

## DRAINAGE FOR IRRIGATED LANDS

Question of Vital Importance to Farmers is That of Too Much Water.

SURPLUS MOISTURE HARMFUL

Experiments Conducted in Different Portions of State Prove Highly Successful—The Remedy.

Drainage for the removal from agricultural land of the surplus water in the soil resulting from extensive irrigation is an important matter in many portions of the irrigated west. Before cultivation was begun probably no locality in the arid region could have been said to be in need of artificial drainage. But the application of large quantities of irrigation water over the arid areas for many successive years tends gradually to completely fill the underground layers with water. Where the subsoil is deep and the natural outlets sufficient, any surplus water gradually works its way into the lower natural stream beds and no injury is done to the overlying soil. In other places where the soil is less porous to water, or where lower impervious layers come close to the surface, or where the slope of the country is very slight, it often happens that the underground movement of the water is so impeded that the soil gradually becomes completely saturated with the water.

**TOO MUCH WATER HARMFUL.**  
This usually happens in the lower portions of the irrigated areas. Too much water in the soil is just as harmful from an agricultural point of view as too little. In the first place the ordinary cultural operations cannot be carried on when the soil is too wet. In the second place many crops do not thrive when the soil is so saturated. In the third place the soil becomes saturated only shallowly and the water in the subsoil becomes saturated only shallowly. But the most serious injury resulting from the saturated condition of the soil is its effect upon the alkali in the soil.

**FORMS ALKALI CRUST.**  
Probably all virgin soils of this state contain a small quantity of alkali uniformly disseminated, a quantity too small as originally distributed to be harmful in the slightest degree. This alkali is slowly dissolved by water in the soil. If the soil becomes saturated so that its surface is constantly moist, there takes place in our dry atmosphere a continuous heavy evaporation from the ground surface. Of course when water evaporates any dissolved salts remain behind in the soil. Hence any alkali in the ground water remains on the surface of the soil when the water is constantly renewed from below there is a continuous addition to the alkali deposit leading to the formation of an extensive alkali crust.

**QUESTION A SERIOUS ONE.**  
This is the history of many fertile lands throughout the western part of this country. Probably there is no valley in Utah in which irrigation is extensively practiced but what has experienced these injuries in some degree. Usually the lands which were the first to be irrigated, and often those lands which were once considered the most valuable, are the ones which have suffered. In some localities considerable areas have been abandoned for cultivation because they have become unable to produce any valuable crop. In other places only comparatively valueless crops or but small yields can be produced. Slowly but steadily the injured areas are increasing in size which makes the question a pressing one for the farmer of this state.

**DRAINAGE THE REMEDY.**  
The whole remedy for these troubles is drainage. Where the injury is still slight, it is comparatively easy to restore the land to its original condition. Even if the land has been entirely ruined it can generally be profitably reclaimed, but the operation is more difficult and may require considerable time. The matter of determining the best plan by which to secure drainage adequate to reclaim land injured by seepage water, is a difficult technical question.

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tion. Soils differ greatly in their properties with respect to the movement of water, and a system that may be perfectly adapted to one situation may be useless in another. Artificial drainage is expensive and it is hence essential that no expensive mistakes should be made in procuring it.

**EXPERIMENTS BEGUN.**  
Realizing the importance of this question, three years ago the office of experiment stations of the U. S. department of agriculture began a series of investigations and experiments in drainage in this state in co-operation with the state Agricultural Experiment station at Logan. The state legislature appropriated \$10,000 for this work and for irrigation investigations during the first two years and the federal department at Washington allotted an equal amount. The last legislature appropriated only \$5,000 to continue the work and accordingly the federal department was reduced. The results obtained during the first two years have been published in bulletin 92 of the Utah experiment station at Logan.

**THROUGH SIX COUNTIES.**  
During the last two weeks Mr. C. G. Elliott of Washington, D. C., chief drainage engineer of the United States department of agriculture, has been in the state looking over the field of work and laying out the next year's work in company with Mr. C. F. Brown of this city, who has responsible charge of the work in this state with his headquarters in the Commercial club building in Salt Lake City. With the advice and co-operation of the department engineers, drainage construction and experiments have been undertaken in six different counties of the state. Some of this work has already been proved to be eminently successful and satisfactory. Other portions are still in the constructive or experimental stage.

**WORK AT THE SYRACUSE JUNCTION.**  
As an example of those which have given satisfaction it might be well to refer to and describe particularly the work done on the Clear Field Orchard company's farm at Syracuse Junction, Davis county.

This farm is situated about one mile southwest of the Oregon Short Line depot at Syracuse on what is generally known as the Sand Ridge. The ground slopes rapidly to the southwest by a series of benches with an average fall of about 50 feet per mile. Most of the soil is a sandy loam. On the lower benches and down near the lake some clay is found. The soil in the immediate vicinity of the Clearfield farm is sandy loam typical of the Ridge. Since the construction of the Weber and Davis counties' canal, the Sand Ridge has become somewhat noted as a vegetable and fruit producing section. Most of that portion of the Clearfield farm which was affected, was apple orchard. The trees were six years old and in excellent condition until 1905.

**SEEPAGE BEGINS.**  
Seepage began to show along the foot of a little bench early in the spring of 1905. Later, the area increased over several acres and summer spraying was attended with great difficulties on account of soft ground. No irrigation water was applied on this ground during the season. Alkali accumulated on the surface so as to attract attention and the leaves on a dozen fine apple trees shriveled as with heat. They lost all of their foliage and fruit. During February of

1907, this part of the orchard again became very wet and the area increased until about six acres were thus affected. At the request of the owners, this orchard was examined in March of 1907, and plans made for relief.

**THE CUT-OFF THEORY.**  
The cut-off theory was adopted in planning these drains. By this is meant the placing of the drains in such a way as to intercept the flow of the seepage water at its appearance thus preventing its spread in the lower ground. In accordance with this, a drain was laid almost parallel to the foot of the bench where the seepage was first noticed. Subsoil examinations were made by means of a soil auger showing a thick water bearing stratum of sand at an average depth of five feet. Accordingly, the grade was fixed so as to intercept the water at this depth. The grade of the tile was three-tenths of a foot per 100 feet. To obtain this depth and grade it was necessary to cut seven feet deep near the outlet. The total line was 2,400 feet, 1,400 feet of which was 6-inch tile and the balance 3-inch. Some difficulty was anticipated on account of sand and water both from a tendency to run together into the tile and also from soft bottom.

**SAND TRAPS MADE.**  
Lumber was provided for laying under the tile as were also sand trap wells reaching 2 feet below grade into which the tiles were laid. These sand traps acted as settling basins for sand. These traps have served the purpose for no doubt they were constructed and no doubt the line from becoming clogged as considerable sand has been caught in them.

The chief difficulty encountered in construction was from earth caving and sliding into the trenches and tile before the tile could be properly laid. As a result of this and the inexperience of those doing the work, the grade on the upper portion of the line is one foot nearer the surface than it was intended.

**IMPROVEMENT APPARENT.**  
The resulting improvements have been showing from the time the trenches were first opened. The very portions where the spray outfit had to be carried out of the mud last year but sufficiently dry to hold a wagon loaded with tile a day or two after the trench was dug. This part was a little firmer than most of the line and it was allowed to stand open for a short time.

A small part of the orchard when the line is nearer the surface than was intended, is still a little too wet but the effect of the new drainage was affected is now in perfect condition as far as alkali and soil moisture is concerned.

**WORK A MARKED SUCCESS.**  
Only one of the dozen trees which were in such a bad plight last year shows any bad effects now. The foreman wants to lay a branch line beneath the other in that portion which is not entirely drained and there is no question but that he will be able to dig to the required depth with the water table lowered as it now is. Work of the same nature and on most instances attended with the same marked success, has been done during the past two years in many of the different counties of the state. These counties are Cache, Boxelder, Weber, Davis, Emery, Sevier and Washington.

**WORK IN MANY STATES.**  
Five years ago the national department of agriculture took up the question of the improvement of agricultural lands by drainage. Since the time investigations have been carried on in more than half the states of the Union in all parts of the country. Mr. Elliott, who has charge of the drainage investigations, has been connected with such work since the first important progress in agricultural drainage in this country 20 or 30 years ago. He is the author of several books on this subject and is recognized as an authority in his line throughout the country. Before he became connected with the government service, he published a drainage journal, in addition to carrying on an extensive practice as a drainage engineer.

**GOVERNMENT WILL ASSIST.**  
The appropriation made by Congress is too limited to permit of any extensive drainage construction out of the public funds. The work is rather intended to be advisory and educational. The department has an efficient staff of competent engineers, and where those in need of drainage are ignorant as to the best manner in which to proceed, whenever possible the department will send an engineer to examine the system, and assist in the supervision of the work. The landowners must bear the expense of actually doing the work. The object of the department of agricul-

ture is to help the farmers to help themselves; to assist them to get started along right lines; and to prevent them from making expensive and discouraging mistakes, for it is just as easy to make mistakes in drainage work as in any other kind of undertaking. Good judgment and long experience are essential for planning a satisfactory system of drainage.

**INFORMATION OBTAINABLE.**  
In some cases in this state where the work was particularly difficult or experimental, the department shared a portion of the expense of construction, but the experimental stage may be considered as fairly passed now, and on account of the reduced appropriation available, the work of the department must be restricted to the advisory relations enumerated above. Any one desiring studies, observations, and experiments which have been made in this state, supplemented by similar data from other states has furnished a fund of reliable information which now fairly well covers the whole subject of agricultural drainage in the arid region.

**LONG LIVE THE KING!**  
Is the popular cry throughout European countries; while in America, the cry of the present day is "Long live Dr. Francis E. Clark, president of the United States Society of Christian Endeavor, tonight called the twenty-third International convention to order. A chorus of 1,000 voices swelled the welcoming ode. The convention was called to order in the presence of the governor of the state, United States senators and representatives, city and county and state officials, and a distinguished gathering of clergy and laity from the four corners of the earth. Seated in the tent in which the meeting was held were delegates from Alaska, two full-blooded Indians; a large delegation from Japan, and delegates from the dark continent and from every European country.

**CROW'S NEST COAL CO.**

J. P. Graves and J. J. Hill Unite Interests and Secure Control.

Spokane, July 9.—It is reported here that Jay P. Graves, president of the Inland Empire System and of the Crow's Nest Coal company, at Grand Forks, B. C., has bought heavily of the Crow's Nest Coal company stock and has allied his holdings with those of J. J. Hill, securing control of the company. Hill owned 45 per cent of the stock and it was necessary to buy \$3,000,000 worth of additional stock to secure control. The effect of the new ownership will be to deprive the Canadian Pacific of about 1,200 tons of coal a month, which it was getting from the colliers. Mr. Graves declined to confirm or deny the report.

**WRECK ON SANTA FE.**

Engineer Killed and Fireman and Brakeman Reported Dead.

Trinidad, Colo., July 10.—As a result of a freight wreck on the Santa Fe at Trinidad, N. M., 20 miles west of Durango, yesterday, engineer Michael Weideman was killed and it was reported that the fireman and brakeman, whose names are unknown, were also killed. The wreck is supposed to have been caused by spreading rails. Traffic on the line was tied up for 15 hours.

**JAPAN HAS MADE NO CATEGORICAL DEMANDS**

Washington, July 10.—From the state department and from the Japanese embassy here came swift and conclusive denial today of the accuracy of the statement cabled from The Hague to the London Daily Telegraph and reprinted in this country to the effect that Japan has made categorical demands upon the United States government for satisfaction in connection with the treatment of Japanese in San Francisco, and has served notice of her intention to deal with the Californians herself if the national government fails to do so.

At the state department it is said that the American public is fully aware of the nature of all the exchanges that have taken place on this subject; that there has been no correspondence of recent date and that there are no negotiations in progress between the two governments. This statement is fully confirmed at the Japanese embassy where, moreover, it is positively stated that Ambassador Aoki is not going to Japan next fall as was reported in a Japanese newspaper.

**A HAPPY MAN**

Is Amos F. King, of Port Byron, N. Y., (55 years of age); since a sore on his leg, which had troubled him the greater part of his life, has been entirely healed by Bucklen's Arnica Salve; the world's great healer of Sores, Burns, Cuts, Wounds and Piles. Guaranteed by Z. C. M. I. Drug Store, 112 and 114 Main Street. Price 25c.

## CHRISTIAN ENDEAVORERS

Dr. Francis E. Clark Calls Twenty-third International Convention to Order.

TEN THOUSAND DELEGATES.

Come from Alaska, from Japan, from The Dark Continent, and from Every European Country.

Seattle, Wash., July 10.—In the presence of 10,000 delegates assembled within the hearing of his voice, Dr. Francis E. Clark, president of the United States Society of Christian Endeavor, tonight called the twenty-third International convention to order. A chorus of 1,000 voices swelled the welcoming ode. The convention was called to order in the presence of the governor of the state, United States senators and representatives, city and county and state officials, and a distinguished gathering of clergy and laity from the four corners of the earth. Seated in the tent in which the meeting was held were delegates from Alaska, two full-blooded Indians; a large delegation from Japan, and delegates from the dark continent and from every European country.

Preceding the meeting the corporation officials and trustees met for the transaction of business. Related trials delayed the meeting, and it was after 4 o'clock when it was called to order. Dr. Clark, of Boston, was unanimously re-elected president of the United States Society of Christian Endeavor; Hiram N. Lathrop, of Boston, treasurer; George B. Graff, of Boston, clerk of the corporation, and Fred H. Kidder, of Boston, auditor, a position newly created by the board. Denominational trustees were elected as follows:

For four-year term—C. C. Brown, D. D., Findlay, Ohio (Church of God); Rev. J. Wilber Chapman, D. D., Winona Lake Ind. (Presbyterian); Rev. A. C. Crews, Toronto, Ont. (Methodist church of Canada); Rev. Alexander Gilroy, Toronto, Ont. (Presbyterian church of Canada); Rev. N. E. Grubb, D. D., Philadelphia, (Mennonite); Wil-

Ham Phillips Hall, New York City, (Methodist Episcopal); Rev. W. T. Johnson, D. D., Richmond, Va. (African Baptist); Rev. Samuel McNaughton, Boston, Mass. (Reformed Presbyterian); Rev. Robert E. Prellow, Brooklyn, N. Y. (Friends' church); Rev. James H. Straughter, West Lafayette, O. (Methodist Protestant); Rev. Hugh K. Walker, D. D., Los Angeles, (Presbyterian); Herbert L. Willcutt, D. D., dean of the Divinity church, University of Chicago, (Disciples of Christ); C. F. Yoder, Ashland, Ohio.

For one-year term—Henry Churchill King, Oberlin, Ohio, to fill the unexpired term of Rev. C. A. Dickinson. F. Edgar Barth, representing the Washington State Christian Endeavor union on the board of trustees, was unanimously re-elected. Mr. Barth is chairman of the 1907 international convention committee.

The Rev. W. T. Johnson, of Richmond, Va., is a colored man. The new members of the board are: Rev. Alex. Gilroy, Toronto, Canada; William Phillips Hall, New York; Rev. James H. Straughter, West Lafayette, O.; Rev. Robert E. Prellow, Brooklyn, N. Y.; Rev. Robert E. Prellow, Brooklyn, N. Y.

Henry Churchill King, of Oberlin, Ohio, was elected a member of the board to fill the unexpired term of the Rev. C. A. Dickinson.

The board of trustees, at the corporation meeting, elected William Shaw, of Boston, secretary.

William Phillips Hall is president of the American Tract society and American Bible league.

St. Paul, Atlantic City and Kansas City are in the race for the 1909 convention seat.

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1. The Brass Bowl. Vance.....\$1.00

2. New Chronicles of Rebecca. Little.....\$1.25

3. The Port of Missing Men. Nicholson.....\$1.50

4. The Lady of the Decoration. Little.....\$1.00

5. The Princess Virginia. Williamson.....\$1.50

6. The Mayor's Wife. Green.....\$1.50

In addition to the above we have a large stock of other popular books of the day.

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## YAMAMOTO ON JAP SITUATION

New York, July 10.—"I think the friendly relations of long standing between the United States and Japan should be preserved and the passing storm dissipated in the waters of the Pacific ocean. I firmly believe that this one incident cannot be thrown in the way of the present relations between the two countries which began at the time of my birth."

This spoke Admiral Baron Gombel Yamamoto, Japanese director of marine during the Japanese-Russian war, as a greeting to the American people today on his arrival here with his suite on board the steamship Yamato. Admiral Yamamoto has been inspecting the gunships and ships of the United States navy and is now on his way to the Pacific coast.

For the reporters, the admiral answered each question first with an expanding smile. His replies were in Japanese, which were interpreted by an aide. When asked what he thought of the intention of the United States government to send practically all of our battleships to the Pacific coast, Admiral Yamamoto, smiling broadly, said:

"I myself have no bad feelings against the United States, but it is a question for this country to answer and not for us to express an opinion."

"America is a country which has been very friendly to us for years, in fact, the treaty between this country and Japan was made at the time I was born. It is an old feeling of friendship which I do not think a passing storm can interfere with, but it depends upon the press to smooth the storm."

The admiral said that much depended upon the attitude taken by the press upon the present situation.

"Too much care cannot be taken by the press to continue Admiral Yamamoto, for a few careless words will do more harm than good. There may be sensational papers, both here and in Japan, and I ask the editors to make a thorough study of the situation before writing their views."

**G. B. BURNANS TESTIFIES AFTER FOUR YEARS**

G. B. Burnans, of Carlisle Center, N. Y., writes: "About four years ago I wrote stating that I had been entirely cured of a severe kidney trouble by taking less than two bottles of Foley's Kidney Cure. It entirely stopped the brick dust sediment, and pain and symptoms of kidney disease disappeared. I am glad to say that I have never had a return of any of those symptoms during the four years that have elapsed, and I am evidently cured to stay. I am glad to recommend Foley's Kidney Cure to any one suffering from kidney or bladder trouble." For sale by F. J. Hill Drug Co., "The Never Substitutes."

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Ladies' Panama and Voile Skirts, value \$15 to \$18, are now \$9  
Ladies' China Silk Waists, value \$8, are now \$5  
Men's Suits, value \$25, are now \$22.50

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