of certain parts of the public domain to be conveyed to the states on performance of certain conditions, and that, before such act, there could have been no dealings between the parties with reference to the subject of the contract, an action by the state to annul the contract because of defendant's failure to comply therewith was one arising solely under the laws of the United States, and therefore removable to the federal courts.—*State of Oregon v. Three Sisters Irrigation Co.* U. S. Circuit Court, District of Oregon. 158 Federal 346.

APPROPRIATION.—

Where a defendant in a water suit, brought for the purpose of determining priorities of appropriators, answers the complaint, and also files a cross-complaint, in which he sets up his claim to a certain quantity of the waters of the stream and pleads the facts entitling him to a decree establishing his rights, and he raises no objection to the insufficiency of description of the lands to be irrigated as contained in the complaint, and in no way calls the matter to the attention of the trial court, and a decree is entered describing the lands to be irrigated both by the plaintiff and the defendants and all the parties to the action in the language of the complaint and the cross-complaints, any insufficiency, error, or defect in the description must be first raised in the trial court, and called to the attention of the court entering the decree, before it can be considered on appeal, and in case of appeal any error assigned by the appellant in reference to such defective or insufficient description will be held to have been participated in and invited by the appellant, and he will not be allowed a reversal of the judgment on account thereof.—*Farmers Co-operative Ditch Co. v. Riverside Irr. Dist.* Supreme Court of Idaho, 94 Pacific 761.

FEDERAL COURT HAS JURISDICTION UNDER IDAHO STATUTE.—

The statutes of Idaho provide that one desiring to appropriate water from a stream must apply to the state engineer and obtain a permit; that, in case a stated part of the works has not been completed within a certain time, an after appropriator from the same stream may petition the state engineer for a revocation of the permit, and that officer, after investigation, shall either cancel the permit and notify the holder or refuse to do so and notify the petitioner; that, in either case, the party feeling himself aggrieved may appeal to the district court of the county in which the point of diversion is situated, making the other party defendant, and filing a petition and a copy of the petition to and decision of the state engineer. There is no further provision as to pleading or procedure. *Held*, that, after such an appeal has been taken, the proceeding in the district court is a "suit of a civil nature at common law or in equity," of which a Circuit Court of the United States is given concurrent jurisdiction with the state courts by section 1 of the judiciary act of March 3, 1875 (18 Stat. 470, c. 137, as amended by Act March 3, 1887, c. 373, 24 Stat. 552, and Act Aug. 13, 1888, c. 866, 25 Stat. 433 [U. S. Comp. St. 1901, p. 508]), and therefore removable under section 2 where the other requisite jurisdictional facts exist.—*Wah-Lewiston Land & Water Co. v. Lewiston-Sweetwater Irrigation Co.* U. S. Circuit Court, Idaho. 158 Federal 137.

OUR GROWING CIRCULATION.—

As we are going to press with our June number we are in receipt of a letter from one of our canvassers in the far West who sends us in from one county alone 172 new, yearly, paid in advance subscribers. This is an indication of the way our circulation is growing throughout the western field, and should be an incentive to advertisers who are looking for trade in that western country. One hundred and seventy-two new, paid subscribers in one mail rather exceeds our weekly average for the past several months, and is very gratifying to the publishers. Please remember that among this list there are, no doubt, many who are possible purchasers of agricultural implements, wagons, pumps, windmills, gasoline engines, spraying machinery, and and there are no doubt many among them who are looking to other localities with a view to purchasing land. It is a well known fact that the irrigator who establishes a farm and makes it increase in value from its initial cost, say from \$25 to \$40 per acre up to as high as \$200 or \$300 per acre, is willing to let go at that figure and reinvest in larger tracts in a newly developing section. An illustration of this is that fact that the original purchasers of land along the north side of the Twin Falls tract in Idaho were from the older irrigated sections of Washington, Montana, Oregon and Utah. These people went into these states at an early day, secured land and water at a low figure, had developed their farms so that they were producing good incomes and were marketable at a very much higher figure than the average farm land. Many of the people who early moved into the Twin Falls tract sold their farms in Washington and Montana for from \$150 to \$300 per acre, and purchased land in the Twin Falls tract at about \$35 per acre, thereby leaving a nice balance for improvements or investments elsewhere. There are many hundreds of this class of people among our readers and land men should take advantage of that fact and place before them a statement of the projects which they wish to market.

THE IRRIGATION AGE should be the best land advertising medium in this country, and we urge land men to give it a trial. An advertisement carried in its columns sometime ago of a large tract of land in the Northwest, some 7,000 acres, produced a buyer within thirty days from the time the number containing the advertisement was issued, and netted the seller some \$3.00 per acre on that lot. It can readily be seen that transactions of this kind are profitable, and should encourage others to patronize our columns.

FEDERATION OF TREE-GROWING CLUBS.

Popularize Tree-Planting.

Monterey, Cal., April, 1908.

Since our people have become aware that we are facing a wood famine the subject of tree-planting has received much attention from publishers:

It seems to me that tree growing would become popular if the right kind of people in each community would start it. Roller skating, bicycling and bridge may be good wholesome fads, why not a tree-growing fad? It would do so much more good in every possible way and so many more of our people, young and old, would be enticed into it. The time is now ripe for a new fad, then let it be the growing of useful trees. My reader is very likely to be the very person to awaken an interest and set an example to make tree growing fashionable.

Get some of your congenial acquaintances together and form a club. Write to Superintendent of Documents, Forestry Service, at Washington, D. C., for a catalogue of books, pamphlets and leaflets on trees, published for free distribution, and select what you think will be useful. You will find that the instructions for growing trees as given in such papers as are printed by the Government, or for that matter, by outside parties, are principally for nurserymen or for extensive tree planters, but to follow directions is beyond the sphere of the average person.

The value of the method of growing trees by the aid of the discarded tin can appeals especially to per-

sons having some experience in propagating trees. Plant some tree seeds in a box, lightly covered with sandy soil (not plastic). When not more than three inches high transfer into cans with bottoms well perforated, and bury the cans to tops in some well-protected spot, shade from hot sun and keep the soil in the cans continuously moist.

Generally, if your seed is good and the above rules are strictly followed, you will meet with success.

The common method of propagating trees requires so much space and labor that very few of our people have participated in it, and most of those who have, became discouraged.

In the wild it is only by chance that a tree seed finds a resting place where right conditions are maintained; thus few of the millions of seeds which fall ever develop into trees, even with those that happen to sprout; so it is inadvisable to sow tree seed broadcast unless under special conditions.

One purpose of the organizations of the Federation of Tree Growing Clubs of America is to distribute seed; exchange, one with another, thus a general diffusion of species will result. As for instance, at Monterey, Cal., we have two very valuable indigenous trees, the Monterey cypress and the Monterey pine. Seeds of these beautiful trees can be had for the asking and postage.

A tree-growing fad is inexpensive and I think the most satisfactory, besides it would be the most interesting and useful one ever started in the world.

Speak of this to your friends! H. A. GREENE,
President F. of T. G. C. of America.

The Temple Irrigation Equipments the most Economical and Certain Means of Lifting Water

55 YEARS' EXPERIENCE

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This shows the pipe lifting the heavy black sand out of one of nature's bed rock riffles. The precious minerals like gold and platinum have been trapped in these pockets or riffles for untold ages, but no method to recover these stored up treasures had been devised before the advent of the pipe dredge. This dredge will enter these pockets and recover the values they contain.

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It is not possible to describe this dredge nor tell of its superiority in a few words. However, IF YOU HAVE USE FOR A DREDGER, it will pay you and save you money to look into the merits of this device. It will also save time. Here is part of what Mr. M. A. Nurse, for 18 years Chief Engineer of the State of California, says about the Pneumatic Pipe Dredge.

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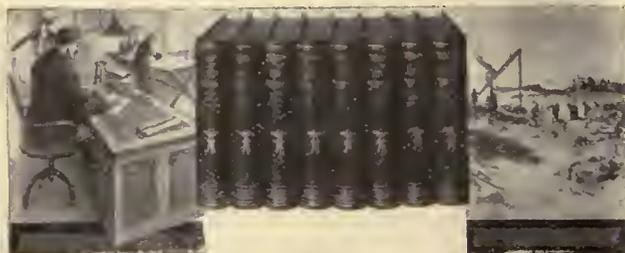
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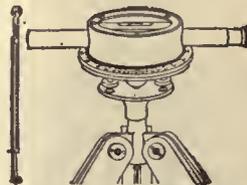
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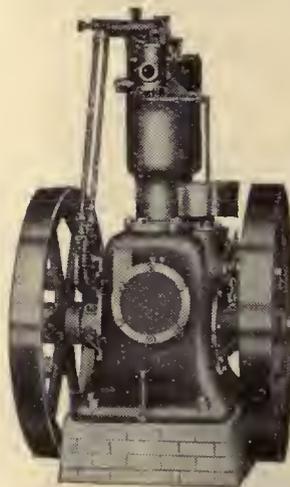
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SEEPED LANDS.

By L. G. CARPENTER.

Professor of Civil and Irrigation Engineering, Colorado Agricultural College, Fort Collins.

One of the conclusions of the investigations reported in bulletin No. 45, of the Colorado Experiment Station, was that most of the seep water came from the ditches, rather than from the water applied to the soil. While this is not always the case, it is generally true. It was found that with ditches in heavy clay there was usually a loss equal to a depth of three inches over the whole canal each day. In sandy soils with some degree of clay, the loss might be two feet a day, and in some cases where there was gravel bottom the loss became many times greater. One of the old canals in the suburbs of Greeley was found to lose at the rate of a depth of 27 feet in one day. It is not surprising that an immediate result was the loss of the garden crops below the canal in that part of town. What attracted my attention to the case and led to the measurement being made, was a field of cabbages, full grown,

with the tops just showing above a lake of water. In this case the canal was an old one and had been running without any material loss. Some plasterers had found an excellent supply of sand where the ditch crossed a draw, and, digging into the sand, had thus given the water full chance to leak, which it did very freely. This illustrates the fact that cleaning a ditch often increases the loss. Silting up the canal with clay sediment very greatly reduces the loss. If the sediment is fine sand, the silt may be of little benefit. Sometimes the construction of low dams to hold up the water and let the silt drop has a marked beneficial effect.

The time has not yet come to generally line the ditches and canals. Measurement of hundreds of miles of ditches has shown that the greatest losses usually occur in limited stretches. Sometimes these may be told by an examination of the soil and the surroundings, but often they cannot be guessed at from a casual surface examination. The better way is to determine the worst places and then to improve these. The presence of signs of seepage below the canal may sometimes indicate where

there may be suspected spots. At present the application of a remedy to the worst places, or an attempt to silt the canal with clay sediment, will do the greatest good at the least expense.

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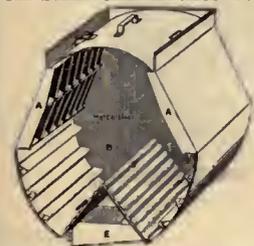
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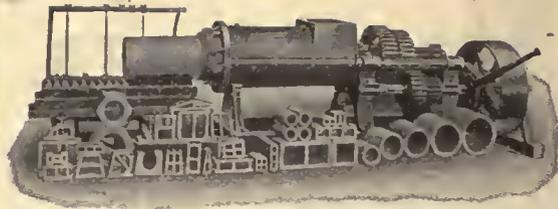
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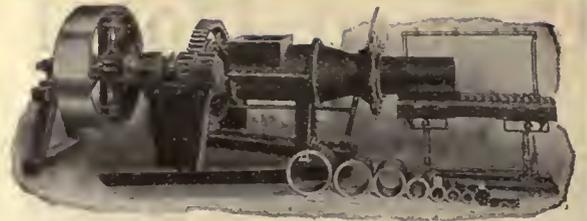
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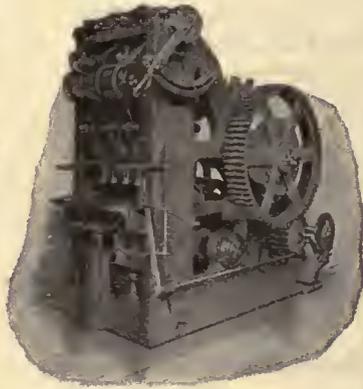
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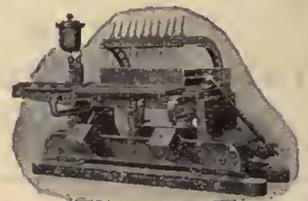
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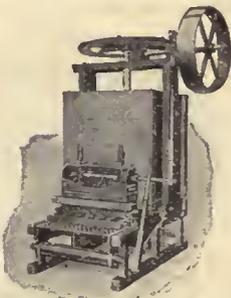
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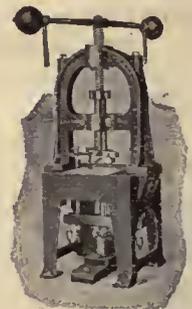
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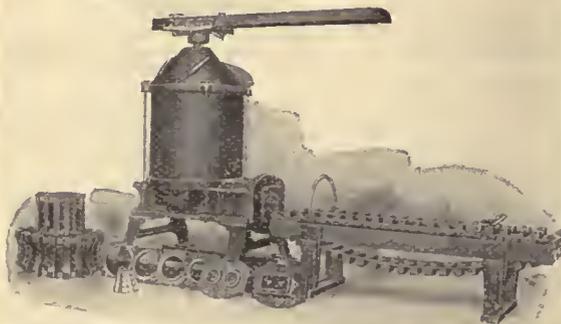
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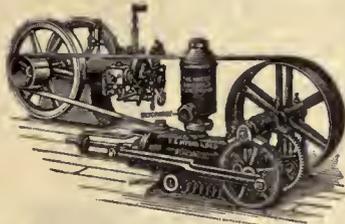
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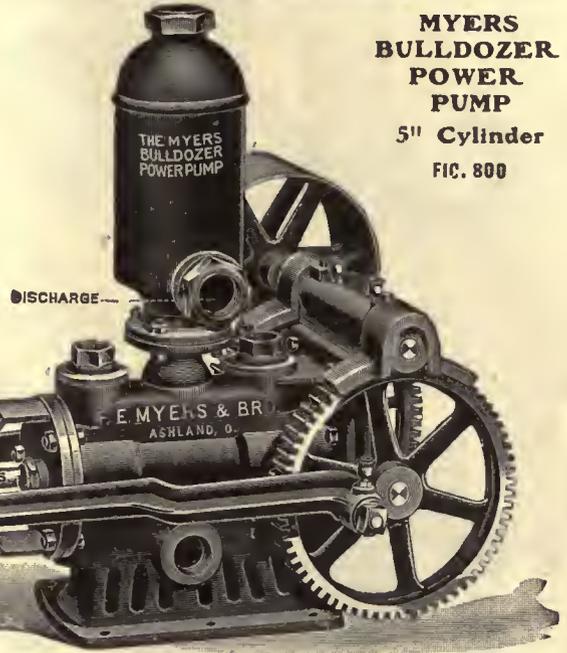
WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

**MYERS
BULLDOZER
POWER
PUMP**
5" Cylinder
FIG. 800



HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

MYERS
BACK GEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

5, 7½ AND 10"
STROKE

FOR BELT,
WIND DR HAND
POWER

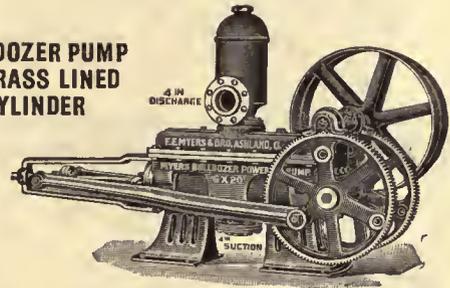
FIG. 1113



BULLDOZER
WORKING
HEAD

BULLDOZER PUMP
6" BRASS LINED
CYLINDER

FIG. 1079



1½" BRASS ROD

FIG. 813



MYERS BULLDOZER
WORKING HEADS

NO. 359

5", 7½", 10" STROKE
DISCHARGE 2½" OR 3"
SUCTION 2" TO 4"

NO. 364

12", 16", 20" STROKE
REGULARLY FITTED 4"
DISCHARGE
SUCTION 8" OR LESS

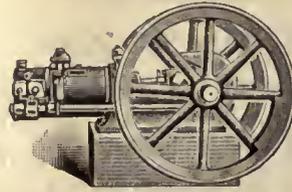
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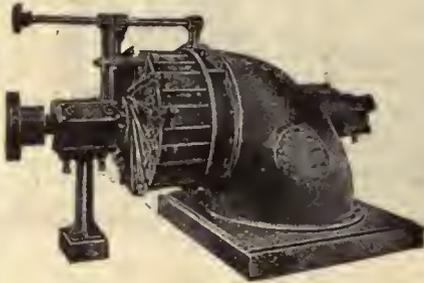
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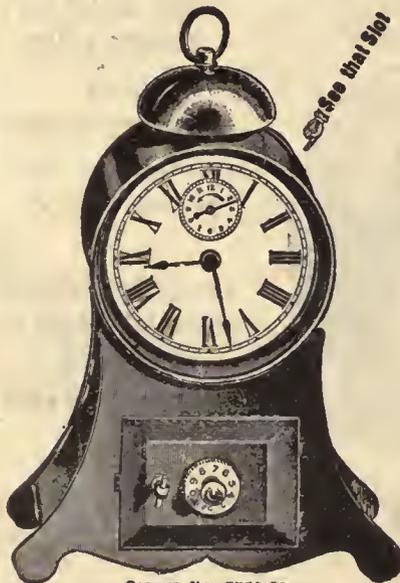
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All wearing parts are carefully machined and accurately assembled. The material used is the best that can be procured. The connection to the pump rod is made by means of a SOLID ROOFL STEEL TURNED WRIST PIN. The specially designed ROCKER ARM DEVICE used in our mills causes the greatest amount of power to be exerted on the upward stroke when the pump is lifting the water. The stroke on our 8 and 10 foot mills can be adjusted to 4½, 6 and 8 inches, and on the 12 foot size can be adjusted to 6, 9, and 12 inches.

We can furnish our mills for either wood or steel towers, but strongly recommend the latter. In ordering be sure to state for which kind of tower the mill is intended. When the mill and tower complete are ordered we include without extra charge, pull out lever and sufficient pull out wire and pumping rod for the height of the tower. When mill only is ordered, we furnish 40 feet of pumping rod and a corresponding quantity of pull out wire.

ALL ALDOCO MILLS ARE GALVANIZED INSTEAD OF PAINTED. Our experience has taught us that painted mills are inclined to rust as soon as the paint scales or wears off.

Our wind mills are constructed in six sections and so planned as to give the strongest possible wheel without increasing the weight more than is absolutely necessary. Aldoco mills are supplied with a SIMPLE EFFECTIVE GOVERNOR which insures regular speed under all varying conditions. In addition to this we have a BRAKE which locks the wheel when thrown out of the wind.

Prices of Aldoco Galvanized Pumping Windmills

Our Number	Diam. of Wheel	Weight	No. of Sails
13-DIA-7701	8 feet	400 lbs.	24
Length of Sails	Length of Vane Sheet	Price	
30 inches	4 feet 6 inches	\$17.60	
Our Number	Diameter	Weight	No. of Sails
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Length of Sails	Length of Vane Sheet	Price	
36 inches	5 feet	\$22.65	



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If you could see the Real "DIFFERENCE" between the NEW BUTTERFLY CREAM SEPARATOR

and any other made—Difference in amount of the cream you get; Difference in the quality of cream; Difference in the way the machine runs. Difference in the number of times a minute you have to turn the crank; Difference in the way the milk is aerated and purified while being separated; Difference in the time and trouble it takes to clean the skimming device—you would say, as hundreds of others are saying today—

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ALDOCO GALVANIZED STEEL TOWER

The corner posts are of best quality Angle steel with rounding corner giving them great strength. They are increased in size and weight every 20 feet thus giving strength where strength is needed. Every 10 feet we have a girl of Angle steel running diagonally in both directions across the tower, and connecting with the corner posts are two round braces, each of which may be tightened separately permitting you to square up the tower at any time. In addition to these cross braces we have heavy steel

rods running diagonally across each side of the tower between the different cross girls. There are 8 of these cross rod braces between every 2 sets of cross girls. Every pair of these rods may be tightened independently of the others which permits you to straighten the tower and hold it rigid at all times. At the bottom of the tower next to the ground we have an angle steel cross girl so that you do not have to depend entirely upon anchor posts. However, every Aldoco tower is furnished with heavy steel anchor posts also. Our towers are equipped with best steel ladders and strongly constructed platforms.

PRICES OF ALDOCO STEEL TOWERS

Style No. 1 to be used with our 8 foot mills—

	PRICE
13 D I A 7711 30 foot tower, weight 540 lbs.	\$19.80
13 D I A 7712 40 foot tower, weight 730 lbs.	26.25
13 D I A 7713 50 foot tower, weight 1000 lbs.	35.75
Style No. 2 for our 10 foot mills—	
13 D I A 7719 30 foot tower, weight 575 lbs.	21.25
13 D I A 7720 40 foot tower, weight 760 lbs.	28.40
13 D I A 7721 50 foot tower, weight 1100 lbs.	37.40

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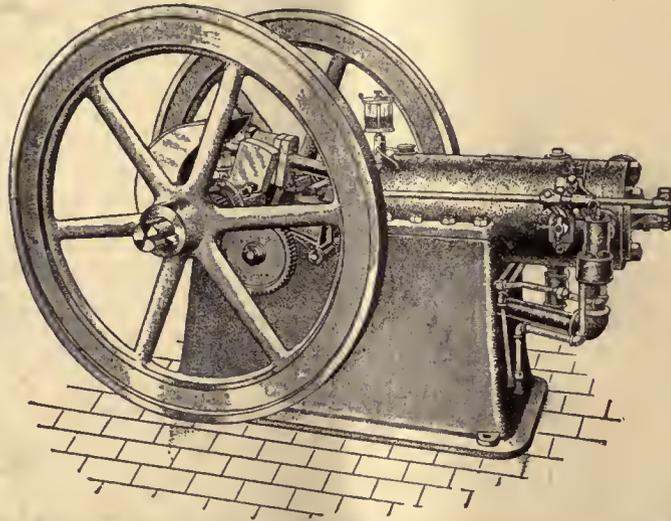
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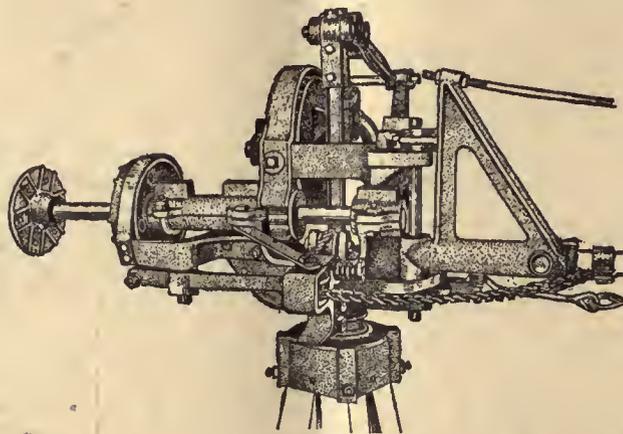
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VOL. XXIII.

CHICAGO, JULY, 1908.

No. 9

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The Deming Co.
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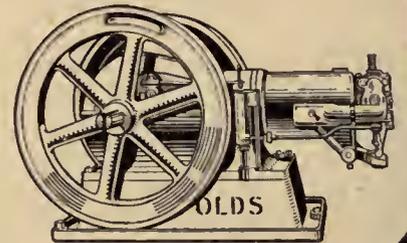
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2¾ inch.	3 inch.	3½ lbs.	12c
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3¾ inch.	4 inch.	5½ lbs.	16½c
4¼ inch.	4½ inch.	6½ lbs.	20c
5½ inch.	6 inch.	10¾ lbs.	34c
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6½ inch.	7 inch.	15 lbs.	48c
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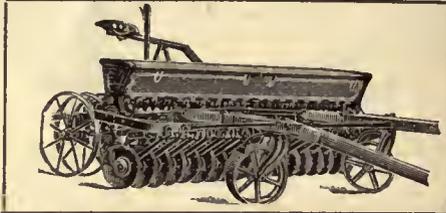
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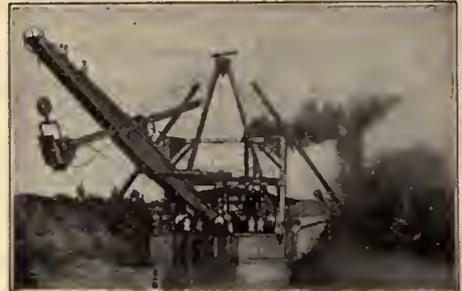
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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, JULY, 1908.

No. 9

THE IRRIGATION AGE

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PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

We are presenting in this issue an article **Belle Fourche Project** prepared by the editor on the Belle Fourche irrigation project in South Dakota. This territory was gone over carefully by the writer in company with the engineer in charge, Mr. Raymond F. Walter. As will be seen from the article a lot of nice photographs were taken, and this is perhaps the most complete description of this project which has ever appeared in print. It will prove particularly interesting to those of our readers who are contemplating changing their location and are desirous of securing correct information concerning the possibilities of building a home in the West. It is our intention to cover in a similar manner, from time to time, each of the government projects, fully describing and illustrating them so that our readers may be able to form a clear idea of what is to be encountered in establishing a home under any one of them, and we will aim to give complete data concerning crops suitable for the different areas described.

Albuquerque Congress. Word reaches us that work is progressing finely in Albuquerque along the line of preparation for the National Irrigation Congress which is to be held in that city during the last days of September of this year. An appropriation of \$30,000 was secured from Congress, and it is stated that the citizens of Albuquerque have put up \$20,000 with which to erect a fine convention

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hall, and a similar amount has been contributed by citizens throughout the territory so that about \$75,000 will eventually be expended to entertain the congress and exploit the resources of that rapidly developing territory. Some question has been raised as to the method of advertising the congress, but we are informed that the committee has recently been giving out some very attractive literature, and the city of Albuquerque has sent out broadcast a finely illustrated book which should be in the hands of every one who is interested in Western or Southwestern development. A copy of this book and other literature may be secured by addressing the publicity department of the Irrigation Congress, Albuquerque, N. M.

Already Selected. Word comes to us from Washington that Mr. Taft, the Republican Candidate for President, has already decided on two men for cabinet positions, viz: James Rudolph Garfield to succeed himself as Secretary of the Interior and Gifford Pinchot who will be promoted from chief of the Forestry Division to the position of Secretary of Agriculture. If this is true the move was, no doubt, suggested by President Roosevelt, who has, as is well known, a strong liking for both of these gentlemen. There will, no doubt, be a very decided opposition in the Senate as well as the House to the confirmation of Gifford Pinchot as Secretary of Agriculture, but judging from the manner in which Presi-

dent Roosevelt has handled the situation, has been able to secure what he wanted in the way of a candidate for President, it is reasonable to presume that he will be successful in "putting over" Mr. Pinchot, provided, of course, that Mr. Taft is elected. It is the impression of many who have studied the situation carefully that the Republicans will have the fight of their life this year in order to elect Mr. Taft, and there will be no certainty of either Mr. Garfield or Mr. Pinchot being in until after the votes are counted.

**Proceedings
of the
Sacramento
Congress.**

In a recent letter from California in which the non-publication of the proceedings of the last irrigation congress held at Sacramento in that state was mentioned, the writer states that he has made inquiry concerning the matter and learns that the reason the report has not been published is that the funds were exhausted before the committee reached that part of their work, and owing to financial troubles and other matters they have not, up to now, secured money for the publication.

The Sacramento people, however, state that the matter is in hand and will be taken up in July, and there is fairly good reason to believe that the publication will be issued.

It is particularly unfortunate that a report of as important a congress as that held in Sacramento should be held out of print for so long a time.

The writer, who was secretary of that congress, secured the best stenographer obtainable and a transcript of the complete proceedings of the congress was in the hands of the local committee and ready for publication in less than twenty-four hours after the day of adjournment. It is safe to say that never in the history of the congress has a complete transcript been ready within thirty days after the adjournment. It appears to us that the people of Sacramento are not awake to the fact that they are losing an opportunity to advertise their town and California generally by the publication of this report.

It is feared by many that when this report appears it will be looked upon as ancient history.

In this, our July issue, we are presenting the second installment of "The Art of Irrigation," by T. S. Van Dyke. The subject treated in this chapter is "The First Mistake," in which Mr. Van Dyke very clearly explains the methods of applying water to the land. It will be seen from a perusal of this article that Mr. Van Dyke thoroughly understands his subject and our readers may, in each succeeding chapter, look for valuable hints and suggestions on this important subject, the art of irrigation. It will be seen that the illustration described in chapter two is rather small and does

not clearly show points brought out in the article. It was intended to have had this illustration larger, but through an error it came out in its present form. By referring to the illustration, however, as the article is gone over carefully, a fairly comprehensive idea may be had of the points discussed by Mr. Van Dyke.

While in the West recently the editor made a trip by wagon of about one hundred and thirty miles through the Belle Fourche Valley and later on through the Spearfish and other valleys lying between the towns of Belle Fourche and Deadwood, S. D. During this trip a stop was made over night at the new town of Vale, which is located about seventeen miles eastwardly from Belle Fourche, illustrations of which are shown in our article on the Belle Fourche project. While there the writer was introduced to Mr. M. W. Read, cashier of the Vale Bank, who gave some very interesting facts concerning the development of this infant town. He stated that it was the general impression that the principal town of the Belle Fourche Valley would be determined by the railway company that would first reach this rapidly developing section, and as a result all of the buildings which have been erected in Vale have been put up with a view to moving them over night to whatever point may be decided upon by the railway company. It is rumored that all of the buildings in Vale are on runners so that teams may be hitched to them and drag them to the new point in case the location is not too far away from its present site. Some of the best informed people are inclined to think, however, that Vale will mark the site of the future metropolis of the lower Belle Fourche valley, and judging from the location of the town and its beautiful surroundings it is not unreasonable to believe that Vale will eventually be the commercial center of that particular section. As an illustration of the growth of business in the town of Vale we will quote from a statement issued by the Belle Fourche Valley Bank of that town of which Mr. Read is cashier. On June 20, 1907, which was the day the bank opened, the deposits were something over \$8,000, and on the same day, 1908, the bank statement shows a deposit of over \$60,000. When it is considered that this country was struggling along with the nearest bank some fifteen miles away up to one year ago and that it now has 177 accounts, one may form some idea of the rapid development of that section. Mr. Read is a typical Western booster and a photograph of his bank appears in this issue. We are also showing in this issue an illustration of the Butte County National Bank of Belle Fourche, of which Mr. W. B. Penfold is cashier. Considerable valuable data was secured by the writer from Mr. Penfold on his recent visit to Belle Fourche,

and we take pleasure in showing a half-tone of the fine institution over which he presides. This building is constructed of red sandstone and would be a credit to any city in this country.

Proposed Increase for Hydrographic Work. We are in receipt recently of several letters from people interested throughout the West concerning the proposed increase for hydrographic work. One letter written by a railway official states that for the past few years the hydrographic branch

of the United States has had an appropriation of \$100,000 annually for the purpose of conducting their work and that the amount has proved inadequate in view of the immense field which is to be covered. Our correspondent states further that the work in question comprises the determination of the amount and character of surface and underground water resources of the United States, the adaptability thereof for irrigation, navigation, public water supply and manufacturing purposes. There is also involved the question of flood prevention which annually does more than \$100,000,000 of damage. The work of this branch has to do with the investigation of stream flow, the determination of the method of flood occurrence and the facilities afforded for storage in the various river basins. The developments that are dependent upon this work comprises the entire reclamation work of the Federal Government as well as that of private enterprise.

Our correspondent goes on to say that up to July 1906, the work of the hydrographic branch of the Geological Survey had been continued in good order under an appropriation made by Congress of \$200,000 per annum. In 1907 this amount was reduced to \$150,000 per year, and that at the last session of Congress it was reduced still further to \$100,000 per year, at which figure it now stands, and his impression is that in view of the inadequate data available for people who are studying the subject of the development of the West that this sum is not sufficient to conduct the work so as to produce results which will enable the large railway companies and private individuals to secure data which will enable them to make a comprehensive estimate of the conditions in various sections of the country. Our correspondent is no doubt correct and as he is a railway official it is reasonable to suppose that he is more than anxious to have the government take over all of the work of this character and be in a position to deliver to the railway companies and others complete data when called for. He contends that it would be absolutely impossible for any private corporation to attempt work of this kind as it would be necessary to have as complete a corps of engineers as may be supplied at any time by the govern-

ment. Others who are interested in the subject, however, claim that the large corporations should stand ready to give assistance or do the work of this kind themselves. It is apparent from the tone of this letter and other letters received that an effort will be made at the next session of Congress to increase this appropriation so that it will reach its former figure, \$200,000 per year.

Announcement.

We are publishing in this issue an article on the industrial enterprises, including irrigation, of the towns surrounding Santa Maria, Santa Barbara County, California, by our Western representative, Mr. A. T. Taylor. Mr. Taylor will soon leave California for Idaho and other Western states where he will continue his good work of developing circulation for THE IRRIGATION AGE. We hope through the efforts of himself and assistants to be able to increase our circulation in the state of Idaho at least 5,000 copies before the first of January, 1909.

A feature of the celebration of the arrival of the fleet at San Diego is the Union Pacific gasoline motor car which President Babcock of the Los Angeles & San Diego Beach Railway had installed as a treat and novelty for the world-girdling jackies and the thousands of others who flocked in and out of the Southern California city while participating in the festivities of the occasion. President Babcock thought it would be a novel experience for the sailor boys and sightseers to have the pleasure of riding through the sunny California climate on one of these modern and up-to-date mediums of transportation, and it is safe to say those who had the opportunity will agree with him.

The trip of this motor car to the coast was a noteworthy one. Ordered at a late date, that it might reach its destination on scheduled time, it was necessary to start the car from Omaha without the customary trials or breaking in. The monster 200 horsepower engine propelling this car was not put together and tested out until the afternoon of April 6th, and had but three hours of actual service propelling the car before starting on this long trip.

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The Belle Fourche Irrigation Project in Western South Dakota

Homes for Thousands in a Delightful Country

By D. H. Anderson

There are thousands of people in this country who dream of some day owning and living upon a farm in the west.

Some one has said that dreams are unprofitable. The contrary is true in many instances. The dreamer is usually also possessed of that inestimable quality, condition or asset, Hope; without which, for many, the world could die and its passing be a blessing. Tinted tales of success lure us to the distant goal but there is

One of the most mysterious conditions surrounding the development of any considerable area of what is known as arid land is the value created in a year or two from one or two dollars per acre to a selling price of one hundred dollars per acre, or more. This change in value is, of course, due entirely to the application of water and cultivation, but it is nevertheless interesting and inspiring. Land heretofore uncultivated which has grown only native grasses is turned over, water applied



Irrigated Farms Under Red Water Canal, Belle Fourche Valley, So. Dak.

no lure unaccompanied by hope. Hope—many of us who are nearing the middle mile stone of life would not sell our capacity for hope for untold wealth. Rosy tales of success without hope do not stimulate. That word implies some undefinable condition which comes after our efforts have been crowned with success. Effort that spells toil and trial, all leading meanwhile to the same indistinct goal.

To the man who has this capacity, who is willing to work, and whose aim, however high, is reasonable and intelligent, the west presents today a tinted picture and an opportunity. The man who has a growing family, a cheerful and helpful wife, both possessing those prime qualities, energy and industry, may easily prove the fallacy of the old saying that dreams are unprofitable, through action which leads to their establishment on a western farm, conducted under an irrigation system, where they may own their own home and work out their life problems amid pure air, healthful sunshine, plenty and delightful surroundings.

Water in the western country is more than useful. It is ornamental with its mirrored beauties of dawn clouds and evening shadows. Water means the life of a farming enterprise in the irrigation districts.

and a crop produced which represents a value of say one hundred dollars or more per acre.



Building of the Butte County Bank, Belle Fourche, So. Dak.

I have often been asked the question, "What is land worth per acre which will produce, net, to the farmer, twenty-five, fifty, seventy-five or one hundred dollars per acre, annually?" I have as often replied that there is no base upon which to estimate the value of land of that character, as land which will earn, net, \$25 per acre,

per year, can readily be made to earn more than that by careful cultivation, and if one would figure on a six per cent basis for the earning capacity of the land and it is making fifty dollars per acre, per year, he could readily put a price on the land so high that it would be entirely beyond the reach of the contemplating purchaser. It has often been said that there will be a time when irrigated land lying adjacent to large cities will and can easily pay twenty-five dollars per acre, per annum, for water; and it is my impression that at no distant day this will be done and still leave a profit for the one who cultivates it.

Land which a few years ago in the Belle Fourche district was worth one dollar and one dollar and a half per acre, may today, under water, be made to earn twenty dollars, net, from small grains and alfalfa. When land is earning fifty dollars per acre there is no doubt but that the water could easily be estimated as worth ten dollars per acre per year. Hence, we say, there is something almost inexplicable in the manner in which land may be developed under irrigation when no unfavorable conditions, such as the presence of alkali, shortage of water or similar difficulty is encountered.

There is hardly any way to estimate what may ultimately be produced on each acre where the farmer goes in for the best paying crops and intelligently cultivates them. That part of the Belle Fourche district, of which we are now writing, will be materially improved each year by working it. The soil is fine, and being aerated by the roots of strong growing crops will be more easily cultivated from year to year and take on more readily atmospheric benefits which would not be likely to reach it in its uncultivated form. It has been said that alfalfa roots are the breathing pipes of the soil, and this is true of any other heavy rooted, hardy crop.

These thoughts come to me following a recent visit to the Belle Fourche Irrigation Project, which is being constructed under government supervision, in South Dakota, on the line of the Chicago and Northwestern Railway.

This particular tract, which will comprise about 100,000 acres when completed, possibly slightly in excess of that, may easily be described by that well known phrase, "A Wonderland in the Northwest."

To one who is unacquainted with the agricultural

possibilities and growth of South Dakota and other states where irrigation is practiced, this district will be full of interest, and our intention is to describe as clearly as possible this particular area with a view to assisting homeseekers who contemplate moving west.

There is nothing more fascinating than the opening up and developing of a new country, especially when that country is fertile, has productive soil and is rich in other natural resources. Those of us who have had some part in the transformation of such a country from its original state of wilderness to the modern dwelling place for man are indeed most fortunate.

Many reclamation projects are now being worked out by the Government and through private or state enterprise in various parts of the country; but it is safe to say that the Belle Fourche project now being developed by the Reclamation Service, under the direct supervision of Mr. Raymond F. Walter, engineer, is one of the cleanest and best planned projects in the entire western country.

Immediately following the passage of the Reclamation Law, Mr. Newell, Chief Engineer of the Reclamation Bureau, sent engineers of known ability into various sections of the country with instructions to secure data which would be available in the selection of desirable locations for irrigation development.

Mr. Walter was sent into South Dakota. He was instructed to examine carefully all feasible localities and report to headquarters. After the careful study of the situation he ad-

vised his superiors that the Belle Fourche project presented the best available features in the state, taking in some 100,000 acres of irrigable land.

This project lies in a territory east and northeast of Belle Fourche, extending altogether about thirty miles eastwardly from that town, and what is known as the North Canal extends about twelve miles north and thirty miles eastwardly in its different windings from that center. The land lies from fourteen to thirty miles north from the Black Hills.

There are 152,000 acres of land included in the Belle Fourche project, 100,000 acres of which is irrigable, the balance is rough land, river bottoms and creeks and other stretches, which are overflowed by the river in flood time.

Of the irrigable land 50,000 acres is deeded, 45,000 acres government land, subject to homestead entry



No. 1. Raymond F. Walter, Engineer in Charge, Belle Fourche Project, Belle Fourche, So. Dak.
 No. 2. Walter W. Patch, Resident Engineer on the Belle Fourche Dam, Orman, So. Dak.
 No. 3. O. T. Reedy, in Charge of Construction of the South Canal and Whitewood Syphon, Vale, So. Dak.
 No. 4. W. W. Schlecht, Snoma, So. Dak., Resident Engineer Constructing the Belle Fourche Syphon and Tunnel.

only, and 5,000 acres is state land, which will be sold to settlers under a law passed by the state legislature requiring the sale of the land whenever water is ready.

The deeded land is owned mainly in large tracts, and from the fact that the law does not allow over one hundred and sixty acres to be held by an individual, a great deal of it will have to be sold, and can be purchased at from eight dollars per acre upwards, the price depending upon improvements and location. The government land can be taken up in tracts of one hundred and sixty acres or under, according to the amount of irrigable land in each farm unit, eighty acres being the standard unit.

Only water for irrigable land has to be paid for. To illustrate more clearly I will say that if a man has sixty-seven acres of irrigable land he will be assessed

sixty-seven one hundred thousandths of the total cost of construction or one one-hundred thousandth for each irrigable acre, this being based on the fact that there are one hundred thousand acres of irrigable land in the tract, and on that base a pro-rata charge is made for each irrigable acre whether deeded, government or state land.

The total cost of the project will be about \$3,000,000. Therefore each irrigable acre will be assessed about \$30, divided into equal annual payments of \$3.00 per acre, per year, for a period of ten years, without interest.

The interest feature may not possibly be clear to some of our readers and I will explain that under

the Reclamation Law the bugbear of interest bearing debt is entirely done away with. The farmer who secures land in a tract developed under this law is called upon to pay only the annual pro rata cost per acre for the establishment of the plant and development of the entire project, to which amount will be added a small tax for maintenance and operation of the project during the ten years the government will retain control and operation. This tax is estimated at forty cents per acre for the first year, and will possibly run above or below that figure according to the measure of economy practiced in handling the project. The cost is, after all, in the control of the water user, the farmer himself, and will depend largely upon the manner in which he handles his interests.

The sum of \$3,000,000 includes water from ditches, also reservoir water. The estimated cost of \$3,000,000

is based on contracts already let or completed, and may vary slightly in either direction.

The laterals are constructed to each man's land, and it is not necessary, as is the case in many private projects, for the farmer to invest money to bring the water long distances from a main canal to his own farm laterals. This is a helpful move on the part of the Reclamation Service as it relieves the farmer from what would otherwise prove a hardship, as some of them would be ready to build the laterals long before others, therefore would have to build them themselves.

When this money is expended it will represent the construction of the following property:

A concrete diverting dam across the Belle Fourche River already completed at a cost of \$100,000.

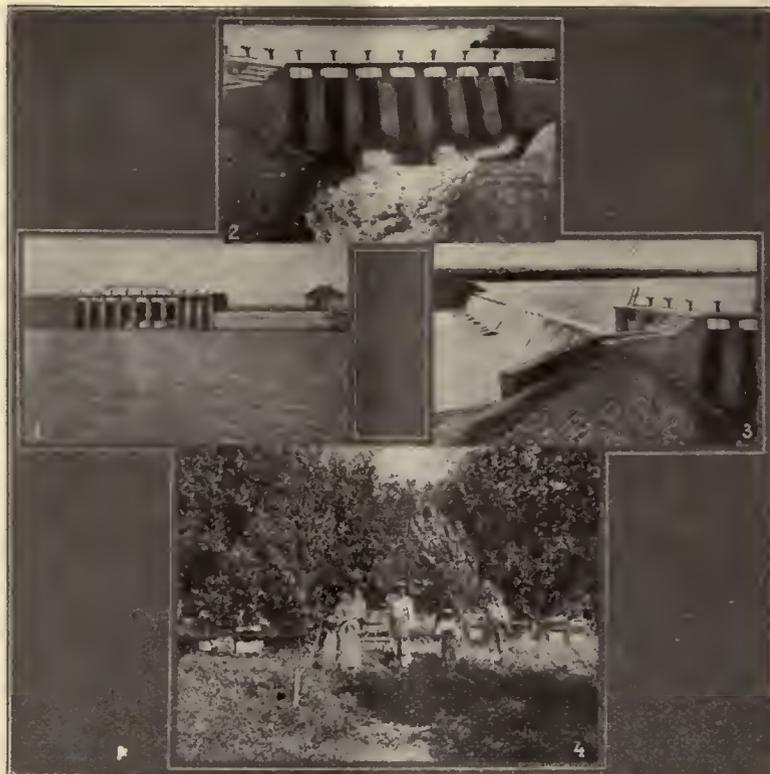
The inlet canal for delivering water from the Belle

Fourche River to the reservoir. This canal is six and one-half miles long, forty feet wide on the bottom, seventy feet wide at the water line, carrying water ten feet in depth, with a capacity of 1,635 cubic feet of water per second. This ditch and dam are completed and in use.

The Belle Fourche Reservoir which will, when full, have an area of over 8,000 acres, and a maximum depth of one hundred feet, will hold over 200,000 acre feet of water, or enough water to cover 100,000 acres two feet deep. With the present rainfall in that district, one acre foot is ample to insure a crop. The water stored in the reservoir could be divided into four irrigations of six inches;

six irrigations of four inches or eight irrigations of three inches. When it is considered that a rainfall of two inches is torrential one may readily determine the quantity that may be supplied under this project, and it is well to remember that this water is stored in a reservoir and can be taken out as the farmer needs it.

In building the Belle Fourche reservoir, an illustration of which is herewith shown, it required a dam which is the largest earth structure in the United States. It is 6,200 feet long on top, 115 feet high, in the highest place, is built of gumbo or heavy clay which is wet and rolled in six inch layers by huge steam rollers. The dam is over 500 feet in width at the bottom. The inside surface or that next to the water will be protected by two feet of screened gravel rolled or rammed into the surface, on which will be laid an eight inch concrete facing. The outside of the dam will be protected from



No. 1. View of Intake Across Back Water at North End of Diverting Dam at Low Water.
 No. 2. Regulator at Head of Main Supply Canal Through Which the Belle Fourche River is Diverted to the Reservoir and the Lands Under the Project.
 No. 3. Diverting Dam in Belle Fourche River near the City of Belle Fourche, So. Dak.; 400 Feet Long and Controls Whole Flow of River.
 No. 4. Irrigated Apple Orchard and Bee Hives on the Stearns Ranch, 7½ Miles Southeast of Belle Fourche.

the wash of rain and weather by sowing it to grass which will be carefully watered and looked after by a man employed for that purpose alone. The number of cubic yards of earth in the dam is 1,600,000. The total cost will be \$1,000,000.

The reservoir formed by this dam will have a length of over twelve miles and the width will average over three miles. Water will be backed by the dam up Owl Creek to the north and westwardly up the valley of Dry Creek. It will be the largest body of water in South Dakota as well as one of the largest in the West, and will prove a great attraction to pleasure seekers, fishermen, hunters and boating enthusiasts.

Water is drawn from the reservoir into two canals through concrete conduits or arches. These conduits are of peculiar construction, and we had hoped to be able to clearly illustrate them but were unfortunate in the matter of securing clear photographs.

One canal known as the North Canal, extends north and northwest from the reservoir and will irrigate some 65,000 acres of land. It is forty-five miles long, twenty-eight feet wide on the bottom and carries water seven feet deep. The other, known as the South Canal, runs to the south and southeast from the reservoir, is eighteen feet wide on the bottom, carries water five feet deep and is also forty-five miles long. This canal will irrigate 35,000 acres of land. The water in this second canal is carried south of the Belle Fourche River and across the bottom lands of that river in

a siphon six feet in diameter. The siphon is very strongly constructed and it is safe to say is one of the best that has ever been built in an irrigated country. It is 3,800 feet long and the water will go through the pipe and under the river with a velocity of ten feet per second. The pipe is built of steel and concrete, the steel frame being first built and then surrounded by an eight inch shell of concrete. Three miles below the siphon it was necessary to build a tunnel through a shale hill some twelve hundred feet long. This work is nearly completed and is being lined with concrete. The concrete is laid in the tunnel and filled in around the slope and top by means of a collapsible steel frame which is something new in work of this character.

The contractors on the work were particularly fortunate in finding good water by drilling artesian wells. One well was sunk 1,407 feet, which flows about sixty

gallons per minute, with a temperature of ninety-four degrees. Four wells are sunk at different points on the work.

In order that settlers may be properly instructed in the art of irrigation and may be taught what is necessary in the way of cultivation and the laying out of land to insure good crops, the Department of the Interior is co-operating with the Department of Agriculture and a quarter section of land has been selected by the latter department as an experimental farm. About one half of this land will be irrigated and the other half will be above ditch so that experiments may be made along the line of both irrigation and dry farming. This will be of inestimable value to the settlers. A considerable portion of the irrigable land has already been put under cultivation and a good sized tract of the land will be

used for experiments in forestry. A wide variety of trees will be cultivated on the land set apart for this purpose with a view to demonstrating what trees are best suited for this particular locality. Both the agricultural experiment station and the forestry division will prove of great assistance to all of the settlers and is a worthy move on the part of both the Interior and Agricultural Departments.

Belle Fourche, the town in which is located the head office of the engineer, is situated at the junction of the Belle Fourche and Redwater Rivers, ten miles east of the Wyoming line and thirty miles from Deadwood and Lead, the home of the greatest gold mine in this

country. The town has a population of 1,800 people, and contains a number of substantial stone and brick business blocks. It draws trade from a territory reaching out a hundred miles to the north and northwest. All lines of business are fairly well represented and there are fine openings for business men as a result of the rapid development of the surrounding country. For a number of years Belle Fourche has been the greatest cattle shipping point in the world, as many as nineteen trains of livestock having been shipped from that point in one day.

Thousands of horses and sheep are also shipped out every year and judging from the appearance of the horses in Belle Fourche and throughout the entire valley, one would judge that there must have been some splendid blood imported into that section years ago.

As indicating the extent of the sheep industry in



No. 1. A bunch of cattle passing through Vale, S. D., en route to summer range.
 No. 2. Government freight train passing through Vale, S. D., en route to Standing Rock Agency.
 No. 3. Street scene in Vale, S. D., showing bank.
 No. 4. First residence erected in Vale, S. D.
 No. 5. Bridge over Belle Fourche River, near Vale.
 No. 6. Bear Butte, near the Ft. Mead Military Reserve, and adjacent to Belle Fourche Project.

that section, it may be stated that during the year 1907 one and three quarter million pounds of wool were shipped from Belle Fourche.

A good grade of coal is mined in Wyoming just across the state line about eighteen miles west of Belle Fourche. These mines are directly reached by rail and there is therefore an abundance of fuel.

Lumber is shipped in from the Bear Lodge Mountains in Wyoming and a good grade of lumber can be purchased for about \$24 per thousand. A good quality of building stone is quarried near the town of Belle Fourche, and a number of the best business structures have been erected from this stone. Belle Fourche has a fine \$25,000 High School building, which was constructed of this material.

There are four churches and five different church organizations.

At an early day, no doubt, new towns will be established at different points in the irrigated area.

The government will try the experiment of building a town, and land has already been segregated for that purpose. This townsite lies immediately in the center of the project, east of the reservoir and north of the thriving little town of Vale, which is on the south side of the Belle Fourche River.

There are many finely developed farms around the town of Belle Fourche and some of them have been developed without irrigation.

One farmer who is located about five miles from the town of Belle Fourche testified recently that he

had been farming more than two hundred acres of land for the past seven years and during that time his wheat had averaged twenty bushels per acre, oats forty bushels and barley forty-five bushels, without irrigation. He has a steam threshing outfit and breaks and plows with horses, milks a number of cows, makes butter and he and his family made a visit to Europe during the past year. This would indicate that there are plenty of opportunities open for the settler under what is known as "dry farming" and this land can, no doubt, be secured at a very low price owing to the fact that no expenditure will be necessary other than the clearing and breaking of the land and fitting up a dwelling and other farm buildings.

The soil under the Belle Fourche project is what is known as gumbo. This is exceedingly rich ground. Soil experts from Washington state that it is, without

a doubt, as strong and productive soil as is to be found in the United States.

All farmers locating under the Belle Fourche project or in that vicinity may be sure of a good market, as they will supply the great mining centers of Deadwood and Lead and other mining towns. It is a well known fact that the mining regions are considered the best of all markets for agricultural products. High prices usually prevail in the mining districts as the result of there being no cultivation of the soil in the hills and mountains and there is a uniformly ready cash market. When it is considered that Deadwood, long noted as a mining center, and Lead, the home of the Homestake Mine, are less than thirty miles away, it may be readily seen that farmers will have little difficulty in disposing of what is known as farm truck, and there is always an outside market by rail for the heavier farm crops.

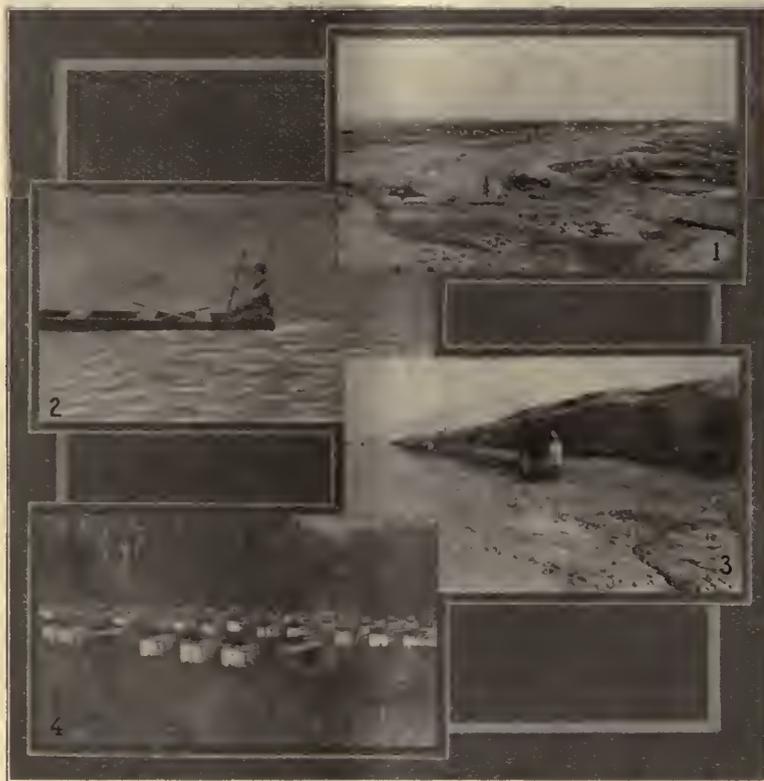
Reports on the project from an engineering standpoint will appear in our issue of August.

WAYSIDE NOTES.

THE IRRIGATION AGE has, from time to time, seen fit to criticize certain features of the Reclamation Service, but this recent visit made by the editor to the Belle Fourche project, whereby he came in contact with the engineer in charge, Mr. Walter and Messrs. Schlecht, Patch and Reedy, his able assistants on the work, (Mr. Schlecht being in charge of the Siphon and concrete work, Mr. Reedy of the office at Vale and Mr. Patch engineer in charge of work on the dam), clearly in-

dicates that these are all kindly disposed, courteous gentlemen who are willing to give assistance in every way to those who are studying the project. The rank and file of the Reclamation Service is composed of men of more than ordinary ability and education.

It was our intention to present to our readers a clear picture of the United States ferry boat which plies between the banks of the river at what is known as the Siphon Camp, and a dim outline is shown by the accompanying half-tone. This boat was evidently prepared hurriedly out of cheap lumber and is known in our part of the country as a scow. The writer was invited to cross the stream in it with Mr. Walter and Captain Schlecht, who manipulates the only paddle which the boat possesses. The other two shown in the picture are what are known as "near paddles." In view of the fact that the Belle Fourche River was in flood at the



No. 1. Great earthen dam at Orman, S. D.
 No. 2. U. S. ferry boat, "James Rudolph Garfield," with Capt. Schlecht at the wheel.
 No. 3. Building of the South Side Canal.
 No. 4. A bunch of beehives on the Stearns Ranch, near Sroma, S. D.

time and running a fifteen mile gait with ripples, the ride was exciting to say the least. Mr. Schlecht insists that THE IRRIGATION AGE turned white about the gills. It was decided on the way over to christen the boat and it was a question whether to call it "The Mary Jane" or the "James Rudolph Garfield." "The Mary Jane" was the choice of one of the party but it was finally decided that "The Garfield" would be an appropriate title. We would suggest to Secretary Garfield that he time his visit to the Belle Fourche project so as to reach there when the river is in normal flow. The passage of the stream in flood in a boat of this description is really dangerous and it is surprising that some serious accident has not resulted from its use. The means of transportation across the stream by this boat is all the more surprising in view of the fact that all of the work of the Reclamation Service is usually of a very high grade. This make-shift affair, however, may possibly be considered good enough to use during the short period when the river is in flood. When the stream is in ordinary flow it is forded at this point. We are presenting some illustrations of the Siphon Camp in this issue.

Some difficulties were encountered in the development of this project as might well have been expected. One feature of more than ordinary moment was the fact that contractors who bid on such work as the tunnel and some other specific sections of the project were inclined to hold the Government up. This was particularly true in the case of the splended tunnel which is almost completed. Bids asked for the tunnel were so high that the engineers decided to do the work themselves, and a saving of something like sixty per cent or better has been made under this plan. This particular case illustrates the good judgment of the engineers in charge, and of the chief engineer, Mr. A. P. Davis.

It was surprising to the writer to note the large number of new homes which have been erected and are in course of construction over the entire Belle Fourche district. It is safe to say that the homes on the north side of the river along that land which will receive the first water from the reservoir, are as numerous as will be found in any well developed farming section of Illinois or Iowa. In fact, it seems that there are more buildings than are to be found in the older states owing to the fact that the farm unit is eight acres instead

of one hundred and sixty and three hundred and twenty acres as in the older states. Some really ornate homes have been erected on the tract by people who were formerly ranchmen and have disposed of portions of their land, thereby securing means with which to erect commodious and comfortable residences.

As will be seen by some of the illustrations, it would be difficult to find more delightful farm features than may be had in the country surrounding Belle Fourche, and on the project which bears its name. Long stretches of well cultivated land are to be seen on all sides of the town of Belle Fourche, which show thrift and plenty. The roads are excellent, in fact this soil packs so as to make a driveway equal to macadamized streets in the city. All through the valley, cottonwoods and other native trees thrive luxuriantly. All of the

homes which have been established for any length of time are surrounded by hardy trees and give evidence of thrift and prosperity.

In discussing the matter of the colonization of the Belle Fourche project with Engineer Walter, I asked him what, in his opinion, would be a safe sum of money for the colonist to bring with him in order to establish a home without too severe hardships. He stated that their line of action had been in the direction of advising prospective colonists to come prepared for say six months or one year, until money crops may be produced from their land. This would mean about \$1,000 for an eighty acre tract, on which the first payment

would be in the neighborhood of from \$250 to \$300, and additional expenditure for modest buildings, breaking the soil, etc., \$750 or \$800.

That is to say, the colonist who arrives at Belle Fourche with reasonable equipment in the way of farming tools, and live stock, including a good team or two of them, if possible, may, by an expenditure of \$1,000 after his arrival or during the first year of his residence, become so firmly established as to be beyond the possibility of want or worry. These are facts which should be carefully considered by those who contemplate settling in the west. One thousand dollars may appear to be quite a sum of money, but it can be very advantageously and profitably used in the development of a farm and the upbuilding of a home. A man could undoubtedly make a go of it on half that sum but it would require skimping and trimming and subject the settler



No. 1. Belle Fourche Project potatoes just after irrigation.
 No. 2. View showing a series of 20-acre tracts farmed profitably near Spearfish, S. D.
 No. 3. Sugar beets and onions irrigated.
 No. 4. Berry patch near Belle Fourche, irrigated.

to many grievous inconveniences which could be overcome by augmenting his "pile" before leaving the east. There could not, by any possibility, be a better investment than an expenditure of \$1,000 in the upbuilding of a home under this project. Success is assured wherever the individual settler is industrious and thrifty.

The land embraced within the irrigated territory of the Belle Fourche project is mainly what is known as gumbo, of a fertile character. Along the river bottoms soil is quite light and sometimes fairly sandy. Again it is a heavy clay loam, lightened somewhat by the slicken and silt deposits of the river during overflow time. The river bottom land is exceedingly rich, but has the disadvantage of being difficult to drain and the farmer who does not clearly understand the application of water to the soil is likely to over-irrigate. There seems to be no difficulty at all, so far as the writer has been able to determine, in the matter of alkali. There is possibly a trace but there is nothing to indicate that settlers have anything to fear from that source.

There is no doubt in the mind of the writer that land and water which may be secured now under the Belle Fourche project at \$30 per acre, or a little in excess of that, will easily command \$100 per acre at the end of five years, and if put out in fruit and other good paying crops it is likely to exceed that sum.

I noticed on the way from Belle Fourche to Vale a farm owned by a Mr. H. M. Stearns. This is a beautifully situated farm and has been worked by Mr. Stearns for many years. His total acreage is three hundred and twenty.

He has on the home place an artesian well which has force enough to operate a motor, which in turn supplies power for a dynamo, and from that he is able to light all of his barns and sheep pens as well as his home with electricity. It is somewhat surprising to go into a long line of barns and pens for sheep and find them nicely wired and lighted by electricity. Mr. Stearns has recently sunk another artesian well on his land which has a flow sufficient, with proper care, to irrigate one hundred and sixty acres of land. This is an unusually strong flow, and his experience in the art of sinking artesian wells has demonstrated to the other property owners in the valley near Snoma the possibility of securing a steady flow of water which has sufficient force to produce power for lighting their

property. Mrs. Stearns informed me that her washing machine and other household machinery were operated by electricity, thereby saving much time and labor. We are presenting to our readers an illustration of an apiary located in the orchard near the Stearns home. This is a thriving colony as may be seen from the photograph and is a large money producer. The bees make great quantities of honey from the blossoms of the alfalfa, of which there are hundreds of acres in that vicinity. In fact, alfalfa seems to do remarkably well in the Belle Fourche country.

Other farmers throughout the Belle Fourche district are going in for fruit, and those who have gone about it intelligently and have taken care of their orchards have been very successful along that line. Their ready market which has been mentioned in the preceding pages, with high prices for fresh and early fruit, makes this class of farming particularly profitable.

In our illustrations of the large earthen dam it will be seen that this work is about one-half completed, and it is difficult at that stage of the operations to secure a photograph which is comprehensive and clear enough to fully define the outlines and finished appearance of the work. A few months later we hope to secure photographs of the completed dam, and they will be reproduced in the columns of THE IRRIGATION AGE for the benefit of our readers who are interested in this particular project.

We are showing in this issue a photograph of the screening apparatus and crusher which produces the material used in the construction of the siphon at the Siphon Camp in the Belle Fourche project. The engineers were particularly fortunate in locating a deep pit of gravel near this camp and by the purchase and construction of the apparatus illustrated have saved large sums in the cost of construction of this part of the work. In fact, it would appear that splendid judgment has been exercised in developing such equipment whereby money is saved and work facilitated.

In reply to an inquiry made of Mr. Walter, engineer in charge, concerning the matter of crops, etc., and other information which would be valuable to prospective colonists, he furnishes us the following replies:

"The crops that can be profitably grown are all kinds of grain, potatoes, sugar beets, alfalfa, hardy fruits



No. 1. View of east portal of the tunnel ready for concrete lining.
 No. 2. View showing forms in place for lining big tunnel with concrete.
 No. 3. Interior of 10x9½-foot tunnel, 1,310 feet long. Driven for \$1.60 per cubic yard, or \$8.00 per foot.

and garden truck. Wheat grass or the native hay also produces an abundant crop when well watered and sells for a high price.

"The lands are free from rock, gravel, or excessive sand, and are from very flat to quite rolling, so the settler has a chance to choose the lay of land he desires, as the soil is all good, that south of the river being a sandy loam and on the north shading into a heavy clay, but all very free from alkali or injurious salts.

"The lands partly belong to the public domain and partly are deeded lands. The public lands can be secured as homesteads by the settlers and requires a continuous residence of five years. The average irrigable area of these homesteads is eighty acres.

"The deeded or private lands can be purchased at from ten dollars per acre, up, according to location and improvements. This price increases very fast as the time draws near for the water to be ready for the different lands.

"The cost of water under this project will be about \$30 per acre, divided into ten annual payments of about \$3 per acre per year, without interest, and is only the exact cost to the government. The first payment becomes due in the fall after the water has been delivered for the crop. An annual maintenance and operation charge of forty or fifty cents per acre is also necessary and is due April 1 of each year.

"The land when in cultivation will be worth \$75 or \$100 per acre, and the crops produced will no doubt pay a good interest on this amount. An excellent chance for a man to secure a good home and pay for same from his crops.

"The markets are first class, as the mining towns of the Black Hills grow no crops and are within wagon haul, although the Chicago & Northwestern railroad connects the project with Deadwood, Lead, Omaha, Sioux City, Minneapolis and St. Paul.

"The climate is good, there being very little snow or cold weather during the winter, while the summers are pleasant and the nights always cool. The temperature seldom reaches 100 degrees F. in the summer and is below zero only a very few days of the winter. The atmosphere is very dry and the health of the community is always good.

"The elevation of the lands is from 2,700 to 3,000 feet above sea level. The country is well supplied with excellent schools and churches. The principal towns

adjacent to or on the project are Belle Fourche, Sturgis, Whitewood and Vale.

"The project is about half completed. The water has been furnished to about 12,000 acres this spring, and this irrigable area will be increased each year as the works are completed.

"The chances that a beet sugar factory will be built in this territory in the next year or two are extremely good, as the capitalists have reported very favorably on this proposition.

"In selecting an irrigated farm the priority of water and the water supply are too often passed over lightly by the prospective settler, who, after location, finds his crops burning up and no water in his canals or for him in the river. The Belle Fourche project has the first right to water on the Belle Fourche river and

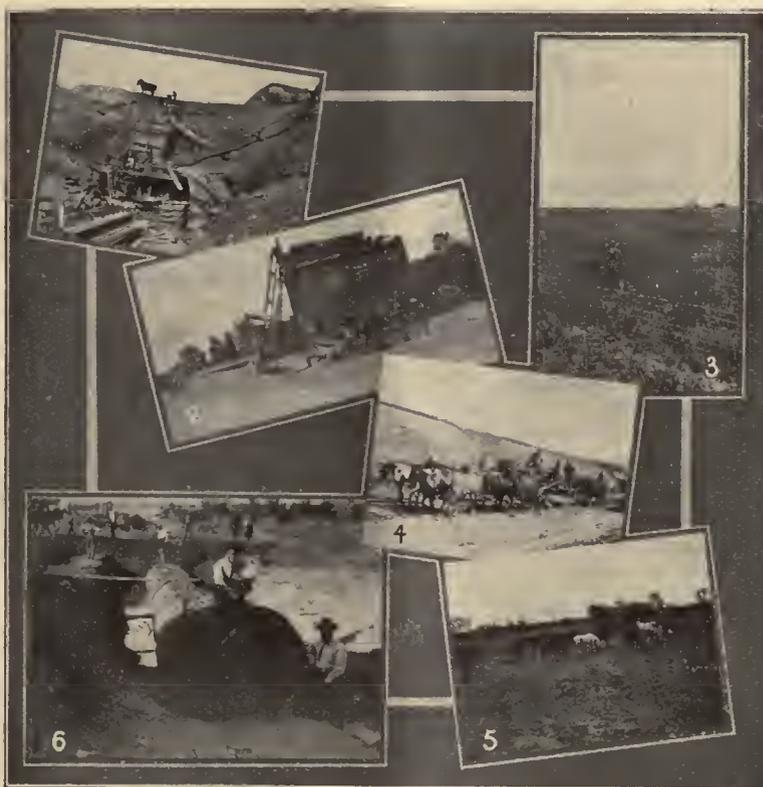
a right to all the water flowing in the river at the Diversion Dam at any time. There are several old canals taken out of the Redwater river and Spearfish creek, which streams are branches and feeders of the Belle Fourche river, but none have been taken from this river direct until this project was begun.

"The average run-off of the Belle Fourche River at the Diversion is 400,000 acre feet, which is sufficient to fill the reservoir twice each year if necessary. It is safe to say that \$1,000,000 worth of water has been running to waste down the Belle Fourche every year, that is that \$1,000,000 worth of crops will be provided on this project every

year with the water heretofore gone to waste. This figure will be doubled as soon as the land becomes highly developed and the feeding and dairy interests are taken up."

In looking over the Belle Fourche Valley the writer was impressed with the fact that there are great prospects there for development along the line of dairying. The native grasses are particularly good for beef making and the combination of the native grass fed with alfalfa should produce an ideal condition for the dairymen.

Another feature which attracts general attention is the fact that sheep and cattle which have been raised in the valley in the past were all shipped to Colorado and other points for fattening, and the Colorado feeders have, as a rule, been making a long margin out of this end of the business. The general impression seems to be that sufficient feed may be raised around Belle Fourche.



No. 1. West entrance to tunnel.
 No. 2. Rock crusher and mixer, for concrete used in construction of syphon.
 No. 3. Distant view of experimental farm building.
 No. 4. Heavy ditch work.
 No. 5. Mules and horses engaged on work taking their Sunday rest.
 No. 6. View of syphon, as it is nearing the river from the north.

The Art of Irrigation

THE FIRST MISTAKE

By T. S. VAN DYKE

About all you know at first about irrigation is that it will cost too much to imitate rain. From which you quickly drift to the conclusion that the next best plan is to cover the ground with a sheet of water. You have a piece that looks very level and turn on a stream. But instead of spreading out it slides off to one side, or collects in little pools with sloughs between. Or it may dish in the center cut, or from a ridge and slide off both sides. In any case it is likely to leave many dry spots and their combined area will probably be too great to be ignored. Three solutions soon suggest themselves.

First to keep the water on long enough to allow the dry places to get wet by water soaking to the sides from the wet spots. If the dry spots are small and you are merely testing the fertility of the soil or in haste to get a few radishes or something of little value this may be the least objectionable of the three for it may not have the water too deep or muddy unless you purposely make it so.

Number two, a special favorite with most tyros, consists in shoveling off the bumps while the water is running and throwing the loose dirt into the water in the low places. When the water goes down you find your uneven shoveling has tripled the number of bumps, and though none are as high as before they are still high enough in spite of the fact that you have raised the low places. And in the low places you have doubled or tripled the thickness of the paste that will bake under the hot sun and which, without your filling, would have been thick enough to stop many kinds of seed and sicken most of the plants that were strong enough to push through it.

Number three is a very choice method devised by those who discover the bad features of the other two. It is simply throwing up a levee around the piece high enough to raise water over all the high spots. You find it would not pay to shovel them off on a tract of any size even if you could do it and also that increasing the quantity of water merely makes it cut more in the low places. The obvious thing is to back it up so as to cover. This is the origin of the "check" system, one of the leading systems of the world and one quite indispensable for many kinds of work. They are called "basins" by some; "borders" from the levees by others; "plots," "pans," etc., but "check" is the most common in all sections. "Basin" really belongs to a modified form in which only a part of the ground is wet instead of the whole.

Divide the engraving herewith into four equal parts with a line through the middle each way. It is from a check full of alfalfa and oats planted October 15, 1907, with oats ready to cut April 1, 1908, for hay. The lower right hand quarter and part of the lower left show the ruinous effect of flooding, temporary in the case of the alfalfa which will outgrow it and make a heavy stand in summer. But the oats while

struggling to overcome it can not get out in time to amount to anything before hot weather.

On the left, both above and below, both oats and alfalfa, for some reason hard to understand, are coming out in good shape though only twenty days before they were as bad as those in the right foreground. The soil and all other conditions seem exactly the same, and, as the check is level on the bottom, the water was the same depth.

The upper right hand quarter shows the oats on the levee which are four feet high very thick and indicate a crop of fifty bushels per acre if allowed to stand for grain. The levee is about twenty inches high and ten to twelve feet at base. The line of flooding shows plainly at the base where the oats run out to nothing. One would at first suppose this was due to the levee being made of top soil scraped from the bottom. But there are fifty-six checks like this in this tract and the same flooding line is just as plain everywhere on all of them. It seems plainly due to the packing of the soil, but that is not all of it. Next fall when the alfalfa covers the whole ground so as to shade the young oats from the hot sun I will drill this again with oats right in the alfalfa and where the ground is now so bare the oats in spring will be as large as on the levee now. I am not guessing at this for I have done it several times.



A Check of Alfalfa Partly Ruined by Flooding.

About four-fifths of the whole tract is damaged like this foreground, but in spite of that flooding is the proper method as will be explained later.

Your selection of method number three may be very bad as many plants cannot endure it no matter how well done. But assuming your choice all right you are quite certain to have grief in its details. The temptation to make the levee out of wet mud instead of waiting for the soil to dry after your first failure is quite irresistible when you are in haste to see something green or get a bite of fresh vegetables. On many soils such levees melt like mush when the water gets a few inches deep and nearly all your attempts to repair them result only in more mush, more muddy water to form a paste inside, and final breaking in spite of you when the water is high enough.

If you wait and make them of dry soil you are quite apt to make them too thin, too loose with weeds, sticks and grass that may lead a small thread of water through, and so low that if the check is of any size the waves from the first wind will breach it. If your ground is so flat that a low, flimsy levee will suffice to hold water long it will probably mean that your ground generally is too flat for easy drainage and that the building of proper drainage ditches should precede any irrigation. For on many soils and for many plants

a quick clearance of the water after being on long enough is essential. But you will naturally leave this discovery until after wasting a lot of time wondering why your stuff doesn't grow better.

Assuming that your levees hold and you have the highest points covered and some crop started you may be surprised to find plants doing best on the highest parts. On the lowest parts they may not even have sprouted, being locked up tight under a blanket of paste. And even on the highest places they may look bad. It does not take you long to discover that the deeper the water the worse the results. This is due to some extent on most soils by the greater pressure tightening the soil and also to handling the water in such a way that it is muddy instead of clear, when the deepest parts get the most mud. Later on you may find that you have been wasting one-half or two-thirds of the water, because if the highest parts got enough to make a good growth of vegetation it is quite probable that the lowest parts had too much. From which you finally conclude that the whole should be graded down to a more uniform surface. A very sage conclusion, but you have little conception of the distance you are from the profitable part of its realization. You are quite apt to think that you have a fine eye to tell a level. But let me tell you that the longer a surveyor uses a fine level the more certain he will be to rely on the telescope and rod instead of his eye. There is but one thing of which you may feel sure, and that is that when you are looking toward high mountains a level on the plains below will look down hill and a ditch running out from a canon will seem to run up hill.

Relying on your eye you are quite sure to overlook such little trifles as a swell of two or three inches if it is broad enough. Or if you notice it you are quite likely to say it will amount to nothing and that the water will go over it anyhow. Still more certain you are to do this if the swell happens to be at the upper side where the water is delivered so that it will have to go over it to get into the check at all. This latter conclusion is all the worse because as long as the ground is bare it may be correct or nearly so. But when covered with a heavy stand of vegetation like grain or alfalfa it may collect all floating leaves or rubbish on its upper edge and throw the water off on the sides leaving a spot too dry when the rest of the field has enough. And in time this may become worse instead of better, the water swinging farther away and wasting in the lower places that would have enough without it. And this you may not notice until the growth become too valuable to change. This may happen when you are well aware of the necessity of perfect grading, for one is often inveigled into the snare through haste or anxiety to see something green. I have thirty acres of alfalfa scratched in hastily to get green pasture for the horses six years ago, although I knew better twenty years before that. It is the bane of my existence now, taking fully twice the water and work required by other tracts properly graded, yet paying too heavily to plow up. California is full of orchards in the same situation for it is about equally bad under all methods of applying water. You may be fortunate if right here you make the worst sort of a failure. For in no other way can most people be made to understand the supreme im-

portance of proper grading. Those who have been through the torment may talk and talk in vain. You will insist that the ground looks all right and is all right when nothing but the level, or leveling by water itself can tell you whether it is or not.

Proper grading is no serious matter if you only realize its importance at the outset and determine to allow nothing else. You do not have to make any large area flat or anywhere near it. But in whatever way you handle the water it should travel at a uniform velocity whether the head of water be large or small or whether it is to run a long time or a short time. And this does not have to be on one face or plane so as to shave off too much top soil. Even a small place may be laid out on several planes so that it can be evenly flooded, and, though in a certain sense this is like terracing, it may be quite free from the expense of terracing such as one commonly sees on hillside gardens.

In a book of this size it is impossible to go far into the subject of grading because it will vary so much with the area to be graded, the quality of the soil, the kind of vegetation on it and so many considerations. On the Mojave Desert in California I sweep brush, hillocks and everything with two large railroad bars slightly curved so as to keep the cutting edges down. One is set behind the other with strong chains and five or six horses are put on each end. With that power and two drivers I don't have to plow at all. Nor do I have to plow in making the checks. I first set four level stakes with the telescope and move the earth above that level with a carrying scraper and four horses abreast direct to the levees. The soil is so dry and loose that this is very easily done. The work is finally tested with water and then polished off with a grading machine when dry. Plowing, when unnecessary, is a nuisance because it increases so much the bulk of the soil that it is harder to work to the grade stakes.

But this would not do for many soils, while for small areas it might not pay to have such an outfit. A drag with a cutting and carrying edge is often better than the railroad iron if brush is not too heavy. But it should be so long and stiff that it will not climb bumps and sink into depressions, but shave the bumps and drop the shavings into the depressions. This should often be forty feet long and loaded with sand bags so as to take a dozen horses or more. No kind of a gouging scraper such as the common "slip scraper" will do good work, though on a small scale fair work may be done with the "buck scraper" by an expert. It may pay you at the start to have a good road grader, while for small garden work you had better grade with shovel and hoe than not at all. When you thoroughly realize its importance you will find a way to do it according to the size and quality of your soil, the value of your crop and the balance in bank. And beware how you try to economize on it for every dollar you save may cost you two or three without your knowing it.

You can now buy a fair level for twenty dollars, though you had better pay twice that. Its use is no such great trick as is commonly imagined. Any boy or girl of fifteen can soon learn to use it well enough and so can any man, no matter how old, if he can add and subtract two figures. No irrigated ranch should,

under any circumstances, be laid out without it, and if necessary neighbors should club together and buy one. For small work a carpenter's level fitted with fine rifle sights does fair work if the rod is not over twenty feet away. Errors will amount to nothing if distance of the rod is reduced to ten feet as most of them will balance each other. Instead of having a rod reading in feet and inches, or feet and tenths of a foot, have it all in inches. The elevation of the telescope will average about four feet above ground while the variation of levels will not be over two feet. A rod with the figures starting at three feet above ground and running to five feet will thus give you twenty-four inches which can be marked off in ink if you have no black paint handy. The remainder of the problem, after adjusting the telescope, is about as intricate as going up town with twenty-four cents, buying a five cent cigar, finding a dime and then figuring out your balance in pocket. There is absolutely no excuse for neglecting it because you can't afford to hire a surveyor and have on your tongue's end the old stock lie "can't teach an old dog new tricks." Maybe you have seen the man who can't write his name. His excuse is "didn't have no schoolin'." The combination of nine letters that make up John Smith is entirely too great for him. But he has not the slightest difficulty with the thirteen cards that make up a suit and the combinations that make a poker hand. Don't imagine you can't run a level because you did not go to a polytechnical school. Get one and don't lay out a ditch or a bit of land without it. Leveling by the water is too slow where the soil takes much time to dry. The carpenter's level on a beam to be dragged around or an upright on the beam with a plumb bob hanging from it, or the plum bob hanging from the top of a big triangle will do fair work on a small scale, but for work of any size the telescope will soon save you in time and bother all it costs to buy and learn to use it.

Supreme Court Decisions

Irrigation Cases

"ABANDONMENT."—

The term "abandonment" as applied to water rights is applicable only to completed appropriations of water, and not to a case where the claimant never acquired a fixed right because of his failure to apply the appropriation to a beneficial use within a reasonable time.

Conley v. Dyer. Supreme Court of Colorado, 95 Pacific 304.

ACTION FOR WATER RENT.—

In an action by an irrigation company for water rent, where there was evidence of lack of care on plaintiff's part in furnishing water, it was proper to give a charge submitting defendant's right to counterclaim for damages to his crop caused by such lack of care.

Colorado Canal Co. v. McFarland & Southwell. Court of Civil Appeals of Texas, 109 Southwestern 435.

SOURCE OF WATER IN INDIAN LANDS.—

Where complainants appropriated in Wyoming waters from a creek rising in the Crow Reservation in Montana, complainants' appropriation attached *eo instante* on the reservation being thrown open to settlement, and became prior to the rights of subsequent appropriators settling on such reservation lands.

Bean v. Morris. Circuit Court of Appeals, 159 Federal 651.

INTERSTATE STREAMS.—

Complainants, by a prior appropriation or diversion in Wyoming of the waters of a nonnavigable stream rising in Montana, acquired the right to continue the diversion of such waters as against a junior appropriator of the waters in Montana; the rights of appropriation not being affected by the interstate character of the stream.

Bean v. Morris. Circuit Court of Appeals, 159 Federal 651.

LOSS OF RIGHT THROUGH NON-USER DEPENDS ON CIRCUMSTANCES.—

What constitutes a reasonable time within which an appropriator of water for irrigation must actually apply the same to a beneficial use as against junior appropriators depends on the facts and circumstances connected with each particular case.

Conley v. Dyer. Supreme Court of Colorado, 95 Pacific 304.

DETERMINATION OF RIGHT.—

A person who, with intent to put water to some beneficial use, diverts it from a stream or other natural source of supply, and makes an application thereof within a reasonable time, has a prior right to use a sufficient quantity of water so diverted to supply his needs not to exceed the amount of his appropriation superior to the right of subsequent appropriators.

Williams v. Altnow. Supreme Court of Oregon, 95 Pacific 200.

RIPARIAN PROPRIETOR OR APPROPRIATOR.—

While the doctrines of prior appropriation and riparian rights are not so antagonistic that they may not exist in the same locality, a settler upon a nonnavigable stream has an election either to rely upon his rights as riparian proprietor or to make an appropriation of the water if it is free and subject to appropriation, and claim as an appropriator, but he cannot do both.

Williams v. Altnow. Supreme Court of Oregon, 95 Pacific 200.

DUTIES OF WATER COMMISSIONER.—

It is not the duty of a water commissioner to make any division or distribution of water between the users thereof from the same ditch, and he has no authority to interfere with the internal management of the affairs of a ditch company, though it is his duty to turn into a ditch no more water to which it is entitled under any decree than is necessary to serve the needs of the consumers under such ditch, and to refuse to turn water into any ditch for the use of one not entitled thereto.

Cache la Poudre Irrigating Ditch Co. v. Hawley, Commissioner. Supreme Court of Colorado, 95 Pacific 317.

IRRIGATION CONTRACT.—

A contract whereby certain stockholders in a ditch company sold their stock to a reservoir company, the vendors to continue in possession of their certificates, and to divert water for the use of their land to the same extent theretofore enjoyed, and the reservoir company to have the right to divert for storage and direct irrigation the difference between the quantity of water actually needed by the vendors and the maximum represented by the certificates in the priorities of the ditch, was invalid as requiring the water rights evidenced by the shares of stock to do double duty.

Cache la Poudre Irrigating Ditch Co. v. Hawley, Water Commissioner. Supreme Court of Colorado, 95 Pacific 317.

IRRIGATION COMPANY CANNOT REQUIRE UNREASONABLE CONTRACT.—

An irrigation company, authorized to exercise the right of eminent domain, engaged in the business of transporting water from a flowing river or natural stream within those portions of the state where irrigation is beneficial for agricultural purposes, which streams belong to the public under the express provisions of Rev. St. 1895, art. 3115, and furnishing it for hire to those entitled to its use, is a quasi public corporation, and cannot limit its liability to the public by requiring unreasonable contracts from those to whom it furnishes water.

Colorado Canal Co. v. McFarland & Southwell. Court of Civil Appeals of Texas, 109 Southwestern 435.

EFFECT OF WYOMING STATUTE ON APPROPRIATION.—

Act Wyo. Ter. March 11, 1886 (Laws 1886, p. 294, e. 61), provide that one claiming a water right shall file in the office of the clerk of the proper county and in the office of the clerk of the district a notice of such claim, and that in any controversy concerning water rights no evidence shall be received in behalf of any claimant until such statement or claim is filed by him. *Held*, that such act was not intended to provide an exclusive method of appropriation; its only effect being to take from an appropriator who failed to file such notice the right to claim an appropriation prior to the time when the water was actually supplied and used.

Bean v. Morris. Circuit Court of Appeals, 159 Federal 651.

APPROPRIATION OF EXPENSE OF SURVEY.—

Where the court, under section 37, Act March 11, 1903 (Sess. Laws 1903, p. 250), orders a survey by the state engineer of the ditches and canals diverting water from a stream, and of the irrigable lands thereunder, and of those to which water has been applied, and the making of maps thereof, the cost of such survey is properly chargeable to the several litigants in the case in proportion to the quantity of water allotted to each. In such case it is proper for the court to make the apportionment and order judgment against each according to the amount properly apportioned to such litigant, and it is unnecessary for any one to file a cost bill covering such item of expense.

Farmers Co-Operative Ditch Co. v. Riverside Irr. Dist. Supreme Court of Idaho, 94 Pacific 761.

DOCTRINE OF "RELATION BACK."—

Two persons began the construction of irrigation ditches before the enactment of the statute regulating the appropriating of water. One of them commenced two ditches about September 1, 1882, and September 5, 1882, respectively, and prosecuted the work with reasonable diligence to completion and the actual using of water. The other person commenced his ditch not later than October 1, 1882, and also prosecuted the work with reasonable diligence until water was brought through it. His ditch was completed before either of the other ditches. *Held*, that the one who began work on the two ditches in September had the prior right, though his ditches were not first completed, since under the doctrine of "relation back" which obtained before the enactment of the statute, as between two persons digging ditches at the same time and prosecuting work thereon, with reasonable diligence, to completion, the one who first began work had the prior right though the other completed his ditch first.

Wright v. Cruse. Supreme Court of Montana, 95 Pacific 370.

PROCEEDING TO ADJUDICATE PRIORITY.—

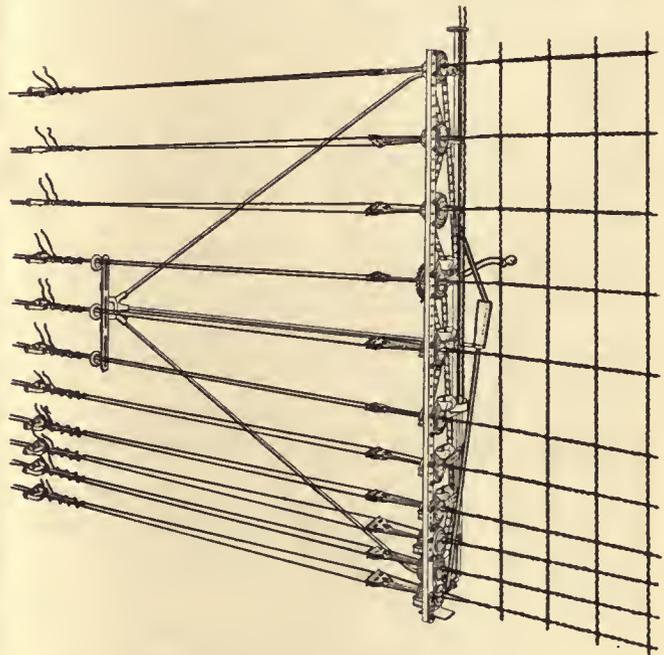
In a proceeding supplemented to an original statutory proceeding for the adjudication of water rights, petitioner alleged an additional application of water so that its appropriation then aggregated the number of cubic feet specified, and prayed a supplemental decree covering this additional application and allowing a priority therefor dated as of the commencement of its canal. Demurrers on the ground that the petition did not state a cause of action were sustained, and a decree entered dismissing the petition without prejudice to petitioner's right to institute proceedings regarding any right claimed by it, and not antedating or conflicting with any of the various rights theretofore adjudicated by the decrees in the adjudication of priorities for the use of water theretofore had. Thereafter petitioner filed another petition, all the facts of which pertaining to petitioner's right had been stated in the prior petition and in practically the same form, involving the same subject-matter and identical issues and parties, and a decree was prayed allowing a priority dating as of the commencement of its canal. *Held* that, though petitioner was given permission to bring a new proceeding to adjudicate a proper priority for such new application of water, the decree was res judicata of petitioner's right to claim its priority as dating from the commencement of its canal.

Laguna Canal Co. v. Rocky Ford Ditch Co. Supreme Court of Colorado, 95 Pacific 287.

FENCE MACHINE.

Field-built fence is acknowledged by the best authorities and all those who have given it any thought, to be far superior to any factory fence ever produced. It fits the ground exactly, and every wire sustains its exact share of the tension. The expense of weaving fence on the posts, with the Perfection Fence Machine, is very little more than the cost of erecting factory fence. By the Perfection method, a saving of 10c per rod can be accomplished, and a better fence produced.

The method is simple. The lateral wires are stretched up and fastened at the one end with an automatic ratchet tension. This device automatically allows the wire to feed out just rapidly enough to allow for twisting the cables when weaving in the stays. When the lateral wires are strung, the weaving process is a matter of turning the crank on the machine and feeding the stays into an automatic picket dropper, with which every machine is equipped. One man and a boy



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can easily build 100 rods per day, which is as much as the average two men will erect of factory fence.

Any weight of wire can be used for the laterals and stays. The stays can be set any distance apart, and the lateral wires spaced to suit conditions. If you have a Perfection Automatic Fence Machine, and a little smooth wire on hand, a fence adapted to any purpose is a matter of only a few hours.

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WHAT CONSTITUTES A GOOD IRRIGATOR.

JOHN G. HALL.

With us in Colorado, and I am told the same difficulty arises in other localities, when farming is carried on by irrigation, the question of getting a good and efficient man to spread the water is a serious one. A man possessing the knowledge, in the first place, of how to run out the ditches in a field of small grain for instance. Before he can do this he must be a practical irrigator. He must be able to know from looking at the land to be irrigated from what quarter or direction the water will come onto this elevation or that elevation, and be able to run the ditches in the field accordingly. His ditches must be run onto the high places, also have a fall of at least an inch and one-half to a hundred feet.

The old saying that water will run up hill in an irrigated country is untrue. Water can be delivered from one hill to another by means of a dyke, siphon, pipe or trough, providing the place of delivery is lower, if higher it requires pressure to deliver it to a higher point.

Great care must be taken to get the ditches where all the ground can be covered with water, also not to plow up any more crops than is absolutely necessary, keeping, if possible, the ditches along roadsides, fences, etc.

Now with the ditches properly run on a piece of ground the next question is to get a sufficient quantity of water to travel over the land faster than the spot which is being irrigated will consume it. With the water turned on it is customary to run it night and day until the field is irrigated.

In my experience I find the greatest difficulty is in finding a man that has a disposition to do the required work. What is the required work? Get up at four o'clock in the morning, go out and change the water from the place it has been running all night. Irrigate the short runs in day time, leaving the long runs for the night; shoveling out the ditch; shoveling up the ditch banks; putting in wing ditches to reach a high spot, or doing whatever necessary to improve the condition. Stay with the water until nine or ten o'clock at night, up again at four in the morning. These are the duties required of a good irrigator. A man of this type is worth from ten to twenty dollars a month more than an ordinary man, who is afraid all the time that he is doing too much for his employer.

The writer of this article has carried his blankets into the field and partially slept for a short time within forty rods of his own house so that the water could be changed every hour during the night in time of scarcity.

In conclusion I wish to say an irrigator possessing the knowledge of irrigation and the qualities mentioned above is a jewel and a blessing to his employer at almost any price.

LINING OF DITCHES AND RESERVOIRS TO PREVENT SEEPAGE LOSSES.

BY PROF. B. A. ETCHVERRY, BERKELEY, CAL.

METHOD OF OBSERVATION.

The ditches were filled each morning to a depth of 2 feet (approximately), the measurements being taken as soon as filled. Measurements were again taken late in the afternoon and also the next morning before refilling the ditches. The instrument used to take the measurements consisted of a wooden post 2 inches by 3 inches, which was driven firmly in each ditch at the south end. The top of the post was about 3 feet from the bottom of the ditch. A right-angle screw hook, with the shorter arm filed to a point, was screwed into the post. The depth from the bottom of the ditch to the end of the hook was 2 feet. This served as a guide in filling the ditch, each ditch being filled as nearly as possible up to this hook. For an exact measurement a piece of steel about 5 inches long, $\frac{1}{8}$ inch thick, and $\frac{3}{4}$ inch wide, was screwed at the top of the post and at right angles to it. This piece of steel projected about 2 inches beyond the post and its upper edge was beveled. This edge was the index from which the measurements were taken. (Fig. 14b.) The measurements being taken with a plumb-bob attached to a steel tape, the steel tape was placed next to the index and the plumb-bob lowered until the point of the bob touched the water. Accurate measurements could thus be taken to $\frac{1}{2}$ of a hundredth of a foot (.005 foot).

Evaporation.—The evaporation was determined by means of a galvanized iron tank placed at the north end of the ditches, between ditches No. 6 and No. 7. Measurements were taken in the morning and in the afternoon in the same manner as for the ditches.

From the observations taken beginning with the 23d and extending until the 28th of July, it was found that the lining of ditches No. 1 and No. 3 were entirely unsatisfactory, as the seepage in them was larger than in the earth ditches with no lining. It is probable that the water percolated through this lining and was carried away through gopher and squirrel holes under the lining. In the earth ditches gopher and squirrel holes were found, but could be stopped; but this oil and gravel mixture had sufficient strength not to break through where the holes were, and they could not be discovered.

From the observations during these few days it was found that the seepage in all four earth ditches was almost identical, so it was decided to sprinkle oil on two of these earth ditches, using in both cases less oil than was used on ditch No. 4.

The gravel-oil mixture was removed from No. 1 and this ditch was used as an earth ditch. Ditch No. 3 was not changed; measurements on this ditch were continued, but it did not improve.

The ditches after July 28 were allowed to dry and after the changes were made were in the following order:

New Order of Ditches.

No. 1. Earth (no lining).

No. 2. Heavy oil sprinkled, 2 1-3 gallons per square yard.

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1 year, and the Primer of Irrigation

- No. 3. Heavy oil and gravel, one part of oil to six parts of gravel (2½ inches thick).
- No. 4. Heavy oil sprinkled, 3 2-3 gallons per square yard.
- No. 5. Earth (no lining).
- No. 6. Thin oil, 2½ gallons per square yard.
- No. 7. Puddled clay, 3½ inches thick.
- No. 8. Heavy oil sprinkled, 3 1-3 gallons per square yard.
- No. 9. Cement mortar, 1 inch thick.
- No. 10. Cement concrete, 2½ inches thick.
- No. 11. Earth (no lining).
- No. 12. Cement lime concrete, 2½ inches thick.

The table accompanying this report (see page 414) refers to the ditches after they had been changed. The water was again turned into the ditches on August 6th, but because of a serious break in the main canal of the irrigation system, the water could not be obtained again until August 28th. Observations were

from the lined ditches with the seepage from the earth ditches, the relation is obtained by making the comparison with the nearest earth ditch.

The efficiency of a ditch is the ratio between the rate of percolation for the earth ditch and the rate of percolation for the adjacent lined ditch; or, efficiency = rate of percolation for earth ditch over the rate of percolation for lined ditch. The larger this ratio the more efficient or water-tight is the lining.

From the mean sinkage or mean percolation of the several ditches is computed the percentage of saving due to the lining in each case. This saving indicates the probable percentage of water saved from the loss which would take place if the ditch was not lined. The experimental cost per square foot of the lining is the actual cost at which the work was done. It does not include the cost of finishing and preparing the ditch for the lining. This cost was about 1 cent per square foot.

1. Table showing Rate of Percolation.

No.	Kind of lining.	Rate of percolation, in per hour for ten consecutive days.										Average	Efficiency ratios
		1st	2d	3d	4th	5th	6th	7th	8th	9th	10th		
1	Earth, with no lining .....	.029	.032	.031	.034	.032	.033	.033	.031	.032	.032	.0329	.0829 .0829 = 1.00
2	Heavy oil, 2½ gallons per square yard .....	.026	.026	.025	.023	.025	.022	.023	.024	.032	.032	.0239	.0329 .0239 = 1.37
3	Heavy oil and gravel												
4	Heavy oil, 3½ gallons per square yard .....	.022	.020	.019	.018	.016	.016	.016	.017	.016	.016	.0176	.0355 .0176 = 2.02
5	Earth, with no lining .....	.040	.036	.034	.034	.034	.035	.036	.033	.037	.036	.0355	.0355 = 1.00
6	Thin oil .....	.035	.034	.032	.031	.032	.032	.033	.030	.034	.032	.0329	.0355 .0329 = 1.08
7	Clay puddle .....	.021	.019	.018	.018	.018	.019	.017	.018	.019	.018	.0185	.0355 .0185 = 1.78
8	Heavy oil, 3 gallons per square yard .....	.024	.023	.024	.021	.024	.021	.021	.020	.022	.020	.0220	.0355 .0220 = 1.50
9	Cement mortar, 1 inch thick .....	.014	.012	.013	.011	.012	.013	.011	.012	.011	.012	.0121	.0330 .0121 = 2.73
10	Cement concrete, 3 inches thick .....	.006	.005	.004	.004	.005	.004	.006	.004	.004	.004	.0046	.0330 .0046 = 7.17
11	Earth, with no lining .....	.035	.036	.035	.034	.032	.036	.032	.032	.031	.030	.0330	.0330 = 1.00
12	Cement lime concrete, 3 inches thick .....	.010	.012	.009	.008	.011	.010	.009	.011	.012	.012	.0114	.0330 .0114 = 2.90

again begun and were taken until September 10th, a period of fourteen days.

For the first four days the results were not very uniform; probably because some of the ditches had held water much better than the others during the interval when no water was available for filling them. The rates of percolation per hour given in the table are the rates of percolation for the last ten days. This rate of percolation is computed from the readings taken each day. The seepage and evaporation for each ditch, from the time the ditch is filled to the time when the level of the water is measured next morning just before filling, give the total seepage and evaporation for that time. Subtracting from this the loss in level due to evaporation gives the loss due to seepage. This quantity divided by the number of hours in which this loss occurred gives the rate of percolation or seepage in feet per hour.

Consulting the table, it will be noticed that the rates of percolation for the three earth ditches were very nearly equal. However, in comparing the seepage

The actual cost per square foot for work on a larger scale would naturally be somewhat smaller. The cost given in the table is estimated from similar work in existence and agrees with the cost in the examples mentioned in the first part of this paper. For oil lining the cost would depend largely on the price of oil. The price assumed in preparing the table was 2 cents a gallon for the oil and 1 cent a gallon to apply it. For cement concrete or cement mortar it is customary to prepare the ditch and finish it carefully. The bottom and side slopes are made even and regular. The cost of finishing on a large scale for first-class work would probably be less than the actual cost on the experimental ditches and would probably not exceed ¾ of a cent per square foot.

For oil and puddle linings, it would not be necessary to finish the ditch so carefully. The removal of weeds may be the only preparation necessary.

MATERIALS AND COST.

Cement.—California Portland cement (Standard Brand), at \$3.00 a barrel in Modesto.

Lime.—Roach Harbor lime, at \$2.50 a barrel in Modesto.

Broken Stone.—Obtained from Folsom, Cal., at \$3.00 a cubic yard in Modesto.

Gravel.—Clean river sand, varying from 1-inch pebbles to coarse sand, obtained from Dry Creek, about three miles from the site of the experiments, at 10 cents a cubic yard. The charge for hauling to the site was \$1.50 per cubic yard.

Puddle.—Difficult to obtain. The only clay available was about three miles from the site, and it had to be dug with picks. The charge for loading and hauling was about \$1.50 per cubic yard.

Heavy Oil.—Natural crude mineral oil (10½ to 11½) degrees Beaumé, from the Sunset District near Bakersfield, Cal., containing not less than 60. to 80 per cent by weight of "D" grade asphalt. The percentage of asphalt is not always dependent on the specific gravity. With two oils of the same gravity, one may contain 80 per cent of asphalt and the other none. The oil was obtained at 85 cents a barrel (42 gallons), delivered on the site.

Light Oil.—Natural mineral oil (16 degrees gravity) containing about 35 to 40 per cent of "D" grade asphaltum. The price was 85 cents a barrel.

Cost of Labor.—All labor cost \$2.50 for an eight-hour day; one foreman at \$5.00 for an eight-hour day; and a teamster with team \$4.50 per day.

RESULTS OF OBSERVATIONS AND EXPERIMENTS.

A study of the table shows that cement concrete 3 inches thick stopped 86.4 per cent of the seepage which occurred in an earth ditch excavated in the same material. This percentage would probably have been larger had the earth been more porous; for this would make the loss in earth ditches greater, while the loss from the cement concrete ditch would probably not have been increased. This is true also, but probably not to the same extent, for the other lined ditches. However, it is quite safe to believe that in more porous or open soil the percentage saved by lining would be greater than shown in the table.

While there is no doubt but that cement concrete is the most efficient as regards seepage, it is also the most expensive, being more than six times the cost of the heavy oil lining (3 2-3 gallons per square yard), which saves 50.4 per cent of the water which would seep were the ditch not lined. This saving with the concrete ditch is 86.6 per cent, or 1¾ times as large. Where water is very valuable there is no doubt but that the concrete ditch is more permanent and economical. But where the water is not so scarce and a little waste will do no damage, the expense of lining the ditch with oil may be justified, while a more expensive lining would be impracticable.

The question will come up: "Is it economical to use oil on a ditch to save 50 per cent or less of the water which is being lost in ditches not lined?" Perhaps there is a great deal of water, and in many irrigated districts the waste of water seeping from the canals and laterals while large is small compared with the larger waste due to over-irrigating the fields and to poor methods of irrigation. These conditions will no doubt better themselves as California becomes more settled and the water is more economically used and more valuable.

THE TEMPLE PUMP.

This is an illustration of the possibilities of the flow of water that can be obtained from a well in a dry country. The owner of this irrigation plant is R. M. Wetzberger, Brush, Colorado. The engine is a double cylinder engine and a centrifugal pump manufactured by the Temple Pump Company of Chicago. This engine and pump are especially adapted to furnish a steady stream of water under almost any conditions. The engine is known as the "Master Workman" of the double cylinder type. It possesses many advantages over any single cylinder engine. It is more economical in the use of fuel. It starts quicker and easier than any single cylinder engine made. Without sacrificing durability the double piston movement does not require as heavy fly wheels, moreover, it is so designed that it does not require a heavy base to lift the wheels from the floor which greatly reduces the weight making it less cumbersome to haul from place to place. Its vibration is far less than any single cylinder, although it weighs less than half as much as an ordinary single cylinder outfit. Many engines vibrate so viciously that half the rated power cannot be used for portable purposes. This engine occupies less space than any horizontal engine and the arrangement of its mechanism enables it to be controlled from its front contributing greatly towards convenience. All lubrication is by gravity which means perfect lubrication, steady running, full rated power and wider range of speed. Its mechanism is in full view. Concealed mechanism is the worst kind of complexity often causing needlessly expensive repairs and making the simple facts of gas engine management an exasperating mystery. It is, therefore, especially adapted for beginners. The working parts of the engine being visible the owner very soon knows the purpose of each part. It is doubly more reliable than a single cylinder engine.

The centrifugal pumps made by the Temple Pump Company of Chicago cost virtually nothing as the Temple Pump Company guarantees that it requires so much less power to operate the centrifugal pump. The table of efficiency issued by its maker is proof of this claim. The table of capacity which is guaranteed by the Temple Pump Company is based on the economical capacity. Any one of these Temple pumps by running slightly faster or slower than the rated speed, pumps 50 per cent more or 70 per cent less than the rated quantity and maintains 50 to 70 per cent of the rated mechanical efficiency according to size. Note the fact that the Temple Pump Company only use two stage pumps for lifts 250 to 270 feet, which is entirely due to the superior construction of these pumps.

The above claims are made by the Temple Pump Company of Chicago, a firm now in its fifty-fifth year, which means reliability and conservatism in all statements made. The IRRIGATION AGE can vouch for the truth of any statement made by the Temple Pump Company.

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Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

Fifth—Lubrication in our engine is absolutely perfect. There is no forced lubrication, lubrication being by gravity. Certainty of lubrication is of vital importance in the steady running and operation of a gasoline engine.

Sixth—All mechanism is in full view, which will enable you to thoroughly understand the operation of a gasoline engine. The worst kind of complexity is concealed mechanism.

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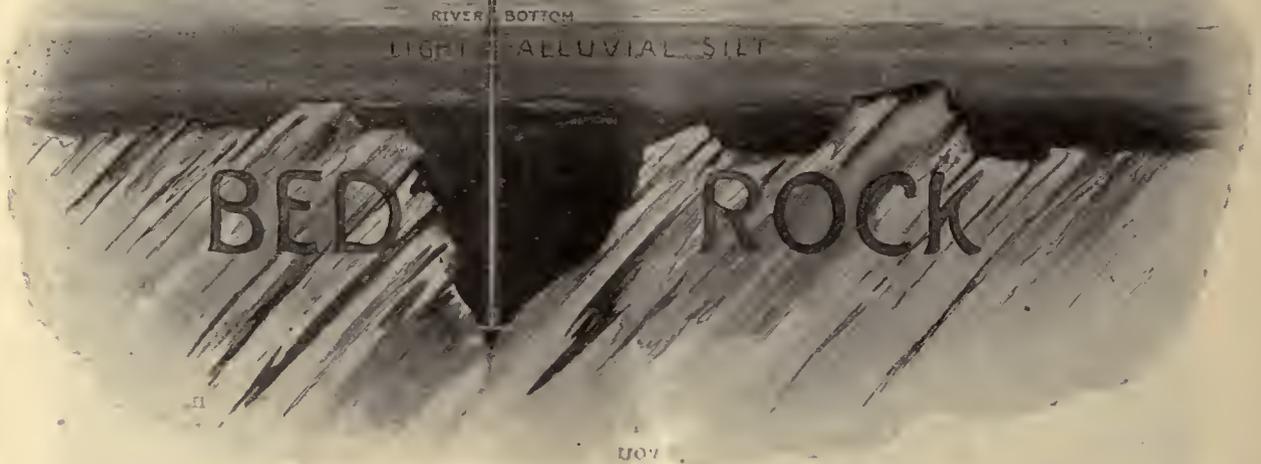
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The Pneumatic Pipe Dredge is a new, inexpensive device for dredging sand, silt, muck and gravel, or any other material or soil susceptible to rapid disintegration by the action of water under pressure.

From one to four or even more pipes can be operated from the same scow; one pump and air compressor serving for all.



Its pipe or head "jets" itself deeply into the material to be handled, breaks it up and forces it upwards through a discharge pipe by the use of water and compressed air mixed under high pressure. It is not a suction or centrifugal dredge. It is a hydro-pneumatic ram.



This shows the pipe lifting the heavy black sand out of one of nature's bed rock riffles. The precious minerals like gold and platinum have been trapped in these pockets or riffles for untold ages, but no method to recover these stored up treasures had been devised before the advent of the pipe dredge. This dredge will enter these pockets and recover the values they contain.

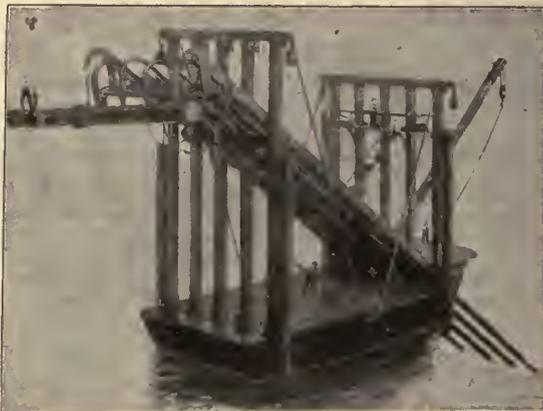
ATTENTION ENGINEERS.

It is not possible to describe this dredge nor tell of its superiority in a few words. However, IF YOU HAVE USE FOR A DREDGER, it will pay you and save you money to look into the merits of this device. It will also save time. Here is part of what Mr. M. A. Nurse, for 18 years Chief Engineer of the State of California, says about the Pneumatic Pipe Dredge.

"Beyond question, the Pneumatic Dredge embraces the cheapest and best application and utilization of mechanical and natural agencies for excavation and transmission of sand, silt, or any material susceptible of rapid disintegration by the joint action of air and water under pressure, that I have ever known through an active experience of over thirty years in river improvement and reclamation. It is simple in principle, cheap in construction, efficient in operation and must on the score of economy and greater adaptability supersede other methods in the broadest field of river and harbor improvement essential to our State and National development."

HAVE YOU DREDGING TO DO?

If you require a dredge for reclamation work, for levee building, for recovering sand or gravel, for filling, for channel or harbor deepening, for mining or for lifting or moving any class of material excepting boulders, DON'T OVERLOOK THE PNEUMATIC PIPE DREDGE.



Pneumatic Pipe Dredge, Operating by Electricity, with Four Ten-Inch Discharge Pipes. Capacity over 15,000 Cubic Yards per day.

CHEAPEST AND BEST DREDGER IN THE WORLD.

The Pneumatic Pipe Dredge can be installed anywhere within a few weeks for a small fraction of the cost of other dredges and it requires only one-fifth the labor, one-fifth the power and one-twentieth the cost of maintenance of any other dredge with similar capacity. It handles from 40% to 60% solid matter all the time and dredges handling from 25 cubic yards per hour to 20,000 cubic yards per day can be built and installed for from \$3,000 to \$25,000. There is nothing to get out of order. Anyone with common sense can run it. It is "fool-proof." Don't you think

IT IS WORTH WHILE INVESTIGATING.

One of these dredges is operating in the heart of the City of Sacramento, California, on a contract for the city. Twice in succession this dredge has been awarded city contracts on competitive bids. Other contractors could not come within a mile of the price bid for the work. Yet the dredge is making money. It is practical results like this that talk.

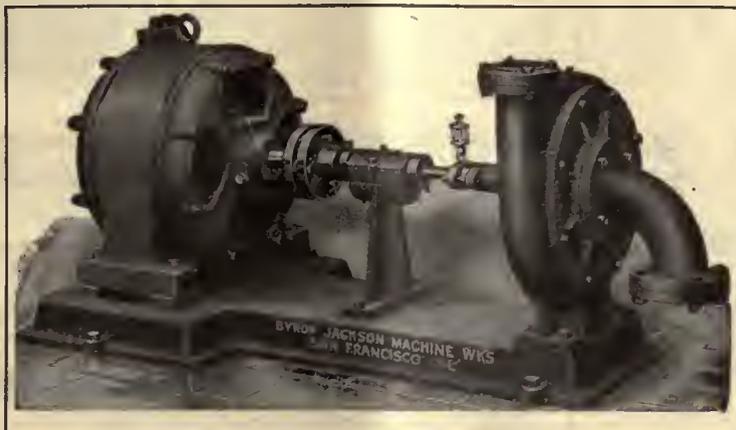
For full particulars about the dredge and its installation on a royalty basis, address

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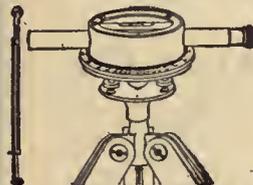
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It has been urged that conditions on Mars are too different from those we know to allow human life—though certain low forms of vegetation might preserve. But why the kind of life, human and otherwise, fitted to earthly environment should be the only variety in the universe is hard to see.

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Facts can be succinctly stated; many astronomers, perhaps most, leave them there. But others think it as much the duty of science to explain as to observe, and some of them are coming to indorse what is now known as the Lowellian hypothesis, that the canals, coming and going, as they do with the planet's recognized seasons, are simply due to vegetation, nourished in spring and summer by an extensive system of irrigation, elaborated to a vast extent, which dwellers on the earth have but just begun to imitate.

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Shall man, imperfect man alone,
Evolve no type above his own?

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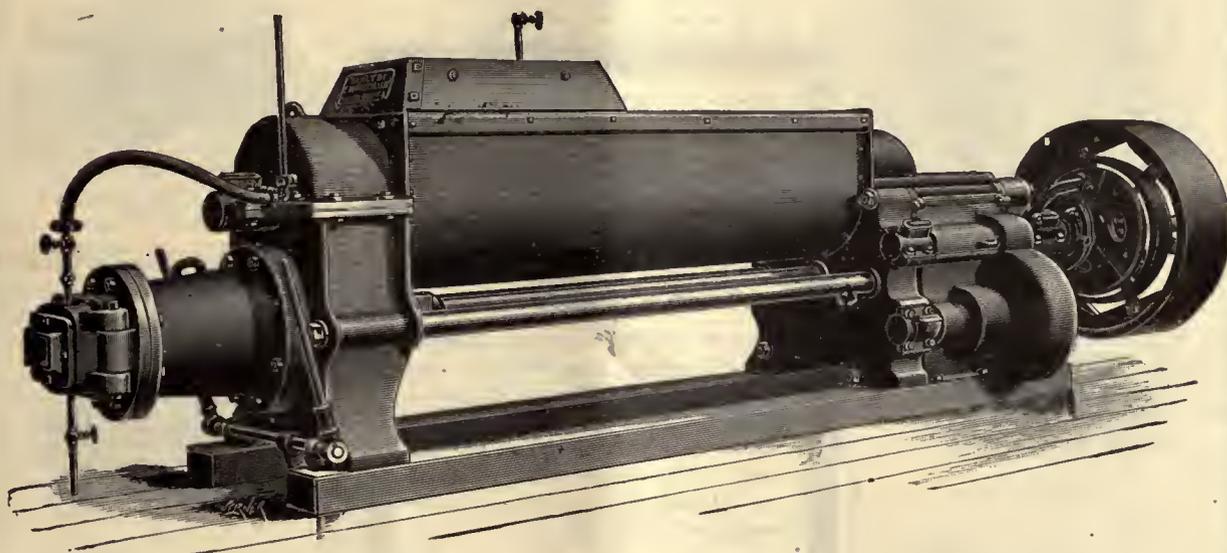
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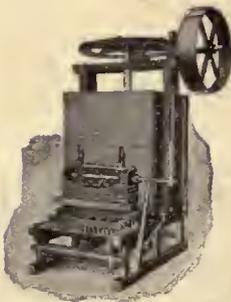
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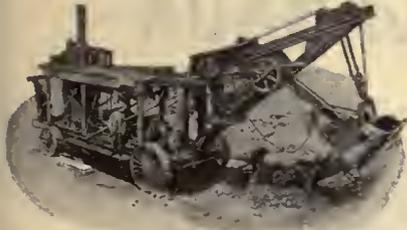
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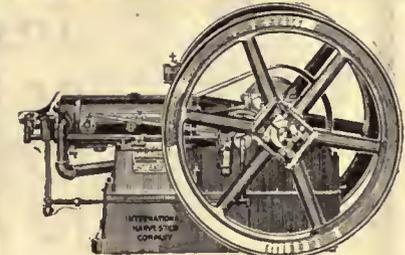
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If you have an irrigation problem it will pay you to investigate and see what an I. H. C. gasoline engine will do for you.

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A Governor That Governs in all winds. Develops 10 full h. p. in 20 mile wind. All power needed for farm, shop, irrigating, etc. Ask about our self-rolling, self-governed, single wheel pump—also Armsaver Husker. Ask for book 80

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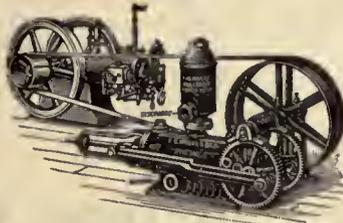
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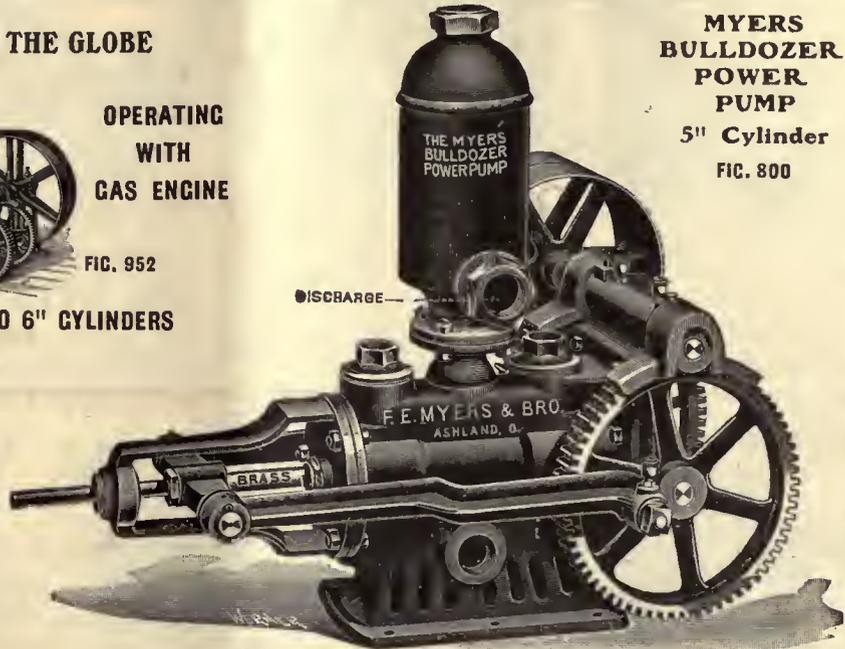


OPERATING
WITH
GAS ENGINE

FIG. 952

MYERS
BULLDOZER
POWER
PUMP
5" Cylinder
FIG. 800

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS



MYERS
BACK GEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

5, 7½ AND 10"
STROKE

FOR BELT,
WIND OR HAND
POWER

FIG. 1113



2½" DISCHARGE

BULLDOZER
WORKING
HEAD

BULLDOZER PUMP
6" BRASS LINED
CYLINDER

FIG. 1079

1½" BRASS ROD

PISTON
COUPLING NUT

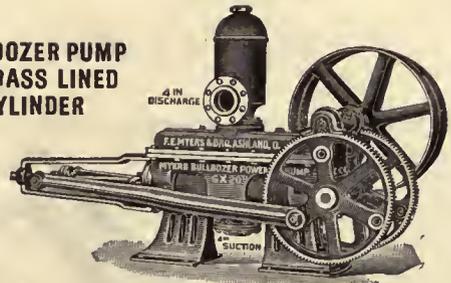


FIG. 813



PIPE FLANGE

THE MYERS
BULLDOZER
POWER WORKING HEAD

RABBETED BOX

F. E. MYERS & BRO.
ASHLAND, O.

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WORKING HEADS

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5", 7½", 10" STROKE
DISCHARGE 2½" OR 3"
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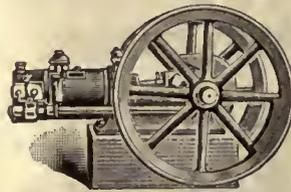
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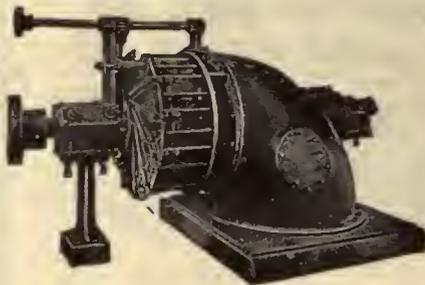


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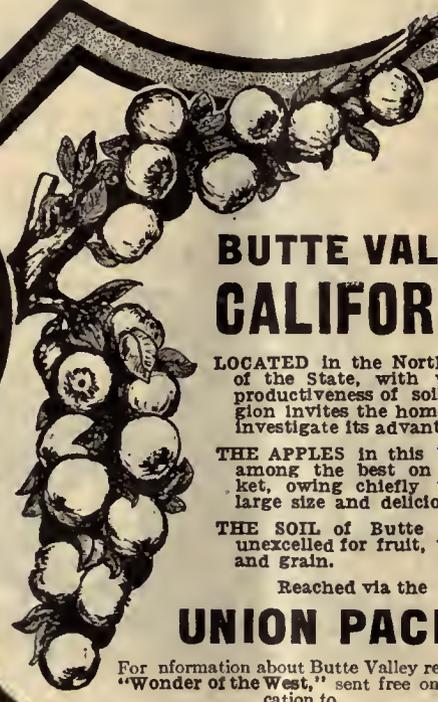


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When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

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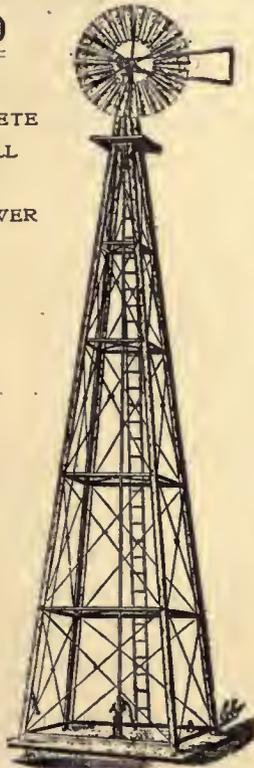
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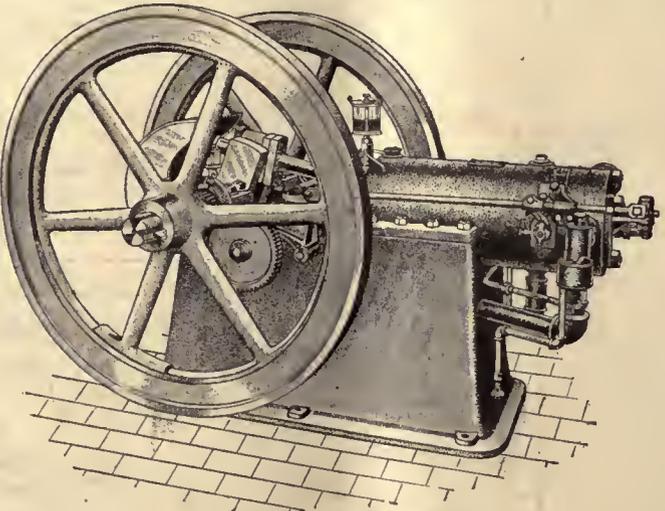
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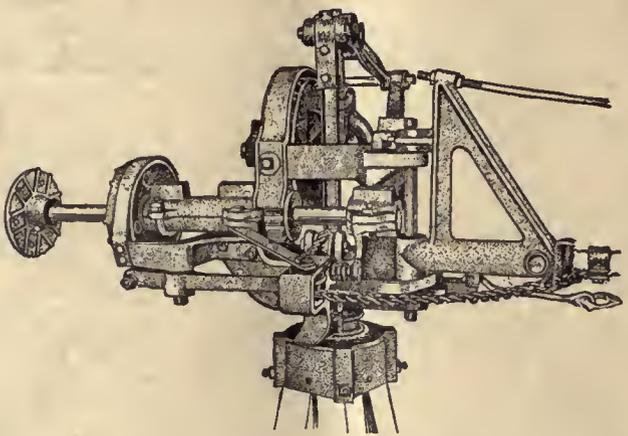
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VOL. XXIII.

CHICAGO. AUGUST. 1908.

No. 10

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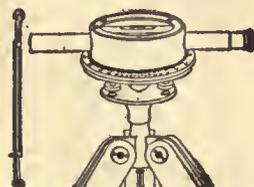
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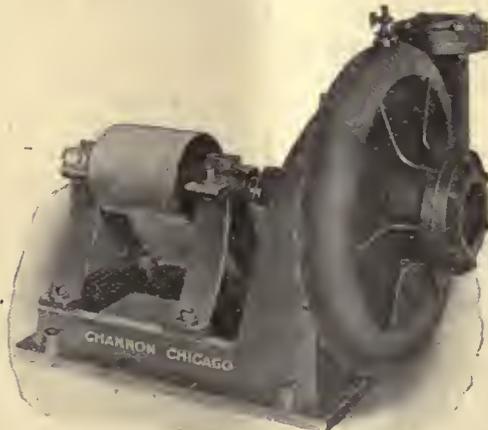


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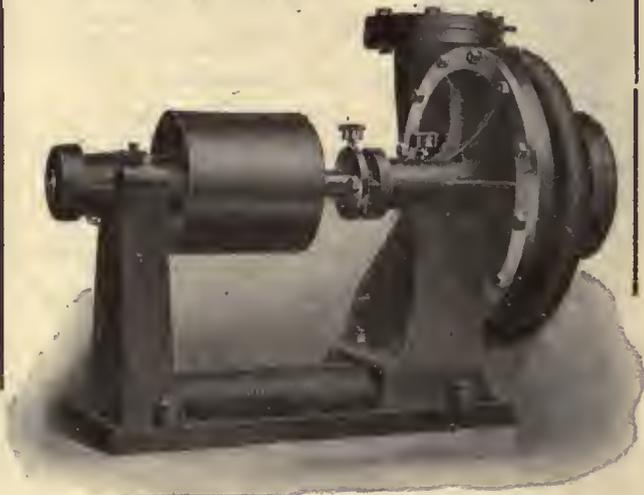
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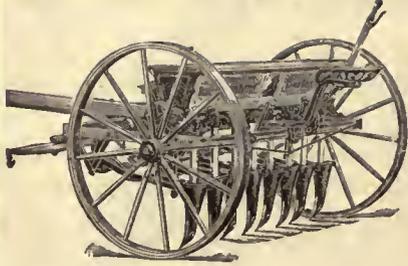
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Irrigation for Farm and Garden, Stewart.....	1.00
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The Primer of Irrigation, cloth, 300 pages.....	2.00
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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, AUGUST, 1908.

NO. 10

THE IRRIGATION AGE

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ARID AMERICA

THE DRAINAGE JOURNAL
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PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

Irrigating Head. We are presenting in this issue chapter three of the Art of Irrigation, by T. S. Van Dyke, the subject being The Irrigating Head. This will prove very interesting matter for our readers.

The Tri-State Canal. We are presenting in this issue a lot of halftones showing scenes along the North Platte River; also views of the Tri-State Canal, and views of homes in that section. We are indebted to the Tri-State Land Company of Scottsbluff for halftones and matter which will later be used in describing this territory.

Wenatchee, Washington. We are in receipt of a lot of fine photographs with descriptive matter concerning the Wenatchee Canal Company's project on the Columbia River at Wenatchee, Washington. Halftones will be made of these photographs, and we will attempt to present a description of this project to our readers in our issue of September.

In Demand. Our article on the Belle Fourche Irrigation Project, which appeared in the July number of THE AGE, was so well received by the people of that section that 1,000 extra copies were called for and distributed inside of ten days after the paper was off the press. In fact, 2,000 additional

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It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 23 years old and is the pioneer publication of its class in the world.

copies could easily have been disposed of had it been possible to have gotten out that extra number. We are presenting in this issue matter concerning the Belle Fourche Irrigation Project from an engineering standpoint which will prove interesting to all.

The Goshen Hole Irrigation project. The Goshen Hole Irrigation project, which is a part of the North Platte Irrigation enterprise, will be treated in an article in a future issue in connection with the North Platte article. This consists of the Goshen Hole canal, which heads in the town of Guernsey, Wyoming, on the North Platte River and extends southeasterly about 140 miles. This canal will cover more than 200,000 acres of land and will necessitate the cutting of a tunnel, which will be one of the largest undertakings, exclusive of the great Pathfinder dam, on the entire project.

Irrigation Congress. We wish to once more call the attention of our readers to the National Irrigation Congress, which will be held at Albuquerque, New Mexico, the last three days in September and the first two of October. The people of Albuquerque and New Mexico have prepared an elaborate program of entertainment and visitors as well as delegates to the congress will be assured of a hearty New Mexican welcome, and a good time generally. September and October are good months to

visit this delightful territory. Side trips will be made to various points of interest throughout New Mexico, and all who attend the congress should make it a point to visit the old town of Santa Fe, which is rich in history and quaint sights. Santa Fe is only a short distance by rail from the main line of the Atchison, Topeka & Santa Fe Railway, and is well worth a visit. We hope to present a lot of good illustrations of New Mexico in our September issue.

Our readers will pardon us for so often mentioning the splendid growth of the subscription list of THE IRRIGATION AGE.

Our Growing Circulation. We are anxious that they should realize how well the paper is being received and know that it is growing stronger every day. We have added to our list within the last thirty days almost 1,000 new, yearly paid-in-advance subscribers, and advertisers who are not patronizing our columns should consider carefully this growth. There is no doubt but that every subscriber whose name is placed on our list is a possible buyer of machinery and all classes of goods used by the home builders in the west. This applies particularly to the manufacturers of general farm machinery, irrigation devices, gasoline engines and pumping machinery and manufacturers of vehicles of all kinds. At our present rate of growth our subscription list should be increased by the end of the year at least 10,000 copies over what it was in December, 1907, and when that number of new readers have become acquainted with the paper and the valuable matter which is presented to them monthly we have no doubt but that we can double our list in the year 1909. THE IRRIGATION AGE is anxious to bring its list up to a point where it may offer advertisers a paid, yearly-in-advance subscription list of 50,000 copies, and this will be brought about, no doubt, within a reasonable time.

North Platte Irrigation Project. A special representative of THE IRRIGATION AGE recently visited the North Platte Valley in western Nebraska and eastern Wyoming and arranged while there to have an article prepared, with suitable illustrations, covering the work of the United States Reclamation Service on this project which comprises all of the work on the North Platte River extending from the town of North Platte, near the 101st meridian to a point where that river enters the state of Wyoming from Colorado at the 107th meridian, a distance which measured by the river is about 500 miles. The project lies about 100 miles north of Cheyenne and is reached from the north by the Chicago, Burlington & Quincy and the Chicago and North-Western railways and from the south by the Union

Pacific and Colorado Southern railways. It is also reached by the Burlington railway from the east. In the easterly portion of the land to be reclaimed by this system the rainfall is at times sufficient to grow crops, while in the westerly section extreme arid conditions are found. According to the last census within the drainage basin of the Platte river is found the largest area of land irrigable by one stream in the United States and the value of the improved agricultural land is no doubt as high as that of any other section with the possible exception of the highly cultivated fruit lands in California, Colorado and Washington.

The elevation of the North Platte project varies from about 3,500 feet to something over 6,000 feet. That portion lying within the boundaries of the state of Nebraska being about 4,200 feet, or about 1,000 feet lower than Denver city, while that lying in Wyoming varies from about 4,000 to 6,000 feet, the greatest elevation being about equal to that of the city of Cheyenne.

Mr. Shumway of Scotts Bluffs, who will prepare matter concerning this project for us and secure photographs to properly illustrate it, has long been a resident of that section and has given considerable time and study to the various methods of irrigation in western Nebraska and eastern Wyoming. Mr. Shumway was one of the pioneers in the valley lying south of the North Platte and is what is known as a "sand hiller" or "soddy," although it may not be out of place to state that his home, which is the finest dwelling in Scotts Bluff, bears no indication of his primitive struggles or undertaking.

Reclamation Service Meeting. While in the North Platte Valley recently the editor of this journal learned that Secretary of the Interior Garfield and officials of the Reclamation Service, Messrs, Newell, Director, and Davis, Chief Engineer, have been making a general tour of the west to investigate the various projects now under construction or nearing completion. The party was taken care of by the different railway lines over which it was necessary to travel to reach these projects, and the Burlington railway acted as host over that portion of territory covered by their lines in western Nebraska and eastern Wyoming. Mr. Eustes, Passenger Traffic Manager of that system, accompanied them on their trip over all of the projects along or adjacent to the lines of that railway and it is reasonable to suppose that much valuable information was secured by the Secretary and his assistants on this trip. During the time of their visit to the North Platte project in western Nebraska a meeting of the engineers in charge of the various projects throughout the west was held at the town of Mitchell, which is the headquarters of the

Reclamation Service for the North Platte undertaking. Various subjects of interest were discussed, among which was the speech of Secretary Garfield to the members of the North Platte Water Users' Association. We are informed that Secretary Garfield spoke very plainly to the members of this association who were in attendance at the meeting, and urged them to work harmoniously together for the good of the project. It seems that there has been more or less trouble among the various individuals comprising this organization, some of whom are desirous of controlling all of its movements and the antagonism which this inclination has created has, to a large degree, held up the work along this canal. Secretary Garfield had been advised of this condition and improved the opportunity at the meeting which was held at Mitchell to state a few facts which will, no doubt, tend to improve conditions under that project. There has been more or less conflict under the North Platte project, owing to the fact that the Tri-State Land Company, who own large areas of land which is watered by what is known as the Tri-State Canal, got in somewhat earlier than the Reclamation Service people and made filings on the water which will enable them to irrigate some 30,000 acres of land. The majority of this land is held in fee by the Tri-State Land Company, which is composed of some of the leading financial men of the country, and this company, through its general manager, Mr. Leavitt, was not inclined to lay down and give the Reclamation people a free hand in that section.

It is understood now that no effort will be made by the Reclamation Service to interfere with the rights of the Tri-State Land Company and the government ditch will irrigate land lying considerably above that which is being reclaimed under the Tri-State ditch. This brings to mind the fact that a more liberal view is being taken by the Reclamation Service officials in the matter of private enterprises which have developed throughout the various sections of the west. Conflict between the Reclamation Service and some of the larger private enterprises in Idaho has died out and we are informed that the service and those at the head of the private projects will work together harmoniously for the general good of the various sections under development. This is as it should be and it is the hope of all that no further effort may be made on the part of the Reclamation Service to interfere with the projects being developed by private capital. THE IRRIGATION AGE has always contended that private capital should be permitted to go on and develop territory wherever possible and that it was the province and intent of the reclamation law to work out large projects which were too extensive to be handled by private individuals with limited capital.

METHODS WE USE IN IRRIGATING SIDE HILLS.

BY JOHN G. HALL.
COLORADO SPRINGS, COLO.

For the inexperienced the side hill is a difficult thing to contend with. The chief difficulties which arise are due to the swiftness of the water which causes the water to pile up in one place and renders the making of a dam to throw it out on the land a very hard problem.

In planting a row crop except where there is a quick fall in one direction the rows are planted diagonally in order to make the grade less steep for irrigating. If possible, a grade of an inch and a half fall to a hundred feet is the best grade for irrigating the row crop. Arrange at the head ditch to turn out the water in small streams because the steeper the pitch to the rows the faster the water will run, so for this reason the water in each row must be diminished in order that it may take as long a time as possible to irrigate to the end of the row. Two reasons are given this, first, in slow irrigating the dirt is not washed away from the plant; second, the ground is soaked well on steep places by the water being held a long time.

In grain fields the ditches through the field should be run nearly straight down the hill with just a slight angle to one side. The reason for this is so that when the water is dammed up and thrown out it will run across the land to the other side and at the same time will be kept within the confines of the ditch. When the water is turned out for a short distance the dam should be moved farther down the ditch and the water again thrown out so it will lap onto the space irrigated by the previous dam. Continue in this way irrigating one land at a time until the whole field is irrigated.

If water is plentiful two lands at a time may be handled by one irrigator.

THE NORTH PLATTE VALLEY.

We are presenting in this issue a number of illustrations showing the fertile North Platte Valley along that far-famed stream near Scottsbluff, Nebraska. These illustrations are from photographs taken by the Tri-State Land Company, located at Scottsbluff.

A representative of IRRIGATION AGE visited this section recently, and while there arranged for a series of articles which will appear from time to time in these columns. In our issue of September we hope to be able to present an article with illustrations on the North Platte or Pathfinder project.

Send \$2.50 for The Irrigation Age, one year, and
the Primer of Irrigation, a 260-page finely illustrated
work for new beginners in irrigation.

STANISLAUS COUNTY, CALIFORNIA.

Picture a dreary stretch of grain fields, unrelieved by trees and with nothing to vary the monotony save an occasional farmhouse or string of mules whose progress could be traced by huge clouds of dust. Such was Stanislaus County, Central California, ten years ago, when irrigation and the wonders it has wrought were but a dream.

Nearly twenty years ago a few far-sighted individuals realized that the dusty grain fields might be transformed into a vast garden with the aid of water, and organized the Modesto Turlock Irrigation districts. A diverting dam was built on the Tuolumne River; canals were dug across the district, and the new era seemed at hand.

At this point the anti-irrigationists, composed of the large land owners, content to let well enough alone and fearing the taxation that would compel them to open to settlement the large holdings, stepped in and began litigation, which threatened to postpone, indefinitely, the dawn of the new era of progress and prosperity in Stanislaus County. The case was hard fought

however, as the result of the untiring efforts of those who successfully fought for irrigation in the dark days of Stanislaus.

In early days one of the banner wheat counties of California Stanislaus County is now nearly to the top of the list as a fruit and dairy county and before many years will lead all others. This wonderful transformation is due entirely to irrigation, and other communities in the semi-arid regions of the United States could well follow the example of "Sunny" Stanislaus.

THE BELLE FOURCHE PROJECT FROM AN ENGINEERING STANDPOINT.

The first essential for an irrigation project is a body of land that requires irrigating, that, is one which produces no crops or only partial crops, due to lack of sufficient moisture, land which with the moisture supplied, has the other elements of fertility to such a degree that the product therefrom would be bountiful.

The second essential is a supply of water from which may be procured the required moisture.

The third essential is the engineering feature by



Dam of Modesto—Turlock Irrigation District, California.

and after the expenditure of large sums by both sides, the case was carried through the various state courts to the United States Supreme Court which decided in favor of the districts.

The work of completing the system then began with renewed vigor and four years ago last April the water was at last turned into the ditches and the day of the large wheat farmer was gone, and to take his place came the intensive farmer, the twenty-acre man. There are still a few of the old-time wheat ranches in the irrigation districts, but they are gradually passing away and in a few years will be but a memory.

During the days of litigation and uncertainty business of all kinds was practically at a standstill, land values dropped to almost nothing and it looked for a time as if the county would never be able to recover from the stagnation into which it had fallen. Turlock was but a village and Modesto a typical, dusty country town in those days, quite unlike the bustling, modern little cities of today.

Four or five years ago, the man who predicted that Stanislaus would in a few years be a fruit and grape center, with two canneries and need for more, and that the county would be fourth among the counties of the state in the value of its dairy products, was laughed at as a visionary fool. All these things have come to pass,

which this water is controlled and applied to the land as needed.

Sometimes these may appeal to one in a different order, as the presence of a large body or stream of water might cause a search to be made for land to which it could be applied, or there may be such spectacular features connected with the engineering works as to draw undue attention to themselves and to cause one to overlook the fact that these features are only a means to an end, that of producing crops.

In the southwest corner of Butte County, western South Dakota, is a valley of rich soil, some twenty-five miles long by eight or ten miles wide, containing approximately 100,000 irrigable acres. This soil varies from a light sandy loam to a heavy loam and rich black gumbo. It is almost entirely free from alkali, and through actual workings on settled farms of some 20,000 acres is found to be very productive. Especially is this so of the lower bottoms of the Belle Fourche River, and along the small creeks which flow into the river, these localities receiving and retaining the more moisture. This special productiveness is an indication of what may be expected of the upper lands when they are supplied with moisture.

Flowing considerably nearer the southern than the northern side of this valley is the Belle Fourche River,

from which the irrigation project is named, and not from the town of Belle Fourche which is about a mile above the diversion dam. This river rises in western Wyoming and is fed by the snows of the Rocky Mountains. Its water shed above the diversion covers some four thousand three hundred square miles and the flow is sufficient to water much more land than is available, if the flow can be stored and none allowed to run to waste.

Having then the land of excellent quality and a bountiful source of water supply it remains to design a system for applying this water to the land. The obvious plan would be to find some place along the river where the bed is narrow and the bank high, and by building an impounding dam, construct a reservoir, in

wide on the bottom and carries about 1,600 cubic feet of water per second. The water is taken from the reservoir through two openings controlled by steel gates, called the North and South conduits, which lead into the North Canal and South Canal respectively. The former has an initial capacity of about 800 cubic feet of water per second and will irrigate some 65,000 acres of land, about the three-fourths of which is public land. Near the center of this area is located the Government townsite, which will be laid out and improved according to best modern practice before settlement is invited. Under the north canal there is being and will be constructed in the neighborhood of 150 miles of laterals and sublaterals.

The main settled portion of the Belle Fourche



No. 1. Scotts Bluff County, Nebraska, exhibit at Nebraska State Fair, 1907.

which the water can be stored and drawn upon as needed. Unfortunately no such place can be found where there is sufficient valley above, and a suitable foundation for a masonry dam which can be used as a reservoir, a full examination of river having been made between Belle Fourche and Moorcraft, Wyo., which is at the head waters of this stream. However, the engineer in charge found that there is an ideal site for a reservoir on Owl Creek, about thirteen miles northeast of the town of Belle Fourche.

At this point are found considerable deposits of very compact clay from which is being constructed the largest earthen dam without a core wall in the world. Across the river about a mile below Belle Fourche has been built a diverting dam of concrete and steel, which is used to divert the water from the river into the above mentioned reservoir through the inlet canal. This canal is approximately six and one-half miles long, forty feet

Valley is on the south side of the river, in the center of which portion is the town of Vale, in fact, this is the only town at present under the project, the Government townsite being not yet opened for settlement. Though there has been a postoffice at the site of Vale for a number of years, it began to grow with the assurance of the irrigation project and now has four large stores, hotels, two livery stables, a bank, newspaper, real estate and United States commissioner's office.

The south side comprises about 23,000 irrigable acres, to reach which the south canal crosses the Belle Fourche River in a steel-reinforced concrete pressure pipe, five feet inside diameter and some 3,800 feet long. About nine miles below this pressure pipe the canal crosses Whitewood Creek in a shorter, similar pipe, but of larger diameter. Under the south side distributing system are about sixty miles of laterals and sublaterals. The south canal also waters about 12,000 acres before it crosses the river.

The Art of Irrigation

THE IRRIGATING HEAD

By T. S. VAN DYKE

Having your ground level enough and levees strong you turn on the water and are quickly plunged into despair by the fact that it is not spreading fast enough to cover the check in half a day. You have merely made the natural mistake of most beginners in having the head of water too small, or, what is the same thing, having the check too large for it. Some turn in too large a head, wash out the entrance gate with the eddy, cut a big hole in the ground and wash the silt over the ground to make it bake worse, break a levee which goes so quickly that it takes the next check perhaps or a whole line of them before the water can be shut off. Too small a head is just as bad in loss of time and waste of water also, for if it takes too long to cover the part of the check that first receives it more water soaks in there than it needs, while the rest does not

To measure this accurately enough when running requires a weir which you will find so well described in other books on irrigation or hydraulics that I shall pass it by for want of space, it being only one of the instruments of irrigation and one that you may not have to use at all. This weir is essential for large quantities of water, but for small ones is generally a nuisance. The miners in early days of California adopted a pressure measurement which for small quantities is accurate enough and is often used to measure as high as two second feet or over. Thus, if a hole an inch square be made in the side of a box and the water inside be kept at a level of four inches above the center of the hole the discharge will be practically one-fiftieth of a second foot. This will be about nine gallons a minute, about thirteen thousand in twenty-four hours, will just fill a 12-foot cube in twenty-four hours which makes 1,728 cubic feet a day.

This is the common measurement for small quantities in California, Arizona and some other states, but in others it is under a pressure of six inches or even seven. In all cases it is called the miner's inch. But you know not what it is until the pressure is given. It is used with a hole one, two or three inches high,



No 2 Outlet of the waste way of the Tri-State Canal. The floor of this part of the waste way is four feet below the bottom of the canal. When water is turned from the canal into the river all silt is carried away, thus preventing the wash filling the canal.

get enough. This slow feeding is a constant source of annoyance and loss and to avoid it properly you must understand the measurement of water, a subject puzzling to some, but simple enough to one who will take a little time to study it.

The standard measure in the United States is a cubic foot a second, or "second foot," as it is more commonly called. If you had an aqueduct one foot deep and one foot wide inside with the water moving at an average velocity of one foot a second this would give you a second foot. But the surface velocity is not the average velocity, because of the friction. For the smoothest flume the surface velocity in the center should be 25 to 35 per cent more than one foot a second and for rough ones often twice that. By dropping a handful of oat meal into a flume carrying water you will see the whole thing as some of the particles float and others sink slowly to the bottom. Even a flume of glass will show eddies all through it in this way and every one of them means some loss of velocity.

But you don't have to be accurate about this. You need only remember that a second foot is seven and a half gallons a second, or a kerosene can, once and a half full, and that it will equal an inch of rain an hour on one acre or two feet a day.

and many inches long with the pressure kept even on the center, the discharge being regulated by a slide running in from one end. The difference in pressures makes great confusion and this is not the best measurement, though you should know what it is. The four-inch pressure has the advantage of being one about fiftieth of a second foot, which equals half an inch (rain measure), in twenty-four hours on one acre.

The acre foot is a more satisfactory expression for the quality of water used in irrigation, being the amount necessary to cover an acre a foot deep. An acre inch is also used the same way though a rain inch or a rain foot is simpler as every one understands rain measure. For this reason I shall use the rain inch in this book wherever possible.

Now if you could just lay down a blanket of water an inch thick on an acre perfectly flat with levees around it to keep it from running off before it could soak in you might be happy, for a while at least. But this is exactly what you cannot do. If the soil is as porous as it should be for good results it will be quite sure to cut badly if you rush in water enough to cover a check in a few minutes. And even then you are likely to get into the ground an inch and a quarter or more on the side near point of delivery to three-fourths of

an inch (rain measure, remember), or less on the side opposite place of delivery. You may think you can fix this by having the bottom of the check on a slope with water delivered at the highest edge so that it will run over quickly. The theory of the novice is that while it is running over the high ground it will be soaking in while the water that collects on the lower ground will compensate in the time it stands and soaks in for the greater length of time that it was running over and soaking into the higher ground. This would be very fine if the soil were all of uniform texture, perfectly graded and perfectly bare, the first two being conditions you are not apt to get. But when it is covered with vegetation you can be certain that uneven wetting will result. And this cannot be prevented by any number of delivery gates at the upper side. Good gates cost money and labor and one to a check is generally all you can afford, for it is enough if other conditions are right. And the first of these conditions is a head of water proportionate to the size of the check.

Mark now the distinction between the quantity of water you have, measured as a running stream, and the

A private reservoir to do this would cost too much in most cases, but every well managed ditch is practically such a reservoir. Instead of each consumer taking water continuously he takes a larger amount at intervals of many days. This enables every consumer to get the amount he wants with almost a certainty, provided he puts in his order to the ditch-tender or secretary long enough ahead to allow him to arrange matters so that he does not interfere with other consumers. The amount thus taken is called "an irrigating head," while the amount for the year which it equals in continuous flow is called the "water right." Using a big "head" once in a while, instead of a continuous flow, makes lively work for a short time and puts the water into the soil with the smallest amount of waste from continued soaking after it has enough. The constant flow keeps work going all the time to irrigate a much smaller area. Consequently, the larger the head the more work it will do provided it does not cut out gates or levees or wash too much mud and silt where it is not wanted or interfere with proper clearance of the checks after enough water has soaked in.



No. 3. Headgate Tri-State Canal, near Scottsbluff, Nebraska.

amount you can have available for use at a given time, for there is nothing more important. Suppose your water right is a second foot to 160 acres, a usual allowance for common farming in many sections. This is on the assumption of a continuous flow of that amount, and if from a private artesian well, small running stream or pumping plant, it will probably be such a flow. But a continuous flow is the last thing you want for that amount of land. What you need will be the equivalent of such a continuous flow instead of the actual flow. A second foot running all the time would be such a slow feed into checks of reasonable size that half or two-thirds of the water might be wasted by too much soaking into the upper part of the checks before reaching the lower parts. It would also take much more time and labor to watch it and change from check to check than if you had, say, ten times that amount running for one-tenth of the time. In fact, for some results a second foot every day for 365 days may not be as good as 365 second feet for one day.

Therefore, you need some kind of a reservoir to accumulate the flow five, ten, twenty or forty days or more, according to your climate, soil and crop and give you the whole accumulation in a much shorter time.

This result cannot always be reached by making the checks small enough. You may find every gate needs a cross gate in the ditch which will increase the cost. You may have to drive haying machinery over the levees and must not have them too numerous. There is a temptation to make them flimsy to save the increased cost of so many more and if well made there is so much more room for gophers and such things to climb up in to escape drowning.

On the other hand, the larger the checks the more difficult it is to adapt the size of the head so as to prevent waste of water from too much soaking on the entrance side more dangerous from waves washing out a levee when full of water, more damage if it does break, and more difficulty in having quick clearance of the water where soil or climate makes it necessary.

Near Lerdo, Mexico, in 1884, I saw a check of about one thousand acres, all in corn. It was an old lake bed apparently dead level and took about all the flow of the Nases River over a day to fill it. The corn was very fine, but I think it was due to excessive richness of the soil rather than good irrigation. I could see no reason for making so large a check except the saving of labor in the first instance to pay for it later

on several times over in water and work. Later on I saw near Jimenez, Mexico, on about the same soil and with same climate some five thousand acres in checks about twenty feet square. It was all in wheat about three inches high and looking as well as winter wheat ever looks. The head available was small and probably was not used over twice during the whole winter and spring. Between these two extremes a great variety of sizes from 200 acres down to half or quarter of an acre are in use in California and other states, but the tendency is toward smaller ones.

The large ones are of all shapes according to the contour of the land for it would not pay to grade them flat or make them square. Perfect levels are run for the lower levee which makes many checks vary from a sharp crescent to a half moon. In some the water will be a foot deep at the lower side and about an inch or so at the upper side. Few have the water less than six inches deep at the lower levee. It is plain that if the crop is good enough on the upper part where the

buildings, corrals, haystacks, etc., but force the water to run as you want it instead of laying out the land to accommodate the water. This again is a question of the value of your crop, but be careful how you decide that it is too expensive. I find one-third of an acre about the best size for checks because water is more valuable for new land than to throw away on the old. I make them flat, although the slope of the land is only three inches in a hundred feet. As these checks are about one hundred and twenty feet square the difference between the upper and lower side is less than four inches. But that wastes too much water on the lower side and where it is necessary to leach out alkali there is not pressure enough on the upper side to get quick and uniform results. I make them level even for alfalfa and if I can get it in early enough in the fall the next year's crop, with oats for hay the first winter, repays the entire cost of the finest work. After that there is a constant saving of considerable labor in waiting and watching the filling besides the saving of



No. 4. Cedar Canyon, one of the many beautiful spots easily accessible from towns in the North Platte Valley.

water is shallow that the lower half had at least twice as much as was needed. This enormous waste is allowed because water is so plenty that it is cheaper than labor and so no grading or very little is done. But I have seen alfalfa fields where the scalding of the crop at the lower side on a hot day caused by the water standing too long would offset the cost of grading in three or four years beside saving half the water.

In such cases the ditches also follow the contour of the land. This means ditches cheaper by the foot, but also longer, with more loss of water from seepage and more expense of cleaning. But it also means much less expense at first and, as there is so much expense in irrigation that you cannot avoid, it is justifiable in most cases. I wish only to show that they are not good models except in the line of economy at the outset. It is a question of finance rather than of irrigation. If you have your own teams and feed and can do your own work it will probably pay you to make small checks and grade them perfectly flat on the bottom and also square and make the ditches straight and parallel. If knolls of any size are too high save them dry for

one-half of the water. If the head should be short in quantity or time of running you can cover the whole when flat, where it would leave a big dry strip on the upper side and one below it only half wet if it were not level.

THE BOSTROM BRADY LEVEL.

We are reproducing herewith copy of a letter concerning the well-known Bostrom Brady improved levels. This firm has been very successful in the sale of its levels throughout the entire irrigated district.

Caldwell, Idaho, April 18, 1905.

Bostrom Brady Mnfg. Co.,
Atlanta, Ga.

GENTLEMEN:

Yours of the 14th inst. received today. Your reply is very gratifying and I will send you another order soon for several Bostrom Improved Levels as I know what your levels are and have found the manufacturers of them to be very satisfactory people to deal with.

Yours very truly,

L. D. COWAN,
Caldwell, Idaho.

Supreme Court Decisions

Irrigation Cases

RIGHTS OF APPROPRIATORS.—

An appropriator from a stream flowing through his premises has not the right to the use of a surplus for irrigation as against subsequent claimants.—*Williams v. Altnow*. Supreme Court of Oregon. 95 Pacific 200.

DESERT ENTRY—SEPARATE CONVEYANCE OF WATER.—

Water applied to a desert entry for the purpose of reclaiming the same does not become inseparable therefrom, and may be conveyed separate and apart from a conveyance of the land.—*Village of Hailey v. Riley*. Supreme Court of Idaho. 95 Pacific 686.

CHANGE OF POINT OF DIVERSION.—

A prior appropriator of water for a beneficial use from a stream or other natural source of supply may change the point of diversion or the place of use so long as it does not

went to flow.—*Williams v. Altnow*. Supreme Court of Oregon. 95 Pacific 200.

APPROPRIATOR'S RIGHT TO CURRENT.—

An appropriator of a certain quantity of water from a stream does not acquire as an appurtenant to his water location the right to the current of the stream as a means of operating devices used by him to divert the water from the stream, nor is such current subject to appropriation as a water right under the Constitution and laws of Idaho.—*Schodde v. Twin Falls Land and Water Co.* Circuit Court of Appeals, Ninth Circuit. 161 Federal 43.

APPROPRIATION—APPLICATION TO BENEFICIAL USE.—

Filing requisite plats and notices of a water appropriation with the clerk and recorder, the commencement and construction of a canal with due diligence, and the actual diversion of water from a natural stream, unless accompanied by a beneficial use of the water, constitutes merely an inchoate right or interest therein, which is insufficient to bar junior claimants if their beneficial use of the water antedates that of the prior appropriator.—*Conley v. Dyer*. Supreme Court of Colorado. 95 Pacific 304.

AGREEMENT AS TO DIVERSION.—

Where prior and subsequent locators of the waters of a



No 5. View of an eighty-acre oat field, Scottshluff County, Nebraska.

prejudice the rights of subsequent claimants.—*Williams v. Altnow*. Supreme Court of Oregon. 95 Pacific 200.

RIPARIAN OWNERSHIP.—

There is no such thing as prior riparian ownership so far as distribution of water for irrigation purposes between riparian owners is concerned; the rights of a riparian owner to the waters being a variable one, depending on use by other proprietors.—*Hough v. Porter*. Supreme Court of Oregon. 95 Pacific 732.

WHAT CONSTITUTES AN APPROPRIATION OF WATER.—

To constitute an appropriation of water there must not only be a diversion from the stream and a carrying of it to the place of use, but it must be beneficially applied, and the measure of appropriation does not depend alone upon the amount diverted and carried, but the amount which is applied to a beneficial use must also be considered.—*Woods v. Sargeant*. Supreme Court of Colorado. 95 Pacific 932.

PRIOR APPROPRIATOR MUST PERMIT WATER TO FLOW.—

After the needs of a prior appropriator of water for beneficial use as measured by his original appropriation have been supplied, or when the water is not actually required or used by him, it is at the disposal of other and subsequent appropriators according to their respective rights, and the prior appropriator must permit it to flow down to them as it is

stream have misunderstandings and differences with reference to the right to divert the waters of a stream and convey them to distant points for use, and they reach an agreement and understanding whereby each shall be permitted to construct his diverting works and ditches, and in reliance thereon they do construct such works and expend money thereon, each will thereafter be estopped from denying the right of the other to divert and use the waters in accordance with such agreement or understanding.—*Saunders v. Robison*. Supreme Court of Idaho. 95 Pacific 1057.

DUTY OF WATER COMMISSIONER.—

Where the right of a reservoir company to a proportion of the priorities belonging to a ditch company depended on the ownership of the stock of the ditch company, the water commissioner, in denying this ownership, based his action on a legal ground, and by refusing to turn water into the canal of the ditch company for the use of the irrigation company, which, as he claimed was not entitled thereto, merely discharged the duties imposed on him by law, and in so doing committed no tort.—*Cache la Poudre Irrigating Ditch Co. v. Hawley, Water Comr.* Supreme Court of Colorado. 95 Pacific 317.

ACTION TO ESTABLISH WATERCOURSE.—

Where defendant ditch company's ditch headed on a main stream several miles below the junction of a tributary on

which plaintiff's ditch headed, and plaintiff, a junior appropriator, sought to appropriate water from the tributary stream at a distance from its mouth, claiming that the water in the tributary stream, if suffered to flow, would not reach defendant's headgate on the main stream, and hence its diversion would not injure defendant, the burden was on plaintiff to show such facts, as it is presumed that the waters of a tributary stream less the evaporation, if not interfered with, will reach the main stream either by surface or subterranean flow.—*Peterson v. Payne, Water Commissioner*. Supreme Court of Colorado. 95 Pacific 301.

NO RIGHT OF ACTION FOR DESTRUCTION OF STREAM CURRENT.—

The right to appropriate water from a stream is not an unrestricted right, but must be exercised with regard to the rights of the public and other appropriators, and a single appropriator who has adopted as a means of raising water to his land water wheels operated by the current of the stream has no right of action because of the construction of a dam below him designed for the irrigation of a large area of land, the property of many owners, which destroys the current of the stream at the place of his location, and makes it necessary for him to adopt some other means of diverting the water off his land.—*Schodde v. Twin Falls Land and Water Co.* Circuit Court of Appeals. 161 Federal 43.

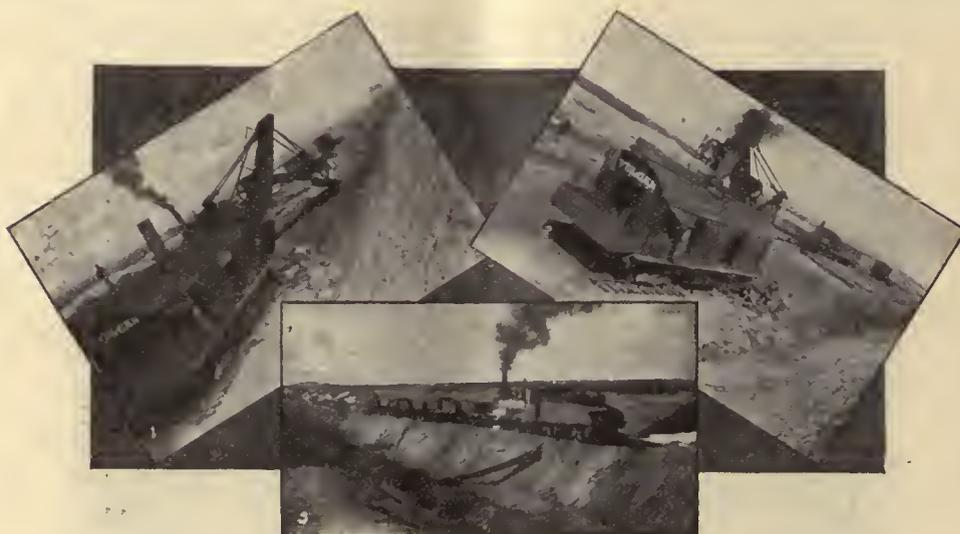
WESTERN SETTLERS FACING TROUBLE.

(FROM THE ST. LOUIS GLOBE-DEMOCRAT.)

In the West they are very much stirred up over the proposition to take from the unreserved, unappropriated public domain reserved for settlers a vast area of 300,000,000 acres and place it in the Forest Service and lease it out for fencing and grazing for the big cattle barons and others whose interests are being crowded by encroachments of the homesteaders.

This would shut out settlers from a pretty big strip of country—well, equivalent to an area 200 miles wide and over 2,000 miles long. This land is not included in the lands concerned in the regulation of streams or conservation of timber supply. This vast area has never been included in the Forest Reserves; it is part of the public domain awaiting settlement.

The agricultural lands of the public domain belong not to the people of the West alone; they belong to the



No. 6. Views showing construction of Tri-State Canal.

PRIOR APPROPRIATION.—

A grantor in 1890 diverted and applied to the irrigation of land adjacent thereto all the waters of a creek and continued to use the same until January 1, 1891, when his grantee moved upon the land and used the water thereafter. A second proprietor diverted the water of the same creek in 1893, and used the same until 1897, though admitting that at all times there was not enough water to supply the grantee's land. *Held*, that the grantee, being the prior appropriator, had a right to the use of all the water necessary to the irrigation of his land, and that the second appropriator had only the right to use the excess of water for irrigating his land.

Wellington v. Beck. Supreme Court of Colorado, 95 Pacific 297.

citizens of every state in the Union. Anybody may go out there, take up a homestead of 160 acres, and make a home in the manner the law specifies.

The act of June 4, 1897, which set aside timbered areas and mountain watersheds for Forest Reserves specifically and distinctly forbade the including of lands good only for other purposes. The idea was that the interest of the settlers should have first consideration. Land unavailable for timber protection or reforestation or for conserving the flow of streams was to be kept open for farms and homes and communities.

Under the proposed "leasing policy" any big cattle magnate may lease and fence up for ten years as much as 10,000 acres; his friends may lease next door to him 10,000 more, and another friend the next, and so on.

It is not likely that any settler would care to undertake the responsibility of taking a family upon a homestead within such inclosure; his life would be a sultry one at best.

But the settler is not likely to have this opportunity, for if the leasehold has had one penny over \$100 spent on it by the cattle owner (which amount is easily covered by the fence), the lessee has a right to debar the settler from entering.

Send \$2.50 for **The Irrigation Age** one year and **The Primer of Irrigation**

CORRESPONDENCE

The following letter was recently received from a Montana subscriber and a copy of same was referred to Messrs Clarence T. Johnson, State Engineer of Wyoming, and James Stephenson, Jr., State Engineer of Idaho. The letter from our subscriber as well as the replies of Messrs. Johnson and Stephenson are reproduced herewith:

THE IRRIGATION AGE,
Chicago, Ill.

GENTLEMEN:

In a recent issue of the AGE you requested that questions on irrigation law be sent you. There is a matter about which I would like some information and if it comes under the head to which you refer would be pleased to have a reply to same through the columns of your paper. The matter is as follows:

I own land under a ditch built by a private concern,

the dimension of irrigation canals built under the provisions of the Carey Act has been received.

I am satisfied that your correspondent misunderstands conditions. Wherever it can be shown that a canal is not large enough to deliver the water needed for the land, it will be made large enough before the canal system is turned over to the settlers. But one Carey Act Canal has been accepted by the state and turned over to the settlers, and I know of no instance, in fact, can conceive of no occasion for accepting a canal in sections.

The question of the discharge of a canal can be so easily determined that it is rather a ridiculous thing to comment adversely or favorably regarding the same unless one has some technical information as a basis for statements made. If your correspondent had said that from the measurements made it would seem that the canal is not large enough, his letter would indicate that he was seeking the truth. The fact as to whether the canal is or is not large enough is a matter to be determined by actual measurements. I do not care how competent a judge a man may be, his estimates are worth but little until he knows something about the actual discharge measurements of the canal in question. It is the business of the state to see to it that the canals are built of ample size. As a matter of ordinary business judgment all settlers should satisfy themselves that this work has been accomplished. If any settler has a doubt as to the measurements and computations made by the state he should hire some person,



No. 7. Building the Waste-Gates, Tri-State Canal, Nebraska.

under the provisions of the Carey Act. The ditch was built in three divisions. The first and second, I understand, has been approved and accepted by State Engineer. The third is to be completed by January 1, 1909. Notwithstanding the report of State Engineer it is the opinion of competent judges that the ditch is not nearly large enough to water land it covers. When all is under cultivation, and it is stated that when the ditch is all completed and approved by the state there could be no recourse on the Ditch Company. What I would like to know is if it can be shown that the ditch is not large enough to carry water to the amount their contracts call for for all the land the ditch covers, can they be compelled to increase it to such capacity before the state accepts it, and before they turn it over to the land owners. Also, how would we go about to secure such information and compel them to furnish the work as per contract?

If you can give the desired information it will be appreciated.

_____, Mont., July 7, 1908.

REPLY OF CLARENCE T. JOHNSON, STATE ENGINEER OF WYOMING.

Cheyenne, Wyo., July 18, 1908.

THE IRRIGATION AGE,
Chicago.

DEAR SIR:

Your letter of July 16th, enclosing an inquiry regarding

competent to make measurements, to check those made by the State Engineer.

Sincerely yours,
CLARENCE T. JOHNSON,
State Engineer.

REPLY OF JAMES STEPHENSON, JR., STATE ENGINEER OF IDAHO.
THE IRRIGATION AGE,
Chicago, Ill.

Boise, Idaho, July 23, 1908.

SIR:

Replying to yours of the 16th inst., would say that the acceptance of this portion of diversion works under the Carey Act project, does not constitute an acceptance of the whole, and that before the works are finally accepted and turned over to the settlers the State Land Board requires the company to prove, unconditionally, that the works are completed in accordance with the company's contract with the state.

In other words, that State Land Board fully protects the rights of the entrymen.

Very truly yours,
JAMES STEPHENSON, JR.,
State Engineer.

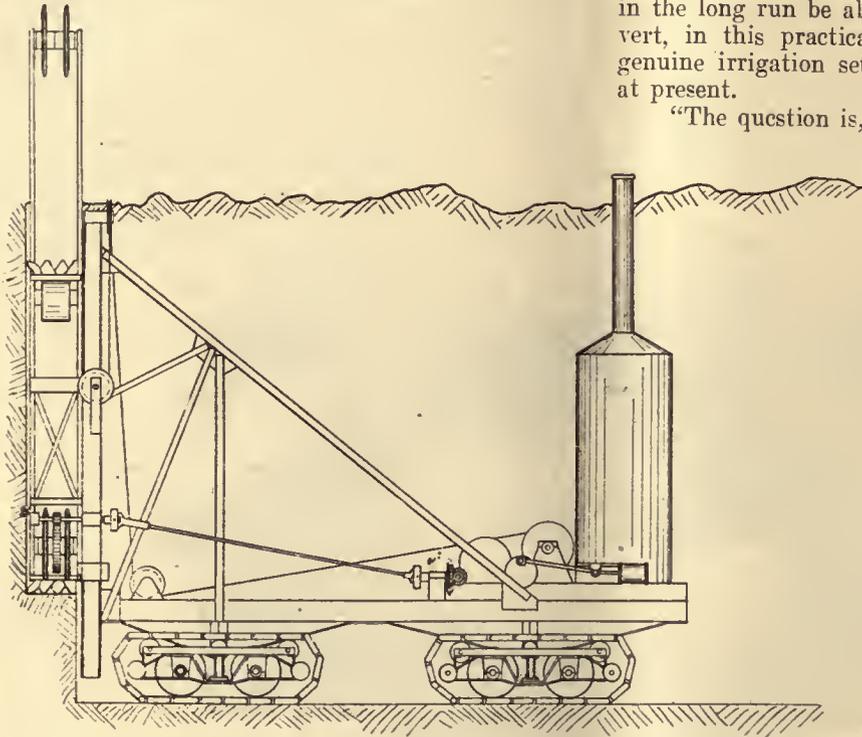
**Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation**

POPULARISING IRRIGATION.

Importing American Farmers.

MR. SWINBURNE'S IDEA.

"What is wanted," says the Minister of Agriculture (Mr. Swinburne), "in order to popularize the system of irrigation in Victoria is an infusion of 'new blood' from the countries where irrigation has been practiced on a large scale for many years past, and where the application of water to the soil has been followed by whole districts and provinces in connection



SECTION AT A-A.

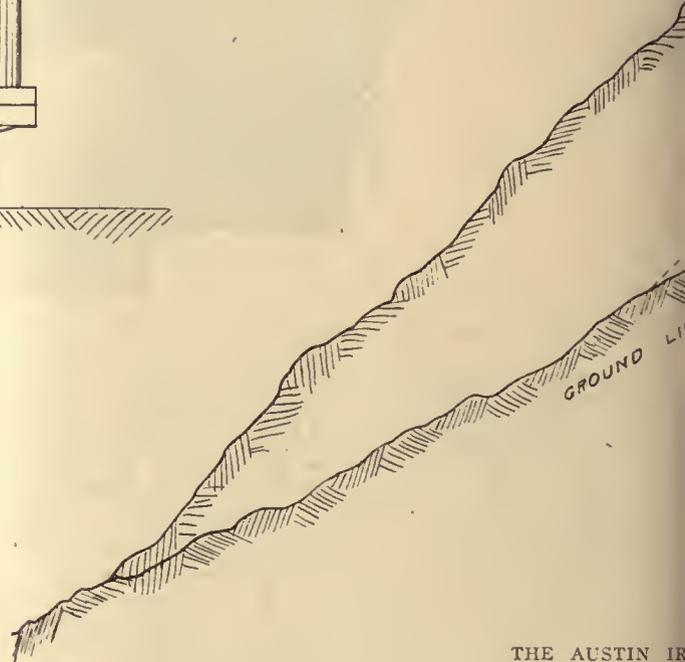
with many classes of agricultural enterprise. Experimental demonstrations of the value of irrigation are useful, and so are lessons and lectures on the subject of how and when to irrigate; but nothing is equal to the teachings of actual experience.

"My investigations into the general question of irrigation in other parts of the world, and my study of the matter in connection with trials made by my department—more especially in connection with the current series of lucerne-growing tests, made under the direction of Mr. Mead—have convinced me that developments in irrigation must be made here as a sine qua non to our agricultural success. One reason irrigation has not made greater headway in Australia is that agriculture has, so far, been conducted on British lines. We are an essentially British community, and we have introduced to this country the agricultural system of the land our people came from. Irrigation is not practised in Britain, hence our people in the earlier days of settlement here knew nothing about the art; and, having followed the dry system for so many years, it is hard for the great majority, even in the irrigation districts, to get out of the old groove.

"My idea, therefore, is that, in addition to engag-

ing our irrigation expert, Mr. Mead, from America, to teach the practice of cultivation with the aid of water, we should make an endeavor to secure the introduction of practical irrigation farmers from the Western States of America and Europe, not as official teachers to our farmers, but as actual operators—as farmers themselves—through whose example, in such districts as they may settle in, neighboring farmers will be able to learn, slowly perhaps, but none the less surely, what Victorian soil in certain localities can produce when treated as the soil is treated in other parts of the world. By securing a leaven, so to speak, of irrigation farmers throughout many of our agricultural districts we shall in the long run be able to 'leaven the whole,' and convert, in this practical way, the several districts into genuine irrigation settlements, which few of them are at present.

"The question is," Mr. Swinburne continued, "how



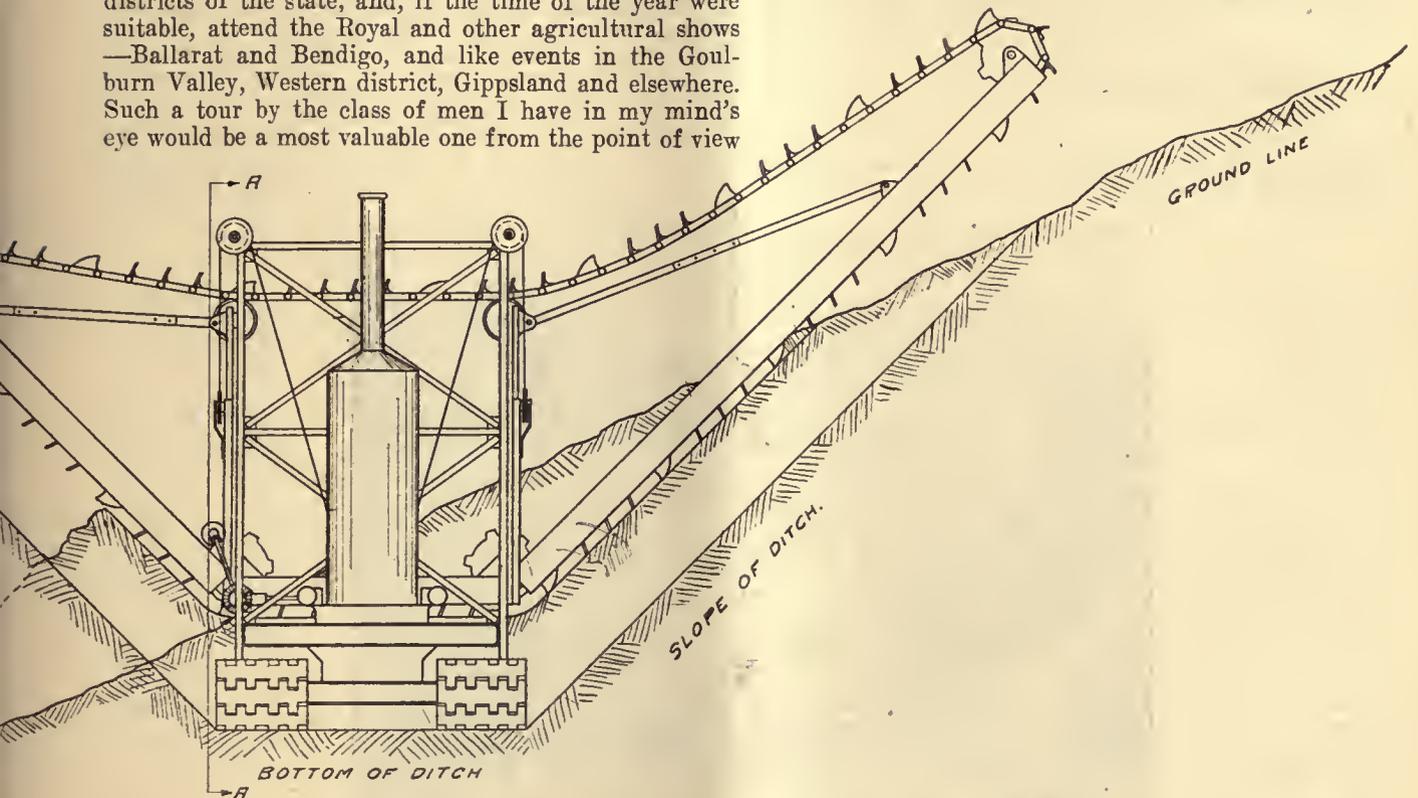
THE AUSTIN IR

can this leaven be best secured? I have conversed with Mr. Mead on the subject of the likelihood of inducing farmers from America to come to Victoria, and he has told me that there are hundreds of farmers over there who would readily throw in their lot with us if they but knew that the land here was as well adapted as it is to the practice of irrigation; for, as a matter of fact, it is much more productive in many parts than the soil of a large number of prosperous irrigation districts in

America. In a short time I hope to be able to advertise widely the irrigation possibilities of the state, as there will be a large number of holdings in the projected irrigation districts available. But what I would like best of all would be to encourage representative farmers and irrigators from these countries to visit Victoria. I would gladly put every facility in their way, and believe it would pay the Government and be in the interests of the farmers of the state to even pay the expenses of two or three representative men. Three farmers of standing and experience in America, for instance, could, if they came to Victoria, visit all the principal farming districts of the state, and, if the time of the year were suitable, attend the Royal and other agricultural shows—Ballarat and Bendigo, and like events in the Goulburn Valley, Western district, Gippsland and elsewhere. Such a tour by the class of men I have in my mind's eye would be a most valuable one from the point of view

judge of the capabilities of the soil, and at the shows they would see the class of produce our land produces. The goods on view 'in our show windows' at the Royal and other shows could not fail to impress them, and, being impressed, they would be moved to speak on their return home with more enthusiasm than they would if they came here at an 'off' period of the year and were able to see the land only, without having an opportunity to examine the results capable of being derived from it."

[The above is reproduced from the *Argus*, Melbourne, Australia.]



THE AUSTIN IRRIGATION CANAL EXCAVATOR
 ESPECIALLY VALUABLE IN SIDE HILL WORK
 SELF-PROPELLING, DELIVERS SPOIL ON EITHER SIDE;
 DITCH BOTTOM AND SIDE SLOPE ADJUSTABLE.
 SKETCH SHOWS 12 FT. BOTTOM, 1 TO 1 SLOPES ON
 SIDE HILL WITH 30° SLOPE.

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F. C. AUSTIN DRAINAGE EXCAVATOR CO.
 CHICAGO, U.S.A.

AL EXCAVATOR.

we are discussing, for in the course of, say, two months of travel through such parts of the state as are adapted to irrigation, together with their visits to the various shows, they would learn much, and be in a position to take back to their own country sufficient information to be able to speak informatively to their friends as to the advantages Victoria offers to the farmers who are versed in the arts of irrigation and crop-growing under that system. In their country tours they would be able to

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for new beginners in irrigation.

Reclamation Service News

Approximately 265,000 acres of land which were withdrawn from any form of disposition under the public land laws in connection with the Sacramento Valley irrigation project, California, have been restored to the public domain and will be subject to settlement on and after August 4, 1908, but shall not be subject to filing or selection until September 3, 1908.

These lands lie in Townships 12 to 15 N., Ranges 6 to 10 W., Mt. Diablo Principal Meridian.

Contract has been executed with James W. Jory, of Klamath Falls, Oregon, for the construction of about five and one-half miles of the South Branch Canal Laterals, Klamath

Hayes Bros. & Co., who immediately commenced work on the North Canal and the big earth dam. They have put in a large force of men and will build a railroad to the gravel pit. It is expected that the gap at Owl Creek will be closed speedily and that the dam will be completed in 1910.

Two hundred and sixty-four linear feet of tunnel were excavated during the month, making a total of 1,075 feet out of the 1,300 feet necessary. The tunnel excavation will be finished during the present month and work on the concrete lining begun.

The time set for the completion of Hubbard & Carlson's contract to complete a certain portion of the Payette-Boise canal system, Idaho, has been set forward fifty-nine days, making the date of completion August 30, 1908. It is believed that causes entirely beyond the control of the contractors delayed their work for that time, and that they should not be forced to pay the penalty provided for in the contract in the event of failure to complete the work on time.

The Pittsburg Testing Laboratory of Chicago, Ill., has been awarded contract for the inspection and testing of materials and machinery which may be purchased from time



No. 8. Some of the picturesque scenery along the North Platte River near Scottsbluff, Nebraska.

irrigation project, Oregon. This work is located fifteen miles southeast of Klamath Falls. It involves the excavating and embanking of about 25,000 cubic yards of material. The contract price is \$3,929.95.

Approximately 106,000 acres of land which were withdrawn from any form of disposition except homestead entry, in connection with the Carlsbad irrigation project, New Mexico, have been restored to the public domain, and will become subject to settlement and entry on such dates and after such notice by publication as the Secretary of the Interior may prescribe.

These lands lie in Townships 21 to 25 South, Ranges 26 to 29 East, New Mexico Principal Meridian.

Approximately 59,000 acres of land withdrawn from the public domain in connection with the Big Bend irrigation project, Washington, have been restored and will become subject to settlement and entry on such dates and after such notice by publication as the Secretary of the Interior may prescribe. These lands lie in Townships 13 to 18 N., Ranges 30 to 40 E., Willamette Principal Meridian.

During April ditch riders were employed in connection with the first unit of the Belle Fourche irrigation project, South Dakota, and arrangements made to turn water out to all the farmers who desire it.

On the 20th of the month the plant and equipment formerly operated by Orman & Crook, were turned over to

to time during the year 1908, for the use of the Reclamation Service. The bid of this corporation quotes a rate of 25 cents per ton for inspection and test of material, and 1½ per cent of contract price for machinery, making no requirement regarding expense of transportation of inspectors.

Contracts for the construction of laterals in connection with the Belle Fourche irrigation project, South Dakota, have been awarded as follows:

About five miles of ditch, involving the excavation of approximately 17,000 cubic yards of material, to Tom Burke, of Belle Fourche; contract price, \$2,637.30.

Six miles of ditch, involving about 28,000 cubic yards of excavation, to Cole Bros., of Orman, South Dakota, \$4,305.

On June 30 the first division of the Payette-Boise irrigation project in Idaho was about 98 per cent completed. All the structures on the main canal are finished, and twenty new contracts were let during June under the co-operative scheme, involving the excavation of about 275,000 cubic yards of material. The total yardage contracted for is 832,000, making eighty-two miles of laterals. About 83 per cent of the co-operative work now contracted was completed before July 1.

Contract has been awarded to T. Ryan, of Seattle, Washington, for laying about 11,200 feet of 55 inch and 1,500 feet of 48 in continuous wood stave pipe in the vicinity of Sunnyside, Washington, in connection with the Sunnyside irrigation project. The contract amounts to \$66,701.80.

Approximately 45,000 acres of land which have been withdrawn from all forms of disposition under the public land laws in connection with the Sun River irrigation project, Montana, have been restored to the public domain, subject to homestead entry only, in accordance with the terms of the Reclamation Act.

These lands lie in Townships 22 and 23 North, Ranges 3 and 4 West, Montana Principal Meridian.

The settlers under the Buford-Trenton irrigation project, North Dakota, finished planting their crops about the middle of June, and practically all the farmers who will use water this season have completed work on the farm laterals. The excessive rainfall during June has put the crops in very fine condition, and so far no water has been required for irrigation.

The June rise of the Missouri river was the highest on record, the water reaching a stage of 16.7 feet above normal water level.

On the Williston project the water stage exceeded the high water reading of 1906—the previous maximum attained on this stream—by 1.6 feet. The large quantities of drift running in the stream made the moorings of the barge carrying the pumps unsafe, and the discharge pipes were disconnected temporarily on that account.

The power plant was in operation part of the month for the purpose of priming the canals, and during the last week in June water was delivered to 100 acres of hay land. The lignite mining continued with an average output of about thirty tons per day. Water is available for about 6,350 acres this season, but it is probable that not more than 2,000 acres actually will be cultivated and irrigated.

Contract has been awarded to the Northern Electrical Manufacturing Company of Madison, Wis., for furnishing controlling apparatus for the operation of sluice gates in Laguna dam, Yuma irrigation project, California-Arizona. The contract amounts to \$4,628.60.

The Secretary of the Interior is now advertising for proposals for the construction of the last Park dam, spillway and dikes in connection with the Orland irrigation project, California. The work involves the placing of about 13,500 cubic yards of concrete and the excavation of about 8,500 cubic yards of material.

An extension of three months has been granted to Messrs. A. Y. Bayne & Co., of Minneapolis, Minn., within which to complete their contract for steel highway bridges in connection with the Lower Yellowstone irrigation project, Montana-North Dakota. It was impossible for the contractors to paint these bridges during cold weather, and the date of completion therefore was advanced.

Approximately 128,000 acres of land which were withdrawn from all forms of disposition under the public land laws in connection with the Minidoka irrigation project, Idaho, have been restored to the public domain and will become subject to settlement and entry on such dates and after such notice by publication as the Secretary of the Interior may prescribe. The lands lie in Townships 7 to 9 North, Ranges 30 to 32 East, Boise Principal Meridian.

Approximately 12,000 acres of land which were withdrawn from all forms of disposition under the public land laws in connection with the Payette-Boise irrigation project, Idaho, have been restored to the public domain and will be subject to settlement on and after August 11, 1908, but will not be subject to entry, filing or selection until September 10, 1908.

These lands lie in Township 7 North, Ranges 1, East and 1 West, Boise Principal Meridian.

During the month of May 3,350 cubic yards of masonry were laid in the Pathfinder dam, which is being constructed near Casper, Wyo., in connection with the North Platte irrigation project. Progress was somewhat retarded on account of raising four derricks on the wall. The dam is now 67 per cent completed.

Water has been running continuously in the Interstate Canal since April 16, and in the first seventy miles and most of the laterals since the middle of May, but owing to the

abundant rainfall but little irrigating has been done. In the first lateral district about 50 per cent of the co-operative work on lateral extensions and placing of lateral headgates has been completed. A force of about forty men and fifteen teams has been engaged in building wooden drops, check gates, waste gates and siphon road crossings and in cleaning laterals. Contracts involving the excavation of about 70,000 cubic yards in extending laterals have been awarded under the co-operative plan during May. All the principal structures on the second fifty miles of the Interstate Canal are now completed.

The pumping barge in connection with the Buford-Trenton irrigation project, western North Dakota, has been put in commission and the pumps were started on May 19. The settling basin was filled on the 25th and on the 26th the water was pumped into the high line canal, demonstrating that the Government is prepared to successfully furnish water to the farms under the first unit of the project.

Approximately 300,000 acres of land which were withdrawn in connection with the Lower Yellowstone irrigation project in eastern Montana, have been restored to the public domain and will become subject to settlement and entry on such dates and after such notice by publication as the Secretary of the Interior may prescribe. These lands lie in Township 18 to 27 North, Ranges 56 to 60 East, Montana Principal Meridian.

On July 1 the Reclamation Service lost two of its foremost engineers, Mr. Douglas W. Ross, Supervising Engineer in charge of the Idaho Division, and Mr. F. C. Horn, Construction Engineer for the same district, who resigned to take up more lucrative work.

Mr. Ross has been connected with irrigation work in Idaho for many years, having been in charge of the construction and operation of several canal systems in Boise Valley, which are now being enlarged and extended in connection with the Payette-Boise project. For four years he occupied the position of State Engineer, and he also conducted investigations for several years to determine the duty of water in irrigation in that state. He has been in charge of the Government work in Idaho since the inception of operations under the Reclamation Act. Mr. Ross and his connection with Idaho irrigation works are so well known that further comment is hardly necessary.

Mr. Horn has had wide experience in all kinds of engineering work, including railroad construction, building of sewage and waterworks systems, shafts, docks, masonry of all kinds, and the erection of buildings such as warehouses, grain elevators, roundhouses, foundries, machine shops, power plants and dams. The Intramural elevated railroad at the World's Columbian Exposition in Chicago, the first third-rail system electric road built in the United States, was constructed under Mr. Horn's direction, as well as the controlling works of the Chicago Sanitary Canal at Lockport, Ill. In this construction which is composed of heavy masonry and steel, several sluice gates of the Stony type, and the next largest gates of this type in the world, were put in operation. Lake Cheesman dam in Colorado, constructed of granite masonry, and at present ranking as the highest in the world—236 feet high—filter beds for the water supply of Denver; the Swan Falls Power plant near Boise, and the Economy Light & Power Company's plant, Joliet, Ill., were all constructed by Mr. Horn.

To the thorough knowledge of the irrigation possibilities of the State of Idaho which Mr. Ross brought to the Service, and Mr. Horn's varied experience in construction work is due the exceptional record made in the construction of the Minidoka project and the excellent progress on the great Payette-Boise system.

The Minidoka project, covering about 85,000 acres of land, was completed on record time. The first contract was let in the fall of 1904, and water was available for almost the entire tract in the spring of 1907. Not only was water ready for settlers, but there was a settler on practically every farm unit under the gravity system, regular trains were running over a new branch of the Oregon Short Line Railroad built through the center of the project, and three towns, with banks, schools, churches, newspapers, etc., had sprung up along the line of the railroad. A portion of the lands on the south side of the river lie too high to be served with water by the gravity system, but power developed at the dam will be utilized to pump

water for these lands. The principal engineering feature of the Minidoka project is a dam of gravity type, 625 feet long, 80 feet high, 130 feet wide on the bottom and 25 feet wide on top. The purposes of the dam are mainly control, diversion and power development. The capacity of the reservoir is approximately 900,000 acre-feet, and the water is distributed through 130 miles of main canal and 110 miles of laterals. The amount of power that can be developed is estimated from 11,000 to 30,000 horse power.

The Payette-Boise project provides of the reclamation of 372,000 acres of land in southwestern Idaho. These lands are tributary to the Oregon Short line, the Boise, Nampa & Owyhee and the Idaho Northern railroads. Construction work is well under way and many new settlers have already taken up homesteads.

The engineer's report on the Yuma irrigation project, California-Arizona, for the month of May states that about 3,500 acres of land under the Farmers' Pump Canal is under cultivation, some 300 acres of this being devoted to cantaloupe culture this season for the first time. Shipments of melons in small quantities were made during the last ten days of the month and it was expected that carload shipments would soon begin. With the new gravity system in operation water will be available for an additional 10,000 acres.

Everything is in readiness to admit water to the gravity system when the river reaches a proper stage. The river is reported about four feet lower than a year ago, but a rise of eighteen inches would be sufficient to allow of the operation of the system. Work is progressing on the producer plant and the foundations for gas engines which will be utilized to pump water during low stages of the river. The main canals have been cleaned and put in condition to receive water far a distance of about eighteen miles. A small force is working on channels to the outlying districts which are badly silted up.

The maximum discharge of the Colorado River for the month of May was 33,700 second feet; the minimum, 23,000 second feet, and the mean, 27,150 second feet.

Work on Laguna dam has been carried on continuously on both sides of the river and good progress is being made.

Approximately 80,000 acres of land which were withdrawn in connection with the Cheyenne River irrigation project, South Dakota, have been restored to the public domain and will become subject to settlement and entry on such dates and after such notice by publication as the Secretary of the Interior may prescribe. These lands lie in Township 6, 7, 8 and 9 South, Ranges 3 to 9 East, Black Hills Principal Meridian.

Preliminary work on the Blackfeet-two Medicine irrigation project, Montana, is well under way. The necessary equipment and animals are being transferred from Shoshone and Huntley projects, where they are no longer needed, and contract has been made for hauling lumber and material for the headquarters buildings at Mission. Preliminary surveys and canal location are proceeding rapidly. Owing to the high stage of the river and the saturated condition of the soil resulting from unusually heavy rainfall, the first construction camp will probably be located about two and one-half miles below the proposed headworks, where work on the steep hillsides and sluffy banks would be difficult. It is believed that the building of bridges across some five or six sloughs between the camp and Two Medicine will greatly increase the freighting facilities, and steps have been taken toward a co-operative scheme of building these bridges whereby the Indian agent is to furnish the lumber and the Reclamation Service is to do the work. Such an arrangement would be an equitable one for both the reservation and construction work.

INDUSTRIAL ENTERPRISES, IRRIGATION AND TOWNS SURROUNDING IN SANTA MARIA VALLEY, SANTA BARBARA COUNTY, CALIFORNIA.

BY A. T. TAYLOR.

While the Santa Maria oil fields are at the present time claiming a wide range of attention, especially among capitalists and investors of the Pacific Coast, the fact remains that agriculture is the life and foundation upon which all other business enterprises are based.

Long after the oil fields of the world have been exhausted and man has ceased to remember oil as a commodity, agriculture will not only have maintained its supremacy in the universe, but with each succeeding generation it will become more and more a part of its very existence, until at last, all other enterprises will be subordinate to her majesty, the soil; and so it will be in the Santa Maria Valley, where today oil is king and agriculture is but a secondary condition, save but to the few far-sighted.

Among the small minority in this valley who have been prophetic enough to foresee the growing importance of this great industry, is the Union Sugar Company. This company was organized about ten years ago by J. W. Atkinson and associates and is composed entirely of San Francisco capital. Though it has met with many sore trials, and all the prejudice attendant upon the success of any great enterprise, it ranks today as one of the greatest sugar properties in the world, and in reality is Santa Maria's greatest benefactor.

As an evidence of the commercial and industrial importance of this company to the Santa Maria Valley, the development of the Santa Maria oil fields can be directly traced to this company, as they were largely, if not wholly, instrumental in creating the first and profitable demand for the product.

There is no other place in the world that is so admirably adapted to the cultivation of the sugar beet as the Santa Maria Valley. Here, in favorable seasons, beets have been planted and harvested during the entire year, or so that it may be better understood, while the beets were being harvested in one part of the field, seeding was in progress in another.

At the present time there are 12,000 acres under cultivation. The approximate yield this year will be 120,000 tons of beets which will produce between 15,000 and 18,000 tons of sugar, or about 360,000 sacks.

The plowing and harvesting is done by the Fowler System of steam engines, of which four sets or eight engines are employed. The seeding season begins in the latter part of October and ends about the first of April. Harvesting begins about the first of June and ends about the first of November.

By the courtesy of J. W. Atkinson, the writer was shown over the entire plant and premises, and even the casual observer could not but have been impressed with the perfect order, cleanliness and above all, the broad and liberal ideas employed in every detail of its management. Success is apparent to the view in every department.

When the factory is in operation it furnishes employment to 1,000 men and 600 horses and mules. They

Will pay for the
\$2.50 IRRIGATION AGE one year and the
 PRIMER OF IRRIGATION

are constantly extending their possessions by lease or purchase and in accordance with the increased product the capacity of their factory is enlarged.

Lime is an indispensable factor in the refining process of the sugar and they have a very fine quarry near Lampoc about twenty-six miles from their factory accessible to the Southern Pacific Railroad.

They have a railroad of twenty-five miles covering the entire plantation for the delivery of the beet product to the factory. The Southern Pacific and Pacific Coast systems have spurs to the factory connecting them with their main lines.

Their irrigation project comprising seven pumping plants and a gravity system with a capacity of 30,000-000 gallons per day when all are in operation is sufficient to furnish twenty inches per acre a year to their whole plantation, and the system can be enlarged as their holdings increase. It is necessary, however, to irrigate only in extremely dry seasons.

As an adjunct to their business, they have a general merchandise store known as the Union Commer-

distributing point, if not equal, is second only to that of Santa Maria.

In an interview with C. F. Twitchell, who owned and laid out the first addition to Orcutt, he said: "Only ten lots remain unsold in the addition, and I contemplate putting another addition on the market in the near future. There is a demand for at least thirty new houses at the present time, and there is a splendid opportunity here for a man with the knowledge and capital to engage in the banking business. Beside, in the professional line, we need badly, a doctor and a dentist. In the mercantile line, there is a splendid opening for a hardware and tin store, and a practical shoemaker will doubtless do a lucrative business."

The population of the town is about 500 and has a fine public school with about eighty-five pupils in attendance.

Mr. Twitchell came to the Santa Maria Valley about thirty years ago from the state of Iowa, and he is counted among the few whose faith in the country has been amply rewarded by the success which he has



No. 9. One type of pioneer home, and two views of present style homes in the North Platte Valley.

cial Company, which is the largest and most complete in the valley.

Among the towns in the valley which have been given impetus by this company and the development of oil, are Santa Maria, Orcutt and Guadalupe.

The transcendent population of Santa Maria is so great that for its accommodation a new and modern hotel is imperative.

Mr. A. L. Popp, a successful farmer and owner of Santa Maria realty, whose father was one of the California pioneers, is the gentleman who has undertaken to supply this necessity. Ere this article has gone to press, he will be ready to receive bids for a modern two-story hotel building, seventy-five by one hundred feet. The building will be modern in every respect, with baths and all other appliances, so that the weary traveler or the permanent guest can enjoy every comfort and luxury to be found in the hotels of larger cities.

On the line of the Pacific Coast Railroad and overlooking the Santa Maria Valley is the town of Orcutt. The growth of Orcutt has kept pace with the development of the oil fields, until today its importance as a

attained. Mr. Twitchell is known by his friends as the father of Orcutt.

On the coast line of the Southern Pacific Railroad in the southern end of the valley is located the town of Guadalupe.

The beet sugar and dairying industries both pay their quota of tribute to this bustling little town which is a distributing point of importance for these products. Within a short distance of the town is located one of the largest dairying industries in the state, the property of E. J. Pezzoni.

Mr. S. Campodonico, who is the representative merchant of Guadalupe, exercises a paternal interest in its growth and prosperity, and it is largely due to enterprise and civic pride that the town has assumed its present proportion and importance.

Mr. Campodonico, as an example of progressiveness to his neighbors, has built an elegant and imposing residence here which would be a credit to any large city.

About seven miles north of Santa Maria, just across the line in San Luis, Obispo County, is the historical little town of Nipoma. The Nipoma grant of

nearly 38,000 acres from which the town derived its name was ceded to Captain William Goodwin Dana by the Mexican Government in 1835.

Most of the descendants of this notable character who are now living still reside in or around the town.

The progress and history of Santa Maria Valley are so closely interwoven with Nipoma, that although it is in an adjoining county, mention of the valley would be incomplete without its association.

It was the pleasure of the writer to have met Samuel A. Dana, one of the remaining sons of Captain Dana, who with his family is now a resident of Nipoma. Through the courtesy of this worthy son, the following facts were obtained:

There are 20,000 acres surrounding the town of the finest land on the Pacific Coast and in the not distant future, when Nipoma will have better railroad facilities, and a class of farmers who appreciate the value of small tracts on the intensified plan of farming, the apple, pear and walnut industry will make this one of the wealthiest and most productive spots in the state.

The soil is exceptionally adapted for the cultivation of these fruits, and the land values are comparatively low when the enormous profits to be derived are taken into consideration. The wonder and mystery of it all is that such opportunities should have for all these years lain fallow.

LINING OF DITCHES AND RESERVOIRS TO PREVENT SEEPAGE LOSSES.

(Concluded.)

BY PROF. B. A. ETCHEVERRY, BERKELEY, CAL.

The prevention of growth of vegetation is an important item and is quite an expense, when in most cases the ditch or lateral must be cleaned out several times

That oil will prevent vegetation and the burrowing of animals on the banks and bottom of the ditch is clearly shown by the example near Lemoore, previously mentioned.

That oil will prevent scouring to a great extent and will allow a much higher velocity of flow of water than the earth ditch may be expected, when we consider its resistance to wave action at the Ivanhoe Reservoir, and the resistance of oiled roads to cutting under the action of running water. This toughness of oil lining was also noticed in filling the experimental ditch each morning. When the water carried by the wooden flume discharged into each ditch through the gate it had a fall of at least one foot. It was difficult to prevent the sloping ends of the earth and puddle ditches from being badly cut up by the erosive force of the falling water. These ends had to be well protected with heavy canvas, and even the erosion could not be altogether prevented. The ditches lined with oil resisted the erosion and showed no cutting, although they were not protected with canvas.

A letter from the superintendent of the Modesto Irrigation District, dated January 21, 1907, states that the ditches were examined by him after the recent heavy rainfalls. The banks of the earth ditches were badly washed where the water ran in; the clay puddle was slightly so, but the oiled ditches showed absolutely no sign of wash. The oil linings are all hard and firm and scratch almost like concrete.

This resistance to erosion will permit in a saving of cross-sectional area due to the possibility of giving the water an increased velocity. The higher velocity will prevent the deposition of silt to a great extent and there will be a consequent decrease in the cost of operation and maintenance.

The puddle lining in the experiment showed a sav-

2. Table showing Results of Experiments.

Description of lining.	Average mean sinkage per hr. in feet excluding evaporation	Efficiency ratios	Per cent. saving	Experimental cost of lining per sq. ft.	Actual cost of lining per sq. ft.*
Cement concrete, 3 inches thick	.0046	7.17	86.6	83	7.5
Cement lime concrete, 3 inches thick	.0114	2.90	65.5	8.3	7.5
Cement mortar	.0121	2.73	63.3	8.88	3.25-3.50
Heavy oil 3½ gallons per square yard	.0176	2.02	50.4	1.20	1.20
Clay puddle, 3½ inches thick	.0185	1.78	47.8	890	1.20
Heavy oil, 3 gallons per square yard	.0220	1.50	38.0	1.00	1.00
Heavy oil, 2½ gallons per square yard	.0239	1.37	27.3	.77	.77
Thin oil, 2½ gallons per square yard	.0329	1.08	7.3	1.00	.80
Earth (no lining)	{ .0329 } { .0355 } { .0330 }	1.00	0.00		

* Excluding the preparation of the ditch. (Last two columns.)

during an irrigation season. (2d) The resistance to scouring, on which depends the velocity which the water can be given. (3d) The prevention of squirrels and gophers from burrowing into the banks and bottom of ditches.

ing in seepage nearly equal to the heavy oil lining when 3 2-3 gallons of oil per square yard was used, and a greater saving than the other oil linings. This puddle lining, whose thickness was 3½ inches, would, no doubt, if made thicker, be more efficient than any

of the oil linings as regards seepage; but clay puddle when wet becomes very soft and will not resist the erosive force of the flowing water unless the velocity is very small. It will not prevent the growth of weeds. For these reasons it is probably not as efficient for canal linings as oil. But where clay is plentiful it would be preferable for reservoir lining. The slopes should, however, be protected against the erosive action of the waves by the use of cobblestones or other protection.

The use of oil in lighter quantities, while not very efficient in preventing seepage, will no doubt prevent the growth of vegetation, as illustrated by the example of the ditch near Lemoore. In this case only 1½ gallons per square yard was used and this quantity has been sufficient to prevent vegetation.

Cement mortar plaster, so extensively used in southern California, showed a saving in seepage water of 63 per cent. Better results were expected, and it is probably safe to expect a greater saving where good work is done, especially where the work is constructed in cold weather. This lining had to be applied when the temperature in the field was probably 110° or over. The cement mortar was mixed in small quantity and quickly applied. As soon as the setting had started the lining was sprinkled and covered with wet canvas, but even with these precautions better work could be done in cooler weather.

This plaster, while very efficient and economical on small ditches, would not be of sufficient thickness and strength to be used on the larger canals and laterals of larger irrigation systems, where a thickness of from 2 to 4 inches would no doubt be successful.

RECLAMATION SERVICE NEWS.

The following described lands have been temporarily withdrawn from any form of disposition whatever under the public land laws in connection with the Sun river irrigation project, Montana: Montana Principal Meridian. T. 22 N., R. 9 W., all Secs. 26, 34, 35 and 36; T. 21 N., R. 10 W., all Secs. 3, 4, 8, 9, 17 and 20; T. 22 N., R. 10 W., all Secs. 28, 29, 32, 33 and 34.

The Secretary of the Interior has arranged a simple plan of cooperation whereby any settler so inclined may secure work on the construction of the canals and ditches, on the big irrigation projects in the West. The contracts with the water users' associations are subdivided into units involving comparatively small yardage, and payment is made by the association in the form of certificates, which are accepted by the Government in payment for water rights. Usually a group of farmers takes a contract together and divides the work between them. In this way many industrious farmers will be able to work out the whole of their indebtedness to the Government.

The Secretary of the Interior has modified the public notice issued November 25, 1907, in connection with the opening of the Shoshone irrigation project, Wyoming, in so far as it relates to the payment of the first installment of the building, operation and maintenance charges on all entries made prior to November 25, 1907. In all cases of entries made before that date for lands shown by the farm unit plats approved September 25, 1907, and for all such lands in private ownership at that time, the first installment of building, maintenance and operation charges will not be required at time of filing water right application, but will become due and payable on December 1, 1908. Those who have made entries since the date of the public notice have been required to file water right application accompanied by the payment of the first installment, as those entries were made with full knowledge of the conditions.

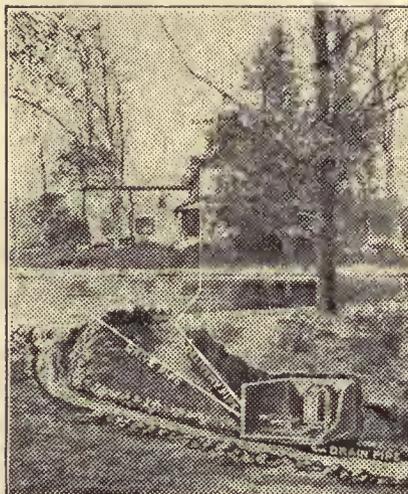
THE HYDRAULIC RAM AN IMPORTANT FACTOR IN SOLVING THE WATER SUPPLY PROBLEM.

We wish to call the attention of our readers to the growing importance of the hydraulic ram as an assistant to man for meeting the irrigation problem.

It is not necessary to confine our comments regarding the hydraulic ram entirely to irrigation by any means, for as now built there are rams which are adaptable to practically all purposes, from the smallest to the largest needs, so today the scope of the hydraulic pumps are well-nigh unlimited where the conditions for their use are favorable.

To cite such conditions as are favorable, we need only say that the water supply for power in the form of a stream, pond or spring, situated anywhere within a mile or so of where the water is to be delivered, is all that is necessary. providing there is sufficient power water to operate the ram and still meet the needs of the user.

So powerful and so mechanically perfect is the Rife Automatic ram, being made, that the large sizes,



One Method of Installing a Rife Hydraulic Ram.

with capacities up to delivering one million gallons a day each to the storage tank, are giving as satisfactory service as are the small sizes used for farm work, ranch, country estates and other purposes.

The principal reasons why the hydraulic rams are used for water supply power where possible are that they are easy to install, pump continuously without any attention or expense, and are comparatively low in cost when considered with other forms of pumping plants which will do the same work.

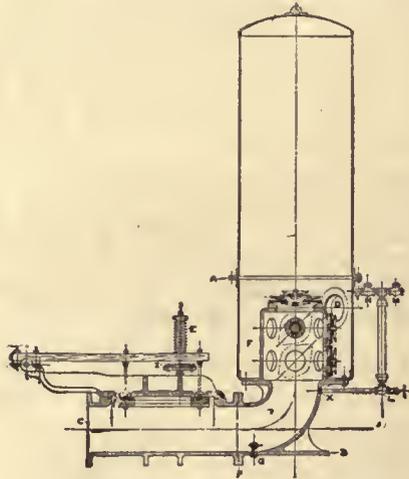
The modern automatic ram has practically no wearing parts, the valves being the only parts that may need replacing, and even these become worn only every two years or so and may be easily replaced.

Another advantage in connection with Rife rams is the fact that they are double-acting; that is, impure water may be used to operate them, but they will deliver pure water or spring water to the supply tank. They will raise water 30 feet for every foot of fall and work under a fall of from 18 inches to 50 feet and deliver water to a height of 500 feet when necessary and when proper conditions are provided.

As to the efficiency of these rams may be cited

the installment of the large size for the United States Government Naval Coaling Station at Narragansett Bay, Rhode Island, where each ram delivers 232 gallons of water per minute, each representing an efficiency of 91.25 per cent.

The accompanying line drawing show the rams used at the Narragansett Bay station. The halftone



Rife Hydraulic Ram in Outline.

illustration shows the simple method of installing the ram where there is a stream or pond available.

The Rife Company issues a book about these highly improved rams entitled "Running Water When and Where You Want it," and it contains much valuable information, aside from the mere description of the

rams themselves regarding this method of solving the water supply problem. The book is free to those who request it, and we therefore suggest that any of our readers write to the Rife Engine Company, Trinity Building, New York City, and request a copy.

This company absolutely guarantees every ram they sell. They give complete instructions as to how to install them, or they will take charge of the entire work, put in a complete water system and guarantee results.

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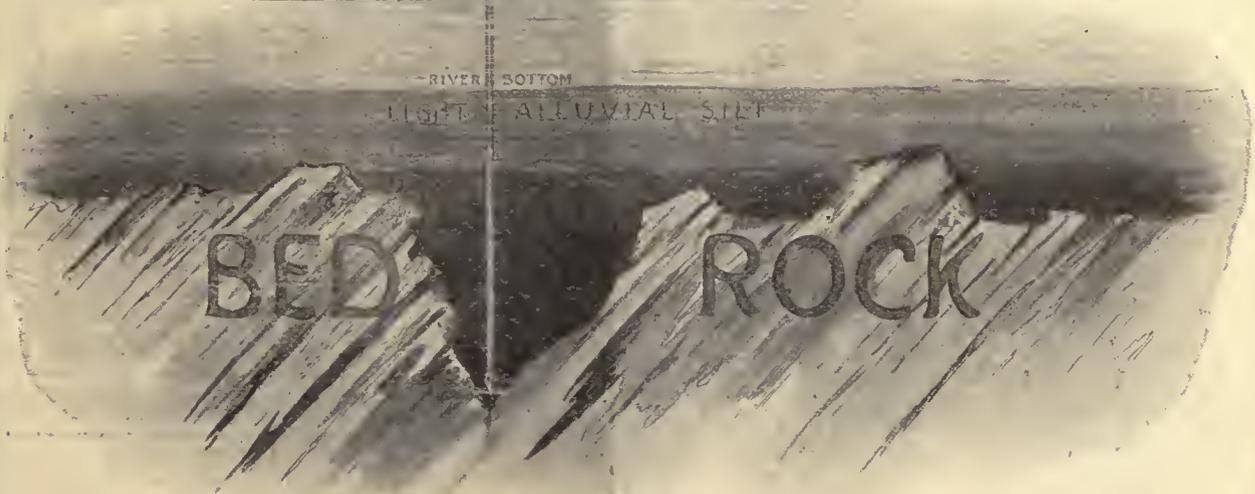
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The Pneumatic Pipe Dredge is a new, inexpensive device for dredging sand, silt, muck and gravel, or any other material or soil susceptible to rapid disintegration by the action of water under pressure

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Its pipe or head "jets" itself deeply into the material to be handled, breaks it up and forces it upwards through a discharge pipe by the use of water and compressed air mixed under high pressure. It is not a suction or centrifugal dredge. It is a hydro-pneumatic ram.



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This shows the pipe lifting the heavy black sand out of one of nature's bed rock riffles. The precious minerals like gold and platinum have been trapped in these pockets or riffles for untold ages, but no method to recover these stored up treasures had been devised before the advent of the pipe dredge. This dredge will enter these pockets and recover the values they contain.

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It is not possible to describe this dredge nor tell of its superiority in a few words. However, **IF YOU HAVE USE FOR A DREDGER**, it will pay you and save you money to look into the merits of this device. It will also save time. Here is part of what Mr. M. A. Nurse, for 18 years Chief Engineer of the State of California, says about the Pneumatic Pipe Dredge.

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If you require a dredge for reclamation work, for levee building, for recovering sand or gravel, for filling, for channel or harbor deepening, for mining or for lifting or moving any class of material excepting boulders, **DON'T OVERLOOK THE PNEUMATIC PIPE DREDGE.**



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IT IS WORTH WHILE INVESTIGATING.

One of these dredges is operating in the heart of the City of Sacramento, California, on a contract for the city. Twice in succession this dredge has been awarded city contracts on competitive bids. Other contractors could not come within a mile of the price bid for the work: Yet the dredge is making money. It is practical results like this that talk.

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SEED ROT OF POTATOES.

BY E. R. BENNET, POTATO SPECIALIST, COLORADO EXPERIMENT STATION, FORT COLLINS, COLO.

Reports have already begun to come in of seed potatoes rotting in the ground. This trouble is caused by a fungus, or mould that attacks the piece of tuber in the ground on the cut surface. The disease was so bad last year in some fields that 90 per cent of the seed rotted in the ground. In some cases this rot started so soon as to prevent the pieces of tubers from sprouting at all. In other cases it started later, rotted the seed, then the fungus attacked the stem. Plants may be found in any field during the season more or less affected with this disease. The plants lose their green color and the edges of the leaves turn yellow or die. If the stem be pulled up, the bark will be found all right, but the splitting of the stem longitudinally will show the sap wood of the stem colored brown or yellow or in the last stages black. Microscopical examination of a cross-section of the stem will show the fungus growing in the cells and across the sap tubes of the stem. The injury, to a large extent, at least, comes from the clogging of the sap circulation by the hypha of this fungus.

This plant, or fungus, that causes the disease, is one of the species of Fusarium, the same or similar to the one that causes the blight or so-called "sleeping-disease" of the tomato. No direct remedy is known for it. One fact that is of some assistance in combatting it is that the disease is much more prevalent on land previously planted to potatoes than on alfalfa, or clover land. Another thing that is quite noticeable in studying the nature of the disease, is that potatoes planted whole are not attacked to such an extent as the cut ones because of the inability of the fungus to get into the stem.

Treatment of seed with formalin, corrosive sublimate, sulphur, lime, etc., have not given any perceptible relief from it.

It is probable that in many cases at least much of the disease is carried to the field in the seed potatoes. The same fungus causes the "dry rot" of potatoes in the storage cellars. It has been very noticeable during the past winter that cellars with poor ventilation, no matter how cool and dry they were, had a high per cent of potatoes affected with this dry rot. Good ventilation and as low a temperature without danger of frost in the cellar is probably the best safeguard against loss from this cause.

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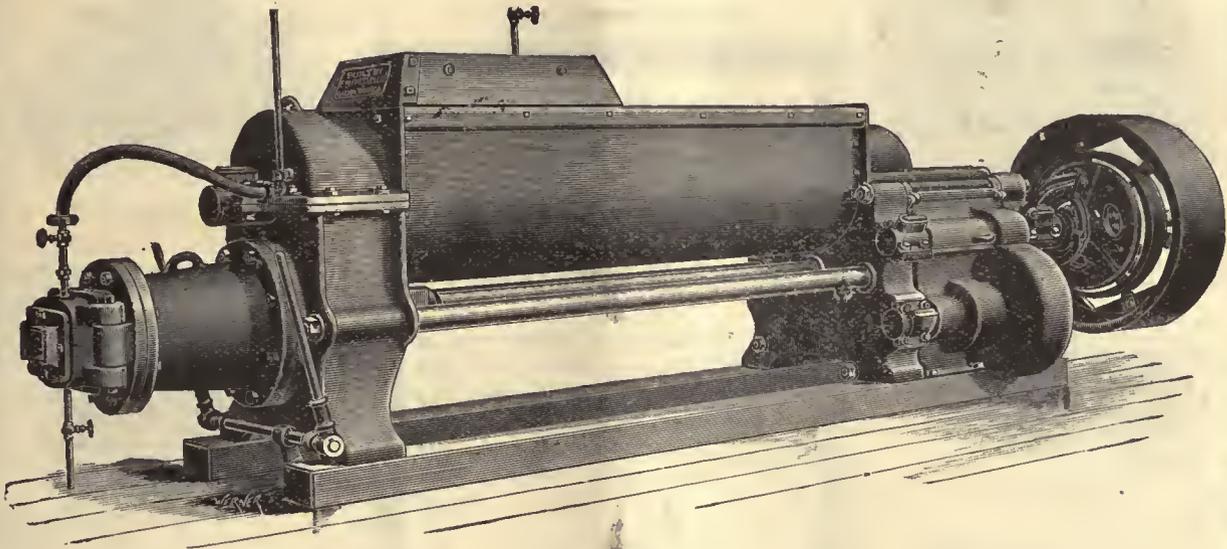
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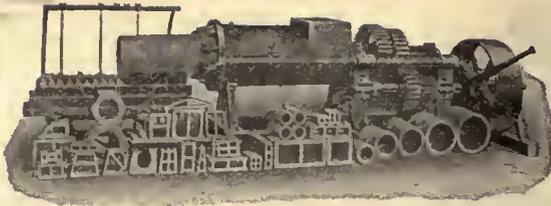
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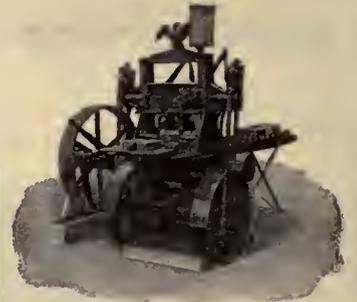
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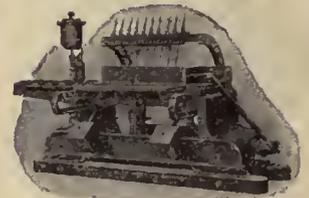
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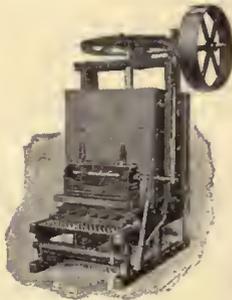
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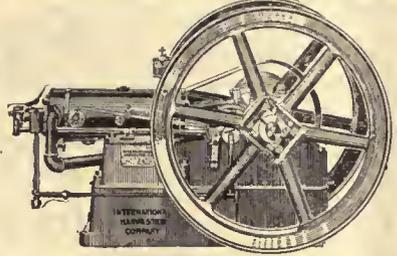
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These settlers and farmers are cultivating all sizes of farms, from garden spots to "forties" and "eighties" and quarter sections and even larger tracts. They are among the most prosperous farmers in the irrigated

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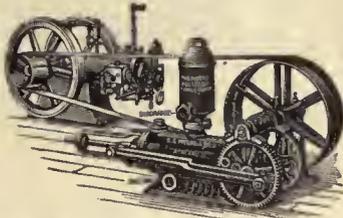
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FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

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BACK GEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

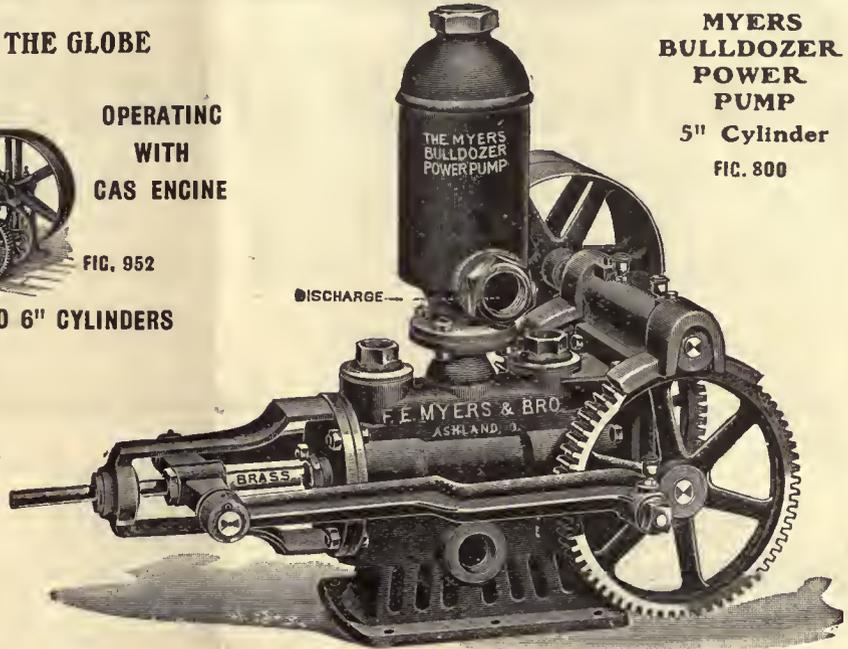
5, 7½ AND 10"
STROKE

FOR BELT,
WIND OR HAND
POWER

FIG. 1113



2½" DISCHARGE



MYERS
BULLDOZER
POWER
PUMP

5" Cylinder

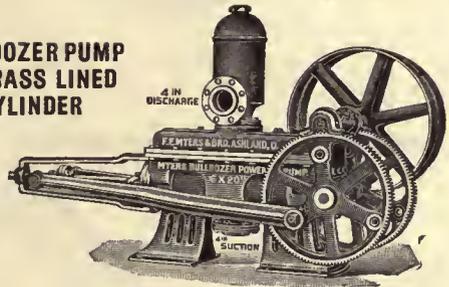
FIG. 800

DISCHARGE

BULLDOZER
WORKING
HEAD

BULLDOZER PUMP
6" BRASS LINED
CYLINDER

FIG. 1079



1½" BRASS ROD

PISTON
COUPLING NUT

FIG. 813



PIPE FLANGE

THE MYERS
BULLDOZER
POWER WORKING HEAD

RABBITED BOX

F. E. MYERS & BRO.
ASHLAND, O.
U. S. A.

24" PULLEY
4" FACE

MYERS BULLDOZER
WORKING HEADS

NO. 359

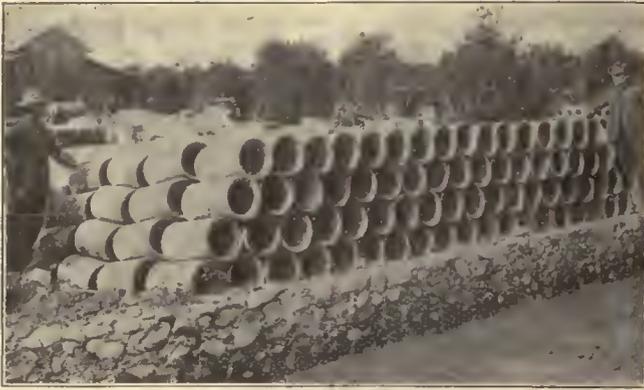
5", 7½", 10" STROKE
DISCHARGE 2½" OR 3"
SUCTION 2" TO 4"

NO. 364

12", 16", 20" STROKE
REGULARLY FITTED 4"
DISCHARGE
SUCTION 8" OR LESS

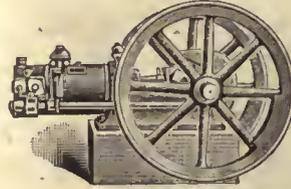
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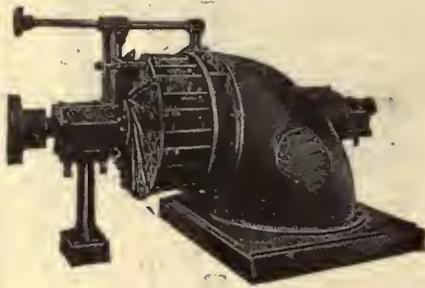
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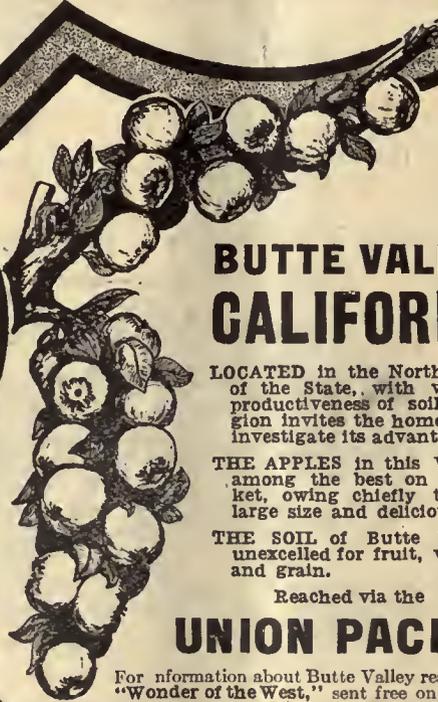


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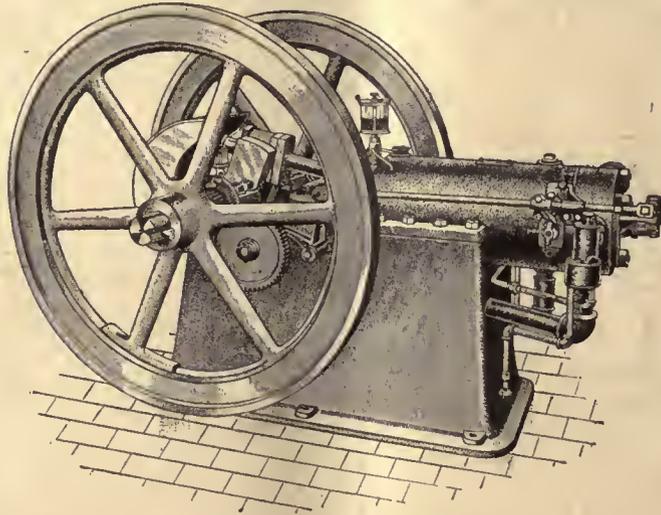
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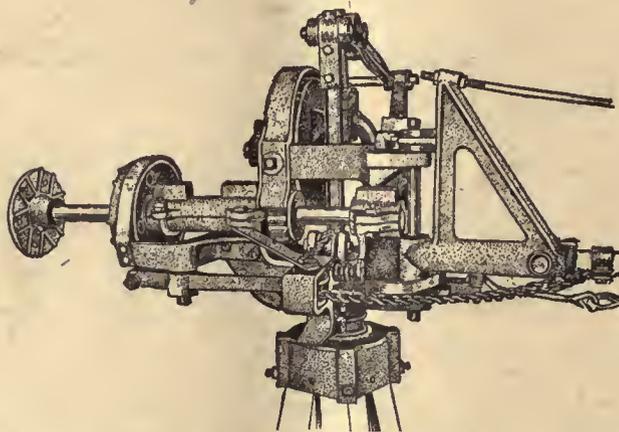
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VOL. XXIII.

CHICAGO, SEPTEMBER, 1908.

No. 11

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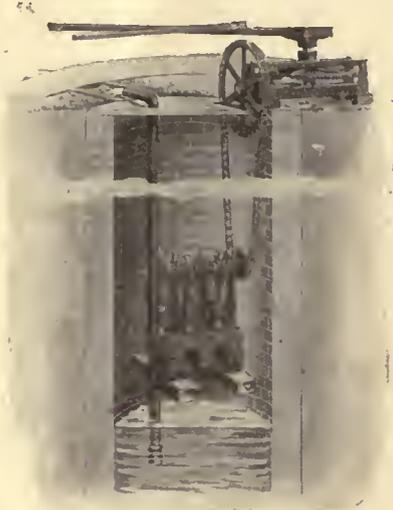
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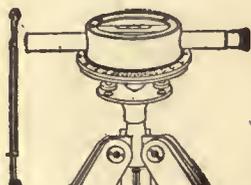
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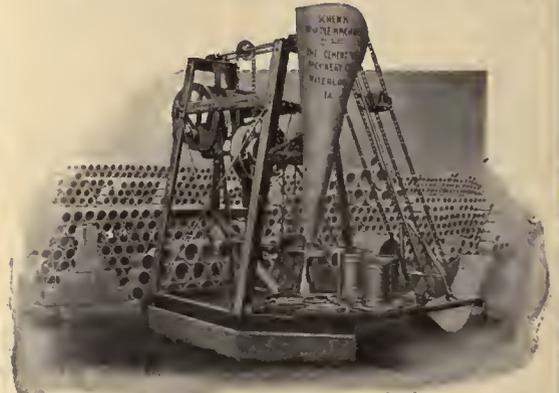


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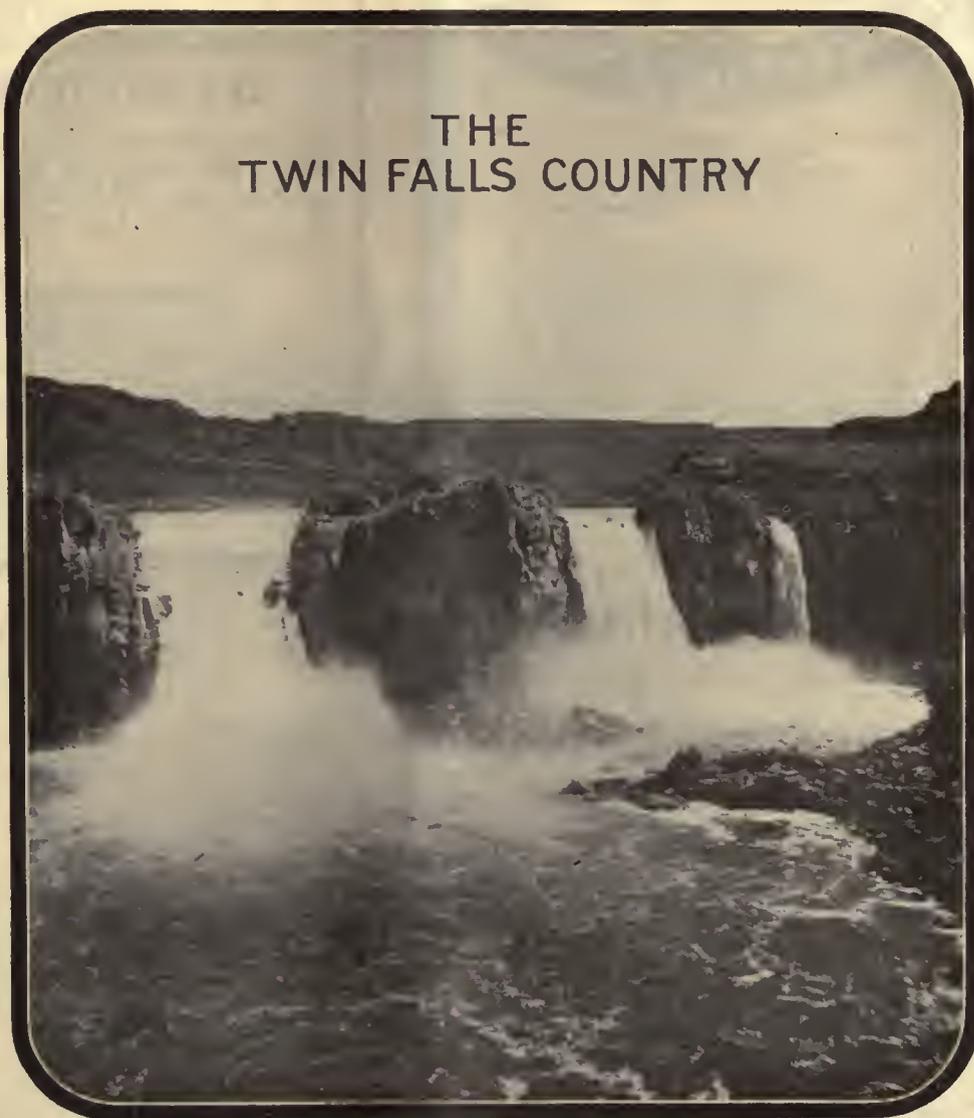
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4¼ inch.	4½ inch.	6½ lbs.	20c
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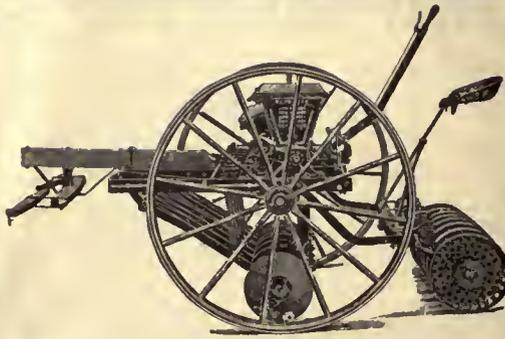
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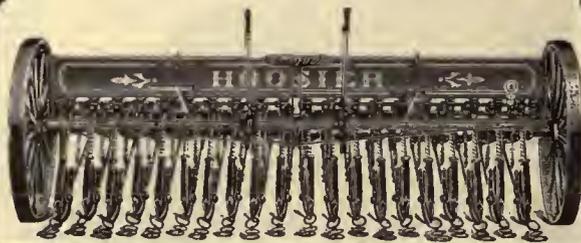
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THE IRRIGATION AGE

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No. 11

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, - - CHICAGO

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D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

Pathfinder Project. Owing to lack of space, it will be impossible to publish the article on the North Platte or Pathfinder project in western Nebraska and eastern Wyoming. This article was prepared for us by Mr. G. L. Shumway of Scottsbluff, Nebraska. Many good illustrations will be shown in connection with this article, which will appear in our issue of October.

National Irrigation Congress. Don't fail to attend the National Irrigation Congress, which is to be held at Albuquerque, New Mexico, September 28-29, October 1 and 2. There is but little time now before the date of opening and we would suggest to all who contemplate attending this congress that they correspond with the local committees at Albuquerque and secure accommodations. Do not fail also to give consideration to the subject of side trips that may be made from Albuquerque into New Mexico and Arizona. There are many points of interest to be found in New Mexico which should be visited by all who are strangers in the territory. This includes the old town of Santa Fe, the petrified forests of Arizona, and the Grand Canyon of the Colorado. All of these are within easy distance of Albuquerque. There are many attractive points still nearer and we are informed that the local committee of the congress has made arrangements for many side trips to different government projects in Arizona. To those who are going from the east to attend the congress it will be well to

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Official organ of the American Irrigation Federation. Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 23 years old and is the pioneer publication of its class in the world.

give this matter thought before all arrangements are definitely settled, so that they may take advantage of all the opportunities presented.

More About Maxwell.

We have received word recently from different associations throughout the United States concerning an effort which is being made by our old friend, George H. Maxwell, George, the erstwhile invincible, the foster father of all irrigation and conservation work throughout the west. Our correspondents tell us that Mr. Maxwell is attempting to induce the different commercial associations throughout the west, among which may be mentioned the National Association of Implement and Vehicle Manufacturers and different associations of dealers in implements and hardware, to contribute various sum of money for large lumps of subscriptions to the almost forgotten magazine, "Maxwell's Talisman." Judging from the reports sent in to us, Mr. Maxwell has not been very successful in his efforts. The dealers and other associations of manufacturers throughout the country have become somewhat suspicious of people who come to them asking for contributions with the idea that this money is to be used for western development. It is doubtful if any one who has followed the matter of western development closely can learn of any single instance when funds so collected have been used to develop a sentiment which would lead to colonization of western areas.

It is true that if the right sort of campaign were

inaugurated and the money could be gotten and expended under the supervision of some commission, this would possibly be a good plan. It is our impression, moreover, that it will be necessary to exploit such sections of the country as are being reclaimed by Federal Irrigation Projects before the public generally will fully realize what the government has to offer in the way of land and the possibility of home building thereon. It is doubtful, also, if the individual who is the head of what is known as the National Irrigation Association has a right to go out to commercial bodies and request contributions for the purpose above outlined.

**Centraliza-
tion of
Power.**

There is being reproduced in this issue an article which recently appeared in the *Denver Field and Farm* under the heading, "Uncle Sam's Advertising Agents" and credited to Mr. C. T. Johnson.

This article is so closely in line with the contentions regularly made by this journal during the past eight or ten years that it is thought worth while to reproduce it at this time and make it particularly prominent so that those who attend the irrigation congress may have a better understanding of conditions surrounding the publicity department of our Federal Government as associated with Conservation and Reclamation.

We quote herewith a letter recently received from a gentleman in Idaho and it is deemed best to give the suggestion as presented to us by Mr. Sabransky. We herewith quote his letter in full:

TWIN FALLS, IDAHO, August 27, 1908.

THE IRRIGATION AGE, Chicago.

GENTLEMEN: Enclosed please find money order for \$2.50, for which please send me the Primer of Irrigation and also THE IRRIGATION AGE for one year, starting with the August number. I like THE IRRIGATION AGE very much, although I would like to see you take a friendlier stand towards the National Forests.

Sincerely,

F. W. SABRANSKY.

It is refreshing to have so clear and honest an expression from a gentleman like Mr. Sabransky. THE IRRIGATION AGE will at all times be very glad indeed, to give due attention to suggestions of this character. We cannot, however, fully comprehend his view of the national forest question without more specific information, and request Mr. Sabransky to send us, in the form of a letter for publication, his views on the Forestry Bureau and the work performed by Mr. Pinchot and his agents.

In this connection, it may not be out of place to say that while the editor of THE IRRIGATION AGE believes fully in the honesty and integrity of Mr. Pinchot, he also feels at liberty to criticise the methods adopted by that gentleman and his associates in the exploitation of work carried on by that bureau. The article reproduced on another page taken from the *Denver Field and*

Farm states in a clear manner the sentiment of a great number of people throughout the western country, concerning those who use questionable methods in their campaign of publicity.

The surprising feature of the whole situation is that men of the qualifications of Messrs. Pinchot and Newell, men whose personality is attractive and whose efforts tend in the main to the upbuilding of the west should find it necessary to resort to this sort of work in exploiting their respective bureaus and the general line of work conducted under their personal direction. Both Messrs. Pichot and Newell are kindly disposed individuals, but it is the general impression throughout the west that this very estimable quality in each has led many well-intentioned censors and others in power to believe implicitly everything suggested by them, thereby leaving them free rein without the supervision or examination of their reports and suggestions, such as is maintained in other equally important departments of the government at Washington.

Just why the President of the United States is so loyal in his support of the Pinchot and Newell regime is difficult to understand by those who have carefully studied conditions throughout the west. It is known that the President is a man of strong convictions and equally strong friendships, but it is also known as is illustrated in the case of Maxwell and others, the Annanias Club for instance, the President very rapidly drops those who do not agree with his policy or suggestions, judging moreover from the manner in which he has supported the Reclamation and Forestry Bureaus one would judge that both Messrs. Newell and Pinchot are wonderfully clever diplomats. We would hardly care to say that their subserviency to the dictation of the President would permit the carrying out of so-called reforms.

In answer to our subscriber, Mr. Sabransky, we will again request him to write us his views for publication concerning the Forestry Bureau and the work conducted under it in his section of Idaho. It is our impression that the forestry work in the southern part of Idaho will bear a closer investigation perhaps than in the central and northern sections. It is also possible that in this section of Idaho the forest rangers have been more carefully selected or being under closer surveillance by men of various branches of the government in that section, also northern Utah, are held down to a cleaner line of work. It is a well-known fact that the rangers throughout Idaho, or a fair per cent of them at least, are men of small mental caliber and many of them are individuals whose ability would not be recognized in the commercial world. It is possible that under the new arrangement where larger salaries may be paid that the personnel of this class may be materially improved. After all, it appears to THE IRRIGA-

TION AGE that the only clean method of handling both the Reclamation and the Forestry Bureau is by a commission composed of strong men who are fully acquainted with the needs of each of these bureaus; men who may be approached by those who have grievances and by those who are trying to remedy evils that may and will perhaps always creep into work of this character.

At the coming congress which will be held at Albuquerque, September 29-30, and October 1 and 2, it is hoped that many matters which have been ignored at former congresses will be taken up and acted upon, among them the grievances of the Inyo County Delegation, who were wholly ignored, in fact ridiculed by government officials at the congress held at Sacramento in 1907. It is true, perhaps, that Inyo County would have received better consideration had not the gentlemen who came from that section exploited their plan through the press before their arrival at Sacramento. One of the peculiar results of this too early exploitation was the fact that government officials were put on their guard. They handled the matter through the daily papers of Sacramento before the congress convened, and in a way belittled the delegation so that when their complaint was brought to the attention of the congress scant attention was given to them.

A peculiar condition exists in connection with the work being done throughout the west by the Reclamation Bureau and this was never more clearly shown than at the Sacramento congress.

Wherever government work is contemplated or being carried on it is reasonable to suppose that all of the citizens of that district will reap benefits to a greater or less degree from an expenditure of the vast sum handled, and the ultimate good results which will follow that expenditure. It is also reasonable to expect the newspapers of each particular district to support the government officials in every way possible and it is fair to suppose that any one criticising the Reclamation Service in any way would be in turn criticised by the papers who represent the district which is deriving good from work of this character.

It was never intended, if our view of the matter is correct, that the Reclamation Service or any other government bureau would use that influence which naturally results from a condition such as described, to belittle individuals who have real or fancied grievances against the methods employed in their locality. It is doubtful if these conditions have ever been clearly brought to the attention of the President, otherwise, it is our impression that he would have taken a decided stand and seen that every one who has a grievance got a "square deal," that being a condition about which the President has talked much in times past. Some day we hope to take up the subject of "the square deal"

and will attempt to illustrate how little along that line the western people have received.

People who have been pioneers, who have spent the better part of their lives in developing virgin territory, who have endured hardships, who have raised families under the most trying difficulties; all of these, so far as our knowledge goes, have changed their mind on the subject of a square deal by the President. One of the most peculiar conditions surrounding the whole affair is that those who know the President and believe in him, feel that he would not tolerate conditions as depicted by us in times past, if all of the facts were clearly laid before him. The trouble is, so far as we are able to judge, the President depends largely on bureau heads, and if an individual in the west complains that he is being imposed upon by an official and the government official reaches the President first, that individual receives scant courtesy when he presents his case at the White House. This is unfortunate, unfair would perhaps be a better word.

Mr. Thomas Walsh, of Colorado, has informed the editor of THE IRRIGATION AGE that the President is inclined to give every man a fair show. Reports from various individuals throughout the west who have attempted to present their grievances to the President would indicate that the contrary is true, and yet we know that Mr. Walsh is sincere in his statement and fully believes that the President is sincere in all of his work and efforts. The general impression in the west is that he is led by some of the men in whom he places the greatest confidence and it is safe to say among these men Messrs. Newell and Pinehot stand clear before the gaze of the men who have helped develop the western empire. Why will the President not investigate more closely and give the mass of people a chance rather than place so much confidence in the heads of bureaus?

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The Primer of Irrigation

THE SIXTEENTH NATIONAL IRRIGATION CONGRESS.

Albuquerque is putting on her holiday dress so that she may present a good appearance at the time of the meeting of the Sixteenth National Irrigation Congress which is to be held in that city September 29-30, October 1 and 2.

Albuquerque is a beautiful city of some 20,000 population. It is the metropolis of New Mexico and the commercial capital and railroad center of an area some 500 miles square. It is also the most important city on the main line of the Santa Fe railway between Topeka, Kansas, and Los Angeles, California. Here are located the Santa Fe railroad shops and one of the Santa Fe's splendid Harvey hotels, the Alvarado. This hotel cost upwards of \$200,000 and can accommodate a large number of guests, and at this hotel



Officers of Sixteenth National Irrigation Congress.

rooms have been reserved for officials of the congress, the diplomatic corps and others of prominence who will be in attendance.

We are showing in this connection a lot of good photos of Albuquerque and vicinity which include some of the reclamation work in the southwest. Perhaps no better point could have been selected for the Sixteenth National Irrigation Congress, in view of the fact that the territory of New Mexico will be greatly benefited by large irrigation projects which are now contemplated or are under way.

New Mexico is largely an unknown territory. That is to say, very few people outside of those who are residents of the territory are acquainted with its possibilities and resources. It has within its boundaries some of the best pine timber in the United States, large areas underlaid with coal and immense tracts of grazing lands as well as large areas in the valleys of its streams, used now to a limited extent, for agriculture. These stream areas will eventually be all put under cultivation as soon as plans of private individuals and Federal projects are put into operation.

New Mexico has large reaches rich in minerals and her valleys are exceedingly productive wherever water is obtained for them. The lower reaches of the Rio Grande valley around Las Cruces and Mesilla are world-

famed for fruit and alfalfa. New Mexico has occupied a prominent part in the development of western America. Within her boundaries lies one of the oldest towns in the country, Santa Fe. This was a prominent town when our central and western cities like Chicago, St. Louis, Detroit and Milwaukee were in their swaddling clothes. The old Santa Fe trail which traversed the country from Weston on the Missouri to the remote frontier of Mexico derived its name from this old city. Here is located one of the oldest churches in America, and there are many other structures in Santa Fe that are so old as to lend romance to their name, and no doubt many of those who attend the congress will make a side trip from Lamy on the main line of the Santa Fe railway up into the hills to the town of that name. In fact, it would be folly for those who have never visited this section to go on to Albuquerque without contemplating the short side trip of twenty miles to old Santa Fe. There are many other interesting points within easy distance of Albuquerque. Not far to the west on the main line of the Santa Fe are found the petrified forests of Arizona and another branch of this road reaches down to the Grand Canyon of the Colorado, one of the world's greatest wonders. From other points along the line side trips may be made to Indian reservations which have become historical from the part these Indian tribes have taken in the history of the west. Many other interesting points are easily reached in a day's travel by wagon from almost any station of the Santa Fe line west of Albuquerque. So much has been written and told about these various points by magazine stories and lecturers that it would not be worth while for us to deal minutely with them. It would be well, however, for all of those who contemplate visiting Albuquerque to consider that they may never again reach a point as near so many historic localities as is Albuquerque.

Las Vegas on the Santa Fe, which lies only five or six hours' ride north of Albuquerque is well worth a visit of a day or two. This is one of the most progressive towns in the territory. In fact, there has been more development along the line of colonization around Las Vegas than in any other section of New



Convention Hall, Albuquerque.

Mexico, with the possible exception of the Pecos valley, which lies to the east of Albuquerque, and Las Vegas which was explored and colonized many years ago. This particular valley has a national reputation and has passed through the varying changes of colonization by proxy, and the real thing. In recent years the government has taken up some of the projects that were fail-

ures under private capital and it is estimated by those who are in touch with the Hondo and other districts that much more healthy and substantial development will be established within the next few years than in any preceding years in the history of that section.

Large sums of money have been made in New Mexico in the last several years by eastern and northern people who have gone in there and have been keen enough to observe the possibilities from a home-making standpoint. One gentleman, Mr. Richard Morley, is said to have made something like \$300,000 there in a few years in land transactions alone and a gentleman and wife from Chicago of the name of Colby went in there several years ago and cleaned up something like \$150,000 or \$200,000 on land deals. Both Mr. Morley and Mr. and Mrs. Colby were comparative strangers to New Mexico ten years ago. They visited there and saw an opportunity to get land at a low price and they have been fortunate in the accumulation of what we are all after, money. We name these two instances to illustrate the possibilities in a section like New Mexico. Perhaps the same results might have been obtained by the same application and effort in other states, but

JAMES S. AND W. S. KUHN.

James S. and William S. Kuhn are two distinguished men in the business world. They are young in years but masters of great undertakings. They were introduced into irrigation circles by H. L. Hollister of Idaho and Chicago. Mr. Hollister then had in hand with I. B. Perrine the Twin Falls North Side Tract of 180,000 acres and the Great Shoshone Falls Power Company. The Kuhn Brothers saw the possibilities in these great projects and placed behind them the strength of their splendid organization. Everyone who is in touch with irrigation progress knows what an impetus they have given to development in the Twin Falls country. Without waiting to complete the North Side system they took up the Twin Falls Salmon Tract, which lies south of the original Twin Falls tract. It speaks volumes for the public confidence in the Kuhn Brothers to say that 70,000 of the 80,000 acres of the Salmon Tract opened for entry, were bought by entrymen at the opening on June 1st, and immediately after, the first payment thus being made two years before water for irrigation will be available. The



Hotel Alvarado and Santa Fe Station, Albuquerque.

this happened in New Mexico and that is where we are all going to the congress. Our advice to readers would be to keep their "eyes peeled" while in that territory for just such opportunities as were taken advantage of by the individuals mentioned above.

We would suggest to all our readers who contemplate visiting Albuquerque at the time of the congress to make arrangements as early as possible for hotel accommodations. The good citizens of that community claim to be able to handle crowds, no matter how large, but it is our impression that there will be such a large attendance at the congress that it will be just as well to arrange for space in advance.

A complete report of the Sixteenth National Irrigation congress will appear in our issue of October. THE IRRIGATION AGE headquarters during the congress will be in Room 16, Alvarado Hotel, where all our friends will be welcome.

North Side Tract is well sold out and the new towns of Jerome, Wendell and Milner are becoming daily more important as business and social centers. The Kuhns are constructing a railroad from Gooding on



J. S. Kuhn.



W. S. Kuhn.

the Oregon Short Line through the Twin Falls North Side Tract. They are also building a large power plant at Lower Salmon Falls. They have established banks at Milner and Jerome and take a leading part in all

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the work of development. They have delivered water for irrigation to the first segregation of 30,000 acres of the North Side Tract and the entire system will be complete this year. An extension is now under way to bring 40,000 acres in Clover Creek Valley, lying north of the Oregon Short Line, under water. The storage dam for the Salmon Tract is now under way and for the next eighteen months 100 to 300 men will be employed in this construction. Besides their interest in irrigation, the Kuhn Brothers are men of large affairs elsewhere. Nine floors of the Pittsburgh Bank for Savings building are occupied by the executive offices of the Kuhn properties.

James S. Kuhn is president of the Pittsburgh Bank for Savings, president of the First National Bank of McKeesport, president of the Municipal and Corporation Securities Company, and director of the Colonial Trust Company of Pittsburgh, the Germania Savings Bank of Pittsburgh, First National Bank of Pittsburgh, and Trust Company of America, New York. He is also president of the American Water Works and

The Art of Irrigation

CHAPTER FOUR

By T. S. VAN DYKE

The first point to consider in making levees for checks is whether they are to be permanent, as for alfalfa, or whether they are to be broken up for cultivation after each irrigation, as for some kinds of orchard and garden work. If they are to remain year after year, with the crop growing on top of them just the same as in the bottom of the check, then they must be made with care and smoothed off along the tops and sides. They must be broad enough on the base to allow a gentle slope rounded to top so that mowers and hay wagons can go over them the same as on the level ground. I have seen them fifteen feet wide on the bottom and two and a half feet high causing no incon-



Rio Grande Project, New Mexico—Leasburg Diverting Dam.

Guarantee Company which has a paid up capital of \$2,000,000 and a surplus of over \$2,000,000.

W. S. Kuhn is president of the United Coal Company, which owns and operates nine important properties in Pennsylvania and West Virginia; president of the West Penn Railways System, which supplies with power, light and transportation some fifty cities and towns in northwestern Pennsylvania, and president of the Twin Falls North Side Land and Water Company, which is spending millions of dollars on irrigation work in Idaho. He is a director of the First National Bank of Pittsburgh; First National Bank of McKeesport, Pa., the Pittsburgh Bank for Savings, the Commonwealth Trust Company and Commercial National Bank, all of Pittsburgh. The Kuhns and associates are the largest private operators in irrigation and to have them back of any enterprise insures its success. Their broad and liberal policy has won the firm confidence of people who are seeking homes upon irrigated tracts. The cause of irrigation was certainly given a great lift when J. S. and W. S. Kuhn entered the field.

venience to machinery and carrying as good a growth on their tops as there was down in the check. This is higher than is generally necessary for small checks, but on account of the danger of breaching from waves when first made, and before they are settled down and filled with roots it is best to make them at least twelve feet on the base and eighteen inches high. This makes them safe until the growth of the crop stops waves in the highest wind, the roots bind the soil so that a breach will be a mere leak instead of tearing away a large part of the levee. A gopher hole can make little more than a leak and that may be stopped by tramping down the top material of which you have so much that you don't have to haul in any. I have some much smaller than this which have lasted six years in good shape, but if you don't lose too much top soil by scraping up big levees, big ones are the surest. Scraping off top soil is no objection for alfalfa, except for the first year, perhaps. After that, if you have true alfalfa ground,—perfect drainage—its fertility makes little difference if you handle the water properly. Care must be used at first in letting in the water, watching the wind and search-

ing out spots in the levee the water may be following, such as sticks, roots, weeds, clots or something that makes a bad bank. The breaking of a big levee of loose, dry earth may compel you to run back to shut off the water and then wait several days for the ground to dry enough for repairs amounting sometimes to half a day's work with man and team for want of a little care by one man.

Levees of this kind must generally be made with a good carrying scraper with material taken from all over the check, so that there is no deep trench left at the base. Many are made by scraping only a few feet from the base and leaving such a trench, but it only wastes water, causes alfalfa to scald on some soils by having the water on too long, and is apt to jar machinery coming over the levee, or to run a mower knife into the ground. Levees may, however, be started by a ridger and built up with a scraper.

Where levees are to be broken up after each irrigation they need only hold long enough to wet the soil deep enough. For wetting new ground to plow for the first time, two shallow furrows run in opposite directions so as to throw the dirt to a central ridge will

are to have an inlet for each one or whether some are to be supplied with water from the checks above. When water has been in a check long enough it should be discharged, and the best place to do it is often into the next one below, provided there is enough left to do the work there, and if there will not be enough left it may be better to turn in a little more so as to utilize the first part instead of throwing it away in a waste ditch. Where you have land enough you should provide a place to use up waste water at the lower end with something like an alfalfa patch for the cow, or a blackberry patch or some tough thing that will do fairly well even under bad irrigation. But your crops may be too valuable to allow any water to be wasted or badly used, and if you are flooding the best way to use it is by discharging one check into another as fast as the first is wet enough.

This is done by breaking the check at the right time, and for checks that are not to be permanent this is the best way. But where they are permanent you are liable to cut the levees too much unless well protected by vegetation. If they are so protected it will be quite a job to cut them quickly enough and also



Central Avenue, West, Albuquerque.

last long enough on most soils. Or if the soil can be scratched up when dry with a cultivator to get earth enough, the ridger may be better. For all orchard or garden work where two or three hours soaking will suffice, the ridger is the cheapest way of throwing a levee if the ground is loose enough. If the water is to stand six or eight hours some patching of the levee by hand may be needed. But all earth put into such levees beyond what is needed is only that much more in the way of plowing and cultivating.

A ridger is simply a box sled with converging runners. The ordinary size is made of a couple of two by twelve plank about two feet apart at one end and four or five at the other, the whole decked over so that a man can ride on the top, and five or six feet long. It is best to shoe the runners with iron and make the whole thing strong. This is dragged by horses with the widest end foremost, scraping the loose earth from an area of five feet or so and squeezing it out through the two foot opening. If this does not gather earth enough a larger one is generally put ahead of it. A ridger sways some but that is a matter mainly of looks. It can be prevented by a long beam stretched along the top or by a rudder in front, so fixed that it does not hurt the ridge. The openings left in the ridges are filled with shovel or hoe.

The next thing to consider is whether these checks

quite a task to repair them so that they will not break the next time before you are ready. A gate at the lowest point is therefore the best thing in such a case and it should be marked with a stick or something so that the first blockhead that runs a mowing machine will not smash it and the machine too. Such gates should have an overflow at a certain height.

Another way of making checks feed each other is to have the water pass around at the upper end of the slope on which they lie. It is there so shallow that it will not cut much and a whole line may be taken care of in this way. This does not discharge the water remaining in the check so that there will be waste unless the whole series of checks is filled very quickly. If the ground is pretty flat and tight there will be little waste and it is a good way to use up night water when you do not want to stay up.

Another good way to use up night water and do it without danger of breaking checks from getting too full is to have them strung along a ditch with the sills of the gates about level with the bottom of the the check and also near the bottom of the ditch. When properly set such gates allow the water to pass in to a certain depth and then flow on. Several acres may in this way be irrigated over night with two feet of water. Considerable is wasted, of course, for it stands in each check while flowing on to the

next one until the soaking finally takes it all. In a head of several times that amount it would irrigate the same area in far less time by day. But under almost any system you will have night water to waste, even where you use night water in heads, which you may have to use when your turn comes, or go without. And if on a canal with many other consumers,

rigid economy at first, even if he has a good bank account.

But some soils are so mushy under the least pressure of water against them that some kind of hard material to control the flow is needed from the start, because a break will wash a lot of soil away, cut a big hole somewhere, and then you will have to



Rio Grande Project, New Mexico—Elephant Butte Dam Site.

as in a prosperous settlement, if you lose your turn at the water you may have to go without for several days or even weeks. So when your turn comes you must be very careful not to lose either water or time with bad levees or poor gates. You may lose both before you know it.

Much of your success will depend on the gates you use to let the water into the checks or keep it out when not needed. Their size and form as well as the material and the amount you can afford to invest in them vary so much with the nature of your soil, the size of the check, the size of your irrigating head, the length of time you can have such a head running, the nature and value of the crop, and the number of times you irrigate, that a whole chapter could not cover half the points to be considered. In the first place you may not need any. On gravelly soils easily handled, wet or dry, with the shovel and not apt to wash much, you can make and break the banks with a shovel if you do not have to irrigate too often and find material for gates too expensive. Grapes, for instance, if the ground is thoroughly wet in winter and spring, will rarely need water more than once in summer and seldom more than twice. There is little danger of water enough from a broken bank or from a washed out opening hurting them. Therefore the same openings may be left that were used for the winter irrigation, provided, you have plenty of water to waste. Corn, potatoes and many other things that need little water if the ground is well wet in spring and well cultivated afterward, are raised in this way. There is nothing dreadful about making new dams and breaking old ones, and garden truck is raised that way on thousands of places. I have done plenty of it with my own hands on both a large and small scale, generally while waiting to find out the best form and size of gate consistent with reasonable economy. There is some loss of time and water but the pioneer, especially on the desert, has to practice

lose a day or two perhaps to get the soil dry enough to repair damages. One of the cheapest ways of avoiding this difficulty is using a sheet of iron like a half moon, to shove in the ground across the stream when you wish to turn it into an opening. This is called a "tapoon" in some places and will do well enough for a short time with a small amount of water. Its great advantage is that it can be put in place or taken out and carried to another place very quickly.



Home of Hopi Indian, New Mexico.

For such small streams as are used in small gardens it is about as good as anything on most soils. But on many soils water cuts under or around it under very slight pressure, and on no soil can it be trusted long under much pressure. For this reason it cannot be used to advantage at the openings of checks—to keep them closed when the water is running on to other checks.

The next best of the cheap means is the canvass dam which is merely a piece of canvass fastened to a staff like a short flag. Laid across a ditch with the ends of the staff on the banks a little earth placed on the edges of the canvass on the bottom and sides of the ditch and tamped a little with a shovel secures it for quite a while, and if the canvass reaches far enough up-stream the downward pressure of the water holds it in place as long as the water does not get under it. This dam if well placed lasts longer than the iron dam, and can be used to turn a much larger stream. But it cannot be set so quickly or taken up so quickly with the water against it, and when taken up it is heavy and muddy and cannot easily be carried about like the other. It must also be set when the ditch is about dry to make a sure job and if much water is running it cannot be set at all.

Far better than all else is a permanent gate frame for each check, made of lumber or concrete where cement is cheap, the gate itself being of wood or iron and sliding up and down without hinges. The size, form, and capacity of this will vary so much with soil, crop, head of water, length of time the

Three feet long is not a bit too much with the gate resting against slanting cleats on the end inside the ditch. When properly set this will need no eddy shields on most soils, nor will it need any apron let into the ground a foot or so to prevent undercutting which will be necessary in almost any other form of gate frame. But you may be quite surprised to find it lifted out of place soon after water running past it in the ditch brings a good pressure against it when the gate is closed. This comes from the water getting underneath it in a sheet and lifting it by hydrostatic pressure from the head in the ditch. It may also be lifted by its own buoyancy when water is flowing through it. In either case a huge muss is apt to be the result. This may be prevented by piling enough earth on it which is easily done because the top should be covered with plank strong enough to stand if stock should tread on it, and a pile of earth will make it much stronger if heaped in a cone. About the time you have this all fixed and go off and leave it for a while you may return to find it all gone again. It simply cut out underneath because you did not level the bed for it and have it well packed if the



Petrified Bridge in Petrified Forest, Arizona.

water runs as well as your finances that it is useless to give more than a few general hints.

Your first error may be in making gate frames too short. The eddies cut away the soil at both ends if much water goes through so that little is left on the sides to stand pressure from the ditch. If you put in safe eddy guards, or wings, then they cost just as much as a longer frame. When this is done you may find the openings are too narrow and not only back up too much of a head of water in the ditch above to leak out through the sides and endanger weak places but increase the pressure on the earth around the gate frame. When you least expect it you may find the water has found its way through in a small stream and pretty soon out it goes. It is better to make it so wide that the height of the water in the ditch is increased very little, with the sill about level with the bottom of the check so that the inflow will not cut out a hole just over the sill by falling. A fall of two inches on some soils will cut out a sill in a short time.

I find the best form is that of a box. To deliver four cubic feet a second it should be at least three feet wide and ten inches high and had better be four feet wide to provide against the day when vegetation in the check makes resistance to the flow.

ground were loose, or it may have cut out the sides because the dirt was not well rammed with the end of the shovel handle. Both are easily prevented by wrapping the box with old blanket, carpet, quilt, bur-lap, old tent or horse blanket or rag of any kind that is big enough. Water makes a wonderful success of finding a passage between earth and other hard material and rag is the hardest thing it can find to struggle against. If you have old gunny sacks in abundance, one about one-third full of earth packed in on each side will make the sides quite safe. Such sacks may be used for the whole thing for temporary work with moderate heads of water as it is almost impossible for water to pass behind them when well tramped and not filled too full. Three of them in a ditch, one in the bottom and one on each side will pass half a foot or even more of water in safety if the bottom below is not too mushy, and another placed in the middle makes quite a good dam for some time. With enough of them you can handle quite a large head of water. But if you can afford it an apron of plank a foot wide set in on the bottom and sides is the surest. And if the soil is mushy it should go in at the lower end and the soil put in dry and be well rammed.

Supreme Court Decisions

Irrigation Cases

PRIORITIES BETWEEN RIPARIAN PROPRIETORS.—

There is no priority between the rights of riparian proprietors to the use of water of a non-navigable stream, but their rights are equal, regardless of location on the stream, or the date of acquiring their title.—*Williams v. Altnow*. Supreme Court of Oregon. 95 Pacific 200.

ADJUDICATION APPLIES ABOVE DIVERSION.—

A judgment and decree adjudicating rights and priorities to the use of the waters of a stream carries with it and adjudicates and decrees the rights and priorities to the waters of the tributaries to such stream above the respective places and points of diversion.—*Josslyn v. Daly*. Supreme Court of Idaho. 96 Pacific 568.

quired by D. from a stranger to the action subsequent to the trial and decree in the action between D. & J.—*Josslyn v. Daly*. Supreme Court of Idaho. 96 Pacific 568.

IDAHO STATUTE ON MEANS OF DIVERTING WATER.—

Rev. St. Idaho 1887, sec. 3184, which provides that owners of lands adjacent to a stream shall "have the right to place in the channel of, or on the banks or margin of, the same rams or other machines for the purpose of raising the waters thereof to a level above the banks requisite for the flow thereof to and upon such adjacent lands," gives a mere license to use an appropriate method for raising the water, but the particular method or means adopted does not attach as an appurtenance to the appropriation of the water as against other appropriators from the same stream.—*Schodde v. Twin Falls Land & Water Co.* Circuit Court of Appeals, Ninth Circuit. 161 Federal 43.

WATER RIGHT TAXABLE AS PERSONAL PROPERTY.—

A "water right" is the legal right to the use of any unappropriated water of any natural stream, water course, or



An Artesian Well in the Pecos Valley, New Mexico.

PRIORITY OF WATER RIGHTS.—

Where the water rights under which plaintiffs claimed title were located prior to any settlement on the lands by defendant's grantors, plaintiffs were entitled to priority, both under Rev. St. Secs. 2339, 2340 (U. S. Comp. St. 1901, p. 1437), securing and preserving such priority of location, and under the custom in force in the territory.—*Driskill v. Rebbe*. Supreme Court of South Dakota. 117 Northwestern 135.

IRRIGATION DECREE NOT BINDING ON STRANGER TO ACTION.—

A decree in an action between D. and J., adjudicating the respective rights and priorities of the parties to the waters of a certain stream for the irrigation of their respective ranches then owned and occupied by them, is not res adjudicata or binding upon D. as to his right to use certain of the waters of the same stream upon another tract of land as appurtenant thereto, which is purchased and ac-

source of supply, and exists only in contemplation of law, and is for purposes of taxation "personal property," within Const., art. 12, sec. 17, and Pol. Code, 1895, secs. 16, 3680, defining "property" as including money, franchises, and other things capable of private ownership, and defining "real estate" as including the possession or ownership of land, mines, minerals, and quarries, and "improvements" as including all buildings, structures, etc., and "personal property" as including everything which is the subject of ownership, not included within the real estate or improvements, so that under section 3716, providing that the personal property and franchises of water companies must be assessed in the district where the principal works are located, a water company owning a water right without the limits of a school district and conveying water by pipe lines into the district, where it is distributed to the inhabitants thereof, is properly assessed in the district; that being the place of business and principal works of the company.—*Helena Waterworks Co. v. Settles, Treasurer*. Supreme Court of Montana. 95 Pacific 838.

TWIN FALLS, IDAHO.

Progress on Two Big Tracts Under the Carey Act—Work on the Salmon Dam.

This has been a busy year in the Twin Falls country of southern Idaho. A large number of settlers have been added to the original South Side tract, where some 20,000 people have established their homes in the last four years. The city of Twin Falls celebrated the fourth anniversary of its opening on August 29, estimating over 4,000 population. The town is now equipped with good waterworks, sewers, electric lights, banks, newspapers, hospital, churches, schools, and all that a live modern town should have. A second school building costing \$60,000 is in process of construction.

On the North Side tract of 180,000 acres the great canal system is being completed and will be in use early next year. The railroad from Gooding, situated on the main line of the Oregon Short Line, to Wendell and Jerome is almost ready for the rails and will be in operation before the close

for the use of the superintendent of construction and his aids. Water will be delivered to the canal system from a tunnel outlet from the dam. The entire system is to be completed for the season of 1910. These two projects have behind them the great financial organization of J. S. and W. S. Kuhn, of Pittsburgh and New York. The bonds are guaranteed both as to principal and interest by the American Water Works & Guarantee Company, which owns some fifty municipal waterworks systems in the cities of the United States and has a paid up capital of \$2,000,000, with a surplus of over \$2,000,000. This company is largely owned by J. S. and W. S. Kuhn and J. H. Purdy, the general manager of the Kuhn properties.

GRADER AND DITCHER.

The 20th Century Grader, manufactured by the Baker Manufacturing Company, 277 Dearborn street, Chicago, is proving a very popular and profitable



Land Hunger as Demonstrated in Idaho—Scene Showing Part of Crowd of Land Buyers at Twin Falls, Salmon River Tract, Twin Falls, Idaho, June 1, 1908.

of the year. Jerome has several hundred population and building operations are going on actively both at Jerome and Wendell, although not an acre has yet been irrigated in the second segregation. All the tract will be under water next year and as some 2,000 water contracts have been signed to date, it may be inferred that the tract will be one of the most active spots in the country in 1909.

On the Salmon River tract, where some 70,000 acres were sold at the opening on June 1, good progress is being made. The great work here is the construction of the dam in the canyon of the Salmon Falls river. At the site of the dam a complete camp has been constructed, including a bunk house for 200 laborers, a house for engineers, cook house and pavilion, a storehouse for 10,000 sacks of cement and other buildings. The electric power line from Twin Falls is completed, being some 35 miles long and 40 miles from the source of power at Shoshone Falls. A traction train is running regularly from Twin Falls to the dam, carrying in supplies and materials. Automobiles have been provided

machine to irrigation farmers.

While designed primarily as a road grader, it has been found well adapted to the work of grading fields and cutting and cleaning ditches.

It is light, weighing only about 600 pounds, yet being constructed of forged steel it is exceptionally strong, and its makers guarantee it both as to strength and efficiency. One man handles it and for a good share of the work two horses can draw it, at the most only four are required. One of these valuable machines will be given away as a trophy at the National Irrigation Congress to be held at Albuquerque in September.

The company will be glad to send free of charge to any irrigation farmer a copy of its handsome booklet.

Reclamation Service News

The Secretary of the Interior has approved the contract executed by the engineer in charge of the Umatilla irrigation project with Mr. J. K. Shotwell, of Hermiston, Oregon, for hauling concrete pipe for use in connection with that project. According to the terms of the contract, the aggregate expenditures will amount to not less than \$3,250 nor more than \$4,062.50, according to the quantity of pipe actually transferred.

Now that the floods in Montana have somewhat subsided, the engineer on the Sun River irrigation project has made an estimate of the damage done to that system. There were 123 breaks in the canal banks, varying from a few yards to 250, and totaling 6,600 yards, the largest break occurring on a steep side hill due to seepage from a private canal backing up water and overtopping canal banks on Sun River system. Some of the culverts will need additions and some concrete pipe at the factory was damaged. It is probable that the repair work will not exceed \$6,000 in cost. The manner in which the canals and laterals handled the excessive amount of water which they were forced to carry, considering their green condition, the fact that they had never been primed and oftentimes were running bank full and carrying twice the amount of water for which they were planned, was highly satisfactory. The canals, of course, have as yet no vegetation on the banks to protect them from erosion, and yet the entire system suffered less than the old ditches in the immediate vicinity which were subjected to less serious conditions.

Approximately 85,000 acres of land, which were withdrawn in connection with the Big Bend irrigation project, Washington, have been restored to the public domain and will become subject to settlement and entry on such dates and after such notice by publication as the Secretary of the Interior may prescribe. These lands lie in Townships 13 to 33 North, Ranges 26 to 42 East, Willamette Principal Meridian.

An extension of 75 days has been granted to Messrs. Bailey & Dupee, of Fort Shaw, Montana, within which to complete their contract for canal excavation in connection with the Sun River irrigation project, Montana. The unusual rains not only delayed the work of the contractors, but destroyed a considerable portion of that already accomplished, and the date of completion of the contract has therefore been set forward to August 15th.

The engineer in charge of the Belle Fourche irrigation project, South Dakota, reports that during July 65,000 cubic yards of material were placed in the big dam, and that the gap probably will be closed by the first of next July. Progress on this dam is being watched with a great deal of interest by engineers throughout the United States. It will be the largest earth dam in this country and one of the largest in the world, having a length of more than a mile and containing about 42,700,000 cubic feet of material. When this dam is completed about 100,000 acres of land will be irrigated. At the present time the entire normal flow of the river is being served through the canal system. This consists of about 100 cubic feet of water per second, and where it has been used intelligently some very fine crops are the result. Crops on the upland and dry farms are practically dried up. The services of an experienced irrigator have been secured to help the farmers plan their laterals and prepare the land for irrigation. There are still 16 farm units under the area for which water is now available that have not been filed upon.

An extension of seven weeks has been granted to Mr. John A. Nelson, of Sidney, Montana, within which to complete his contract to construct lateral ditches in connection with the Lower Yellowstone irrigation project, Montana, North Dakota. Unusually severe storms and the difficulty in securing laborers during the harvest time in 1907 delayed the contractor and the date of completion of his work has therefore been set forward to September 2, 1908.

An extension of two months has also been granted Mr. James Munn, of Deadwood, South Dakota, for the construction of structures under the Lower Yellowstone project. Mr. Munn was delayed in his work by causes entirely beyond his control, and the date of completion of his contract has therefore been set forward to September 30, 1908.

The Secretary of the Interior has awarded contracts for electrical apparatus for use in connection with the power plant, Minidoka irrigation project, Idaho, to the following companies: General Electric Company, of Schenectady, New York, amounting to approximately \$7,660; S. Morgan Smith Company, of York, Pennsylvania, about \$11,500; Westinghouse Electrical & Manufacturing Company, of Pittsburg, Pennsylvania, amounting to approximately \$115,500; The Allis Chalmers Company, of Milwaukee, Wisconsin, two contracts amounting to about \$101,517 and \$39,710, respectively.

Contract has been awarded to the Standard Building Company, of San Francisco, California, and H. K. Luce, of Seattle, Washington, for the construction of the Sulphur Creek wasteway and structures in connection with the Sunnyside irrigation project, Washington. The work includes the dredging of about 7 miles of channel, involving about 310,000 cubic yards of excavation, and the placing of about 1,600 cubic yards of concrete masonry, and 2,000 cubic yards of riprap. The contract amounts to \$66,960.

Officials of the Reclamation Service who have just visited the Umatilla irrigation project in northern Oregon, are most enthusiastic over the prospects of this section. Mr. C. J. Blanchard, statistician, writes from Hermiston:

"This is the best new town on any project I have visited. It is a real town of brick and stone and concrete, and some mighty pretty homes. It's growing, too. It is building an \$8,000 house, has two banks, two good hotels, several double two-story brick blocks, etc.

"The ten and twenty-acre farm unit is the popular scheme here and horticulturists are finding this a most attractive location. Around the townsites five acre orchards are being developed. Broad avenues are being laid out from the town into the country, and trees are being planted which in this country in five years will create shaded boulevards. I am impressed with the fact that the opportunities here for the small orchardist and truck farmer are unequalled. I believe the time is not far distant when this will be one of the show places of the West, as I have never seen a place where the growth of everything is more rapid than here."

The Secretary of the Interior has authorized the construction of the highway extension from the Shoshone dam site along the north side of Shoshone river to Kelley's ranch (a distance of about 5 or 6 miles above the upper end of the new reservoir), and also the construction of a bridge across Shoshone river at the latter point. This road extension is necessary as the Shoshone reservoir will overflow lands extending up both the north and south forks of the Shoshone river and will inundate the present public highway from Cody, Wyoming, along the north fork to the Yellowstone National Park. Secretary Garfield has recently been over the site of this proposed work and has directed that it should be constructed conditional on the performance of certain work by the county commissioners of Big Horn County, Montana. It is estimated that the work will cost about \$60,000. On account of the urgent necessity for the construction of this road, it has been decided to build it under force account and thus avoid the delay incident to advertising, executing contracts, etc.

During July 13,020 cubic yards of material were laid in the Roosevelt dam. Nearly all of this was placed in the gap at the north and bringing this part to an elevation of 30 feet. A flood on the 18th and 19th nearly went over this part of the dam. The south end of the dam is at an elevation of 75 feet. More than 7,000 barrels of cement were ground at the Government mill in July, and 10,197½ barrels were delivered. Well drilling on the Gila Indian Reservation has been in progress and the towers of the transmission line have all been erected. Stringing of the wires is now in progress. During the first part of the month there was a scarcity of water, the lowest stage of the river being reached on the 7th when the flow amounted to nearly 326 second feet. Crops did not suffer for lack

of irrigation water, however, as the river rose gradually after the 10th until the floods of the 18th and 19th.

The Secretary of the Interior, who has just visited the Umatilla irrigation project, Oregon, has modified his order of December 27, 1907, which stipulated that the first payment on account of building and operation should be payable on or before March 1, 1908, to read as follows:

The first payment on account of the charges for all irrigable areas shown on the plats, whether or not water right application is made therefor or water used thereon, shall be due and payable at the local land office at La Grande, Oregon, on or before December 1, 1908, the total payment for building and operation and maintenance being not less than \$7 per acre.

The instalments of the building charge, \$6 per acre, for subsequent years shall be due and payable at the same place on or before December 1st of each year, and until further notice the operation and maintenance charge of \$1 per acre of irrigable land shall be due and payable at the same time and place.

No water will be furnished to lands in any irrigation season unless all parts of instalment for operation and maintenance for preceding years have been paid. The terms of Public Notice of December 27, 1907, are to remain in full force and effect except as modified by this order.

A message received at the office of the Reclamation Service this morning announced that the high pressure gates in the outlet tunnel of the Shoshone reservoir have been successfully installed and that water is now flowing through the tunnel. This marks an important step in the construction of what will be the highest dam in the world, which the government is erecting in the canyon of the Shoshone river in northern Wyoming, for the storage of water to irrigate 150,000 acres of land in the vicinity of Cody. These gates are placed in the outlet tunnel passing through the solid granite cliff around the right end of the dam. The elevation of the inlet of this tunnel is 230 feet below the top of the dam and the reservoir capacity between the mouth of the tunnel and the crest of the spillway is 500,000 acre feet. For the purpose of controlling the discharge of water through this outlet tunnel, the three large cast iron sluice gates have been installed. The body of each of these gates is 7½ feet long and 4½ feet wide, closing a waterway of 7 feet by 3 feet 8 inches in section. The total weight of each gate is estimated to be nearly 10,000 pounds and will have brought upon it by the immense head of water above it a total pressure of about 440,000 pounds, which with the weight of the gate will require an operating machine capable of lifting approximately 120,000 pounds. The gates are set in cast iron frames supported by large cast iron bed plates and columns embedded in and attached to the concrete piers and side walls of the gate chamber. Many of these castings are very large, the heaviest being the partition columns, each of which weighs 12,800 pounds.

The Shoshone dam blocks a narrow gorge in the river. It will rise 310 feet above its foundation. It is 108 feet long on the bottom and only 175 feet long on top. The dam will create a lake with a superficial area of about 10 square miles and an average depth of something like 70 feet. Twelve miles below the dam, a diversion dam has been built in the river, turning the stream through a tunnel ¾ miles long into a large canal. The system has now reached a point where water can be delivered to 15,000 acres and settlers principally from the Middle States are now taking up their homes on this land. Alfalfa, wheat, oats, barley, the hardier vegetables and fruits can be produced abundantly when water is applied. The land is traversed by the Chicago, Burlington & Quincy Railroad, and there is an abundance of fuel in the coal mines in the vicinity and lumber in the nearby forests. Probably 10,000 acres for which water is now available are open to entry.

The Secretary of the Interior has approved an increase of stock in the Umatilla Water Users' Association from 9,000 to 22,000 shares. The association, which is made up of land owners under the Umatilla irrigation project, Oregon, was organized with a capital stock of \$540,000, divided into 9,000 shares of a par value of \$60 each. The project has since been extended to include a total of 22,000 acres, and in order that there may be one share of stock for each acre of land, it has been necessary to increase the stock to \$1,320,000, divided in 22,000 shares of a par value of \$60 each.

THE SANTA MARIA OIL FIELDS—CALIFORNIA.

The Santa Maria oil fields, the latest developed, are already the greatest in the state, and in the line of being the greatest in the world, especially as more oil territory is being continually developed. Recent developments show that there is a large field of fuel oil at the eastern end of the valley in addition to the immense production of light oils in the main field.

It will supply to a great extent, not only oil for the state, but for the foreign trade.

The Santa Maria oil wells are situated in the northern part of Santa Barbara county among gently sloping hills of from 600 to 1,000 feet elevation, on both the northerly and southerly side of the Santa Maria divide, the main field from eight to eleven miles south and the eastern field from fourteen to eighteen miles southeasterly of Santa Maria City. The wells are so situated that the oil gravitates from them in pipe lines to Port Harford, an average distance of about thirty-five miles from the main field, and by pumping the flow of oil is still further increased.

The oil well locations command a beautiful view of a broad and fertile valley looking westwardly over the ocean and as far northerly as Port Harford.

The town of Oreutt, named after the Union Oil Company's successful geologist, lies close to the main field, where many of the Union Oil Company's large tanks are located; close by are also the Standard Oil Company's tanks.

The city of Santa Maria has the commanding situation of the valley and is a bustling center of activity and trade. Aside from its oil fields it is the center of a large grain, bean, poultry and butter producing section. Six miles southwest lies Betteravia, the large sugar beet plant, beets being grown by the company upon its irrigated lands in different parts of the valley. Santa Maria is connected by an eight mile trolley line with the town of Guadalupe on the Southern Pacific.

The population of Santa Maria is over 2,500, and the tributary valley had an additional population, including Oreutt, Guadalupe, and Betteravia of over 4,000.

While the first wells were discovered in 1902 in the pioneer field (the Western Union at a depth of 1,500 to 1,800 feet), it was not until late in 1903 that the Graciosa Oil Company, adjoining, under the management of A. Phillips, discovered that the main oil reservoir was at a much greater depth.

The Pinal Oil Company, in the fall of 1903, had previously developed some shallow gushers, though many of these wells have subsequently been deepened. Since this time the average depths of wells have ranged from 2,600 to 3,600 feet. The deep wells pass through from 500 to 1,000 feet of oil shale, or oil-sand formations. The gas pressure at these depths is very great, giving rise to flowing wells, frequently to gushers. The production is often enormous, some of these wells yielding from 500 to 1000 barrels daily, and being of remarkable permanency with an occasional well exceeding even these figures. Anything less than 150 barrels daily production in these deep wells is considered a poor one, the average being much above that. Owing to the depth of oil sands penetrated the production declines very slowly, and when the natural flow from the wells does decline, pumping is then resorted to.

The average gravity of the oil ranges from 23 to 27

degrees, except in the case of a few shallow wells, where the gravity is heavier. At the Palmer well in the eastern extension an ideal fuel but heavier oil has been discovered. The oil in the Santa Maria field is remarkably pure, not over an average of $1\frac{1}{2}$ per cent water and sediment being found. For asphalt base there are no wells known which are freer from impurities.

The Union Oil Company, the largest producer in the field, has two pipe lines to Port Harford, a little over thirty-five miles each, in length. This company also has its own line of tank steamers at Port Harford and commands shipping facilities to different parts of the coast as well as abroad.

The Standard Oil Company has no wells of its own in the field but purchases its oil from some of the op-

THE ORLAND PROJECT, CALIFORNIA.

Soil and Climate.

As mentioned in a former number, Stony Creek rises in the Coast Range Mountains, and finding its progress barred by many ranges of hills, it is forced north some sixty miles, intercepting many mountain streams, and finally, a veritable river, emerging upon the plain about ten miles northwest of Orland.

For ages past it has poured out upon the valley floor at this point the detritus brought down by its many tributaries, building a huge fan-shaped mound about ten miles across at its eastern end, twenty miles along the radii, and practically one hundred and



Shipping Hay from Mesa, Salt River Valley, Arizona, to the Mining Camps.

erating companies and gravitates or pumps it in an eight inch pipe line from the field near Orcutt to Port Harford into its line of tank steamers. The Standard has at present a large contract with the Pinal and Brookshire companies and has recently made a contract with the Union at prices above previous contracts, amounting to 1,000,000 barrels annual delivery for three years.

Pipe lines of fully 1,200 miles convey oil in every direction; ninety-five per cent of which finds direct seaboard outlets, so that this field is practically independent of railroad transportation, and is therefore not controlled as with other fields by the Standard Oil Company.

The production of the field has steadily increased from 100,000 barrels in 1903, 6,000,000 barrels in 1906, to about 800,000 barrels per month at the present time.

twenty feet high. This building process has been carried to such an extent that the Sacramento River has been forced from its course, making a wide detour to the east where it passes Orland.

The soil deposited by this action is classed as Sacramento Sandy Loam, Sacramento Loam, and Sacramento Gravelly Loam according to the fineness of the material deposited. The sandy loam is the finest, most fertile land known to the valley. The greatest area of this is found east of the project and is devoted to raising beets for the Hamilton sugar factory, though a considerable body lies within the limits to be irrigated. The gravelly loam lies in narrow belts extending from northwest to southeast, evidently being ancient beds of the stream, while between these are broad belts of Sacramento loam, which contains some gravel but is principally of loam

a little coarser than that classed as gravelly loam with a slight mixture of clay.

To the west and to the north of this "mound" can be found a different type of soil, which evidently has not been worked over by the creek. It is of a reddish color, contains a little gravel, and is classed as San Joaquin loam.

The Sacramento gravelly loam has always been held in light esteem for purposes of dry farming, as owing to its looseness it does not retain sufficient moisture during periods of drought; but it is very fertile when supplied with the necessary moisture. Some of it is now irrigated and is producing the finest alfalfa, oranges and lemons. Judged by the returns under "dry farming" the San Joaquin loam is considered a little better than the gravelly loam, while the Sacramento loam is prized next to the sandy loam. The climate of California affords the greatest surprise to her eastern visitor. To find the upper Sacramento Valley, six hundred miles north of Riverside and Los Angeles, enjoying practically the same temperature as those much-advertised cities seems little short of paradoxical, yet it is true that the isothermal lines follow the contour lines; that the effect

UNCLE SAM'S ADVERTISING AGENTS.

Denver Field and Farm.

It is impossible for those who have not experienced pioneer life or who have never made a study of conditions under which settlement takes place to understand the difficulties which confront a settler or to formulate laws or regulations relating to the control of our natural resources which will assist him instead of being a detriment to his progress and prosperity. A settler generally depends largely upon public officers for advice. It is difficult if not impossible for him to present his cause in such way that he will be understood unless he is given opportunity to do so verbally. Rules and regulations made at Washington are often not understood even by the local officer who is charged with their administration.

The settler seldom sees the local officer and when he makes an inquiry the rules and regulations are generally sent him without interpretation. Under these conditions any policy which will lead to a centralization of control of all natural resources at Washington will tend only to increase the hardships of the settler and



Scene in Petrified Forest, Arizona.

of latitude is almost inappreciable, altitude alone seeming to determine the temperature.

The great valley of the state is four hundred miles long, walled in on all sides by lofty mountain ranges making it in effect a great room with one climate except for minor modifications of slope, exposure, or relative elevation. In general, then, the climate at Orland is the same as in all parts of the valley, except for the slight difference caused by its position on the "mound." For, as is well known, the colder air being heavier drains down on the lower levels, and in flowing down the valley it, like the river, makes a detour around Orland, giving a practical immunity from frost that permits the lime that most tender of citrus fruits to thrive and bear heavily.

The nights are always cool and pleasant, and one is sure of a refreshing night of slumber after the warmest day. The summer afternoons are warm, but owing to the low humidity the heat is not distressing. No prostrations ever occur, though men and teams work in the fields in the warmest weather. In fact the sensible heat is less here with the thermometer at 100 than it is in the Mississippi valley at 85.

render his condition less envious. In order that we may clearly understand the present power and influence of some great bureaus at Washington we must study their policies and their methods of securing support. Those who scrutinize the papers and magazines cannot fail to notice that articles identical in purport and language are published on the same day in many widely separated towns and cities.

The reader who desires to continue his studies will find that these large bureaus at Washington control press agencies which are conducted by men employed at the expense of the government. These press bureaus are maintained for the sole purpose of advertising the chiefs of the bureaus, creating public sentiment in favor of their policies and criticizing and ridiculing all persons and policies which in any way oppose these great administrative machines. The heads of these press agencies may be designated in the pay roll as statisticians or by some other title which protects the bureau and serves to mislead the public. By co-operation with staff reporters at Washington despatches indorsing the policies of the bureaus are sent to the press of the country.

These great political bureaus have other opportunities for exploiting the chiefs and their policies. Certain periodicals have been established and have received government support for this purpose. Two prominent bureau chiefs for several years co-operated with a molder of public sentiment employed by the railroads and hundreds of thousands of dollars were spent each year in advertising these favored men and at the same time criticizing and condemning those who have unfortunately nothing but ability and a creditable record to recommend them. Many publications issued by these bureaus are designed to secure the endorsement of the people regardless of the truth or of scientific fact. It would be presumed that the business of these great bureaus would consume the time and energy of any single man charged with such a responsibility and that he would have little opportunity or occasion to appeal to public sentiment to obtain support for his department.

Work well done is generally recognized even under a republican form of government. Regardless of this natural assumption these bureau chiefs spend much of

their time attending conventions and resorting to all kinds of political expedients to obtain favorable endorsements from meetings called for the purpose of obtaining an expression of sentiment from the people. While we of the west can easily satisfy ourselves regarding the activity of these men in our local affairs, yet we seldom appreciate the workings of the great bureaus at the national capitol. I have appeared before committees of congress where some of these bureaus have been represented by their chiefs and an army of employees. I have been able to study their system of lobbying and fully appreciate the disadvantage resulting to any department of government or state whose interests may conflict in any way with one of these great machines so long as the present practice is allowed to continue. The history of civilization shows conclusively that the best use of natural resources is made when the control of such resources is intrusted to those locally concerned either in development or in their conservation. Under all conditions the burden of public control and maintenance falls on the community where the natural resource is found and this has been recognized by the great bureaus at Washington.

How Pneumonia May Be Cured.

Dr. Simian Bishop, one of the oldest physicians in California, who formerly lived in Virginia City, Nevada, has had greater success with pneumonia, probably, than any physician in the United States. He treats the disease as follows:

In the beginning the patient is put to bed and his breast is covered with a thick coating of cayenne pepper. Antiphlogistine is thickly plastered over this on the chest, after which a jacket is put around the body. The cayenne pepper is spread thickly, possibly a pound of the pulverized form, over the back as well as the chest, and the back is covered with an old undershirt, or jacket, which has been first cut open and which is afterward sewn on tightly.

The first thing done after this is for the patient to take lobelia seed tea. A teaspoonful of lobelia seed steeped in water and taken produces a violent vomiting, which gives the stomach exactly what is said to be necessary in the way of a thorough cleansing.

Following this Thompson's Composition powder, a teaspoonful to a cup, and made into a tea, is taken three or four times a day, like coffee. The dose is three tablespoonfuls. It is a hot preparation and produces great perspiration.

The fever is controlled with broken doses of quinine, and an expectorant with ammonia therein used to loosen the cough. For the bowels, five grain doses of cascara sagrada in tablet form, and if there are typhoid symptoms, epsom salts is used. In addition to this the ventilation should be the best procurable.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for new beginners in irrigation.



The GREAT AMERICAN DESERT is DISAPPEARING

THE great ranges are fast being taken up by individual settlers, and thousands of prosperous farmers are taking the place of the few cattle kings that were monarchs of the ranges a score of years ago.

It is the story of the magic touch of water upon the dry land.

I. H. C. Gasoline Engines in Irrigation Enterprises.

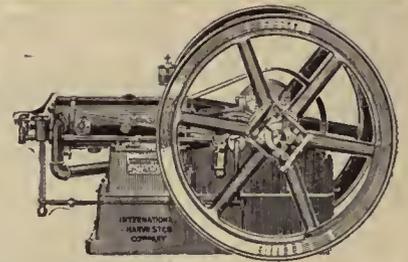
If you have not kept yourself posted on irrigating matters, you will be surprised at the important part I. H. C. gasoline engines are taking in the reclamation of these waste lands.

Hundreds of settlers and farmers have no other means of getting water upon their lands than these engines.

These settlers and farmers are cultivating all sizes of farms, from garden spots to "forties" and "eighties" and quarter sections and even larger tracts. They are among the most prosperous farmers in the irrigated

WESTERN GENERAL AGENCIES: Denver, Colo., Portland, Ore., Salt Lake City, Utah, Helena, Mont., Spokane, Wash., San Francisco, Cal.

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sections. They are raising grains, alfalfa and other grasses—vegetables, fruits, etc.

They find that with an I. H. C. engine they can get water in large quantities upon their land, and that they can get it dependably and economically. They find the I. H. C. engine method of pumping more direct, more profitable and more satisfactory than any other means heretofore employed.

I. H. C. gasoline engines are simple, dependable and powerful. They pump water economically, and you will find that they run with very little attention.

If you have an irrigation problem it will pay you to investigate and see what an I. H. C. gasoline engine will do for you.

Vertical engines in 2 and 3-Horse Power. Horizontal engines (Portable and Stationary) in 4, 6, 8, 10, 12, 15 and 20-Horse Power.

Also, gasoline traction engines, pumping, sawing and spraying outfits.

Call on the International local agent, or write the nearest branch house for catalog and colored hanger.

Make Your Unproductive Land Profitable

Don't let a part of your land be idle because of a lack of water. Irrigate it. If there's a running stream or spring on any part of your farm the water can be delivered just where it will do the most good. Simply install a

NIAGARA HYDRAULIC RAM

and start it going. Better than a gasoline engine or windmill. Write for booklet C, and guaranteed estimate. We furnish Caldwell Tanks and Towers.

NIAGARA HYDRAULIC ENGINE CO., 149 Nassau St., New York. Factory: Chester, Pa.



150,000 Acres of Rich Irrigated Land in the Eden Valley

Southern Wyoming is now open for entry under the Carey Act.

The greatest opportunity ever offered citizens of the United States by the Federal Government and State of Wyoming to own a rich irrigated farm.

You may secure a filing on a claim in Eden Valley without leaving your own home.

Of all the larger projects this is the only one on which the company has been able to deliver water to land promptly on time and without asking for an extension of time.



Headwaters of Big Sandy River.

Settlers have been coming in rapidly and have already placed a large area under cultivation. These settlers are building permanent homes.

New purchasers are arriving daily.

It has developed that the soil is prolific. This is evidenced by the crop returns from this year's crop. All crops are produced here in abundance.

Potatoes do well under the Eden project and large profits are derived from them.

Any time within six months after water is turned on you can obtain title to your land.

An 80-acre claim of Eden Valley land is a good sized farm for an ordinary family and will produce a revenue equivalent to more than a quarter section in the rain belt. In Eden Valley good soil, water and sunshine are available in correct proportions to produce plentiful crops, which are always sure, like the payment of Government Bonds, but of far greater income yield. Irrigation is the best crop insurance.

The cost of the irrigation system is assessed against the land at the rate of \$30 per acre, payable in ten annual installments, which, with the payment of 50c per acre to the state for the land, brings the cost per acre to \$30.50.

After all payments are completed the entire irrigation system becomes the property of the people who enter the land.

Mr. W. G. De Celle, Vice-President and General Manager of The Eden Irrigation & Land Company, will be in attendance at the Sixteenth National Irrigation Congress at Albuquerque, and those who desire to talk with him about this project will find him at Room 16, Alvarado Hotel. For additional information address

EDEN IRRIGATION & LAND COMPANY

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Manufacturers of all kinds of Hand and Windmill Pumps

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Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

Second—Although weighing about one-half the weight of a single cylinder engine of same rated capacity, vibrations are practically overcome, demonstrating conclusively that in proportion to strain the double cylinder "Master Workman" is the stronger engine.

Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

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WHO WILL GET IT?

A 20th Century Grader is offered as a prize for the best collective exhibit (at the NATIONAL IRRIGATION CONGRESS) of vegetables, grain and feed grown by a single New Mexico farmer upon a single irrigated farm.

See Our Exhibit at the National Irrigation Congress and Exposition, Albuquerque, N.M., September 29th to October 10th.

The Photograph Shows a 20th Century Grader making seed-beds on Herman Blueher's Irrigated Farm. He's successful. He knows how to make money; how to save it; how to invest it. This is proven by the fact that his truck-farm at Albuquerque, New Mexico, supplies the entire Harvey System of eating houses on the Sante Fe Railroad.



SAVES MR. BLUEHER A THIRD

Albuquerque, N. M., Feb. 15, 1906
I wish to say that I have bought and am using one of the Twentieth Century Graders and can cheerfully say that for land leveling, seed-bed making, ditching and for all kinds of irrigating work it has no equal. Since purchasing my Twentieth Century Grader I have reduced my force of men until I am only using one-third as many as before, and the work done by this machine is far superior than can possibly be done by hand and has a much more finished appearance. I have fifty acres in my truck farm, and can very easily manage it with one machine. I am very glad to recommend it to anyone for same. I also wish to recommend it to be a first-class machine for making of good roads.

(Signed) Herman Blueher

If he finds our 600-lb. Grader easily handled by a team and one man, and adaptable to field or road work you and other irrigation farmers can cut expenses in the same proportion.

Handsome free Booklet "20th Century Highways," tells the full story, showing large cuts of Grader and its parts. Write today for it.

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I Must Absolutely Prove That

10 Acres of this Irrigated Land

Can be Made to Earn Over **\$100.00** A Month For You



Geo. E. Barstow
President
Pecos Valley Land & Irrigation Co.

I Will Sell it to You for \$3.00 a Week

BARSTOW TEXAS

Land, all under cultivation, income property from the very beginning, if you can save \$3.00 a week. You can go and live on it—absolutely assured of an independent living from it alone. Or arrangements will be made to have it cultivated for you for a small share of the crops. Now I can and will prove all this from the highest authorities in the land. All you have to do is—write to me and say, "Prove to me that ten acres of your Texas Irrigated Land can be made to produce an income of from \$1,000.00 to \$5,000.00 a year." I have the proof, so read what my company will do for you.

New Safe Land Plan

I will deliver at once to the Citizen's State Bank of Barstow, Texas, a Warranty Deed to ten acres of the land of the Pecos Valley Land and Irrigation Company as per the subdivision of the Company's property made by John Wilson and filed for record with the County Clerk of Ward County, Texas.

I will deliver at once to you, one of our Secured Land Contracts for the Warranty Deed at the Bank—on the contract appears a certificate signed by an Officer of the Bank and certifying that the Bank has your deed and will deliver it to you according to the terms of your Secured Land Contract. The Bank acts as an independent agent for both of us—to guarantee fair play.

You must pay \$3.00 a week, or at the rate of \$3.00 a week in monthly, quarterly, semi-annual or annual payments. Or you can pay as much faster as you like.

At the end of each year—if you take more than a year to complete your payments—you will be credited with 5 per cent per annum on the amount you have paid.

\$15 down and \$3 a week paid regularly, and the interest credits, will mature your Contract in a little over two and three-fourths years.

But you can mature your Contract by paying the same total amount, \$483, in a day, a month, six months, a year, or in any less time than 2 1/2 years, and whenever your regular receipts and your interest allowance credit receipts total \$483, all you have to do to get your land is to take or send your receipts and your contract to the Citizen's State Bank at Barstow, Texas, together with twenty-eight vendor lien notes each for \$39, payable one every three months for seven years.

The Bank will then give you your Warranty Deed to the land, which, according to the Contract and the Deed, must be fully irrigated and all under cultivation.

Remember this is ten acres of land which I must first prove is capable of producing an income of from \$1,000 to \$5,000 a year.

Any one who is familiar with the results from Texas Irrigated Land will tell you that the safest, surest way to gain a large and permanent income from a small outlay is to get hold of a few acres of Texas Irrigated Land. But, heretofore, it has required some capital—at least a few hundred dollars—and it has been necessary for the purchaser to go and live on the land and develop it.

Now, my company makes it possible for you to get ten acres of the finest kind of Texas Irrigated Land, all under cultivation, income property from the very beginning, if you can save \$3.00 a week. You can go and live on it—absolutely assured of an independent living from it alone.

You get this land for \$483, which you can pay in less than three years—\$15 down and \$3 a week—and you then have only four \$39 notes each year for seven years to pay out of your income.

Can you hope in any other way, so safe and sure as this, to have so large an independent income in so short a time?

I believe the purchase of Texas Irrigated Land to be the best way for a man of small means to make himself independent. And I believe I am qualified to pass judgment as I have been interested in irrigation matters locally and nationally for 15 years.

The results are simply astounding to those who are unfamiliar with the great subject of irrigation. And I believe the happiest man these days is the man with the little ten acre irrigated farm—(President Roosevelt says, "Even 5 acres is enough to support a family and keep it busy").

The owner of a Ten Acre Irrigated Farm doesn't have to "knuckle to the boss," nor strain his conscience in the struggle of the intense commercialism of the day.

His income is practically untouched by "financial depression." His living and peace of mind are not dependent upon the whim of any man.

He is king in his own little domain. He can make his little ten acre farm as much as a quarter section (160 acres) unirrigated, would produce—as much as between twenty and eighty thousand dollars in cash would bring, loaned out at 6 per cent.

He has his close neighbors, his telephone, good roads, schools and churches—in fact, all the comforts and conveniences of life that come with the prosperous close-knit community, though they pass by the great isolated farm.

The land I want you to buy is all good rich soil, irrigated from Canals and Ditches already constructed in the most approved modern fashion and carrying an abundant supply of water taken from the ever-flowing Pecos River.

It is within a few miles of Barstow, Texas, and Pecos City, Texas, (the two towns are only 6 1/2 miles apart)—the land lies between the towns and a little to the north and served by the Texas & Pacific Railway and the Pecos Valley Line of the Santa Fe System.

With rich soil, a splendid climate and the uncertain quantity —moisture—eliminated, agriculture and horticulture can here be scientifically carried on to the splendid profit of the land owner.

The abundant crops of large and in every other way superior hay, grains, cotton, vegetables and fruits are equaled in only a very few favored spots.

The justly celebrated Barstow Grapes are considered by many to be even better—variety for variety—than those raised in Southern California—and we are 1,200 miles nearer the great Eastern market. But all this is the merest outline of what I desire to show you in detail. I am only attempting to make it clear to you that you can have an assured independent living income in less than three years if you can possibly save \$3 a week.

I have promised to submit the proof. All you have to do is write for it. Will you do that today, even if you can't commence right away? I want the address of every man or woman who is willing to save \$3 a week if I can prove that the result will be financial independence in less than three short years.

There is nothing philanthropic about this proposition, but I especially want to hear from the wage-earners. I have worked for fifteen years to develop this Irrigation System and this community. It would be gratifying to me to have those who most need it reap the benefits of my labors.

It will be more convenient for you to address me at St. Louis, and I am equipped there to best answer you.

GEORGE E. BARSTOW, President
Pecos Valley Land and Irrigation Company, of Barstow, Texas,
849 Missouri Trust Bldg., St. Louis, Mo.

Safeguarded

The Bank will deliver your deed direct to you when your \$3.00 a week and interest credits total \$483.00

It Doesn't Take Long

Wyoming Land and Irrigation Company

Now constructing canals for the irrigation of 70,000 acres of land in the famous Big Horn Basin of Wyoming.

15,000 acres of this land will be ready for sale January 1, 1909.

The soil is unusually rich and produces immense crops of Sugar Beets, all kinds of fruits, Oats, Wheat, Barley, Rye, Potatoes and three crops of Alfalfa.

The water supply is abundant and is taken from streams located in the Government Forest Reserve in the Big Horn Mountains.

For terms and further information address

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IRRIGATED FARM LANDS OPEN TO SETTLEMENT IN THE BIG HORN BASIN OF WYOMING

Thousands of acres of the choicest irrigated lands in America are now open to settlement, some under Government canals and some under private canals—and all on easy terms of payment.

These irrigation systems when completed will irrigate several hundred thousand acres of land, comprising one of the most desirable irrigated districts in the United States, from the standpoint of climate, depth and fertility of soil, variety, quality and yield of crops, abundance and certainty of water supply, desirable character of settlers, educational, religious and town advantages, and good markets and transportation facilities.

Hon. Frank W. Mondell, chairman of the Committee on Public Lands of the House of Representatives of the United States, says:

“Taken all in all, no region that I know of in the United States has a brighter prospect than the Big Horn Basin; so wide is the range of its products and possibilities that it might easily be made self-supporting and self-sufficient. Fortunate, indeed, are the people who have cast their lot with that region and who continue to pin their faith to its assured future.”

If you are interested in securing a farm in this ideal irrigated region, write to me for the new Burlington Route Big Horn Basin folder, with large map, telling all about these lands; also for folder of the Reclamation Service telling all about the lands under the Government Canals. They're free. Write for them today.



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Denver Reservoir Irrigation Co.

6% Bonds at Par

Nine Miles From Denver, Colorado

begins a farming area stretching from Denver half way to the celebrated Greeley and Longmont region (the best known irrigation district in the world) which is the basis of an issue of bonds now owned and offered by us, namely:

6% Land Secured Bonds

due each year from 3 to 11 years. Principal and semi-annual interest payable at American Trust & Savings Bank, Chicago. Denominations—\$100, \$500, and \$1,000 (orders accepted for single bonds) issued by the—

Denver Reservoir Irrigation Company

which has acquired and merged into one system the properties of 9 active, operating irrigation companies in the immediate vicinity of Denver, thus endueing the Company with some of the earliest water rights in Colorado, dating back 30 and 40 years.

These water rights give prior use of the direct river flow and the flood waters of the principal streams of the eastern slope of the Rocky Mountains, besides tapping the Fraser, the largest river on the western slope. Water stored in reservoirs for use in the summer after the streams fail is indispensable to sugar beets and other late crops. **Stored Water is Stored Wealth.**

Security Under the Bonds:

Primarily, mortgage liens on the Denver Reservoir Irrigation Company's system, including water rights, canals, reservoirs, sites, etc., and all properties now owned or hereafter to be acquired by the Company, conservatively estimated worth between

Two Million to Three Million Dollars

Secondly, collateral security in the form of mortgage liens upon farm and orchard land to be supplied with contract water derived from sales of reservoir stock representing water rights sufficient for the land, and by the water stock itself, which is not delivered to purchaser until his payments are completed.

The farmer has ten years to pay for a perpetual water right at \$50 per acre. The deed of trust securing the bonds provides that these mortgage liens given to secure the payments for water rights, shall be deposited with the AMERICAN TRUST & SAVINGS BANK, CHICAGO, TRUSTEE, in the ratio of one and one-quarter times the amount of the bonds issued, which ratio must be maintained during the life of the bonds.

Trowbridge & Niver Co.

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Municipal Bonds

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The value of the collateral security therefore may be stated as follows:

As security for each \$1,000 bond in addition to the liability of the company, the trustee bank holds \$1,250 mortgage liens upon land estimated worth, with water, over \$3,000, or THREE TIMES the amount of the bond.

The Denver-Greeley District

is said to be the richest farm and fruit community in the world, producing apples, cherries, strawberries, raspberries, melons, sugar beets, peas, onions, potatoes, asparagus, tomatoes, cucumbers, etc., which, owing to their quality and the proximity of Denver, the market place of over a million people in Colorado and surrounding states, yield an income of \$250 to \$1,000 per acre.

These securities are unparalleled in attractiveness in the history of irrigation in the United States in the following respects:

FIRST, Location: Namely, immediately adjoining Denver, the metropolis of the growing West, with a dozen railroad systems which distribute Denver-Greeley products to the whole Rocky Mountain region extending from Montana to Texas, affording a ready market for all that can be produced in a radius of many miles, giving a potential value to these lands beyond that of any irrigated section east of California.

SECOND, Comparative values: In other irrigated sections fruit lands command from \$300 to \$2,000 per acre; farm lands from \$100 to \$350 per acre, even in isolated and sparsely settled localities.

The lands adjoining Denver on the west and north command \$200 to \$1,500 per acre, but as a basis for estimating the security under these bonds, we have taken \$100 per acre as the land value while our mortgage liens securing the bonds represent only \$32 per acre.

Purpose of Bond Issue:

These mortgage liens are pledged to secure funds for canal extension and construction of the Standley Reservoir—10th and largest in the system.

Expert report by Dr. Elwood Mead Chief of United States Government Irrigation Investigation Department and an illustrated booklet will be furnished on request.

Trowbridge & Niver Co.,
First National
Bnk Bldg.,
Chicago, Illinois

Please send copy of report, illustrated pamphlet and further particulars regarding Denver Reservoir Irrigation Company 6 per cent bonds

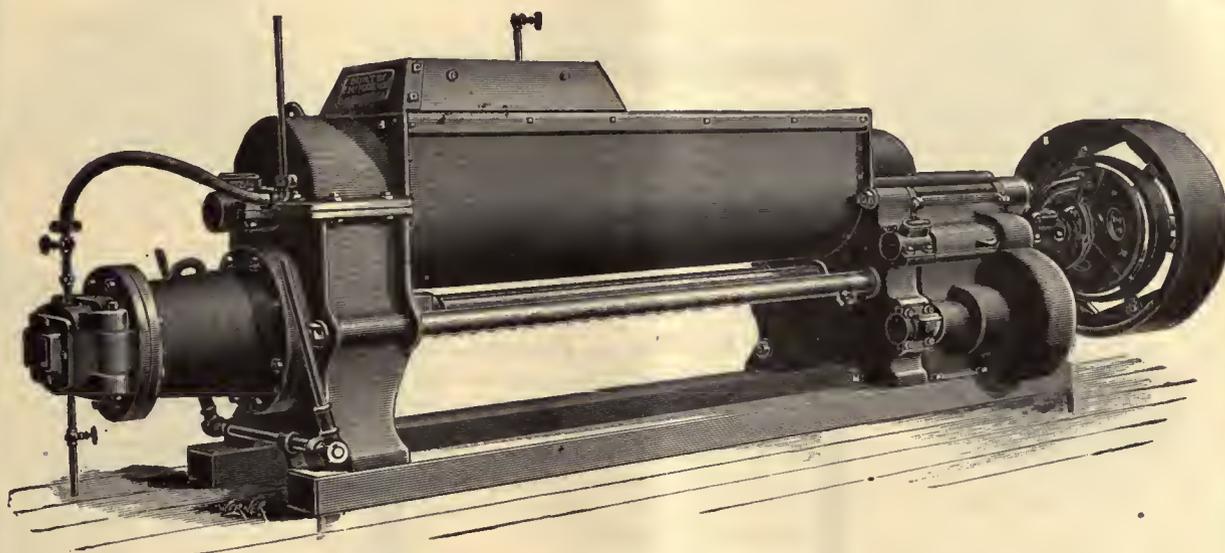
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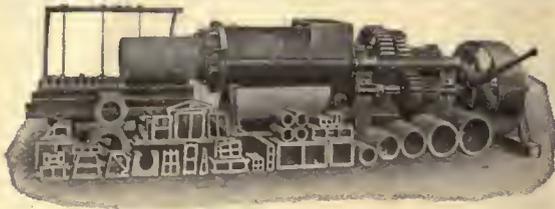


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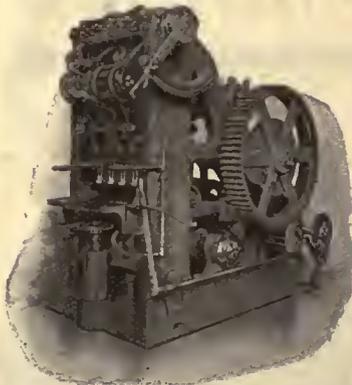
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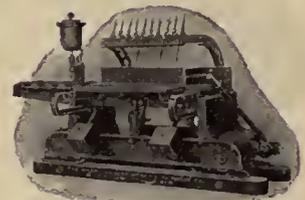
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We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

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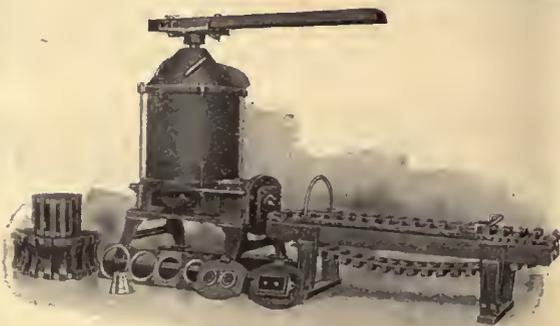
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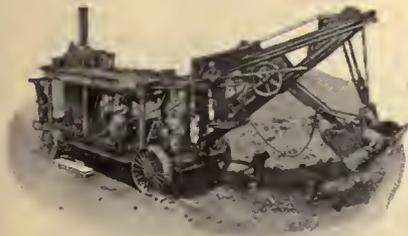
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\$1,000 Reward
for its equal. Wind power doubled. Two 14 in. wheels work on same pinion; second wheel gives more power than first.

A Governor That Governs in all winds. Develops 10 full h. p. in 20 mile wind. All power needed for farm, shop, irrigating, etc. Ask about our self-acting, single wheel pump—also Armsaver Husker. Ask for book 60
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Pumps water from spring, stream or pond automatically. Inexpensive, simple, reliable. Satisfaction Guaranteed. Raises water 30 feet for every foot of fall. 7,000 in use.

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The engine that will please you.

Any style engine 3 to 60 horse power.

Write for special prices.

MENTION THIS PAPER. NEAT-NOBBY-HANDY

In Musselshell Valley Montana—Profits

Where a few years ago settlers in Montana where engaged principally in stock-raising, diversified farming is now being successfully carried on at great profit.

Large yields of wheat, oats, barley, potatoes, vegetables, alfalfa and timothy hay are being produced in the fertile Musselshell Valley, in central Montana, along the Pacific Coast extension of the

Chicago Milwaukee & St. Paul Railway

Thousands of acres of fertile lands have been opened to settlement in Montana in the past year through the construction of this new transcontinental line. Land is still cheap there and plenty of government homesteads may still be secured close to the towns on this new line. These towns are growing and will provide additional markets for the crops.

It is well worth your while to make a trip there to see for yourself the opportunities now offered.

Maps and descriptive books regarding the country along this new line are free for the asking.

F. A. MILLER
General Passenger Agent
CHICAGO

GEO. B. HAYNES
Immigration Agent
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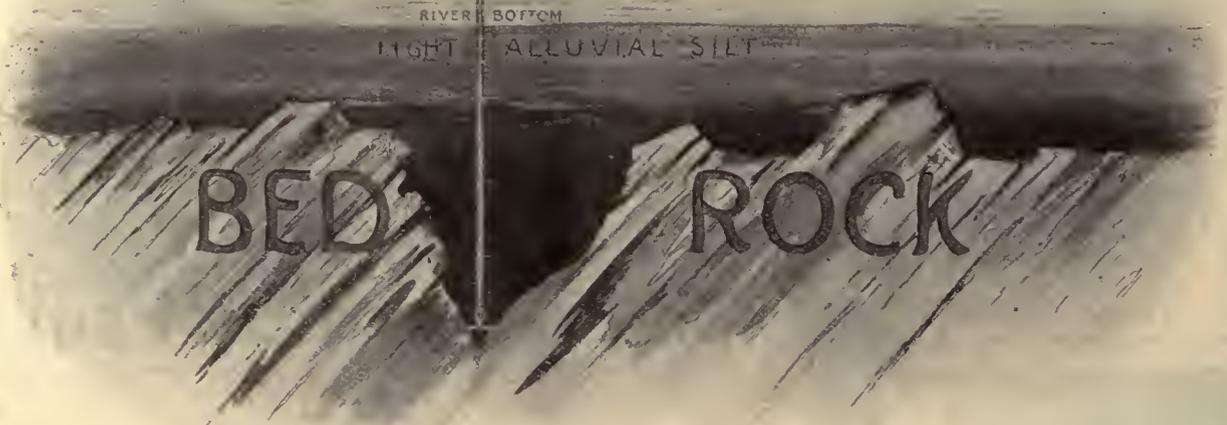
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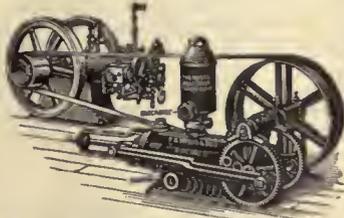
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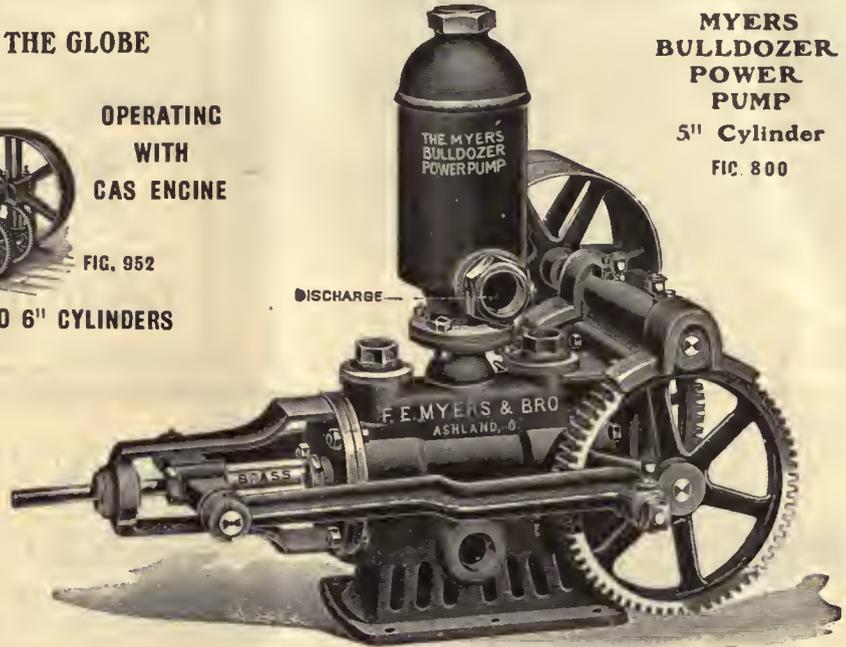


OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

MYERS
BULLDOZER
POWER
PUMP
5" Cylinder
FIG. 800



MYERS
BACK GEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

5, 7 1/2 AND 10"
STROKE

FOR BELT,
WIND OR HAND
POWER

FIG. 1113



BULLDOZER
WORKING
HEAD

BULLDOZER PUMP
6" BRASS LINED
CYLINDER

F.C. 1079

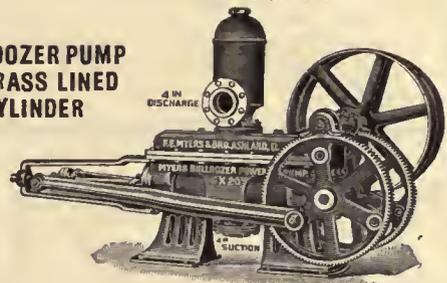


FIG. 813

MYERS BULLDOZER
WORKING HEADS

NO. 359

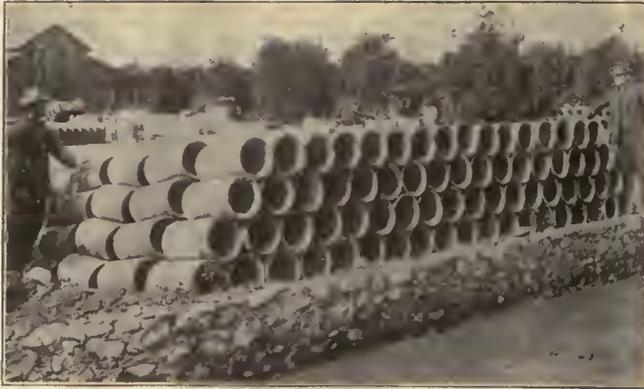
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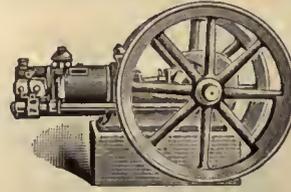
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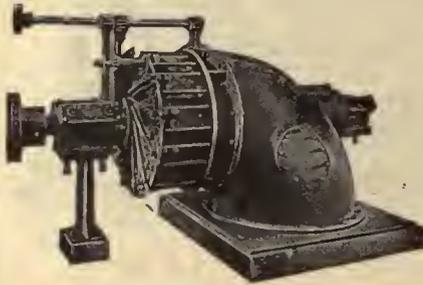
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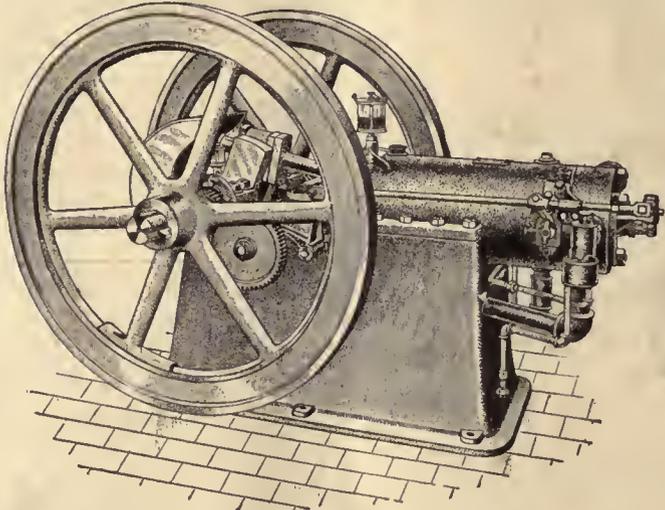
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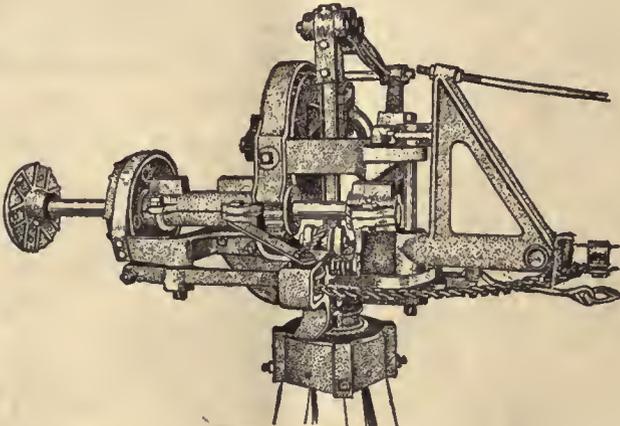
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VOL. XXIII.

CHICAGO, OCTOBER, 1908.

No. 12

TITLE REGISTERED U. S. PATENT OFFICE

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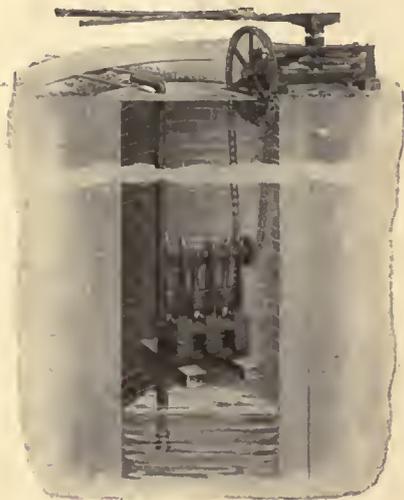
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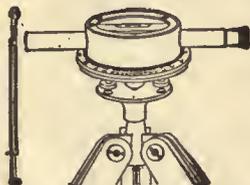
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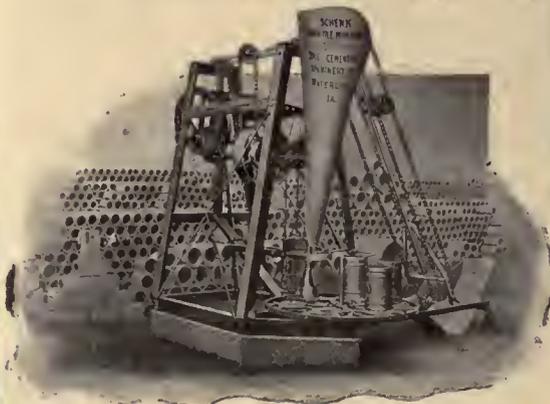


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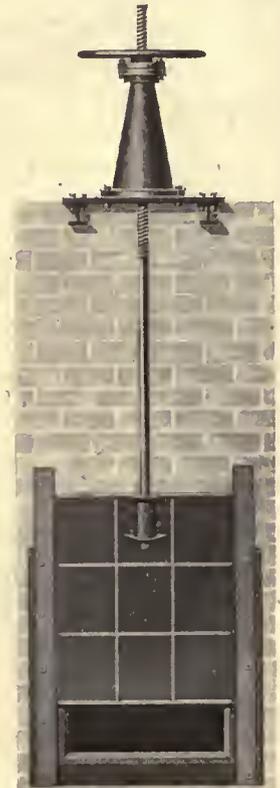
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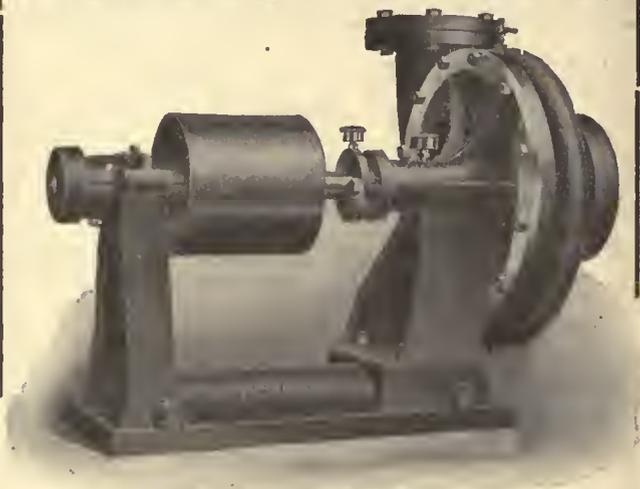
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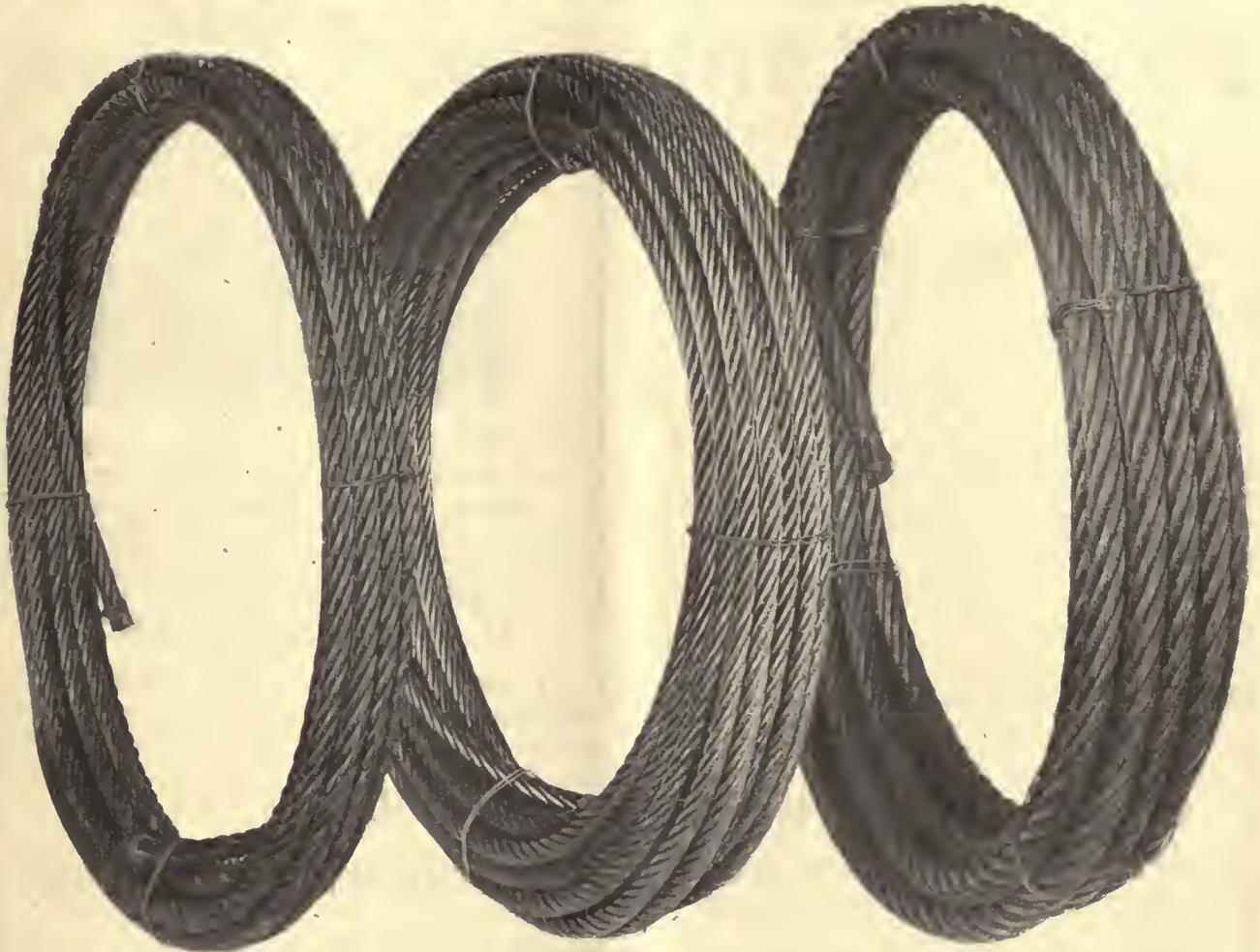
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THE IRRIGATION AGE

VOL. XXIII

CHICAGO, OCTOBER, 1908.

No. 12

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
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IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 23 years old and is the pioneer publication of its class in the world.

Delay in Date of Issue. Owing to the fact that the editor of *THE IRRIGATION AGE* was detained at the Congress at Albuquerque, until the third of October, and could not reach Chicago before the fifth, after which a report of the Congress, such as appears in this issue, was prepared, it was impossible to bring this number of *THE IRRIGATION AGE* out on the tenth of the month, which is the usual date of issue. It was thought best to delay the October number for a few days and give a fair report of the Congress in that issue. The principal papers delivered at this Congress will appear in these columns from time to time during the coming year.

Beaman Scores Pinchot. We are presenting in this issue a paper on the National Forests and Forestry Service, which is taken from a report of the proceedings of the Sixteenth National Irrigation Congress, said paper having been delivered before the Congress by Judge D. C. Beaman, of Denver. This paper attracted more than ordinary attention owing to the fact that it was a severe criticism of the methods of the Forestry Bureau and directly antagonized the views of those who are adherents of the Pinchot policy of conservation.

Judge Beaman has made a very careful study of this subject and is by long odds the best posted man in the ranks of the opposition to the Forestry Bureau. He has made a study of forestry affairs and hopes to prove that Mr. Pinchot's policy of reforestation will be of

little service to the present or other generations within the next one or two hundred years.

He maintains that it would be much better to plan out work of developing the west so as to allow all lands susceptible of agriculture to be thrown open, regardless of whether they are in forest reserves or not.

It is our intention to publish regularly hereafter, articles from well known opponents of the Forestry Service, which will exploit the views of the opposition to that service.

The Sixteenth National Irrigation Congress has come and gone, and those who attempt to clearly describe all that transpired in connection with that Congress, both in open meeting as well as under cover, will find it a difficult task and perhaps learn that after a careful description they have made enemies of the intriguers who under the surface carried out a plan which had been maturing during the past year under the able generalship of the director of the Reclamation Service and some of his trusted allies outside of the Service. The gentlemen who have assisted in framing up a political propaganda in the Congress found it necessary to call on some of the old crowd for assistance, and one result of the new plan was the bringing back to the fold of George H. Maxwell, of New York, Massachusetts, Illinois and California. It is remarkable that Mr. Maxwell has the audacity—allowing that he has more of that quality than the average individual—to en-

ter again into the work of the National Irrigation Congress from which he withdrew after a resolution had been passed at the Congress in Portland, stating that no one was authorized to collect money in the name of the Irrigation Congress. It is a well known fact that the individuals referred to in that resolution were Mr. George H. Maxwell and the chairman of that particular congress, Mr. Boothe, of Los Angeles, Cal. Mr. Maxwell had withdrawn from the congress after he had been roughly handled by some of those who favored cleaner development along this line, and his last appearance at a congress prior to the Sixteenth Congress was at El Paso, Tex. As he was not allowed to dominate the congress at Ogden and El Paso his well known petulance overcame his judgment, and that coupled with the resolutions which precluded the possibility of future collections by himself and Mr. Boothe in the name of the irrigation congress caused his entire withdrawal from the deliberations of that body.

It is also known that Mr. Maxwell and his publication, which at that time was largely circulated and read, stated that the usefulness of the Irrigation Congress had ended. This suggestion in his paper created considerable amusement among his acquaintances as it was inferred that the congress would lose its value as a deliberating body by his withdrawal from it.

It is a well known fact that the congress became very much stronger after his attempt to kill it by merging it with the Trans-Mississippi Congress. Each succeeding congress has shown greater strength with a large number of delegates and it is presumed that Mr. Maxwell would have been glad to have come back into the fold prior to this time if he could have done so without being openly ridiculed.

As stated in previous lines his audacity is remarkable in view of these facts and his deliberate taking over of authority in the Sixteenth Congress at Albuquerque has brought about a feeling of resentment and disgust among those who have worked steadily for the upbuilding of the congress and the development of the west.

It is the impression of THE IRRIGATION AGE that Mr. Maxwell was induced to attend this congress by Messrs. Newell and Pinchot, both of whom failed to put in an appearance.

It is not our intention to further comment concerning Mr. Maxwell, as an outline of his plans will be found elsewhere in this issue.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for new beginners in irrigation.

Reclamation Service News

Approximately 10,800 acres of land which were withdrawn in connection with the Big Bend irrigation project, Washington, have been restored to the public domain and will be subject to settlement under the public land laws of the United States on and after November 14, 1908, but will not be subject to entry, filing or selection until December 14, 1908.

These lands lie in Townships 13 and 14 North, Ranges 32 to 35 East, Willamette Principal Meridian.

The Secretary of the Interior has authorized the Reclamation Service to begin the construction of the Clear Lake dam, Klamath Project, Oregon, by force account. The total estimated cost of this work is approximately \$165,000. Bids for the erection of this structure have been rejected on the grounds of excessive cost, and it is believed that the work can be carried on effectively and economically with the force in hand.

Contract has been awarded to the Union Portland Cement Company, of Ogden, Utah, for furnishing 2,000 barrels of Portland cement for use in constructing the Strawberry Valley irrigation project, Utah. The contract price of the cement is \$1.10 per barrel f. o. b. cars at Devil's Slide, Utah.

The following lands which are required for reservoir purposes in connection with the North Platte irrigation project, have been withdrawn from any form of disposition whatever under the public land laws:

Nebraska—T. 24 N., R. 58 W., w $\frac{1}{2}$ nw $\frac{1}{4}$ and w $\frac{1}{2}$ sw $\frac{1}{4}$, Sec. 10, and Secs. 14, 15, 21 and 22.

Wyoming—T. 24 N., R. 60 W., nw $\frac{1}{4}$ ne $\frac{1}{4}$, e $\frac{1}{2}$ ne $\frac{1}{4}$, s $\frac{1}{2}$, Sec. 5; all Secs. 7, 8, 9, 10, 15 and 22. T. 24 N., R. 61 W.; all Secs. 1 and 13. T. 25 N., R. 60 W., sw $\frac{1}{4}$ se $\frac{1}{4}$, Sec. 32.

These lands had previously been withdrawn from all forms of disposition except homestead entry in connection with this project.

The Secretary of the Interior is asking for proposals for the purchase and removal of standing timber upon lands immediately surrounding Lakes Clealum, Kachess and Keechelus, in Kittitas county, and Bumping Lake, in Yakima county, Washington, involving about 63,000,000 feet B. M. of merchantable timber, 2,000 telephone poles and 20,000 railroad ties. The bids will be opened at the office of the Supervising Engineer, United States Reclamation Service, 417 Beck building, Portland, Oregon, on November 16, 1908.

The Secretary of the Interior has approved the contract entered into by Mr. Louis C. Hill, Supervising Engineer in the Reclamation Service on behalf of the United States, and the Pioneer's Consolidated Transfer & Storage Co., of Phoenix, Arizona, for furnishing and hauling about 33,000 barrels of fuel oil for use in the cement mill, Salt River irrigation project. The estimated total amount of the contract will be \$145,200.

Contract has been awarded to W. H. Mason, of Klamath Falls, Oregon, for the extension of the South Branch Canal of the Klamath irrigation project, Oregon-California.

The work consists of the construction of about 7 miles of canal, involving the excavation and embanking of about 112,000 cubic yards of material. Mr. Mason's bid amounted to \$22,703.90.

About 32,600 acres of land lying in Townships 13 and 14 N., Ranges 12, 13 and 14 East, Willamette principal meridian, Washington, have been withdrawn from any form of disposition whatever under the public land laws, in connection with the Tieton irrigation project, Yakima valley, Washington.

Contract has been awarded to the Long Lake Lumber Company, of Klamath Falls, Oregon, for furnishing lumber for use in connection with the Klamath irrigation project, Oregon-California. The contract provides for the purchase of 291,000 feet board measure, of lumber, at the rate of \$12 per thousand feet. It is also provided that there shall be furnished 300,000 feet board measure of dimension lumber at the rate of \$15 per thousand feet, and 185,000 linear feet of corner stops, splines, etc., at the rate of three-tenths cents per linear foot, making the total amount of the contract \$8,547.

Sixteenth National Irrigation Congress Held at Albuquerque, New Mexico.

The sixteenth National Irrigation Congress, which assembled at Albuquerque, New Mexico, September 29th, was attended by nearly 900 accredited delegates and taken all in all was a successful meeting. The fear entertained by many who attended the Congress that Albuquerque would not be able to take care of her guests during that period was unfounded. So far as has been learned, ample accommodations were offered.

While many of the speakers billed failed to appear, there were enough good papers delivered to make the Congress an exceedingly interesting one, both from a scientific or general irrigation standpoint.

The head of the Reclamation Service, Mr. Newell, was unable to attend owing to the fact that he was looking after some work for the people in the Hawaiian Islands. Mr. Pinchot, it was stated, was detained in Washington by work connected with the new bureau

One of the most interesting features of the congress was a paper read by Judge D. C. Beaman, of Denver, criticising the Forestry Bureau. This paper created a great deal of criticism and resulted in bringing out talks from those opposing his views. The article by Judge Beaman is printed elsewhere in this issue and will be found highly interesting.

It is a peculiar fact that criticism of either the Forestry or Reclamation Bureau in the Congress or elsewhere brings out strong protest from the friends of these bureaus, so strong in fact as to lead the average individual to believe that antagonism is anticipated and that the individuals are always on hand to combat anything that may not be to the liking of either one of these departments.

It was very evident from the beginning that friends of the Reclamation and Forestry Bureaus had so shaped



View of Convention Hall on Opening Day, Sixteenth National Irrigation Congress, Albuquerque, New Mexico.

established by the President to assist the farmers of the country. It was the impression of all delegates present that these two gentlemen should have attended this congress regardless of any demands upon their time as matters of more than ordinary importance in connection with each bureau were brought to the attention of the Congress, and could have been answered much more satisfactorily by them than by subordinates who were sent to represent them.

The Reclamation Service was ably represented by Mr. A. P. Davis, Chief Engineer, who is a man of unusual attainment in his line of work, and an all-around "good mixer." The fact that very few of the Reclamation and Forestry people were in attendance, as compared with former years, was particularly noticeable.

Mr. C. J. Blanchard, Chief Statistician of the Reclamation Bureau, looked after the interests of his department and George H. Maxwell was in attendance and very active, and his work all through the Congress would indicate that he was an indirect, if not a direct representative of both the Reclamation and Forestry Bureaus.

things as to control the actions of the Congress and repeated efforts were made, some of them successfully, to develop sentiment in favor of the two bureaus named. This was particularly noticeable in the Resolutions Committee where Mr. Maxwell, at one time friend and advisor of the president, attempted to dominate all deliberations of that committee. His actions were a source of much comment by all those who have been acquainted with his connection with the Congress since the time he first attended it at Phoenix, and in view of the fact that the congress at one time passed a resolution repudiating the National Irrigation Association, of which Mr. Maxwell is the head, his presence and domineering attitude were all the more remarkable.

It is a question in the minds of many who attended this Congress what interests support Mr. Maxwell. Among those, however, who are acquainted with his past history, no doubt exists as to who is furnishing him money, and evidence in the hands of the IRRIGATION AGE and others will make clear his position in a very short time. Mr. Maxwell has continuously and persistently advocated the repeal of certain laws, viz: The

Desert Land Act and the Timber and Stone Act. Resolutions favoring their repeal were put through at the Congress held at El Paso and had apparently no weight in Congress. It was expected that at this meeting a letter would be presented by one of the delegates which would show conclusively that Maxwell's continual cry for the repeal of these acts is the result of his connection with large corporations who have large holdings of lieu land scrip, the value of which would be greatly enhanced by the passage of a law repealing them.

There is no doubt at all but that many abuses exist under these laws but that may be safely said of any law in existence.

It is well known, moreover, among those who understand the inner workings of the propaganda headed by Maxwell and some of the government officials, that Maxwell's Homecroft idea and other suggestions along the line of policy advocated by him are used as a mask to hide the real line of work on which he is employed.

The audacity of the man at the Sixteenth Congress was all the more surprising in view of the fact that in an issue of his publication, "Maxwell's Talisman," which came out shortly after the adjournment of the Congress held at Portland, Oregon, a statement was made that the Irrigation Congress had lost its usefulness and would no longer be recognized as an exponent of the influences associated with the development of the arid west. This statement was made by Mr. Maxwell in his publication after the organization of which he is the nominal or real head, was repudiated by the Congress at Portland. When all of this came out, subsequent to an expose of his methods, which was brought about by an investigation, of the Committee on Irrigation of the House of Representatives. How long the delegates to future Congresses will tolerate this aggressive action brought about by the fact of Mr. Maxwell having come back into that body depends entirely upon how clearly future delegates may be posted as to his real motives and former conduct.

If a letter which the IRRIGATION AGE hopes to make public in this or a subsequent issue, had been read before the Congress it is doubtful if Mr. Maxwell would have been permitted to speak before that body. It is thought best not to go into this matter too thoroughly at this time, but if the permission of the recipient of the letter is obtained it will be produced in a prominent place in a future issue of THE IRRIGATION AGE, and a copy of that issue will be mailed to all delegates who attended the Albuquerque Congress.

It will be seen by a perusal of the resolutions adopted by the Congress that very many desirable suggestions were made and THE IRRIGATION AGE is inclined to believe that the majority of the resolutions presented and adopted will make for the general good of the irrigated west.

The following officers were elected for the Seventeenth National Irrigation Congress:

Geo. E. Barstow, Barstow, Texas, President; Col. D. H. Loveland, California, First Vice-President; R. E. Twitchell, New Mexico, Second Vice-President; I. D. O'Donnell, Montana, Third Vice-President; B. F. Fowler, Phoenix, Arizona, Secretary.

The committee on permanent organizations and order of business included in its report a recommendation for the formation of a board of governors to consist of the committee and four others, this board to give them aid throughout the year and to establish permanent

headquarters so that the work of the Irrigation Congress may become continuous. It was also recommended that an assistant secretary be appointed, without compensation, to have under his charge the important work of publicity. While there was no general criticism of the move toward the formation of a board of governors, it appears after looking into the matter carefully that this was a direct attempt on the part of the friends of the Forestry and Reclamation Service to absolutely control the Congress and all future preliminary and other work connected with it. This tendency is not new to the older delegates and if it could have been clearly shown what would result from an organization of such a board, it is doubtful if its formation would have received the sanction of the permanent organization committee or the Congress as a whole. It was, no doubt, a well arranged plan on the part of Messrs. Beard, Secretary Fowler and some others to absolutely dominate all future work which may come before the Congress. It is, moreover, very evident that when this situation dawns upon the minds of the delegates of the next Congress some action will be taken to restrict the power of this board. The general idea in itself is good but it is doubtful if the gentlemen who proposed it may be classed as the sincerest friends of clean development along irrigation lines. The tendency of this move is to follow along the line of centralization of power as indicated by the work of the Reclamation and Forestry Bureaus. If at some future Congress active working delegates who have no axes to grind are properly organized it is the impression of THE IRRIGATION AGE that a change will be made in the plan and that their power will be so minimized as to leave the delegates free in the control of the deliberations of the Congress. No body of two or three or four men should be permitted to dominate the work of the Congress or outline its policy in advance, heedless of the will of those who are appointed delegates.

This matter will be discussed at greater length in future issues of THE IRRIGATION AGE.

Many able papers were delivered at the Congress, among which may be mentioned those of the President, Mr. Gowdy; the address of welcome by Gov. Curry, of New Mexico; and particular attention should be given to the very able paper by Ex-Governor L. Bradford Prince, of New Mexico, on "Yesterday and Today." The paper by John Barrett, Director of The International Bureau of the American Republics, on "Irrigation's Great Progress through Pan-America," was well received and favorably commented upon as was also the address by Mr. Geo. C. Anderson, the eminent engineer of Colorado, on "Irrigation in Colorado." Thursday's program included an address by Mr. A. L. Fellows, of Colorado, on "Reclamation of Arid Lands under the District Irrigation Law." Among other speakers were C. M. Mott, of Minnesota, who spoke on "Forestry as a National and a State Problem." Mr. C. J. Blanchard, Chief Statistician of the United States Reclamation Service, delivered a very interesting talk, illustrated with stereopticon views on "Homemaking by the Government." All of those who heard Mr. Blanchard, speak in the highest terms of his work and it may not be out of place to say that he is doing splendid work in connection with the exploitation of the possibilities of home building under the Reclamation Law. Mr. Blanchard is a man of wide experience in the newspaper line and has made innumerable friends through his fine, clean work.

An address by Dr. J. W. McGee, secretary of the Inland Waterways Commission, on the "Natural Movement of Waters in Sub-Arid United States," was an extremely interesting paper and we hope in some future issue to publish it in full.

The attendance of representatives of foreign countries was very gratifying to the delegates and much valuable information was obtained through the talks delivered by these gentlemen.

Spokane, after a spirited fight with the delegation from Colorado, who were working for Pueblo as the next meeting place of the Congress, won the honor of entertaining the seventeenth session of the National Irrigation Congress in that delightful city. While very many of the delegates were inclined to favor Pueblo as the next meeting place, it was thought better to give the honor to Spokane so that some of the advantages of the inter-mountain country in the northwest would thereby become more generally known. Spokane is one of the most beautiful cities in the United States and has some of the best hotels to be found west of Chicago. It is the general impression that all delegates to the Seventeenth Congress will be royally entertained by the wide-awake citizens of that metropolis of the inland empire. The railways centering in Pueblo were represented by very able men and a strong fight was made by them to secure the Congress for Pueblo, and while there was some criticism concerning some of the lines the IRRIGATION AGE is in position to say that all of the representatives of the lines centering in Pueblo used every effort to secure the Congress for that city, in fact many of the best known railway representatives worked to accomplish this end, and the citizens of Pueblo owe a vote of thanks to these men for the splendid work done on behalf of their city. It is the hope of the members generally that Pueblo may have an opportunity some day to entertain the Congress. It is understood that a strong fight will be made for Pueblo at the meeting next year.

The membership of the Permanent Board of Control of Governors is as follows: George E. Barstow, Fred J. Kiesel, W. J. McGee, B. A. Fowler and W. A. Beard. One vacancy remains to be filled on this board and it is doubtful who may be appointed. There is plenty of good material and it is strange that the matter was left open. It is the impression of THE IRRIGATION AGE that the sixth member of this board of control should have been selected from some of the railway men who were in attendance. Mr. Costello, of the Great Northern; Mr. Mott, of the Northern Pacific; Messrs. Merritt or Seagraves, of the Santa Fe or Mr. Wantland, of the Union Pacific; Mr. McAllister, of the Southern Pacific, and Mr. King, of the Missouri Pacific, are all available and would add much strength to the combination, as the advice of a practical railroad man on a board of this character would be of unquestioned value. It is believed that some one of the gentlemen named may be appointed as the sixth member.

In conclusion, it may not be out of place to again refer to George H. Maxwell, who is criticised in the early lines of this article. Mr. Maxwell possesses many fine qualities. He is a good orator, too good, in fact, and is a great organizer, but it is the impression of those who know him best that if he had some good manager, such as prize fighters are blessed with, who would either chloroform or handcuff him at stated intervals, he would go away from public meetings without

leaving the impression that the meetings could have gotten along equally as well without him. The man has, as stated above, some good ideas, and if he would express them and then subside his full strength would be apparent, without subjecting his hearers to the inevitable nauseating effect brought on by conflicting emotions. Mr. Maxwell is like many public and after-dinner speakers. The desire to become conspicuous in this line seems to be a mania with him. It is hoped that as years come and go this may be made clear to him so that his efforts may be less strenuous and as a result more gratifying.

NOTES ON THE CONGRESS.

The Spokane delegation came to the Congress firmly determined to win the next meeting for their city. They had as good an equipment of printed matter as has ever been presented and among other things a hundred or more boxes of very fine Washington apples were shipped to Albuquerque and distributed to all the delegates. In fact, Spokane kept an open house in the publicity room of the convention hall and made many friends through the generosity of her delegates.

The delegates from Pueblo crated a very good impression and were earnest in their efforts to secure the Congress for that city. They were handicapped to some extent, however, owing to the fact that Pueblo is only five hundred miles from Albuquerque, and it was the general impression that the Congress should be held at a greater distance from Albuquerque. Much good advertising was secured by the delegates from Pueblo in their effort to secure the Congress and their work will result in much good for their section of Colorado.

The Santa Fe Railway system is to be complimented on the able manner in which its representatives handled their part of the work in connection with the Congress. This is particularly true in the case of Mr. R. E. Twitchell, who carried the burden of all publicity and organizing work with Col. Hopewell, of Albuquerque. Mr. Twitchell is responsible for securing the Congress for Albuquerque and has devoted almost the entire year to the development of plans for the entertainment of delegates and the exploitation of the resources of the territory of New Mexico. The advertising secured through his efforts and the Congress can hardly be estimated. It is safe to say that this Congress and the advertising incident thereto is worth millions of dollars to property interests in that territory.

Governor Curry, of New Mexico, created a very good impression by his good fellowship and energetic work.

Mr. B. A. Fowler, Secretary, performed his duties in a very satisfactory manner and the general impression was that he should be retained for another term.

Mr. George E. Barstow, the newly elected president, is a man of wide experience along irrigation lines and is the head of extensive irrigation work in and around Barstow, Texas, and will make an able president.

The selection of Col. D. H. Loveland, of California, as first vice-president, gives universal satisfaction, as does that of R. E. Twitchell, of New Mexico, as second

vice-president. The election of Mr. I. D. O'Donnell, of Billings, Montana, as third vice-president, gave satisfaction. He is known as one of the best irrigation experts and one of the largest growers of alfalfa in the United States. Mr. O'Donnell has large land holdings in and around Billings, Montana, and was formerly very active in the deliberations of the irrigation Congress. It is very gratifying to his many friends to have him again become identified with this body so that his advice and suggestions may be available.

We give below a copy of the resolutions of the Sixteenth National Irrigation Congress, as adopted by that body.

REPORT OF COMMITTEE ON RESOLUTIONS.

The Sixteenth National Irrigation Congress takes note with great satisfaction of the recent progress in irrigation and in other uses of waters, and records its high appreciation of the fact that greater progress has been made in this direction during the years since the congress has been an active factor in public affairs than during all the earlier years of our country's history. Great as this progress has been, there is need for continued action on the part of this organization and of the citizens who have combined to render the successive congresses successful. In some measure, indeed, it seems clear that the organization has barely passed the threshold of its career of usefulness to the people of our great west.

The leading sentiments growing out of this congress are expressed in the following resolutions:

Resolved, that we signify appreciation and approval of the work of the federal government largely in accordance with the recommendations of past congresses; that we particularly commend and indorse the work of the reclamation service in extending the usefulness of the waters of the arid region, thereby increasing our population and production, and multiplying homes on the land, together with the work of the forest service, especially in its relation to the protection of the headwaters, the prevention of floods and the regulation of streams; that we endorse and approve the work of the United States geological survey, particularly in the hydrographic and topographic branches, and strongly urge on the Congress a more liberal support of these branches of the public service; that we approve and commend the work of the bureau of soils in its soil surveys, and especially in its demonstration of the adaptability of soils to particular crops throughout the arid region, and urge on the Congress the extension of this branch of the service on a larger scale; that we commend the operations of the bureau of plant industry in the introduction of improved crop plants adapted to arid conditions; that we approve the work of the weather bureau and urge more extended determinations of rainfall and climate throughout the western United States; that we endorse and approve the work performed in the offices of drainage and irrigation investigation in the department of agriculture; that we commend the plans adopted by the federal government for a more complete use and co-ordination of our living waters for irrigation, water supply, power and navigation, to the end that this great resource may be the greatest good to the greatest number of our people; and that we favor the movement toward the wiser use and conservation of all of our natural resources recently started by the President of the United States and the governors of the several states at the instance of the Inland Waterways Commission.

Whereas, an accurate knowledge of soil conditions is essential to the profitable development of irrigation and agriculture in the arid region, and whereas the bureau of soils of the United States department of agriculture is supplying this as rapidly as appropriations will permit, therefore,

Be it resolved that the Congress of the United States is respectfully urged to support the work of the bureau with a liberal appropriation.

Whereas, the Congress of the United States, at its fifty-fifth and fifty-sixth sessions, reduced the appropriation for the topographic and water resources branches of the United States geological survey from \$350,000 to \$300,000, and from \$200,000 to \$100,000, respectively, and whereas the work of these branches of the public service is especially vital to the development of the arid region because of the necessity of accurate predetermined knowledge of the water supply available for

irrigation, and of the topographic conditions controlling its use; therefore,

Be it resolved that this congress respectfully and emphatically urges that these appropriations be restored to the original amounts at the coming session.

That this congress recognizes the growing importance of the development of electric power, not only for the purposes of lighting, manufacturing and commerce, but also in aid of irrigation by pumping from subterranean sources. Developments already accomplished in this direction warrant the assumption that, in the not far distant future the lands irrigated by water pumped from such sources will equal, if they do not exceed, lands irrigated from the natural flow of streams. The development and use of our streams for the generation of electric power not only aids and increases irrigation directly, but is beneficial in many other ways. First, it renders possible and profitable the construction of reservoirs in the high mountains, withholding excessive floods, thus aiding reclamation and also conserving this injurious flow which is later added to the beneficial flow of water available for irrigation. Second, it is the one great source of supply immediately available for lighting, heat and power, as a substitute for other fuels, thus limiting the rapid destruction of our forests and also conserving and saving our supplies of coal and other fuels. Third, the use of electricity for pumping renders it possible permanently to reclaim and irrigate vast sections of our arid lands otherwise impossible of irrigation or reclamation. Fourth, its extensive development will cheapen and extend manufacture and commerce, thus affording an immediate home market for the products of our irrigated farms and also cheapen transportation to other markets.

Therefore, be it resolved that the necessary rights of way and rights for the construction of reservoirs and other uses of the public lands, for the development of electric power, should be aided and encouraged in every reasonable way, and all such rights and uses should be granted and allowed upon equal terms with similar rights granted for the direct purpose of irrigation. Such uses being public uses subject to the control of the state, should continue so long as the right to the beneficial use of the water and the duty to supply the power continue under state laws. And no burdensome charges or discriminations should be exacted or imposed as a result of which such beneficial developments may be delayed and the investment of capital therein prevented and the cost increased to the consumer.

That the national government, as a part of the comprehensive national policy of internal improvements for river control and regulation and the construction of inland waterways and utilization of water power, and for the enlargement to the utmost possible extent of the area of the country available for agriculture and homes on the land, and for the protection of those homes from either flood or drought, shall build not only levees and revetments where needed and drainage works for the reclamation of swamp and overflowed lands, but shall also preserve existing forests, reforest denuded areas, plant new forests and build the reservoirs and engineering works necessary to safeguard against overflow, and save for beneficial use the flood waters that now run to waste.

That a census of the standing timber in the United States should be authorized by Congress and that the states should be urged to co-operate with the nation for the preservation and enlargement of our forest resources, by the adoption of uniform forest laws and systems for forest protection, and the preservation and right use of the forests, and that forestry, irrigation, drainage, flood protection, water storage and river regulation and control for navigation and water power should be regarded as one great inter-related subject in all legislative and executive policies.

That power made available by national irrigation works, when once applied to pumping or other duty connected with irrigation, should be regarded as appurtenant to the land, and we urge the enactment of laws to this end.

That in endorsing the work of the United States reclamation service we especially commend the plan of co-operation between the settlers and the federal government whereby settlers receive credit on their water rights in exchange for labor and material.

That we heartily commend and strongly urge the continuation of the work of the United States geological survey in the investigation of the artesian and other underground waters of the arid west.

That we approve and urge the continuation of the wise policy of the states and counties in saving life and preventing

suffering in the arid region by providing desert wells and water saving devices, by erecting permanent guide boards and by providing penalties for their removal or defacement, and by protecting springs, wells and waterholes from contamination under severe penalties; and that we favor the co-operation of the United States geological survey with the states and counties in locating and maintaining these water sources and in disseminating accurate information concerning them, through maps and reports.

That in commending the reclamation act of 1902, we express our satisfaction with recent demonstrations of the large importance of underground waters; and that we favor the utilization of this great resource for irrigation just as the surface waters are utilized, using pumps and other water raising devices as adjuncts and parts of the irrigation works.

That we favor and urge upon Congress the early repeal of the timber and stone act, to the end that the accumulation of the public timber lands in the hands of a few great corporations may be avoided.

That we strongly urge upon Congress the speedy creation of the Southern Appalachian and White Mountain natural forests.

That this congress heartily endorses the policy of the present administration in its efforts to preserve timber lands throughout the Union, and we earnestly recommend to the several states their hearty co-operation in the work of preserving the forests in their borders, and recommend in every state the creation of state and national forest plantations, sufficient to supply the demand for wood and timber of the people of such state. While appreciating the importance to the west and the entire country of the protection of our forest by every adequate means, we favor the highest utilization for all economic purposes of all our public lands.

We therefore recommend that an adequate appropriation be made at the next session of Congress for the use of the hydrographic division of the geological survey to determine by experiment, measurement and observation the practical effects of grazing and lumbering on the supply of water for irrigation, and on the erosion of soil, and silting up of streams and reservoirs, and we recommend that such investigations extend over the entire watersheds both in and out of national forests and that such investigations be prosecuted simultaneously throughout all the states and territories in the arid and semi-arid west.

The importation of free tropical sugar in competition with our home product would be destructive of the domestic industry. We therefore urge our representatives and senators to earnestly oppose the enactment of any legislation that would allow such competition.

That we favor the adoption of vigorous measures in each of the Trans-missouri arid and semi-arid states and territories to secure the creation of immigration bureaus, supported by liberal appropriations, in order that reliable and official information may be available for the benefit of homeseekers.

That this congress expresses its appreciation and endorsement of the tree growing movement being promoted by the Federation of the Tree Growing Clubs of America.

That it is the sense of this congress that such legislation should be had, in justice to the forest service and claimants to property rights within national forests, as will provide for a review at the instance of any party affected, by a competent tribunal, of controversies relating to homestead entries, or forest control or regulation, or arising from any action, regulation, or the ruling of forest officers.

That whenever large tracts of land suitable for agriculture and which are not natural forest, and which are not intended to be made forest and which are not necessary or proper for the preservation of the forest or the watershed or water supplies for the purposes to which they have been devoted, lie within forest reserve boundaries, such tracts should be restored to entry as public land.

That we urge the Congress of the United States to amend the so-called Carey act, so as to make it apply to territories as well as states.

That it is desirable that this congress shall co-operate so far as it may be able, with the National Conservation Commission for the promotion, and accomplishment of its purposes, the president of this congress is authorized and directed to appoint a committee to be known as the conservation committee of the National Irrigation Congress, which shall consist of the president of this congress and four other members, to be appointed by him, to co-operate and aid the National Conservation Commission in its objects and purposes in so

far as they coincide with the objects and purposes of this congress.

That in harmony with the report of the special committee authorized by the Fifteenth Irrigation Congress, we urge the importance of holding an early session of this congress, at Washington, D. C., and authorize the president of this congress to appoint a committee of three, to communicate with state and territorial legislatures, with a view of securing appropriations and of taking such other steps as may be necessary to effectuate the purposes of this resolution, such committee to report at the seventeenth session of this congress.

Whereas, the members of our National Congress at Washington should be familiar with the sentiments which find expression in the resolutions adopted by the National Irrigation Congress at its annual sessions;

Now, therefore, be it resolved, that the president of the National Irrigation Congress be empowered to appoint a committee of five to be designated as the Congressional Committee, whose duty it shall be to present the resolutions adopted by this congress to the National Congress at the session following their passage by this congress and to urge their importance and the necessity of their recognition by the National Congress;

Resolved, that the congress extends its sincere thanks to the territory of New Mexico, and the city of Albuquerque, its commercial organizations and citizens for the hearty welcome and generous hospitality which have been extended to the members of this congress; also

To Governor Curry, and to the other officials of the territory and city for their courteous care for the welfare and comfort of the delegates;

To the governments of France, Brazil, Chile, Canada, Cape Colony, Germany, Italy and Mexico for the interest and recognition shown in the appointment of delegates to the congress;

To the press of the city, territory and county for the consideration shown in the reports of the proceedings;

To Frank C. Goudy for the frank and impartial manner in which he has presided over the deliberations of the congress, and

To B. A. Fowler, the efficient secretary of the congress;

To W. S. Hopewell and R. E. Twitchell, chairman and secretary of the board of control for their untiring efforts in perfecting the highly successful arrangements for the congress.

To Miss Caroline Strong, the conductor, to the quartet, and to the chorus of ladies and gentlemen who furnished the excellent musical program for the congress; also

To John J. McClellan, the author and composer of the Irrigation Ode;

To the Mexican government for the presence of the Regimental band, of the state of Chihuahua;

To the Atchison, Topeka & Santa Fe Railroad Company for its enterprise and effort looking to the success of the congress.

That this congress requests that the report of the proceedings of its sessions be published within thirty days.

THE FARMER AND HIS RESERVOIR.

This is the time of the year when every farmer should ask himself whether his reservoir and irrigation ditches are ready for next year's service.

To retain the Fall precipitation, Winter snows and Spring rains in the reservoir means a guarantee of plenty of water for next year's crops. When the weak spots are repaired and the headgates examined and put in good order the farmer can feel secure about his water.

The rapid increase in the cost of lumber for headgates and repairs when they get leaky, is causing many farmers to put in iron headgates, which cost a trifle more to commence with, but more than pay for themselves by the saving on the cost of repairs.

The Handbook for irrigators, which is being sent free to farmers by C. D. Butchart, of Denver, Colo., gives full particulars about Northwestern Iron Headgates and other irrigation specialties that farmers are interested in. Every farmer should send for one of these books, as the information contained in it will give many little helpful hints to irrigators.

The Art of Irrigation

The Results of Bad Flooding Cultivation, Etc.

By T. S. VAN DYKE

CHAPTER FIVE

After you have let the water out of a check when all is ready you may be grieved to see the bottom that lately looked so smooth all full of depressions and ridges. Such is quite certain to be the case if you have plowed it deeply. Even without plowing it may be caused by the honeycombing of the soil by gophers and squirrels. And where desert soil has never been thoroughly wet for lack of rain it may settle some. But when smoothed off again there will be no more trouble of that sort and flooding will stop the gopher's fun.

Finally you have everything in shape and a crop comes up smiling. Suddenly it looks pale and weary and you feel something like the sagging of your heart toward your boots. Where are the wonders of irrigation you have heard so much about? Day after day goes on with faint growths in spots, fainter yet in others, fair in others, absolute standstill in others. It is not poverty of the soil, cold weather, bad planting, or bad seed; the certainty of which makes more sinking of the spirits.

Nothing alarming. Perhaps you put on water too deep and packed the ground too hard. If you are under a new ditch, with few consumers as yet, the water company will probably let you use all the water you please without regard to the amount you have bought, and will not hold you down to the limit until the number of new consumers compels it. In such case you are quite apt to think you are getting ahead of somebody and hasten to take advantage of it. The number of places that have at first been injured in this way, and good enterprises that have been more or less "hoodooed" by the sorry muss the prospective buyer saw on every hand, are quite incredible to one who has not traveled about such places in their early settlement. One of the largest and best enterprises in California had to be withdrawn from the market for that reason. With the best of land and surest of water rights the owners could not sell it for half the cost of the water alone and have been farming tens of thousands of acres of it themselves ever since. Another farther east and perhaps the largest in the west was held up for years the same way. The same thing has spoiled many a ranch where the owner wanted to hold the right to all the water in a stream and had to use it on his land in order to hold it, and is common in cases where one has a good water supply where the delivery costs nothing; such as an artesian well which generally costs nothing after the boring.

But perhaps you did not do this, but only allowed a small depth of water to stand too long. Perhaps you did neither and the trouble is only a natural result of any irrigation that covers the whole ground with a sheet of water long enough to wet it properly. The following rules will help you, but remember they are only general and subject to many exceptions dependent upon soil, climate and the peculiarities of the vegetation.

First. Nearly everything is more or less injured by flooding when very young. And some things may be

locked up by the layer and fine mud thus formed, so that much of the seed is lost.

Second. The deeper the water and the longer it stands the worse it is, especially if the water be muddy.

Third. The hotter the weather, the higher the sun, and the sooner it strikes the ground after the water is off the worse it is.

Fourth. In a time of high winds, drying down after flooding may injure much more than in still weather.

Fifth. Nearly everything endures flooding better as it grows older, but many things never do as well under it as under the furrow system with good cultivation where the water is never allowed to come within two or three feet of the plant. The best illustration of this is the orange and lemon, but it is much the same with other trees and with many garden vegetables.

Sixth. Some things become so tough that they do about as well under flooding as they would under a rainfall of equal amount, such as alfalfa two years old on loose open soil.

Seventh. The injury from flooding is much less in damp air than in dry air, such as is found on the deserts, but in cold weather the injury is not so great.

The only remedy the tyro knows is to pour on more water as soon as the top of the ground begins to look dry. And the more you pour it on the more things may not improve, especially if the soil is fine and tight and the weather hot and windy. You are sealing out the air which the roots must have for good work. It is not so easy to say why standing water injures almost anything more or less by simply touching the stalk, but there is little room to doubt the fact.

The true remedy, if you must flood, is to have the ground so wet and so thoroughly cultivated at the time of planting that the seed will come up and grow a long time without needing more water. By that time it may endure it. In midsummer this would be difficult to do with many crops, but in early spring if the wind is not too great it is quite easy. In autumn, where it is not too cold, such treatment is almost a certainty for grain, turnips, potatoes, peas, and all stuff that grows best in cool weather, as well as for new alfalfa, though alfalfa makes its best yield in the heat of summer. It is hard to make a novice believe that ground thoroughly wet and loosened up by good cultivation will carry a crop for many weeks without more water, but in some sections where grain cannot be raised at all without irrigation immense crops are carried in this way to very near the point of heading. This needs a rich soil and perfect weather conditions, but even on poor soil with weather most too warm it can be carried to six or eight inches high, after which on many soils flooding will hurt it very little. And even where it does injure it some the damage is generally overbalanced by the greater thickness of the stand that can be matured by control of the water. The straw may not be so great, but the yield of grain will be increased. It is the same where it is cut for hay in the dry regions. If the size of the stalk is reduced the quality is improved so that stock eat it clean instead of leaving half the stalk. The same principle applies to many other things. One of the advantages of irrigation is the greater stand of vegetation that can be crowded on an acre. If the soil is rich enough considerable increase of the yield is certain.

This is made more possible by the greater amount of sunshine of the irrigating sections, so that on very rich land over one hundred bushels of corn can be raised on an acre by closer planting. I have seen one hundred and fifteen taken from an acre, but this was from extraordinary soil and irrigated with great skill, though not cultivated because it was too closely planted. The season is here so long that all weeds can be killed before planting, so that cultivation for that purpose is needless. The ground remains wet and loose until the corn is high enough to sap the moisture, at which time flooding will not hurt it on loose vegetable mold such as this was.

Remember that on some soils the injury to anything from flooding is very light, while some things like onions and blackberries are but slightly affected, even when young. Alfalfa, beets, carrots and lots of garden stuff are but slightly hurt, even when young, if the weather is cool. Hence one of the first things you should do, which you can do on a small scale, should be to study out the effect of flooding on different things on your particular soil and in your climate. You may find them pay heavily in spite of the fact that they look sickly for a while. On my ranch flooding injures about everything at first and grain will stand still long enough to make me very tired of watching it, but after awhile it begins to move and finally makes a good crop of the finest hay where the ground is rich enough. If allowed to head it makes largest heads and the plump-est berry I ever saw, but hay pays so much better; I raise nothing for grain. The size of the grain is due to the cool weather in heading time and I mention it only to show that flooding does not in that case affect final results. For reasons hereafter given you may have to irrigate by flooding, so the sooner you find its effects on your place the better. It is also very convenient in many cases where you do not have to do it.

Where checks are too broken up after being once used cultivation cannot be begun too soon after the ground has dried to the right point. And it cannot be continued too steadily until the loss of moisture taken by the roots of the crop makes it necessary to irrigate again. If trees are young this time will be much greater than you imagine if you keep up constant stirring of about four or five inches of the top soil. Four things seem now beyond question:

First. That the soil needs air.

Second. That keeping the top soil loose makes a mulch that retains moisture.

Third. That from the moment you stop the cultivator the top soil begins to settle and lose its power of retaining moisture.

Fourth. That weeds or grass, instead of benefiting by shading the ground from the sun, so that it won't dry out so fast, only dry it the faster.

It used to be thought that loosening the top soil made it dry faster. So it does for an inch or two. But below that it retains moisture far better. It is not uncommon in California to see well cultivated ground where you can pack the soil into a ball in your hand less than a foot below the surface in September, though it has had not a drop of moisture since spring from any source. Of course, it won't do this with anything growing in it, but the moisture will vanish in a few weeks with a heavy stand of grain, corn or old trees.

The value of something to shade the ground is a

common delusion of the tyro in irrigation. For a few days it does keep its moisture at the immediate surface. Grain, alfalfa and many other things will sprout and grow well in the shade of thin grass or weeds where the sun after flooding would greatly injure them. But the after effect is to rob them of moisture in a way that may overbalance any early advantage. While control of the water makes it better than where you have to depend on the rainfall the difference between ground well cultivated and that full of weeds has been too long observed in the irrigating sections to be questioned now. When I came to Southern California in 1875 the oranges were dry, sour, pithy and thick skinned and would be absolutely unsalable today. In less than twenty years they became exactly the reverse, with a percentage of first grade sometimes running as high as ninety. Before that no fruit buyer would touch them and all had to be picked and packed by the grower himself and almost always at a loss. By 1890 almost any one could sell his whole crop on the trees for cash, the buyer taking all the risk. One glance at the uniformity of the fruit on the heavily laden trees told the experienced buyer exactly what he was getting. By the growers themselves the difference is universally attributed to the continuous use of plow and cultivator. During the long summer the cultivator rarely rests, although the last weed and spear of grass has long been gone. In some places planting on better drained ground and irrigating with furrows instead of flooding has had considerable to do with the results, but cultivation is plainly the main thing and its office in aerating the ground seems as valuable as its retention of moisture. The same effect is plain with most all kinds of fruit. Another result has been to reduce the amount of water once deemed indispensable for irrigation. The best oranges and lemons are now raised on less than half the water they once received, while deciduous fruits in many places need less than a third of the old supply. The difference with grapes where well cultivated is still more ridiculous. The country is at least four times richer in water and a dozen times richer in the quality of the fruit. It has no trouble now in selling every particle of first grade fruit at the best price, when before it could hardly sell anything except at a loss, and a loss for which no one could blame the buyer or consumer. We never had water enough to make it unhealthy, but in many other sections swamps, mosquitoes and malaria made many a settler think irrigation the greatest of humbugs and sent many a one back to the land of rain, broken in spirit, health and pocket.

WHAT THE GROUND CONTAINS.

Is a question which many of the farmers have never tried to answer. Its treasures of minerals and of pure water should be revealed by the use of the "American" Drilling Machinery. Every neighborhood should organize a company and by working together and sharing the profits and advantages, wherever found, great additions to the wealth of the community as well as the individuals would result. Any who are interested in this question should write for the new illustrated drilling catalog of the American Well Works, Aurora, Ill.

This office is in receipt of catalogue No. 71 describing Dean Bros. Power Pumps. Those who are interested in this class of machinery may procure a copy of the catalogue by addressing Dean Bros. Steam Pump Works, Indianapolis, Indiana.

Western Irrigation Leveler and Ditcher.

A New and Valuable Machine for Leveling Land and Building Field Laterals.

A new machine has recently been put on the market by the Western Wheeled Scraper Company of Aurora, Ill., for leveling land in irrigation work, making field laterals, vegetable borders and drainage ditches. This machine is also suitable for grading roads and is the result of many years' study on the part of Mr. R. J. Hand, the inventor, of San Antonio, Texas. The company manufacturing the machine

day and is best operated by one man and four horses. It can, however, be operated but would do less work, with two horses.

The work is done by setting the blade at an angle of 45 degrees to the line of draft and adjusting the depth of cut by hand wheels, which automatically lock in position. Just enough soil is cut from the elevation to fill the depressions and any excess soil is worked along the blade to the rear end



Irrigation Leveler and Ditcher.

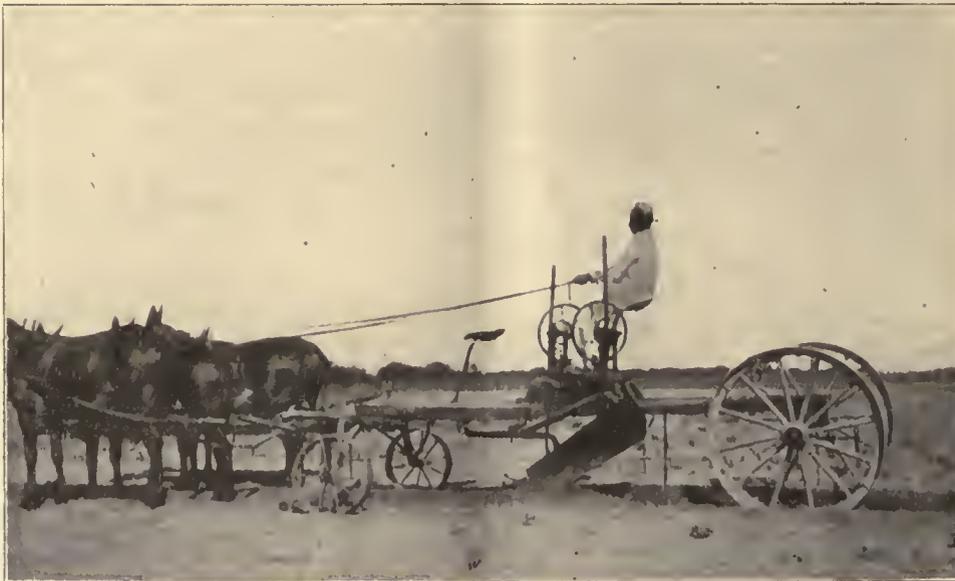
had it on exhibition on the grounds of the Territorial Fair at Albuquerque during the time of the Irrigation Congress in that city.

We are reproducing herewith several cuts which illustrate the workings of the machine and its general design.

The principles involved in this machine are new in their application to this class of work. The use of the long wheel

and picked up by the front end on the next turn of the machine and this process is repeated, the machine being driven continuously around the field in the same manner as a mowing machine.

The driver has nothing to do but keep his horses on the line and handle the adjustment wheel. Because of the curve of the blade and the angle at which it works the land is



Irrigation Leveler Making Borders.

base which places the reversible cutting blade sufficiently far from either end of the frame to allow the soil cut from the elevation to be dropped in exactly the right amounts and in the proper places, thereby filling the depressions and perfectly spreading the soil so as to produce a perfect plane over the entire field. This work is done automatically and forms a very even surface from rough fields, hog wallows and what is known as bumpy ground.

This machine is said to be able to handle five acres per

pulverized while being leveled, the result being, so the inventor claims, the same as that obtained by a disc harrow, and it makes the surface so smooth that much less water is needed in irrigation, and a more perfect distribution of the water handled increases the production of the soil. It is claimed by Mr. Hand that this fine pulverizing of the soil produces vegetables and fruits of a more uniform size, which is an important consideration so far as shipping or storing them is concerned

It is said that a field which is worked by this machine is so uniform in its grade that there is no excess of water on any part of it. As will be seen by the illustration the wide tires on the machine reduces the draft to a minimum and at the same time leaves no depressions and provides means to constantly control the depth of cut of blade.

The Western Leveler is equipped with adjustable axles, both front and rear, which allows the operator to place the frame in any desired position while building laterals or ditches.

The blade can be set at a vertical angle of 45 to 60 degrees and will build laterals and borders at a great saving of time, finishing them ready for water without the use of a shovel.

Alfalfa borders may be constructed of any width and height and the water furrows refilled so that mowers, rakes

erable body of water flowing a short distance below the surface of the ground. The Garden City project consists of a power plant and two or three separate electrically driven pumping stations, located along the line of flow of the underground water, to make this water



The Western Irrigation Leveler Building Ditches.

and wagons will pass over them without severe jarring or jolting usually encountered in fields so constructed. It is said that the borders made with this machine will produce alfalfa equal to any other part of the field.

This machine is especially recommended to truck growers for making vegetable borders, and it will do this work with one operation without the use of plowing.

The Western Irrigation Leveler and Ditcher has given excellent satisfaction where used by sugar planters in making cane beds.

Another excellent feature of the machine is that it may be used very advantageously in the construction of roads.

For further information concerning this machine, we refer our readers to the Western Wheeled Scraper Company, Aurora, Ill.

PUMPING UNDERFLOW WATER IN THE GARDEN CITY IRRIGATION PROJECT.

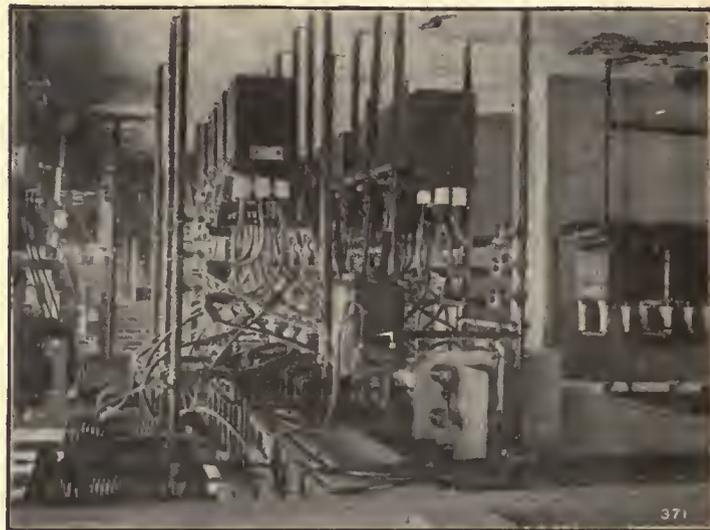
Among the various projects under construction by the United States Reclamation Service is one in the vicinity of Garden City, Kan., known as the Garden City project. The Arkansas River, which flows through this section of the country, is in the wet season a large body of water, while in the dry season its bed is practically dry. There is, however, a consid-



Generating room, showing 225-K. W. direct connected, 6,600-volt, 60-cycle, 3-phase steam turbine driven revolving field alternators, each unit having a direct connected exciter.

available for irrigation purposes by pumping it to the surface in times of drought.

The area affected is a strip of land approximately 10,000 acres, extending from the Arkansas River

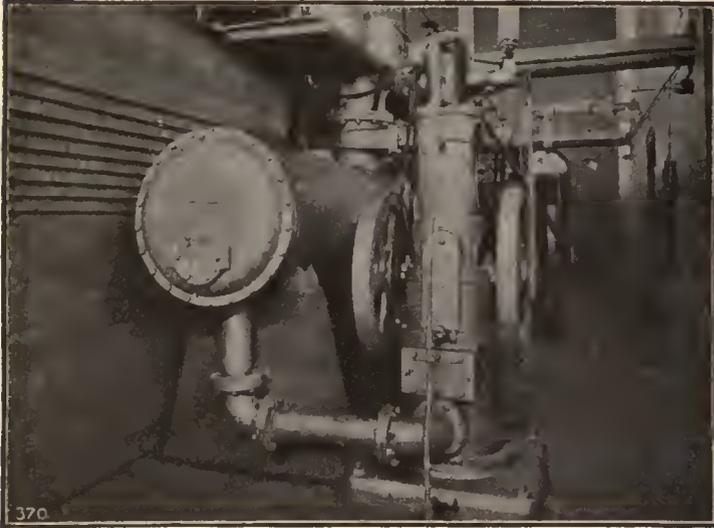


Electric auxiliaries and connections, showing oil switches, transformers and connections located in the basement beneath the switchboards. Switches are all remote controlled interlocking oil type, feeding a double set of bushbars. Multiplex lightning arresters are on each incoming line.

northeast for about 20 miles. During the wet season the water for irrigation purposes is taken from a canal fed by the Arkansas River, known as the Farmer's Ditch. At the junction of the Arkansas River and this ditch are a set of flood gates, arranged so when the water in the river is at a sufficiently high level it flows into the ditch, feeding desired tributaries. When the water in the river falls below the requisite level to feed the ditch the supply is pumped from the underground flow into the canal by equipment in the various stations; the flood gates are meanwhile closed.

A single power-house develops the electrical energy for running all of the pumping stations. It contains two 200-hp. boilers, set singly, for generating steam at 160 lb., each boiler being supplied with a superheater which superheats the steam to 120 degrees Fahr. Leading from the coal supply house outside the power-house there is a small steel track, on which two ½-ton fuel cars carry the coal into the boiler room. The steel stack is 150 ft. high.

The turbine generators are of 225-kw. each, 6,600



Condenser floor, showing condensers and vacuum pumps, a separate surface condenser and vacuum pump for each steam turbine. Circulating water is supplied by the electrically driven centrifugal pump.

volts, 60-cycle, 3-phase, with exciter direct connected to the shaft of each of the generators. The turbines are designed to operate at their best efficiency with 150 lb. steam at the throttle, 100 degrees superheat, condensing into 28 in. of vacuum. The turbines are fitted with an automatic system for filtering and supplying the machines with oil. Two surface condensers manufactured by the Wheeler Condenser & Engineering Co. are installed, each condenser being fitted with Edward's vacuum pump. Each condenser has a capacity for taking care of 5,200 lb. per hour, maintaining a vacuum of 1½ in. absolute with cooling water at 65 degrees Fahr.

The switchboard consists of five panels, two for the generators, one for the exciters and two for line service. On the generator and line panels are the switches which control the oil switches, located in the basement below the switchboard.

The installation was in charge of Mr. Charles F. Slichter, supervising engineer, and Mr. O. H. Ensign, electrical engineer, of the U. S. Reclamation Service. The contractor for the plant was the D'Olier Engineering Co., Philadelphia.

Send \$2.50 for *The Irrigation Age*, one year, and the *Primer of Irrigation*, a 260-page finely illustrated work for new beginners in irrigation.

Supreme Court Decisions

Irrigation Cases

RESERVATION OF WATER BY UNITED STATES.—

The general government has power to reserve the waters on the public domain and exempt them from appropriation under state laws.—*Conrad Inv. Co. v. United States*. Circuit Court of Appeals. 161 Federal 829.

GRANTS OF ARTESIAN WATER RIGHTS.—

Where there are several grants to different persons of rights to take specific amounts of water from an artesian well, the ordinary rules as to grants apply, and each grantee, taking with notice of the estates held by the prior grantees, holds subject to such estates.—*Charon v. Clark*. Supreme Court of Washington. 96 Pacific 1040.

DIVERSION IN ANOTHER STATE.—

The jurisdiction of the courts of Idaho to ascertain and determine water appropriations within this state is not ousted or defeated by the fact that a defendant sets up in his answer that he has an appropriation of the waters of the stream in controversy and that he diverts the waters from such stream in the state of Wyoming for use and application in irrigating lands situated within that state.—*Taylor v. Hulett*. Supreme Court of Idaho. 97 Pacific 37.

GRANTS OF WATER RIGHTS AND SALE OF ARTESIAN WELL.—

Where the owner of an artesian well granted plaintiffs a perpetual flow of a certain amount of water therefrom delivered on their land, and then, when plaintiffs were in possession and enjoyment of such flow of water, granted defendant the land embracing the well, subject to all existing rights to take water therefrom, defendant cannot be protected, in his interference with the flow, under the principles applying, in the absence of contract, to diversion of percolating subterranean waters.—*Charon v. Clark*. Supreme Court of Washington. 96 Pacific 1040.

RESERVATION OF RIGHT OF WAY FOR DITCHES.—

Act Cong. Aug. 30, 1890, c. 837, 26 Stat. 391 (U. S. Comp. St. 1901, p. 1553), provides that all patents for lands thereafter taken up under any of the land laws of the United States on entries or claims validated by the act, west of the one hundredth meridian, should reserve a right of way for ditches or canals, "constructed" by authority of the United States. Held, that the word "constructed," as so used, did not limit the reservation to a right of way for ditches already constructed, but extended as well to those "to be constructed" by the government in furtherance of its irrigation scheme for the reformation of arid lands.—*Green v. Wilhite*. Circuit Court, Idaho. 160 Federal 755.

PRIOR RIGHT OF INDIANS.—

Where the Indians on the Blackfeet reservation had a prior right to the use of the waters of Birch creek for irrigation to that of defendant, which had acquired by appropriation and purchase large quantities of land adjacent to the creek, which it had proceeded to irrigate by means of canals and a dam in the creek, a decree restraining defendant from obstructing the waters of the creek to the extent of 1,666⅔ inches from flowing down the channel to points of diversion for the benefit of the Indians on the reservation, and providing that the amount of water in excess of that specified in the decree should be subject to the subsequent order of the court, was proper.—*Conrad Inv. Co. v. United States*. Circuit Court of Appeals. 161 Federal 829.

EXTENT OF APPROPRIATION.—

Section 1 of the desert land act (Act March 3, 1877, c. 107, 19 Stat. 377 [U. S. Comp. St. 1901, p. 1548] 6 Fed. St. Ann. 393) provides that a claimant's right to water for irrigation and reclamation must depend upon a bona fide prior appropriation, but does not require that the appropriation should be from one stream or source of supply, or deny to a settler the right to use on his claim water to which he has a bona fide right by prior appropriation from any source. An owner of land consisting of two tracts, one of

which was his brother's pre-emption, which had been transferred to him, and the other a claim taken by him under the desert land act, made an appropriation prior to appropriation by any other person of certain water of a stream, the head of which was on his brother's pre-emption. *Held*, that the appropriation entitled the appropriator to a sufficient amount of water to irrigate the land to which the appropriation was intended to be applied at the time of the appropriation, whether it was on the desert land claim or the pre-emption, and hence it was error to confine his rights by the appropriation to the pre-emption.—*Williams v. Altnow*. Supreme Court of Oregon. 95 Pacific 200.

FENCING IRRIGATION CANAL.—

Plaintiff irrigation company condemned a strip 150 feet wide and 1/2 a mile in length through defendant's farm, and constructed a canal about 60 feet wide within the strip, with paths on each side for the use of its canal riders and other employes. Defendant's land on each side of the canal was farming land, and adjoining his land on the south, was farming land, and on the north a public road. The entire tract was inclosed by fences; the fence on the north boundary having been erected before, and that on the south about the time of, the condemnation of the strip, both maintained up to the water of the canal, but with a gate in each across the canal path, so as to obviate the necessity of constructing a fence along the canal path through the whole length of his farm in order to protect it, and the gates being about 12 feet wide and easily opened and closed. Plaintiff objected to the erection of the gates as an interference with the use of the path by its employes in driving horses along it in dredging the canal, which was necessary several times a year. *Held*, that the facts did not show an interference with the reasonable enjoyment of plaintiff's easement so as to preclude a contrary finding.—*Utah-Idaho Sugar Co. v. Stevenson*. Supreme Court of Utah. 97 Pacific 26.

OBLIGATION TO FURNISH WATER.—

The obligation of a corporation organized to sell and distribute water to furnish water is created by Const., art. 14, sec. 1, declaring that the use of water appropriated for sale or distribution shall be a public use and subject to regulation in the manner prescribed by law, and does not arise under St. 1885, p. 95, c. 115, requiring a corporation appropriating water for sale or distribution to furnish water to the extent of the actual supply, and providing that any corporation neglecting so to do shall be liable in damages to the extent of the actual injury sustained; and a water company guilty of fraud, oppression, or malice in failing to furnish water is liable to exemplary damages within Civ. Code, sec. 3294, providing that in an action for the breach of an obligation not arising from contract exemplary damages may be recovered, where defendant has been guilty of oppression, fraud, or malice.—*Lowe v. Yolo County Consol. Water Co.* California Court of Appeal. 96 Pacific 379.

EDEN VALLEY, WYOMING.

A Rapidly Developing Irrigation Project.

BY WARREN EDWARDS.

Among the recent irrigation projects in Wyoming that are being rapidly developed and settled up is that of Eden Valley. This district is situated in Sweetwater county along the Big and Little Sandy rivers and lies about fifty miles north of Rock Springs, Wyoming, a city with a population of 6,500, the nearest railroad point on the main line of the Union Pacific railroad.



No. 1.—Diversion dam on the Big Sandy River, showing head gate for main canal at left and spillway for Big Sandy at right, Eden Valley project, Wyoming.

The Eden Valley tract was first thrown open to settlement in the fall of 1907, and water was first delivered this summer. There have been about 40,000 acres of land sold to settlers, some of whom have built homes and are now cultivating it. The land is all being settled under the Carey act, being a part of the allotment by the government to the state of Wyoming under act of the national congress. The price at which the land and perpetual water rights are being disposed of to the settlers is \$30.50 per acre. The size of the



No. 2.—A view of main canal between diversion dam and reservoir No. 1, Eden Valley Project, Wyoming.

farms being bought by the settlers is mostly eighty and one hundred and sixty acre tracts.

The company developing the Eden Valley project is the Eden Irrigation and Land Company and is backed by Chicago capital, Farson, Son & Co., bankers, having taken the issue of bonds, amounting to \$700,000.

The Eden Valley project is not an entirely new



A Sugar-Beet Farm in the Arkansas Valley, Colorado. This field yielded 22 tons to the acre.

one as the company to develop this land has been organized several years, the originators of the project having been Jesse Knight, now of Salt Lake City; ex-Governor Chatterton of Wyoming and other Wyoming pioneers, who acquired the irrigation rights and organized the company some years ago, but the work of developing the system and completing it was not actually begun until Farson, Son & Co. took over the bond issue. The construction work and active management of the enterprise is being superintended by W. G. De Celle, vice-president and general manager of the land company.

The original plans for the system contemplate the irrigation of about 150,000 acres of land, lying along

land at the foot of the Wind River mountains, at a place called Leckie Basin. This basin is a great natural reservoir site on the Big Sandy river. By a comparatively small expense this can be turned into a reservoir which will hold 100,000 acre feet of water. This is to be used as storage water and will be turned into the bed of the Big Sandy, brought on down to the diversion dam and there diverted into the main canals of the system. At such times the Big Sandy is often low. The Leckie reservoir is also to be fed with water from the Little Sandy river by diverting this stream into the basin



No. 3.—A rock cut on main canal above reservoir No. 1, Eden Valley Project.

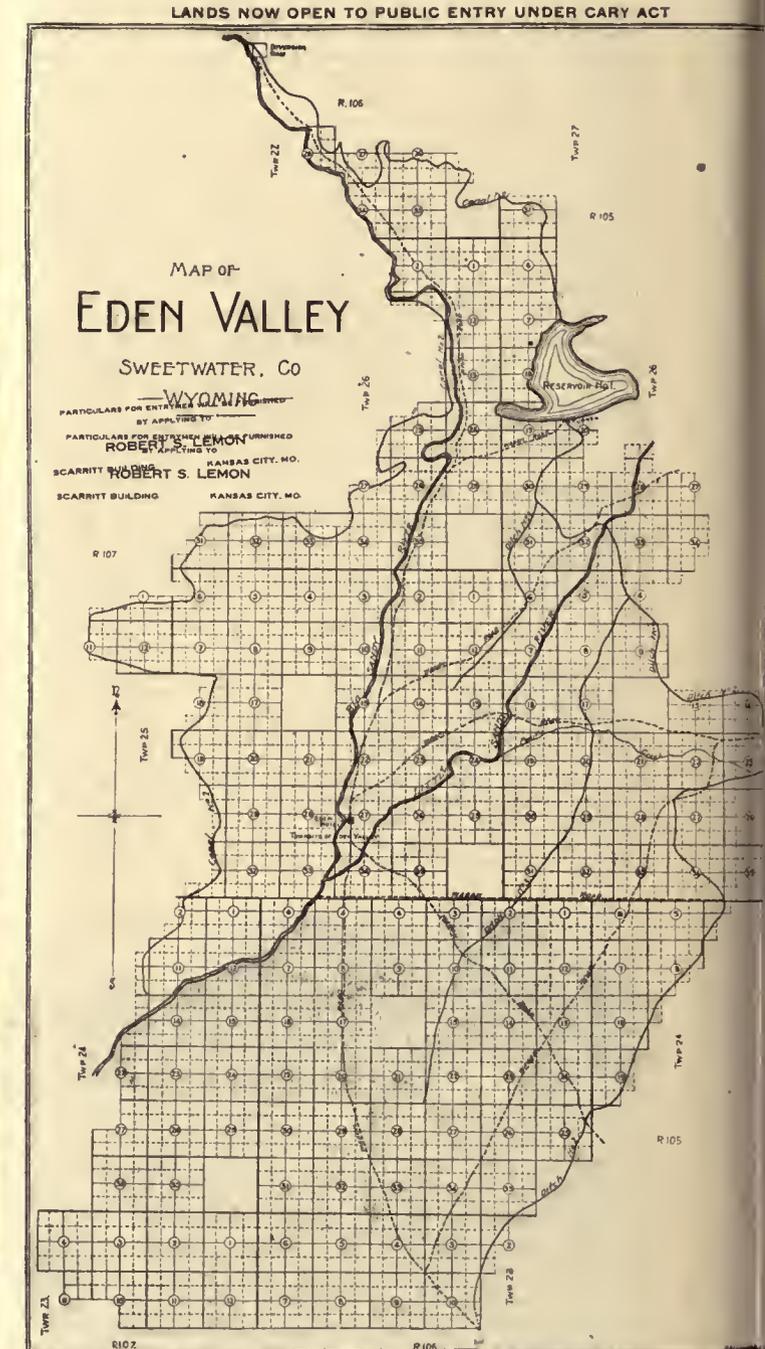
the Big and Little Sandy rivers. When the system is completed there will be this much or more land under ditch. There is now completed about forty miles of main canal which has been built by the company and is ready for the delivery of water. The company this year completed reservoir No. 1, which is situated on the tract and is shown on the accompanying map. Water is now being taken from this reservoir for use on land which has been brought in this year. This reservoir contains about 1,400 acres and is filled direct from the Big



No. 4.—View on main canal between diversion dam and reservoir No. 1, Eden Valley Project.

Sandy river by a canal leading from the diversion dam, as shown in the accompanying illustration. The plans provide for about thirty feet average depth of water in this reservoir.

The original plans for the system provide for a large reservoir some forty miles north of the irrigated



through a canal about one and a half miles long and by other streams tributary to the Big Sandy river.

The first part of the system built was the canal leading from the diversion dam on the Big Sandy, a point about fifteen miles north of the irrigated tract,

to reservoir No. 1. This ditch is twenty-two feet wide on the bottom, thirty-five feet at high water and carries water five feet in depth. It is about twelve miles long. It has a drop of about eighteen inches to the mile. All of the irrigated land lies south of this ditch. A concrete dam is now being constructed on the Big Sandy at the point where the water is being taken out, equipped with gates through which the supply for reservoir No. 1 is taken. The water for irrigation is taken from reservoir No. 1, through a tunnel at the south end, where it flows into the main canal in district No. 1.

The irrigated tract is divided into four districts as may be seen by reference to the map. District No. 1 contains all of the land lying between the Big and Little Sandy rivers; district No. 2 contains the land lying south and east of the Little Sandy river and north of the section line running east and west, and crossing the junction of the Big and Little Sandy rivers; district No. 3 comprises all of the land lying south of this line and east of the Big Sandy; district No. 4 is all of the land lying west of the Big Sandy river.

It is expected that all of the land will be irrigated and brought under ditch as fast as possible, except the land in district No. 4, concerning which the company has not yet announced its plans. This land cannot be irrigated until the Leckie reservoir or some other system of storage has been completed.

The company is now completing the canals that lie east and south of the Little Sandy river and expects to finish this work late this fall, in plenty of time to deliver water to the land next spring. All of the ditch work to be done by the company in district No. 1 has been completed and laterals for irrigating the land are now being built by the owners of the land.

The canal which waters the district south of the Little Sandy river will be carried across that stream by means of a flume, the ditch being brought close to the banks of the stream and the flume supported by concrete abutments.

Eden Valley is a high table land or plateau, lying between the Wind River mountains on the north and the Union Pacific railroad on the south, about midway between the two. To the east of the valley is a low range, called the Jackamore Hills, and on the west is the high rolling prairie, similar to the Eden Valley tract and extending to the Green river, which is about fifty miles away.

For many years Eden Valley has been the summer range for vast herds of sheep. Excellent grass is found here all summer. The land generally is covered with a thick growth of sage brush of several varieties, the black sage predominating. This brush, however, is only twelve to eighteen inches high, having been browsed off by the sheep. The method of breaking the ground is to plow it with a sulky plow, harrow, rake and burn the sage brush, when it is ready for seeding. This is comparatively inexpensive as the ground plows easily, a three horse team breaking from two and a half to three acres per day. The cost of clearing and breaking, where it is contracted for, ranges from \$5 to \$7 per acre.

Farming on a large scale has not yet been accomplished in Eden Valley. The settlers who moved into the valley this summer planted crops and have had good success where the ground was properly prepared and water was secured at the right time. One field of oats, owned by the Wright Brothers and about eighty acres

in extent, made a good yield. The grain was of good quality and very heavy. Potatoes planted late in June made an excellent crop and farmers who sowed alfalfa secured a good stand. The season in all respects was a very backward one and farmers were late in getting in their crops. Field or Canadian peas made a good growth when sown early and well cared for.

The season in this part of Wyoming is a short but intense one and grain should be sown early, even as early as April and May to do well. Through July and August the days are hot and dry and excellent weather for grain, potatoes and sugar beets, the latter crop promising to be one of the leading crops of this section.

The nights even in midsummer are cool, but the temperature sometimes rises to one hundred degrees during the day. The heat is not oppressive on account of the altitude, which is slightly over 6,000 feet.

The soil in Eden Valley is of a reddish tinge and very fertile. The surface soil is a sandy loam, varying from a few inches to several feet in thickness, is more sandy in some places than others, a condition which does not seem to affect its productive qualities, however, wherever water is supplied. Below the red soil or sandy loam there is a subsoil of gravel and sand from eighteen inches to two feet deep. Rock is found at from thirty to fifty feet. At this depth good water for domestic purposes has been secured, the deepest well that has been sunk in the valley being sixty-one feet. One well fifty feet deep has twenty-six feet of water.

The majority of the settlers who are coming into Eden Valley are from the central states which border along the Mississippi and Missouri rivers, although a number from the irrigation districts of Colorado have bought land here. They are a very intelligent class of farmers and will undoubtedly develop this part of Wyoming as rapidly as conditions will allow. At the present time the nearest railroad is at Rock Springs, but the surveys of both the Chicago & Northwestern and the Chicago, Burlington & Quincy railroads cross this tract, and it is believed that one or both of these roads will build through within the next few years.

The Union Pacific railroad has surveyed and will build this fall or next spring a branch road from Rock Springs north to within about twenty miles of the valley. This railroad has located coal mines on the branch. These mines have been opened up and are now ready to mine the coal.

Eden Valley is believed to be underlaid with coal and while no veins have been opened on the irrigated tract, cheap coal can be had at Rock Springs and will be much nearer when the railroad has been opened. Native lumber can be secured in the mountains to the north, the nearest point being about thirty miles from the north end of the tract.

The irrigation company owns and operates a hotel located at the junction of the Big and Little Sandy rivers near the center of the tract. The town of Eden has been located here. There is a postoffice at the hotel. The townsite which is owned by Mr. F. P. Knott of Denver and which has been set aside will be thrown open for settlement in the spring. A number of prospective merchants have signified their intentions of opening stores. There will undoubtedly be a town at this point, as it is the most central location on the tract, and that within the next year. A quarter section of land has been set aside for the town of Eden.

The National Forests and the Forest Service.

By Judge D. C. Beaman, Denver, Colo.

Nothing is further from my desire or purpose than to disparage in any degree the benefits arising from the establishment of forest reserves in forest areas of the Rocky Mountains.

Forest preservation, water supply and kindred subjects have long been of interest to me as a citizen desirous of promoting them in so far as consistent with justice to and peace and contentment among those who are more directly and pecuniarily interested.

I go even further in the protection of forests than the Forest Service has ever gone, and contend that no sound and thrifty tree should ever be cut, except to supply the localities near to, or necessarily dependent, for their proper development, on the respective forests.

This, these localities are justly entitled to, and this no one should have the power to deny them.

Notwithstanding the benefits which have accrued from the forests, and are likely still to accrue therefrom, it is nevertheless true that from a narrow and mistaken policy in some directions pursued by the Forest Service, there is nothing else in recent times that has alienated so many people from a cordial support of these governmental operations.

I want to say at the outset that I absolve Secretary Wilson from direct responsibility for these unwise and oppressive acts. I have known him for nearly a generation. I went to Iowa when it was a territory, and there was neither a railroad, a telegraph nor a bathtub west of the Mississippi river. He came soon after. I honor and respect him as a great and good man.

It seems also proper for me to say that, having lived on the frontier for nearly sixty years, I believe I am pretty well acquainted with frontier people and conditions generally; that business and recreation have, for the last twenty-five years, taken me through the timbered regions of the mountains of Colorado, more generally and frequently than most men, and given me more than ordinary familiarity with the people and conditions peculiar to them, and I believe qualify me to discuss the questions that I propose to present to you.

Time forbids any presentation whatever of the obstructive measures which have practically stopped all mineral prospecting in forest reserves, or any individual cases of grievances of cattlemen or homesteaders, which are numbered by hundreds, except so far as may be necessary to illustrate the manner in which the Forest Service is trying to deceive the people and restrict the development of the forest states, notwithstanding its loud professions to the contrary.

We are now in a progressive, as well as a sensational period, and it is well to separate these ideas and eliminate so far as possible from serious consideration the latter.

Mr. Pinchot, as the head of the Forest Service, has treated us to theories of both kinds.

Mr. Pinchot says that heretofore, and even now, we are wasting our resources; that they will soon be exhausted, whereas they should be preserved for posterity. This he especially applies to coal, iron and timber, and figures out the number of years that these resources will last.

At the time he made his figures, however, some

recent discoveries of enormous bodies of coal in Alaska, and iron in Pennsylvania, had not been made.

He puts the coal and the iron ore upon the same basis for exhaustion, ignoring the fact that while we absolutely consume our coal, we do not consume our iron ore; that its form is simply changed, and that practically all the iron ore ever mined is still in existence in some form, and that when the days of extensive railroad building in this country shall be over, and the air ship in successful operation, there may be a surplus of scrap iron instead of a scarcity of iron ore.

How are we wasting our resources today? It is easy to make this charge, but has Mr. Pinchot ever informed us just what we are to do to prevent this so-called waste? Shall we stop mining coal, shut down our steel works, gas and electric plants, and go back to the blacksmith shop and the tallow candle?

It is nothing new to have hobgoblins of future disaster placed on dress parade to frighten the credulous. Eminent professors of science years ago, on the basis of statistics carefully worked out, showed that the world was nearing the end of its gold resources; that starvation would confront us in a few years; that the sun is fast drawing near, the recent heat being only a part of the process by means of which the extremes of temperatures will change places; that what is now the torrid south will become the frozen north, and vice versa, so that before many years palm trees will grow in Alaska, cane sugar and cotton will be the harvests of Maine and Colorado, and the mountains of the west be no longer covered with snow and coniferous forests.

Another, with equally convincing argument, predicts that the atmosphere will desert us, and waterless rocks and sand only remain in a sunless and starless universe.

Mr. Pinchot has recently seized upon the starvation idea as a good thing to play on, as, in his article in your souvenir of this Congress, he says that by 1950 our population will be at least 150 millions, and "That will call for twice as much food as in 1900. If our children are not to go hungry, we must either grow more on our present farms, or make new farms by reclaiming the desert and the swamp. But at the best, reclamation can supply but a small part of the increasing needs of the coming generation."

So we will be right up against it in forty-one years. You will, however, observe that he says nothing about reclaiming those parts of the forest reserves which are treeless, and suitable for agriculture, of which there are thousands of acres. The reason for this omission will be shown presently.

Mark Twain, I believe it was, in referring to this character of science, said that it was "very fascinating; one gets such wholesale returns of conjecture from such a trifling investment of fact."

Not only has Mr. Pinchot advised us long ago just how much timber we have, but just how long it would last, had not forestry scientifically solved the question of its preservation and utilization, and we had supposed that these questions were forever settled, at least in Washington. Notwithstanding this, he recently issued two circulars to consumers of and dealers in timber.

In the first, to consumers, dated August 1st of this year, it is said:

"We know fairly well the extent of the wood consumption of the nation, except for fuel and domestic purposes. No satisfactory data upon these items are in existence, and it is extremely difficult to estimate them."

He then asks for figures on the consumption by the persons addressed.

In the second one, to dealers, dated September 8th, a month later, it is said:

"The Forest Service has been asked to secure data for a report to the Commission upon the extent of our forest resources, the rate at which they are being consumed and the measures necessary in order that they may be perpetuated and utilized to the best advantage."

There was appended to this thirty-four questions, to which answers were requested.

This is most remarkable, as the last circular contradicts the first as to knowledge of the rate of general consumption, and the two read in connection with each other, show that the Bureau does not know either of the things which its chief has long been putting before the public as unquestioned facts.

Is it possible that bureau wires have got crossed, and truths are sparking off?

We have also been accused by Mr. Pinchot of wasting our water power, and no doubt will soon be accused of wasting the air and the sunshine, although we are using all we need and they return to us by natural laws in apparently undiminished quantity.

Nothing more pertinent on conservation for posterity has been said than the remarks made in Congress recently by Hon. M. A. Smith of Arizona, as follows:

"I am afraid that we are going a little fast in the hysterical ardor to conserve our resources for the benefit of posterity. If we save our coal, iron and lumber for the use of posterity, then posterity, actuated by the lofty example of their fathers, must likewise preserve these resources for their posterity, and time will at last show a nation of fools sitting among the unused resources essential to its growth and happiness—still preserving things for posterity—still 'conserving their resources.'"

A recent writer on the subject has also hit the mark by saying:

"The cry raised by Mr. Pinchot has been parrotted by the newspapers and magazines until the man bold enough to suggest that these predictions of alarmists have never in past history been verified, is regarded as almost a blasphemer.* * * A large and worthy portion of the people accept the Forester's dictum implicitly as any text of Holy Writ; but when his time limit shall have expired, some other scare will be worrying the hysterical, and his predictions, if remembered at all, will be relegated to the ridiculous, along with the others."

"These pet bugaboos of the self-appointed guardians of posterity are really as baseless and insubstantial as the ghosts that peopled dark stairways and closets in the days of our early childhood."

At the Public Lands Convention at Denver last year, there were presented, by myself and others, some instances of flagrant abuses by the Forest Service, and Mr. Pinchot, who was present, was called on to answer or defend them, and he promised the chairman in the presence of the Convention to do so when he got the floor.

Instead of doing so, however, he merely waived

them aside by saying that "all those which were abuses have since been corrected, and we will therefore wipe them off the slate."

He then said he wanted only to hear from the man himself who had the complaint, and not from those not using the forests.

In the first place it was not true that any of the abuses mentioned had been corrected. Most of them were of a nature which could not be corrected, as the injury done was irreparable, and our complaint was that his rules made it possible for such incurable outrages to be perpetrated on poor men who were trying to make homes.

He also knew that few of them were able to travel several hundred miles, pay hotel bills and take their chances of getting his ear, and that we were fully authorized to present their cases.

Such evasion and trifling as this is unworthy of a representative of a great government.

In McClure's Magazine for July 1st, an article appeared entitled "Gifford Pinchot, Forester," written by one Will C. Barnes, and embellished by a portrait of Mr. Pinchot, and one or more pictures of the ruin which he says was wrought by the early settlers of the West. Some of these pictures had before done duty in illustrating other magazine articles, boosting the Forest Service, and evidently were furnished by Mr. Pinchot.

The writer of the article in question, in order to impress the reader and give extra weight to his praise of the Forest Service, prefaced it by the following statement:

"That the writer, then a range cattle raiser in Arizona, was one of the first to feel the effects of the new forest policy, gives him all the more right to speak as he does of these things; that he joins with loud tongue and bitter pen in the general denunciation of the 'Pinchot policies' makes it all the more a pleasure to him now to defend and explain them in so far as he can."

He does not, however, state or intimate that his former denunciation of these policies was wrong or in any way mistaken, nor does he give any reason why he has changed his mind, which ordinarily would be expected, in order to add weight to his fulsome praise of what he once condemned.

On reading the article it seemed obvious that the writer was under cover, and if his trail could be found, something would develop. On looking into the report of the Secretary of Agriculture made in response to a resolution of Congress requesting the names, etc., of forest employes who had been accused by members of Congress of "pernicious activity" in attending various conventions and public meetings where the forest service was to be discussed, I found on page 58 the following:

"Will C. Barnes, inspector of grazing. Place of employment, Washington, D. C. In attendance at meeting of Trans-Mississippi Congress Nov. 19 to 22, 1907, at Muskogee, Okla., by direction of Forester, and as delegate from New Mexico. Expense, \$14.50."

This sufficiently explains Willie's change of heart, but it also leaves his article utterly barren of merit. How thrifty the Forest Service is to get one of its employes in Washington appointed a delegate from New Mexico to attend at government expense.

But a worse phase of it is that the writer has put before the people what he would have us believe is a real conversion of a man once an honest and "loud-

tongued" opponent of the policies which he now stands for, yet deliberately conceals the real cause of his change of opinion, if indeed he has changed it in fact, which is doubtful.

To say that Mr. Pinchot did not approve the article is to offend common sense. There is no room for doubt that he not only approved it, but that he prompted it and furnished the pictures and data as to his birth, history and exploits with which the article is filled.

The cause is weak that requires such actions, and it is an insult to the American people that any public officer should resort to such means to create public sentiment in his favor in order to obscure the methods he has adopted to annoy the settler and miner who happens to be in or near a forest reserve.

The report of the Secretary referred to consists of fifty-seven pages, and shows some 1,400 appearances of forest supervisors, inspectors, etc., at numerous meetings throughout the United States, some to discuss "forest business," but principally to address the public, or to attend meetings of stock growers, and boost Mr. Pinchot and misrepresent the real issues between his policy and those who are interested in forest reserves.

The expense to the Forest Service for this exploitation is given as \$19,424.00.

Mr. Pinchot has been advertised in various magazine articles as the "Man who saved the nation" and credited with being the author of forest preservation, etc., when the fact is that forest protection was first agitated by western men years before Mr. Pinchot got into the limelight, or made up his mind to save his country, or had opportunity to do so. In proof of this it is only necessary to refer to the fact that the first act authorizing the setting apart of forest reserves was passed March 3, 1891, and that President Roosevelt in his letter of July 14, 1908, to Mrs. Cleveland, announcing that he had changed the name of the San Jacinto forest to Cleveland forest, in honor of her deceased husband, said:

"President Cleveland was one of the first to recognize the need of forest preservation."

To Mr. Pinchot, however, does belong the honor of boosting his Bureau of Forestry through lecturers, whose expenses are paid out of public money, and by adopting such oppressive rules of administration as to cause opposition to him personally from those who are and always have been in favor of reasonable forest preservation.

The whole controversy between the Forest Service and the people of the West is over a few indefensible and unnecessary regulations, all of which could be eliminated if Mr. Pinchot would for one day take up with those having personal and practical knowledge of forest conditions in the West, and act fairly and reasonably in view of the facts and the needs of the people concerned.

Why does he not do this instead of having his employes, through the magazines, give him credit for "making two blades of grass grow where one grew before" is incomprehensible to those who would like to see men and farms grow, as well as grass and trees—both in sensible harmony and with injustice to neither.

If he would do this, his employes could give more attention to their duties and less to "educating" the people of the West (the most of whom do not require it), at government expense.

(To be continued.)

LOMPOC VALLEY, CALIFORNIA.

BY A. L. TAYLOR.

In no place in the United States are the successful results of intensified farming so forcibly demonstrated as in Lompoc Valley in the western part of Santa Barbara County, California.

The opportunities here awaiting the scientific small farmer are perhaps without parallel in any other part of the West. The startling statements which follow were obtained by the writer from a score or more farmers in the valley, but to give the account of each one respectively would require a volume. Lack of space demands brevity, so the facts will be applied to the valley in general, and the names of the individuals from whom they were obtained and who stand sponsor for their truthfulness will hereafter be given as references to our readers.

The various soils of the valley are adobe, black loam, sandy and sediment. The heavy soils are best adapted to mustard, barley, onions and beans, although barley, beans and potatoes do remarkably well on the sandy soils. The sediment and lighter soils are better suited to fruit culture.

In 1907 a tract of ten acres yielded two hundred and sixty-two sacks of yellow danver onions per acre. They were contracted for at planting time at one cent per pound and immediately after harvest were sold for two cents per pound. There are several other instances where as high as two hundred sacks per acre were produced. There are one hundred pounds to the sack and the average yield is about one hundred and fifty sacks to the acre. The market price of onions varies from 50c to \$2 per hundred weight. Of course, there are sometimes crop failures which are invariably due to planting in soil not adapted to the product or a bad season, the latter being very rare.

Whether success or failure attends the effort, onions are the most expensive crop raised, save for the cost of sacks and handling. The average cost of production is about \$35 per acre.

Lompoc Valley is the only place in the United States where mustard is produced in merchantable quantities and from whence it is shipped to the European markets. A sack of mustard weighs 90 pounds and last year the largest yield was thirty-eight sacks to the acre. The average yield was about sixteen sacks, which was larger than the average yield for several years past. It is one of the cheapest crops to produce, but it so impoverishes the soil that it should not be raised more than one year in three. The cost of production per acre is about \$15.

Barley is one of the heavy yielding products of the valley. Upon the ranch of Mr. James Cantlay as high as ninety-four bushels of barley per acre have been harvested. This is the largest yield known. Forty bushels per acre, however, is not looked upon as an exceptionally large yield. When the yield is not twenty bushels or better it is usually cut for hay. Hay brings from \$5 to \$10 per ton and produces from a half to four tons to the acre.

Beans are an enormously profitable crop. Last year twenty-one tons of the variety "Kentucky Wonder" were taken from eighteen and one-half acres. More small white beans are raised than any other commer-

cial variety. Of this variety thirty sacks to the acre were produced in 1907. There are 90 pounds to the sack and the average is from twelve to fifteen sacks to the acre. The varieties of beans produced in Lompoc Valley are too numerous to mention.

Potatoes are a most profitable crop and the Lompoc Burbanks are known throughout the state as a potato of superior quality. Many of the farmers state that their net profits from this product have been as high as \$50 and \$60 per acre.

Fruit raising, although a comparatively young industry in the valley, and one which has been attended with many discouraging set-backs, has thus far produced handsome profits and the outlook this year is brighter than ever before. There is a growing foreign demand and the producers now have a strong organization for their protection and the profitable handling of their product, all of which will no doubt result in great financial benefit to the industry.

The cool and moist climatic conditions of Lompoc Valley are especially favorable to the production of apples. Lompoc apples were awarded medals by both the New Orleans and the Chicago Expositions. They are eagerly sought for in the markets of France, Australia, South America and the Islands of Hawaii.

Strange as it may seem, the elements of the Lompoc climate, so conducive to the growth and excellence of the apple, carry an attendant ill known as powdery mildew, which until the last two years has proved a serious menace and has very materially retarded the growth of the industry. Through the untiring efforts of Mr. I. M. Clark, a successful horticulturist, a remedy in the form of a lime and sulphur spray has been discovered which has effectually checked its ravages and given new impetus to the enterprise.

Mr. W. H. Schuyler, commissioner of horticulture for the Lompoc district, has also been an untiring champion of the industry, and it is largely due to the interest which he has manifested in safeguarding the horticultural products, that their superiority and excellence have been attained. He has forty acres in cherries, apples and pears. The superiority of flavor and quality of the cherries from his orchard are known throughout the state and in the markets of the East, and in competition with other cherries coming into market at the same period, they always bring from three to four cents more per pound.

Mr. Schuyler has made a close study of the horticultural conditions of Lompoc Valley and he says: English walnuts, peanuts, tobacco and sweet potatoes will undoubtedly be profitably cultivated here in the near future.

Agriculture, dairying, stock and poultry raising are to be reckoned among the important and large dividend-yielding industries of Lompoc Valley. There is no place where the conditions are more favorable for their success.

The mountains surrounding the valley are teeming with mineral wealth which are lying fallow for the lack of money and enterprise to develop them. Considerable development work, however, is being done at the present time in the oil fields, about four miles east of Lompoc. Upon this property there is a well now producing six hundred barrels per day of thirty-two gravity oil. This is the highest gravity of any well in the state. This oil brings \$2.50 per barrel.

Great deposits of lime rock, said to be the finest in quality of any found in the state of almost inexhaustible quantities, immense deposits of diatomaceous earth, bituminous rock, gypsum and glass sand are all found within a few miles of the city.

While irrigation in the valley has only been adopted in a small way, its success so far has been more than gratifying and it is prophesied that the entire valley will in the near future have an adequate and efficient irrigation system.

To the lovers of the rod and gun, Santa Ynez River and Lompoc Valley offer days of alluring sport with the wary trout and that most fascinating and wingy bird—the California quail—which abound in thousands along the low foothills that surround the valley.

Mr. Walter R. Smith, proprietor of Smith's Hardware and Sporting Goods Store of Lompoc, said: It is not generally known by the lovers of field sport that this is one of the finest quail sections in the state. There are a few, however, who are acquainted with the fact, mostly traveling salesmen for sporting goods. It has been my pleasure to have accompanied several of these gentlemen on shooting trips and fishing excursions and always with pleasurable satisfaction and good results.

Mr. Smith carries a complete line of sporting goods and those who contemplate either a fishing or shooting trip in the Lompoc Valley can be accommodated with every requisite for such an outing and should they so desire he will accompany them to the places where the best shooting and fishing can be obtained.

The city of Lompoc has a population of upwards of fifteen hundred. It is nine miles from the seacoast on a branch line of the Southern Pacific Railway, which connects with the main line at Surf.

It has two splendid banking institutions, the Lompoc Valley Bank and the Bank of Lompoc. Both occupy architectural structures which are ornaments to the town. It is said to the credit of their financial strength that the late financial panic would have been unknown to them had they not read of it in the newspapers.

The Lompoc school system is one of which her citizens are justly proud. The school buildings are architecturally handsome and imposing.

Land values range from \$10 to \$150 per acre, according to the location and character of the soil.

Following are the names of the farmers from whom the data for this article was obtained. They are all men of brains, with the energy and ability to use them, who have made small farming a science, most of whom have acquired a competency by their efforts and have been identified with the problem of agriculture in the Lompoc Valley for more than a quarter of a century: W. H. Schuyler, commissioner of horticulture; I. M. Clark, horticulturist; H. E. McCabe, J. D. McCabe, L. F. Shanklin, F. O. Harris, Chas. A. Davis, J. A. Stambaw, James Cantley, J. S. Henning, J. G. Bissinger, H. Poland, W. A. Lewis, I. F. Lewis, J. W. De Wolfe, Guy Hibbits, O. Hoover, J. Kolding, and R. D. Rennie.

Lompoc has an active Chamber of Commerce, of which Mr. A. G. Balaam is the secretary. He is prepared to furnish detailed information upon application to those desiring it.

IRRIGATION IN THE BLUEWATER VALLEY OF NEW MEXICO.

One of the most attractive side trips to be taken from Albuquerque, both for the practical irrigator and the investor and homeseeker, was that to the plant of the Bluewater Development Company, about one hundred miles west and immediately upon the Santa Fe Railroad in Valencia County.

We left at eight thirty on Friday night and were in the comfortable ranch house of the company shortly after midnight. Parenthetically, it may be said that one of the buildings now in use by the Bluewater Company was a station on the old trail to California. Indeed, traces of the trail may be seen from time to time in going through the country, and this, perhaps, as well as any other thing emphasizes the wonderful development which is conveying the great Southwest forward at a speed realized by few who are unfamiliar with it.

The next morning we drove to the dam which impounds as pretty a sheet of water as one would care to see, surrounded by hills which form a natural reservoir, capable of impounding when fully developed 92,000 acre feet of water.

We were very favorably impressed by the stability of the

construction of the dam, formed as it is of rock taken from the walls of the canon in which it is located, and having an earth apron affording an absolute seal for the whole.

Another feature of the construction which impressed us was the control tunnel driven through the solid rock and entirely separate from the dam itself. It is hard to believe that this body of water offers the only opportunity for a citizen of New Mexico living west of Albuquerque to take a boat ride.

Returning to the valley we drove over some of the

twenty-five thousand acres embraced in the project, although perhaps a better idea of this was obtained later from the train as we ran for nearly half an hour through a valley supplied by the water from the reservoir.

We saw oats which will produce sixty to seventy-five bushels to the acre, and which are now selling at about one dollar per bushel, and other crops in proportion, and later learned that beets grown in the valley proved to be the best in conformation

and size of any exhibited at Albuquerque. Our favorable impression gathered from what was necessarily a cursory examination was confirmed by the fact that the lands are being purchased by experienced irrigators from the irrigated districts of California and Colorado, but that they are buying



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is not difficult to understand when one realizes that at Blue-water is found the only spot on the railroad for a hundred miles where anything is, or, for that matter, can be grown.

When asked as to the markets, the manager, Mr. E. Z. Ross, located at Albuquerque, New Mexico, laughed and said that they had to fence against their market, but when one realizes that this land is situated in the midst of one of the few remaining sheep districts and that perhaps a quarter of a million sheep range within one hundred miles of it, with practically no other feed being grown in that vast territory outside of the excellent range, one can well understand the remark. Then, too, the camps of the American Lumber Company within twenty miles, Fort Wingate a little farther off, where hay is shipped in by the government from California, the thriving coal town of Gallup just beyond Wingate and Albuquerque, where they have to ship in hay, etc., from Kansas, prompt the query whether New Mexico will ever be able to raise enough to supply its own needs and reduce the exorbitantly high prices now obtained for products of the sale to a level approximating the prices for which similar products can be obtained in other parts of the country.

RECLAMATION SERVICE NOTE.

The installation of the high pressure gates in the outlet tunnel of the Pathfinder Reservoir has been practically completed. The electrical operating machinery for use in connection with the gates has not yet been installed as the power house is in process of construction. The gates have, however, been operated with oil pressure from a hand pump against a small head and have been found to work very satisfactorily. The dam has been built to an elevation of 81 feet above the foundation, bringing it therefore to a distance of 129 feet from the level of the road bed passing over the crest of the dam. The engineer in charge of the construction estimates that it will require about nine months to complete the structure. The work is now entirely out of the reach of high water, and can, therefore, be pushed as rapidly as the plant and force employed will permit.

Water will be furnished from the Williston irrigation project, North Dakota, under the provisions of the Reclamation Act, in the irrigation season of 1908, for the irrigable land shown upon farm unit plats of Township 154 North, Ranges 100 and 101 West, and Township 155 North, Range 100 West, approved April 24, 1908, and on file in the local land office at Williston, North Dakota. Homestead entries, accompanied by applications for water rights and the first installment of the building and operation and maintenance charges, may be made under the provisions of said act for the farm units shown on said plats. Water right applications may

also be made for lands heretofore entered and for lands in private ownership, and the time when payments become due therefor is hereinafter stated. The limit of area per entry, representing the acreage which, in the opinion of the Secretary of the Interior, may be reasonably required for the support of a family on the lands entered subject to the provisions of the Reclamation Act, is fixed at the amounts shown upon the plats for the several farm units. The limit of area for which water right application may be made for lands in private ownership shall be 160 acres of irrigable land for each land owner.



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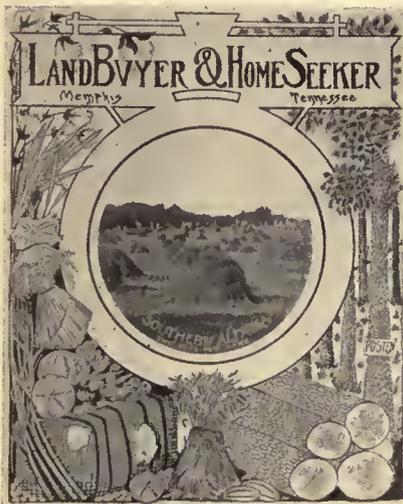
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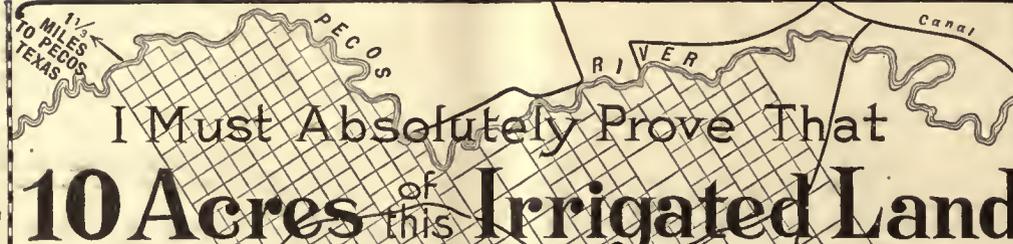
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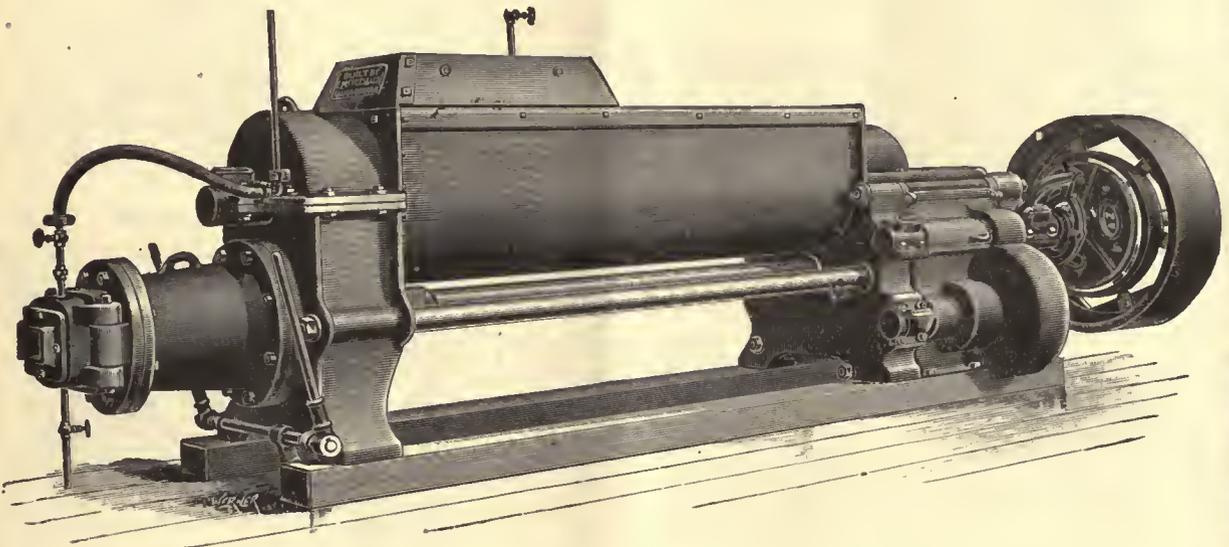
It will be more convenient for you to address me at St. Louis, and I am equipped there to best answer you.

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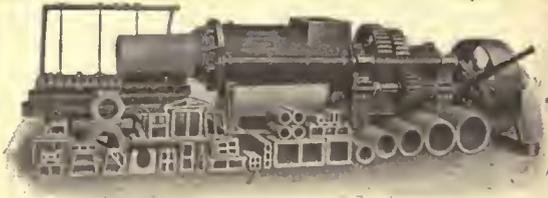


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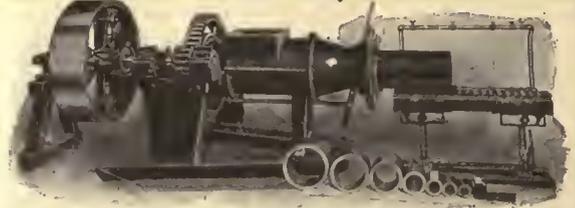
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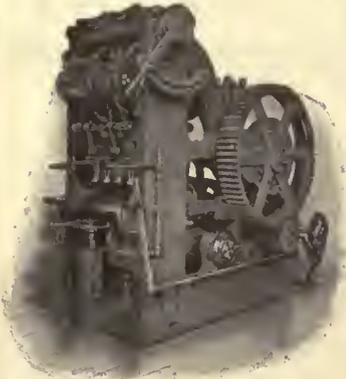
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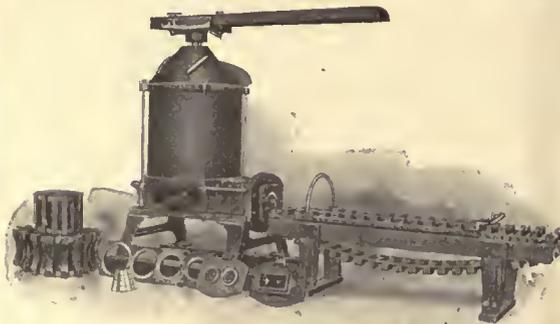
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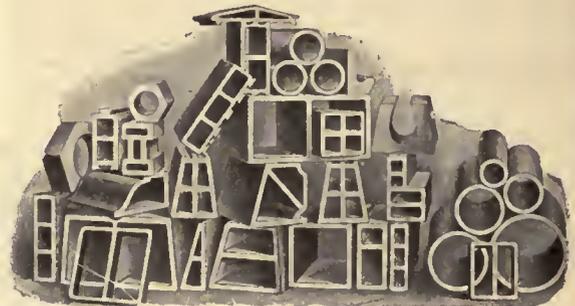
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1 year, and the Primer of Irrigation

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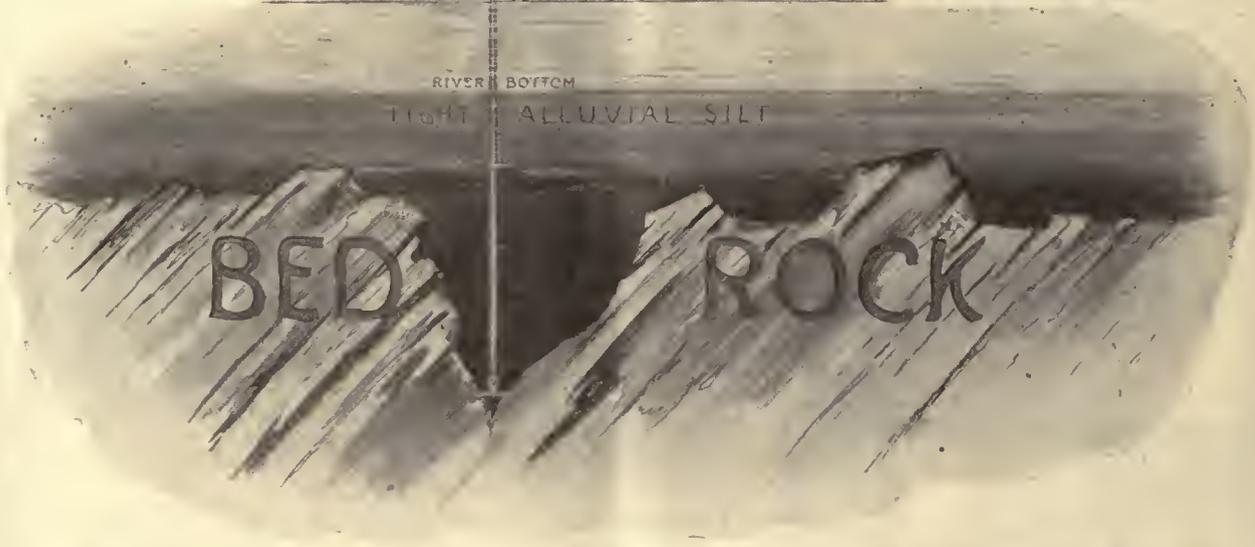
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The Pneumatic Pipe Dredge is a new, inexpensive device for dredging sand, silt, muck and gravel, or any other material or soil susceptible to rapid disintegration by the action of water under pressure

From one to four or even more pipes can be operated from the same scow; one pump and air compressor serving for all.



Its pipe or head "jets" itself deeply into the material to be handled, breaks it up and forces it upwards through a discharge pipe by the use of water and compressed air mixed under high pressure. It is not a suction or centrifugal dredge. It is a hydro-pneumatic ram.



The Bed Rock Pneumatic or Compressed Air-Pipe Dredge. This shows the pipe lifting the heavy black sand out of one of nature's bed rock riffles. The precious minerals like gold and platinum have been trapped in these pockets or riffles for untold ages, but no method to recover these stored up treasures had been devised before the advent of the pipe dredge. This dredge will enter these pockets and recover the values they contain.

ATTENTION ENGINEERS.

It is not possible to describe this dredge nor tell of its superiority in a few words. However, IF YOU HAVE USE FOR A DREDGER, it will pay you and save you money to look into the merits of this device. It will also save time. Here is part of what Mr. M. A. Nurse, for 18 years Chief Engineer of the State of California, says about the Pneumatic Pipe Dredge.

"Beyond question, the Pneumatic Dredge embraces the cheapest and best application and utilization of mechanical and natural agencies for excavation and transmission of sand, silt, or any material susceptible of rapid disintegration by the joint action of air and water under pressure, that I have ever known through an active experience of over thirty years in river improvement and reclamation. It is simple in principle, cheap in construction, efficient in operation and must on the score of economy and greater adaptability supersede other methods in the broadest field of river and harbor improvement essential to our State and National development."

HAVE YOU DREDGING TO DO?

If you require a dredge for reclamation work, for levee building, for recovering sand or gravel, for filling, for channel or harbor deepening, for mining or for lifting or moving any class of material excepting boulders, DON'T OVERLOOK THE PNEUMATIC PIPE DREDGE.



Pneumatic Pipe Dredge, Operating by Electricity, with Four Ten-Inch Discharge Pipes. Capacity over 15,000 Cubic Yards per day.

CHEAPEST AND BEST DREDGER IN THE WORLD.

The Pneumatic Pipe Dredge can be installed anywhere within a few weeks for a small fraction of the cost of other dredges and it requires only one-fifth the labor, one-fifth the power and one-twentieth the cost of maintenance of any other dredge with similar capacity. It handles from 40% to 60% solid matter all the time and dredges handling from 25 cubic yards per hour to 20,000 cubic yards per day can be built and installed for from \$3,000 to \$25,000. There is nothing to get out of order. Any-one with common sense can run it. It is "fool-proof." Don't you think

IT IS WORTH WHILE INVESTIGATING.

One of these dredges is operating in the heart of the City of Sacramento, California, on a contract for the city. Twice in succession this dredge has been awarded city contracts on competitive bids. Other contractors could not come within a mile of the price bid for the work. Yet the dredge is making money. It is practical results like this that talk.

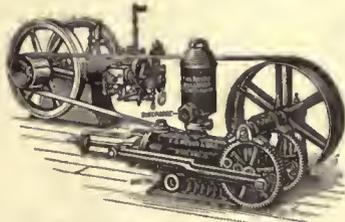
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MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" TO 6" CYLINDERS

MYERS
BULLDOZER
POWER
PUMP

5" Cylinder

FIG. 800

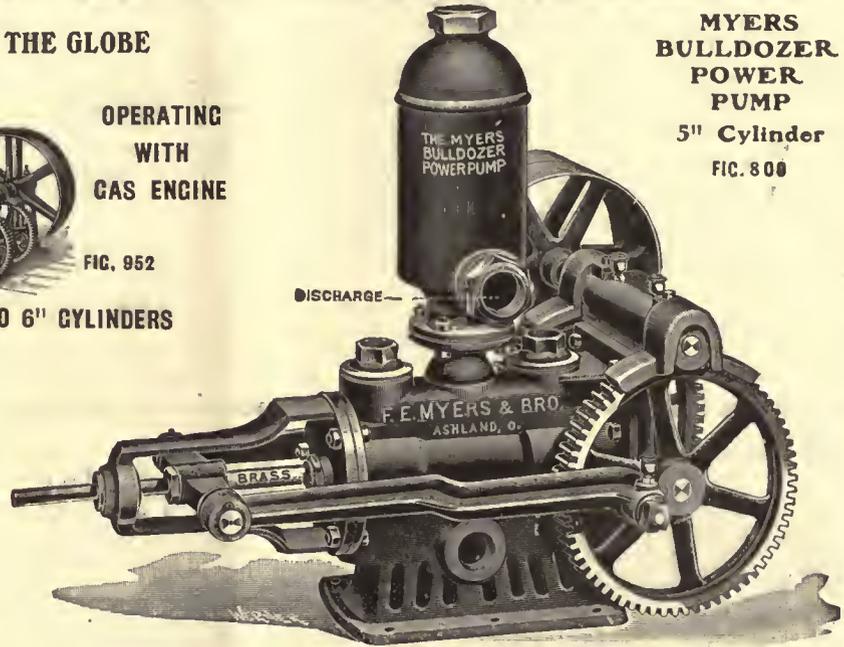


FIG. 1079

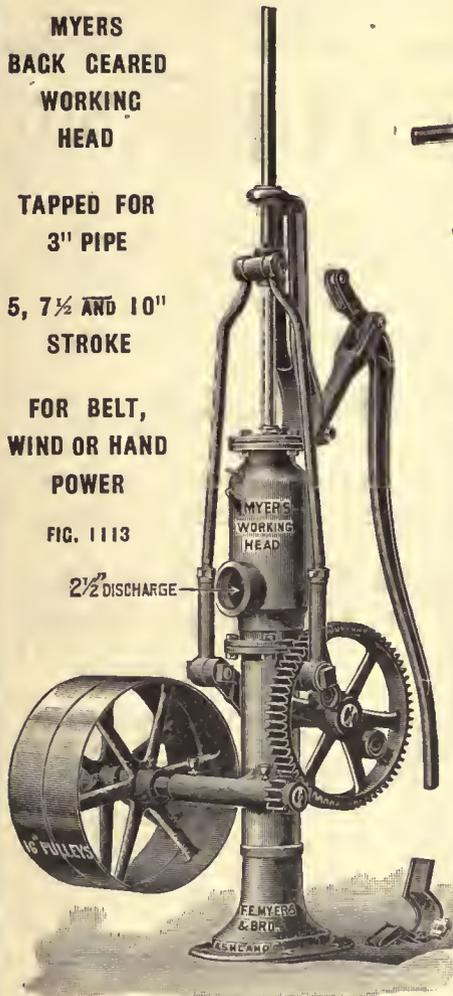
MYERS
BACK GEARED
WORKING
HEAD

TAPPED FOR
3" PIPE

5, 7½ AND 10"
STROKE

FOR BELT,
WIND OR HAND
POWER

FIG. 1113



BULLDOZER
WORKING
HEAD

BULLDOZER PUMP
6" BRASS LINED
CYLINDER

1½" BRASS ROD

PISTON
COUPLING NUT

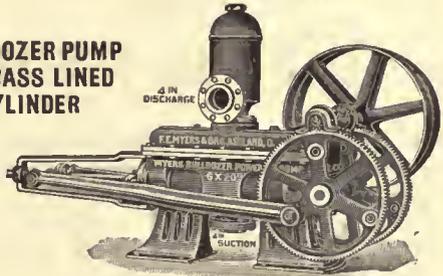
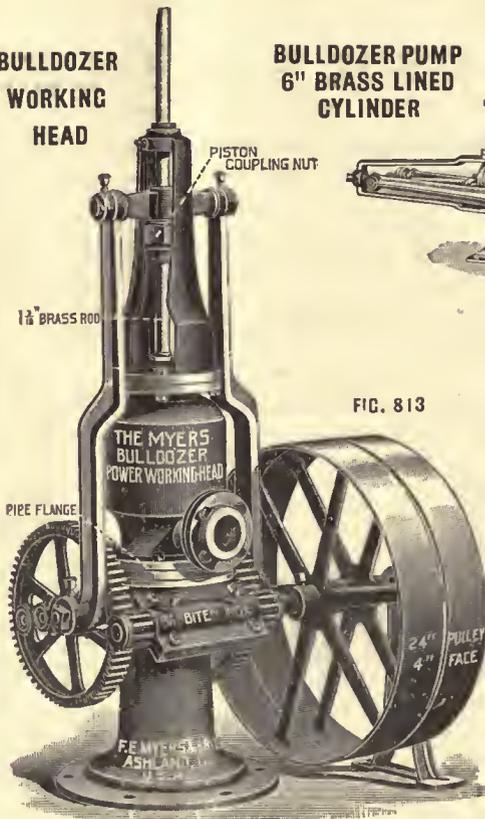


FIG. 813



MYERS BULLDOZER
WORKING HEADS

NO. 359

5", 7½", 10" STROKE
DISCHARGE 2½" OR 3"
SUCTION 2" TO 4"

NO. 364

12", 16", 20" STROKE
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DISCHARGE
SUCTION 8" OR LESS

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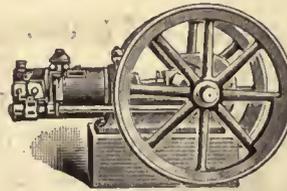
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RANGER HUMANE
REVOLVING BARB WIRE

DeKALB FENCE CO. DeKalb, Ill. Kansas City, Mo.

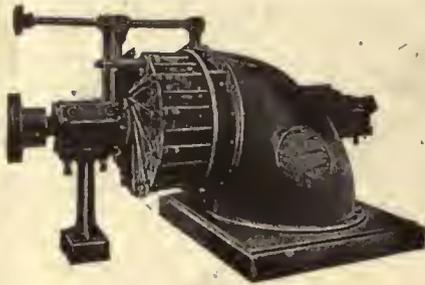
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14D-116

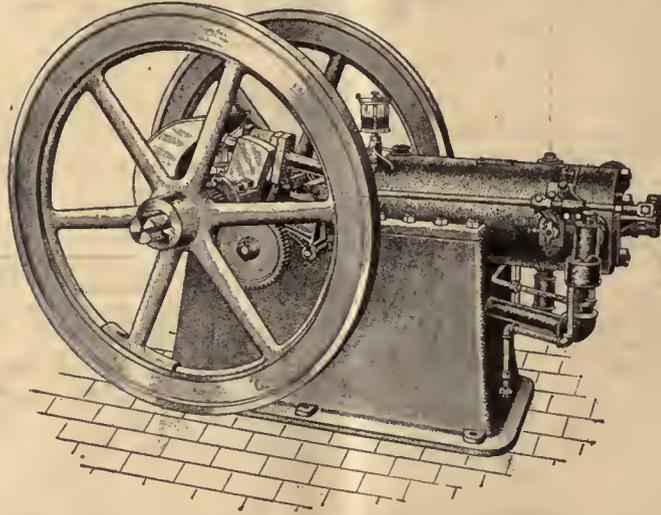
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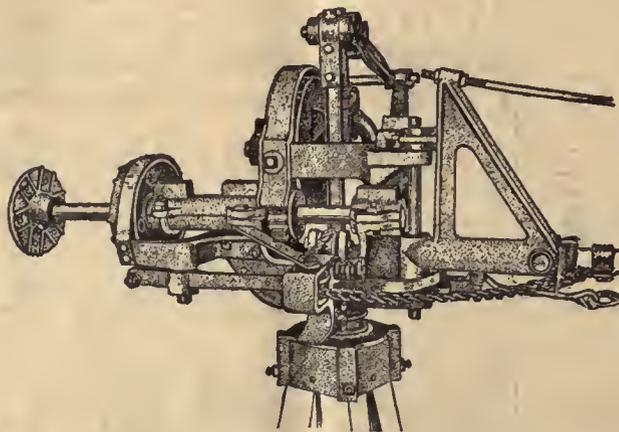
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