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NEW RECLAMATION ERA

VOL. 20

JANUARY, 1929

NO. 1



THE DESERT RECLAIMED

PHOTOGRAPH OF A PORTION OF A PAINTING BY FRANK J. MCKENZIE, REPRESENTING BROADLY THE SALT RIVER PROJECT, ARIZONA, FOR EXHIBITION AT THE INTERNATIONAL EXPOSITION IN SEVILLE, SPAIN, 1929. SEE PAGE 11.

RECLAMATION

FOR many years the Federal Government has been committed to the wise policy of reclamation and irrigation. While it has met with some failures due to unwise selection of projects and lack of thorough soil surveys, so that they could not be placed on a sound business basis, on the whole the service has been of such incalculable benefit in so many States that no one would advocate its abandonment. The program to which we are already committed, providing for the construction of new projects authorized by Congress and the completion of old projects, will tax the resources of the reclamation fund over a period of years. The high cost of improving and equipping farms adds to the difficulty of securing settlers for vacant farms on Federal projects.

Readjustments authorized by the reclamation relief act of May 25, 1926, have given more favorable terms of repayment to settlers. These new financial arrangements and the general prosperity on irrigation projects have resulted in increased collections by the Department of the Interior of charges due the reclamation fund. Nevertheless, the demand for still smaller yearly payments on some projects continues. These conditions should have consideration in connection with any proposed new projects.

*—From President Coolidge's message to Congress
December 4, 1928*

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ROY O. WEST
Secretary of the Interior

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Commissioner, Bureau of Reclamation

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No. 1

Interesting High Lights on the Federal Reclamation Projects

A COMMITTEE of water users on the Grand Valley project, which has been considering the advisability of the water users taking over the operation of the project, reported recently that the operation of the project by the Bureau of Reclamation was some \$1,300 cheaper than an estimate of the cost under association management, and accordingly recommended that the present policy be continued to the contract date of January 1, 1932.

THE Thanksgiving turkey pool on the Boise project, amounting to 25 cars of dressed turkeys, sold at 41 cents. It is estimated that the Christmas pool will amount to 79 cars.

THE Boise project reports that the Southwestern Idaho Apple Growers Association has strengthened its organization and is enlarging its field to include potato and onion growers.

ALFAFA seed and alsike clover seed produced last season on the Minidoka project are of exceptional quality and find a favorable market price. A carload of clover and alfalfa seed shipped from Rupert to a Minneapolis seed company brought the growers approximately \$10,000.

AT the State seed show held recently at Rexburg, Idaho, Minidoka project farmers took a number of prizes. Almost a clean sweep was made on Great Northern beans grown near Rupert. South Side division farmers won prizes on Federation wheat, Netted Gem potatoes, and red clover.

AT the San Francisco Livestock Show an Aberdeen Angus steer entered by D. E. Alexander, of the Klamath project, won the selection as grand champion fat steer and was sold on the block for \$1,850 cash. This was the only entry from Klamath County.

APPROXIMATELY 50,000 pounds of turkeys were shipped from the Milk River project for the Thanksgiving trade.

THE sugar factory on the Belle Fourche project was expected to end the season's run about Christmas. On November 26, the average sugar content of the beets sliced was 16.45 per cent, with a high of 18.1 per cent.

Salt River Project Makes Large Payment

The Salt River Valley Water Users' Association, the organization of water users operating the Salt River Federal irrigation project in Arizona, has sent to the Bureau of Reclamation its check for \$609,553.67 in payment of construction charges due December 1, 1928.

This payment, together with two previous payments in July and October, brings the total payments from this project this year to nearly \$1,759,000. These payments furnish ample proof of the economic success of this outstanding Federal reclamation project.

The Salt River Valley Water Users' Association originally owed the Federal Government \$10,166,000. To date it has repaid \$5,286,000, or more than half.

AT Gibson Dam, Sun River project, 7,500 cubic yards of concrete were placed during the month, leaving only 23,000 cubic yards to be placed of the total of 160,000 cubic yards.

THE Tieton Water Users' Association collected \$42,981.77 during the month of November. For the same period in 1927, collections amounted to \$41,120.50, and in 1926 to \$27,668.61.

FOUR new settlers were placed as tenants, with options to buy, on lands in the Zurich district, Chinook division, Milk River project. These tenants were placed upon property acquired by Winston Bros. Co., district bondholders. In order to aid in the settlement and development of this district, Winston Bros. Co. is assisting to some extent in financing worthy settlers.

ADDITIONAL plantings of paper shell pecans are being made on the Yuma project and it is anticipated that the acreage of this crop will be materially increased during the winter and spring months.

THE total yield of grapefruit from the Yuma Mesa will be in excess of 25,000 boxes for the season. This yield will probably be trebled in 1929 as the area of bearing trees will be materially increased.

SHIPMENTS of turkeys from the Orland project for the Thanksgiving trade totaled 35 cars of dressed birds, weighing approximately 126 tons.

THE orange packing plant on the Orland project has been enlarged to accommodate the olive growers in grading and preparing their product for shipment.

PAYMENTS totaling \$4,822,500 were made in November by the Great Western Sugar Co. and the Holly Sugar Corporation for sugar beets delivered at the dumps on the North Platte project prior to November 1:

AN automobile dealer on the Newlands project sent a prime Diamond "N" brand, 24-pound Thanksgiving turkey to Henry Ford by air mail. The postage on the turkey was \$55.65.

Colorado River Board Reports on Boulder Dam Project

The full text of the report is contained in H. R. Doc. No. 446, 70th Congress, 2d Session

THE board of engineers and geologists appointed under authority of Joint Resolution No. 65, Seventieth Congress, approved May 29, 1928, made its report to Secretary West the latter part of November, and on December 3 the Secretary transmitted the report to Congress. The resolution provided that the board should examine the dam sites in Boulder Canyon and Black Canyon on the Colorado River, review the plans and estimates, and advise as to the safety, economic and engineering feasibility, and adequacy of the proposed structure and incidental works. Maj. Gen. William L. Sibert, United States Army, retired, is chairman of the board, and the other members are D. W. Mead, engineer, Robert Ridgeway, engineer, Charles P. Berkeley, geologist, and W. J. Mead, geologist.

The findings of the report are briefly summarized as follows:

SELECTION OF SITE

The board examined both sites in question, studied the available data concerning them, the geological formations surrounding them, and the seismic history of the region. At Boulder Canyon the foundation rock is granite and associated granitic rock of excellent quality. Regular joints and more irregular fractures are numerous and there is an occasional fault zone. Test tunnels prove that these are of little consequence to within a few feet from the surface. On the whole the rock is strong, substantial, durable, and the whole mass is essentially tight. There is no danger of the rock failing to meet requirements as a dam foundation. The rock in the vicinity is suitable for construction materials, and there are local sources of good gravel. If no other site was available, the Boulder Canyon site could safely be used as far as geological conditions are concerned.

The most favorable site in Black Canyon is about 40 miles distant from Las Vegas, Nev., and the Union Pacific Railroad. A construction railroad from Las Vegas would pass near available gravel deposits and the best quarry sites. The foundation is a volcanic breccia or tuff, a well-cemented, tough, durable mass of rock standing with remarkably steep walls, and resisting the attack of weather and erosion exceptionally well. The rock formation is somewhat jointed and exhibits occasional fault displacements, which are now completely healed. It is almost ideal rock for tunneling, is satisfactory in every essential, and is suitable for use in construction.

Geologic conditions at Black Canyon are superior to those at Boulder Canyon. The Black Canyon site is more accessible, the canyon is narrower, the gorge is shallower below water level, the walls are steeper, and a dam of the same height here would cost less and would have a somewhat greater reservoir capacity. The rock formation is less jointed, stands up in sheer cliffs better, exhibits fewer open fractures, is better healed where formerly broken, and is less pervious in mass than is the rock of the other site.

There is no doubt whatever but that the rock formations of this site are competent to carry safely the heavy load and abutment thrusts contemplated. The board is of the opinion that the Black Canyon site is suitable for the proposed dam, and is preferable to Boulder Canyon.

Danger from earthquakes and deformation.—The district is recognized as having comparative freedom from present-day earth movements, and the conclusion is that danger from local earthquakes of enough violence to threaten a properly constructed dam in Black Canyon is negligible.

THE DAM

It is feasible from an engineering standpoint to build a dam at Black Canyon that will safely impound water to an elevation of 550 feet above low water. A dam of the gravity type is suitable for the site in question, provided the maximum stresses allowed do not exceed those adopted in standard practice. The proposed dam would be by far the highest yet constructed and would impound 26,000,000 acre-feet of water. Failure of such a structure would cause immense damage to the country below, and therefore the dam should be constructed on conservative, if not ultraconservative, lines. It is the judgment of the board, that the dam should be designed for maximum calculated stresses not exceeding 30 tons per square foot. This will add materially to the cost of the structure.

Cofferdams and river diversion.—To control the flow of the river during construction, the proposed plans contemplate the diversion of 100,000 second-feet of water around the dam site by means of tunnels through the canyon walls. The board finds that it is not feasible to construct the rock-fill cofferdams, excavate to bed-rock, prepare the foundation, and place concrete for the permanent cofferdams in one low-water season of less than nine months without undue risk to the men working in the excavations and inhabit-

ants of the valleys below. It is further of the opinion that the proposed diversion is inadequate and that provision should be made for diverting around the dam site, through tunnels, at least 200,000 second-feet. The height of water against the upper cofferdam should be limited to about 55 feet above low water as a measure of safety.

Permanent spillway.—Water in quantity should not be permitted to flow over a dam of this height. A permanent spillway utilizing the increased capacity of the diversion tunnels provided in the revised plans will make it practicable to prevent any expected flood from overtopping the dam.

Excavation for main dam.—It is the judgment of the board that it is feasible to make the required excavation for the permanent dam, but it is their opinion that plans and estimates of cost should include provision for the control and handling of a considerable volume of water seeping into the excavation.

POWER PLANT

While a power house must be fitted to a particular site and its equipment must be designed and selected for the particular conditions existing at that site, the entire installation will nevertheless be largely standard, and offers no particular difficulties. The plans proposed are feasible from an engineering standpoint.

ALL-AMERICAN CANAL

The bill provides for the construction of a canal connecting Laguna Dam with the Imperial and Coachella Valleys. The main canal would be 75 miles long, entirely within the United States, and for a section of 10 miles, would cross a region of sand dunes. Although difficulties are presented by the drifting sand, the board finds it is entirely feasible to construct, maintain, and successfully operate the canal. The board believes that the canal should be lined with concrete through the sand-dune region, and should be given a slope sufficient to carry the inblown sand to a suitable place for deposit and removal.

ESTIMATES OF COST

A review of the estimates for the proposed structures resulted in the board reaching the conclusion that these estimates should be modified as follows:

Dam and reservoir (26,000,000 acre-feet capacity).....	\$70, 600, 000
1,000,000-horsepower development.....	38, 200, 000

All-American canal.....	\$38, 500, 000
Interest during construction on above.....	17, 700, 000
Total.....	165, 000, 000
In this revision, stresses in the dam have been limited to a maximum of 30 tons per square foot, and a diversion capacity of 200,-000 second-feet is provided. If canal to Coachella Valley is considered a part of the main canal, add.....	
	11, 000, 000
Total estimated cost for all items in H. R. 5773.....	
	176, 000, 000

These estimates are based on a construction period of seven years.

ADEQUACY OF PROPOSED STRUCTURES

A dam of 550 feet above low water across the Colorado River at Black Canyon will be adequate in the board's opinion so to regulate the flow of the Lower Colorado as to control ordinary floods; to improve present navigation possibilities; and to store and deliver the available water for reclamation of public lands and for other beneficial uses within the United States.

WATER SUPPLY OF THE COLORADO RIVER

The board estimates the flow at Black Canyon, without further depletion, as follows:

Average low flow for a period of 15 to 20 years.....	Acre-feet 10, 000, 000
Average high flow for a similar period.....	14, 500, 000
Average of high and low periods.....	12, 250, 000

It is estimated that the present flow is depleted by water taken for irrigation in the upper basin by approximately 2,750,000 acre-feet, which amount, if added to the above estimated average flow, would increase it to about 15,000,000 acre-feet. This is the amount apportioned by the seven States compact for division at Lees Ferry.

MINERAL SALTS IN THE RESERVOIR

The waters of the Colorado are normally high in dissolved mineral salts, but the amount is well within the limits of accepted practice for irrigation purposes. The waters impounded in the Black Canyon reservoir would overflow, to a limited extent, lands in the Virgin Valley that contain beds of soluble salts. It is the opinion of the board that the actual salt content will not be increased to an injurious amount, even in the beginning, and that, in a comparatively short time, the

incoming silt will be so effective in blanketing the salt deposits that the salt content of the river waters will be reduced to about the present amount.

SILTING OF THE RESERVOIR

The best determinations available indicate that silt deposition in the proposed reservoir would be at the rate of approximately 137,000 acre-feet per year. At the end of the first 50-year period there would still be available approximately three-fourths of the effective reserve capacity for irrigation and power and a slightly larger proportion of the flood reserve capacity. It would take about 190 years to fill the reservoir with silt providing there is no additional upstream reservoir development resulting in reduction of the rate of silt delivery.

RIVER SILT BELOW THE DAM

With the continuous regulation of river flow afforded by the proposed reservoir and the virtual elimination of high flood waters a tendency to silt stabilization will follow. Ultimately the silt content will be virtually eliminated. The board believes that marked improvement will be shown within the first 10 years, especially in reduction of the amount of extremely fine suspended silt, which at present causes most damage to irrigated lands. Thereafter improvement will be gradual, though erratic, on account of occasional floods.

POWER

It is believed that under present conditions of irrigation a continuous output of 550,000 horsepower, or 1,000,000 horsepower on a 55 per cent load factor, could be maintained even during the years of normal low flow. As the use of water for irrigation increases, the amount of water available for power will decrease and a time will arrive when, during periods of low water, the full estimated amount of power can not be maintained. Within a 30 or 40 year period, even with a reregulating reservoir, the power output may be reduced to five-tenths or six-tenths of the capacity of the proposed plant during a long dry period.

The whole matter is further complicated by the proposed seven States compact. It is quite probable that the compact attempts to apportion more water than the actual average undepleted flow of the river. The situation is still further complicated by the fact that the upper States are authorized to take more than an equitable proportion of the flow of the river, for any one or more of a series of dry years, provided they permit a total

of 75,000,000 acre-feet to flow down the river in a period of 10 consecutive years.

In any event, the upper basin has, by virtue of its location, first call on the water of the river. The withdrawal of the allotted share of the annual flow during any series of years of low flow may make it impossible to carry out the terms of the compact during the latter part of a low 10-year period. If the low flow continued for a considerable term of years, the proposed storage at Black Canyon would be inadequate to provide sufficient water for the lower basin through such a period. The power output would also be seriously affected and might be reduced below the estimated minimum previously stated. With the uncertainties of the flow at the Boulder Dam it is impossible to estimate closely the average annual putput of power which would obtain during a 50-year period.

ECONOMIC FEASIBILITY

In considering the economics of this project, the board recognizes the importance, among others, of the following factors:

1. It is of much economic importance that an agreement limiting the amount of water assignable to Mexico should be made prior to the completion of the Boulder Dam project.
2. The board believes that the growing demand for power in Southern California, when considered on a conservative basis, will be sufficient to absorb the probable power output of the proposed hydroelectric plant.
3. If the Boulder Dam project is completed and put in operation, carrying as it does the costs of flood protection works and the All-American canal, it will be impossible to meet operation, maintenance, interest, and a sufficient sinking fund to retire the cost of the project within a 50-year period.
4. If the income from storage can be reasonably increased and the capital investment reduced by the cost of the All-American canal, together with a reduction for all or a part of the cost properly chargeable to flood protection, it would be possible to amortize the remaining cost with the income from power.

AN indication of the increase in prosperity of the Rio Grande project is shown by the number of new schools being constructed. During the past year four new grade schools were constructed at various points in the Mesilla Valley, two union high schools at Hatch and Anthony, and enlargements made to school buildings at Hill and San Miguel.

Status of Federal Reclamation Work in the United States

Address before the American Railway Development Association, Chicago, Ill., December 7, 1928

By George C. Kreutzer, Director of Reclamation Economics, Bureau of Reclamation

DURING the last year or two, and more pronouncedly during the last few months, a one-sided discussion has taken place on reclamation as carried on by the Federal Government. Some of the most influential agricultural, civic, and professional organizations seem to have reached the conclusion that Federal reclamation should cease until there is a need for more agricultural products of the kinds now being produced in abundance. Broadly this conclusion is based on the belief that money spent in reclamation is taken from the General Treasury and that farmers thereby contribute to the creation of more agricultural products to compete with those grown by themselves. It therefore involves first the origin and support of the reclamation fund; second, the completion of products produced on reclamation projects with those sent to market by farmers in general, and third, a lack of appreciation of what these enterprises have contributed to the establishment of near-by cities and towns, of profitable lumbering and mining industries, and to the enlargement of successful livestock operations, all of which have created larger markets for both manufactured goods and agricultural products produced elsewhere.

THE RECLAMATION FUND

The reclamation fund is not collected as general Federal taxes. It is made up of a combination of revenues from a portion of the receipts from sales of public land within the 16 Western States, from bonuses, royalties, and rentals from petroleum and other minerals, and from the repayments by water users. It is significant in this connection that the main source of revenue for construction now comes from settlers' payments on older projects. During the past few years the average gross annual revenue flowing into this fund has averaged about \$8,500,000.

THE RECLAMATION ACT

The Federal reclamation act was advocated and approved by President Roosevelt. It became a law June 17, 1902. It was a part of his farsighted program of conservation. It was his belief that, instead of depleting natural resources in the West, there should be established irrigation projects of lasting benefit and use of the local communities and the Nation.

This was especially logical if these projects were financed by money derived from the sale or rental of natural resources within the several Western States. The West would then be financing its own development. This is precisely what the reclamation act and amendments thereto provide. The policy of Federal river and harbor improvement had previously been adopted as a national program.

President Roosevelt's message to Congress in 1901 stated in advocacy of the reclamation measure: "The storing of flood waters of our rivers is but an enlargement of our present policy of river control under which levees are built on the lower reaches of the same stream." However, reclamation differs in two fundamental features from river and harbor control work, first in the source of the fund which comes from the West and second the amounts expended must be repaid directly by those who use water.

Subsequent to the approval of this act, the conservation of timber through the creation of forest reserves became a national policy. This removed large areas of public land from ever being taxed by the States. Additional large areas were included in national parks and Indian reservations. It was only natural that a portion of the revenues from the remaining public domain should be set aside to create in the West an enlargement of irrigation in a country where water must be supplied by artificial means to grow crops and maintain a profitable agriculture.

EXTENT OF RECLAMATION

Since reclamation has been a policy of the Government 24 projects have been constructed and 4 are under construction at present. The 24 constructed projects located in 15 Western States include 1,956,910 irrigable acres, to which a full water supply is furnished. In addition, the Government furnishes supplemental water to 1,482,950 acres which are included in private enterprises which had an insufficient water supply. The projects are subdivided into 38,428 farms with a resident population of 143,227. The population of the 207 cities and towns included in these projects is 429,683. The projects and towns are served by 685 schools, 683 churches, and 135 local banks.

Previously reclamation was carried out exclusively by private capital, which naturally selected the less expensive and least difficult engineering tasks. Along

western streams the early pioneers could construct a brush or loose rock dam and build with their own labor, teams, and scrapers a ditch to divert water to their meadow or bottom lands. Mutual companies or districts took the next step to construct irrigation works for a group of neighbors where it required a pool of their resources to bring the common benefit of water to the community. The large and difficult undertakings were left because of the large amount of money required to provide the works. These were the tasks undertaken by the Government which could finance them out of the reclamation fund. It was an independent agency that could assist in getting water rights adjudicated on State and interstate streams and provide supplemental water to many near-by enterprises at reasonable rates. This accounts for the large area previously mentioned as receiving part of its water from Government works.

ECONOMIC CONSIDERATIONS

The insistent demand by organizations previously mentioned to stop reclamation is brought forth as a measure of farm relief. In advocating such a course the fact is lost sight of that the agriculture on these Federal projects does not depress general agricultural market conditions. These enterprises make more of a market than they fill. An analysis of almost any typical reclamation project will conclusively show this to be true. The Salt River project in Arizona contributes a cheap food supply to Phoenix and a half dozen other towns on the project. Cheap power and local food make the operations of the Inspiration Copper Co. possible. This project with its production of power and green foods has stimulated other mining industries in Arizona. The people on the project and in the towns consume large amounts of agricultural products grown elsewhere and buy great quantities of manufactured goods. In 1922 Senator Ashurst prepared a statement for the Congressional Record on the carload shipments from other States to the Salt River project. These totaled 7,935 loaded freight cars of goods, wares, and merchandise which were shipped from 43 different States. The shipment from the Corn Belt States totaled 2,037 cars of various kinds of merchandise. The people who made these goods consumed farm products which were grown mainly outside of the irrigated areas.

Mr. B. E. Stoutemyer, district counsel of the Bureau of Reclamation at Portland, stated in an address before the Oregon Irrigation Congress recently with reference to the Minidoka project, Idaho, as follows:

This project was located in a section where there was no settlement, no towns, and no irrigation until the Government project was built. This is also a typical and representative project in the class of farm products grown.

In 1927 the project included 2,390 farms. On these farms there were 7,091 residents and there were 7,950 residents in the project towns. It is evident that each of the 2,390 farm units supported two families, one family on the farm and one family in the towns on the project.

In addition to these two families supported on the project by each farm unit, it is also certain that the purchases of the two families keep a third family employed in the industrial and commercial centers of the East, Middle West, and Pacific coast, so that each farm unit supports three families—one on the farm, one in the project towns, and one in the commercial and industrial centers. Of these three families all are consumers of farm products, but only one is producing farm products.

The farm population for all projects is 143,227 and there are 429,683 persons in project towns. This is a ratio of one to three.

He might have added also concerning Minidoka that out of this sagebrush desert a total wealth has been created for farms, improvements, equipment, and livestock estimated at \$23,000,000. This does not include the value of town property, factories, railroads, highways, or public improvements. In 1921, the latest year for which data are available, the value of manufactured goods shipped to the project amounted to \$3,430,000.

One of the Government's successful projects is in the Yakima Valley, Wash., and last year the Yakima Chamber of Commerce estimated that eastern firms took about \$30,000,000 from the valley in return for goods and merchandise of all descriptions purchased by the residents of Yakima, Benton, and Kittitas Counties. This included everything from breakfast food to automobiles.

Mr. Stoutemyer stated further with reference to the character of the products produced on the Minidoka project:

On this project, as well as on nearly all of our reclamation projects, the crop most extensively grown is alfalfa hay. It also grows a limited amount of wheat which is one of the farm crops of which we have a surplus for export. But the acreage of alfalfa and clover is about three times as much as the acreage in wheat. The total acreage devoted to alfalfa and clover is 45,454 acres. Of this 41,259 acres are cropped for hay and 4,195 are harvested for seed. Both alfalfa seed and clover seed are products which we import to a considerable extent.

Alfalfa and clover hay is used extensively in the keeping of livestock on farms and for winter feeding operations. The need for more alfalfa hay adjacent to the western ranges is urgent due to the changed conditions in the livestock industry. When cows were worth \$15 a head and ewes \$2 a head, it was not important if part of the herd was lost during a severe winter. Now cows are selling for \$75 a head and ewes at about \$10. They are so valuable as to make the loss of part of the herd on the range serious. As a result, stockmen, who are not near a cheap supply of hay are carrying only about half the number that could be carried with a near-by supplemental feed supply. The shortage of feeder cattle and the high price of beef has caused appeals to be made to lower the tariff on feeder cattle from Canada and Mexico. Reclamation should be extended wherever winter feed shortages are serious to make the highest use of our ranges and provide feeders for finishing in the Corn Belt.

The sheep industry is essentially a western industry and is dependent for its expansion on more alfalfa or other hay near the ranges. For a number of years the average family has been unable to buy lamb because of its high price. This high cost is not created by finishing lambs for market but by the high cost of feeders. Feeder lambs have been selling from 11 to 13 cents per pound at shipping time. Along with an increase in sheep would come an increase in wool production. In 1927, 328,000,000 pounds of wool were produced in the United States and we imported 264,000,000 pounds from foreign countries.

On northern projects in 1927, 61,963 acres of sugar beets were grown, producing

744,000 tons of beets, valued at about \$6,000,000. In the same year the United States imported 4,126,000 tons of sugar, but produced only 1,164,000 tons. The sugar-beet industry affords employment for a vast number of people beginning with the hand labor to grow the crop and ending with the operation of the refineries. They are all users of food and fiber produced in this country. This industry is on the increase and ought to be encouraged. The development agents of western railroads have some interesting figures on what an acre of sugar beets means in revenue to their lines, which shows the economic importance of this crop in supporting modern transportation.

We contend that if thoughtful consideration is given to the character of products coming from these projects and the location of the projects themselves, with reference to other industries, no one would object to a modest program of reclamation.

THE 10-YEAR PROGRAM

This is what former Secretary of the Interior Work had in mind when he adopted a 10-year program of construction. This was based mainly on improving conditions on existing projects and adopting new ones which involved partially irrigated land with an inadequate water supply or water provided by private development at such high rates as to tax settlers off their farms. In this latter class are the Owyhee and Vale projects in Oregon, the Minidoka gravity extension in Idaho, Echo Reservoir in Utah, and the Kittitas in Washington.

Improving conditions on constructed projects included drainage to relieve settlers of seepage, constructing additional dams or other improvements to



Irrigated sugar beets on the Minidoka project, Idaho

facilitate irrigation and complete other unfinished work. This tentative program should be completed in 1937.

ECONOMIC PROBLEMS

In completing the projects already begun and in carrying on reclamation in the future, we must recognize that to make reclamation socially and economically successful, is not a simple undertaking. Great changes have taken place in agriculture during the past 25 years. Reclamation must be adjusted to the changes.

Reclamation consists of two separate and distinct operations. One is the building of the works to provide water. The other is the preparation of the land and the improvement of the farms so that the water can be used. The works are well built and there is no question concerning the ability to deliver water to farms to meet the needs of farmers and do it efficiently and economically.

Thus far the second phase has never been regarded as a part of Federal reclamation. It was left entirely to the unaided efforts of the settlers. There is a difference of opinion whether that is the proper solution. Many still believe that if the land is good and the water supply ample the farms will be settled and somehow a profitable agriculture will be created. In cooperation with the development departments of several transcontinental railroads we have tried to secure settlers for unoccupied land under the canals. Where the farms were partially improved, with a livable house and suitable outbuildings, and partly prepared for irrigation, we were able to get settlers. On the unimproved land the results were negative. Settlers came, looked over the farms, and moved on. They did not

have the money to build houses and farm buildings, fence, and level land and have enough left to live until a crop was grown. These were good tenants with limited means. Few people realize the cost, work, and sacrifice involved in changing raw sagebrush land into a well-improved and profitable farm. Experienced tenants or the sons of irrigation farmers know what this entails and will not rent or buy raw land.

This is the unfilled gap between the completed canal and paying farms. There is no agency now which partially improves farms before settlement or furnishes money on satisfactory terms to assist the settler in completing the improvement and equipment of farms. Funds can be secured in many localities on satisfactory terms to buy livestock, but no agency furnishes it to erect houses, farm buildings, or to provide fences and leveling. Federal land banks can only loan on improved farms producing definite and certain incomes. Local banks can loan money for 90 days and sometimes for six months, but this is far too short a period. Besides the annual interest rate in these new regions is usually 10 per cent or more.

Railroad officials and representatives of the Bureau of Reclamation have urged local communities to organize financing corporations. These communities are long distances from the money centers and have not the money available locally or means of securing the money for development purposes. The States have been approached, but some are prevented from furnishing this aid by constitutional inhibitions. Others have not the means. In other countries this necessary credit and aid is provided by the same agency

that builds the works. This plan has been tried long enough to remove this phase of reclamation from the realm of experimentation. At present some 30 countries give aid in settlement. Advances range from \$2,000 to \$3,000 and the interest rates vary from 3½ to 6 per cent, repayments being allowed over a long period of years.

A bill now before Congress is intended to furnish a laboratory test of this help in settlement and farm development. It authorizes that \$500,000 be taken from the reclamation fund for this purpose. Not more than \$100,000 would be needed the first year. This measure would limit advances to not more than \$3,000. The settler would have to match the money provided and a mortgage would be taken on land and improvements for the amount advanced. It would restrict loans to the erection of houses and outbuildings and to the preparation of land for irrigation. The money would be returned in a shorter period by requiring the settler, as soon as the farm was developed and income assured to secure a loan from the Federal land bank.

Wisely directed credit for this purpose would complete the settlement of projects and assure an agriculture which would return the cost of irrigation works in accordance with reclamation law. I hope those of you who are interested in western reclamation will secure copies of H. R. 9956 and S. 2829 and make a study of their provisions.

What has been stated regarding Federal projects is equally true concerning private irrigation and drainage districts. The default in the payment of interest and principal on bonds is largely due to a lack of settlement and farm development on these enterprises. Bondholders are confronted with the problem of writing off part of the debt or contributing additional funds to create project earning power. Up to the present, except in a few instances, writing off part of the debt has been resorted to.

INVESTIGATIONS IN THE SOUTHERN STATES

Investigations made in seven of the Southern States show that raw farm land, even though drained, falls far short of the full purposes of reclamation. Draining water from swamps without removing timber and stumps leaves the new settler with tremendous obstacles to be overcome. To successfully establish farming communities requires that areas be developed large enough to give them an agriculture independent of that of the surrounding country. Homes should be provided for at least 200 settlers working together in one community to solve their



Harvesting almonds on the Orland project, California

common economic and social problems. Drainage, roads, schools and other community improvements must be provided as part of the development. Where land requires clearing, a portion should be cleared on each farm and prepared for cropping before the settler acquires the land. An agricultural credit fund should be provided from which advances can be made to supplement settlers' capital in improving farms. This would leave a large part of the settler's capital to be used for the purchase of farm implements, tools and machinery, work stock, meat and milk animals, seeds and fertilizers, and for meeting living expenses while the first crops are being grown. A development and crop program should be thought out in advance of settlement. Repayment for farms and advances should be permitted over a long period with a low rate of interest.

In the southern section of our country the main crops are cotton and tobacco, largely produced by tenants. The wealth they produce goes largely to those who handle and process the raw material. They do not produce the foodstuffs required in their States for man and beast. In 1920 the amount of cash sent out of the seven Southern States under investigation for bread, meat, grain, hay and forage, and other foods and feeds was \$1,408,851,000. For the 12 Southern States the food and feed deficit was about \$2,500,000,000 per year.

The South needs distinctly fewer tenants and more farmers who cultivate the land they own, and a change in its agriculture. This can best be accomplished by demonstration planned settlements utilizing the best experience in reclamation and the science of farming. Doing this need not add to the surplus of a single crop now produced in abundance. It should lessen crop surpluses wherever practiced. Doctor Branson, of North Carolina, states it is manifestly wise for a farmer to produce his own hog and hominy, hay and forage.

Although the West and South differ widely in soil, topography, and climatic conditions, and the methods of reclamation would show wide variations, the human problems of settlement and economic development are essentially alike. There is no question of the adequacy of the irrigation works constructed by the Federal Government in the West, nor of the reclamation work contemplated in the South. In each, however, more and more attention must be given to the solution of the problem of the settler of small means during the early years of developing his farm.

The value of Federal reclamation not only to the West, but to the Nation as a whole, was forcibly brought out by

Owyhee Irrigation Project Booklet Issued by Bureau

AN illustrated booklet has been issued recently by the Bureau of Reclamation, giving information for prospective settlers concerning the Owyhee irrigation project in eastern Oregon and western Idaho. The project is discussed under the headings of "Location," "Irrigation Plan and Cost," "Payment for Water Rights," "Present Development," "New Land Appraised," "Need for Settlers When Water is Available," "Soil and Climate," "Crops," "Livestock and Poultry," "Crop Utilization and Markets," "Towns," "Railroads and Highways," "Recreation," and "Cost of Materials and Equipment."

The bureau points out in the opening paragraph that it can not be definitely stated when water will be available for irrigation, as this will depend on the progress made in construction and upon the amount of appropriations made by Congress from year to year. Accordingly the bureau does not recommend that settlers purchase privately owned land and attempt to farm it before water is available, as the precipitation in this section is too low to permit profitable farming without irrigation. Public land under the proposed works has been withdrawn from entry and will not be restored until water is available. Following out the general policy of the department to prevent land speculation each 40-acre tract has been classified and valued by an independent board of appraisals without reference to the proposed irrigation development. The values for undeveloped land vary from \$1 to \$15 per acre, depending on the depth and character of the soil and the smoothness or unevenness of the land which affect the cost of preparing it for irrigation.

The contract between the Owyhee irrigation district and the United States provides that all land excepting that in the pumping districts and under the Owyhee Canal, held in a single ownership in excess of 160 acres, shall be sold to settlers

President Coolidge in his message to Congress on December 4, in which he said:

For many years the Federal Government has been committed to the wise policy of reclamation and irrigation. While it has met with some failures due to unwise selection of projects and lack of thorough soil surveys, so that they could not be placed on a sound business basis, on the whole the service has been of such incalculable benefit in so many States that no one would advocate its abandonment.

at not more than the appraised value. Under the reclamation law water can not be furnished to land in a single ownership in excess of 160 acres. Lands held in ownerships of less than 160 acres have also been appraised and may be sold for more than the appraised value upon the condition that 50 per cent of the selling price in excess of the appraised value shall be turned over in cash to the irrigation district to be applied as a credit to the water right on that particular piece of land.

The Owyhee project provides for the irrigation of lands in Oregon and Idaho along the southern and western sides of Snake River Valley. Of the 125,000 irrigable acres in the project about 70,000 acres are in the ir natural state covered with black sagebrush. About 40,000 acres are under privately managed irrigation districts which derive their water supply from the Snake River by means of pumping. Of this area about 30,000 acres are in cultivation. About 12,000 acres are irrigated by gravity from the old Owyhee Canal, also under private management.

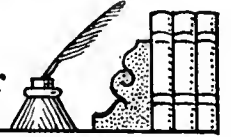
A contract has been entered into for the construction of the Owyhee Dam and work is now in progress on the construction of a railroad to the dam site. This dam, when completed, will be 405 feet high, towering 56 feet above the 349-foot Arrowrock Dam, which is the highest completed dam in the United States, also constructed by the Bureau of Reclamation on the Boise project, Idaho, and topping by 43 feet the 362-foot Schraech in Switzerland, the world record holder at present. The dam is designed as a concrete arch with a crest length of 840 feet, a volume of 542,755 cubic yards, and will store 715,000 acre-feet of water.

It is stated by the department that the completion of the project will afford opportunity for 1,000 to 1,200 settlers in addition to those now farming in the pumping districts and under the Owyhee Canal. Although undeveloped land on the project should not be purchased until the works are completed, settlers who desire to become familiar with the climate and farming conditions in anticipation of entering or purchasing irrigated farms when water is available should have little difficulty in securing places to rent on some of the lands now under irrigation either on this project or on the Boise Federal irrigation across the river in Idaho.



Reclamation Project Women

By Mae A. Schnurr
Secretary to the Commissioner



New Year Suggestions

ANOTHER year to plan and take advantage of the experience of the past year.

Some of us have, in good faith, set up a budget, only to have it topple before our very eyes by the ravages of unexpected expenses. This is particularly true of a family budget. Sometimes it is set up too "tight."

A great deal of worry over what seem to be "unexpected" household expenses could be forestalled if some recognition were made of them in the annual budget. Sickness, new clothing needed, replacements of furnishings, repairs to the car, entertaining, and obligatory gifts are among the commonest of the supposedly unpredictable expenses that often upset the budget.

The exact cost of medical care will, of course, be unknown, but if an average of several years back be taken, a tentative monthly allowance can be assigned for "health." If this is left to accumulate

when unused, the visits of the doctor need not cause financial consternation.

A definite sum, not to be exceeded, can be allowed each one in the family for clothing. This will be as generous or as small as previous experience has indicated to be necessary. The purchase of the more expensive articles like coats and suits can be planned for the months that are otherwise least heavily burdened. Similarly, the cost of running a car for a year can be estimated and distributed. Limited allowances for gifts, vacations, and entertaining can be made, provided the members of the family cooperate in adhering to them.

The following set-up is suggested as a nucleus, to which can be added particular classes peculiar to your needs:

Use a large double sheet of paper, dividing it into 13 vertical columns, one for listing the 10 usual groups of expenditure—food, housing, operating, furnishing and equipment, clothing, health, development, personal, automobile, and savings—and one for each month of the year

in which to enter estimates of expenditures in each one of these groups.

Certain fixed expenses, like payments on a house, insurance premiums, telephone bills, and many others occur regularly in all months or certain months. Set them down in the proper columns. Divide your annual allowances for other expenditures in the same way, estimating them as best you can by what that department of living cost you last year if you kept a record. This annual spending plan, when completely filled in, will have to be adjusted to the monthly income. Very often the first plan exceeds the actual income and has to be pruned down until your estimate fits what you will have to spend. If you have never kept household accounts, you will have to guess to some extent. Often after careful spending records have been kept for a month, you can make a plan for the coming year. January first is a good time to make a beginning.

Congratulations, Orland Project Women

At the orange and olive exposition, held recently at Oroville, Calif., first prizes were awarded Orland oranges and olives, and the exhibit as a whole received two ribbons. The exhibit from the project was made possible through the cooperation of the water users' association, the chamber of commerce, and the Orland orange growers.

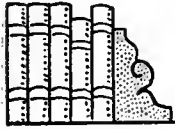
A striking feature of the exposition, which, according to an article in the San Francisco Examiner, drew the attention of every observer, was the little home canneries, developments of domestic skill in the preserving, candying and processing of fruits and vegetables. Commenting on these, Ernest Hopkins says:

"Some of these little home canning factories put up the very best and classiest products of the sort that can be found. Their output is small and choice; their history is almost invariably the same. Some Sacramento Valley housewife will have started putting up this or that exceptional product of her husband's farm, at first as a labor of love. Presently a farm center or improvement club will

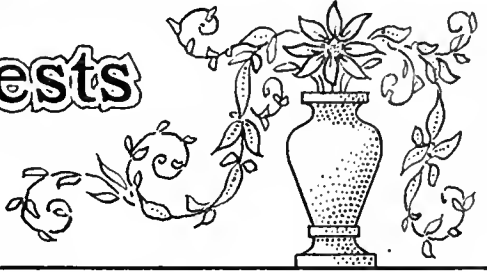


Irrigated pumpkins, North Platte project, Nebraska-Wyoming

and Their Interests



and Associate Editor
New Reclamation Era



have staged one of these delightful little fairs that are always occurring throughout the valley, and the housewife's candied jujubes or glacé pears will have attracted attention and won a blue ribbon."

It's an easy step from the labor of love to the extra cash of a commercial venture. An exceptional crop of tomatoes or cling peaches commanded too low a price from the canneries because they were, surprising as it may seem, too large to can. To keep the crop from being a total loss a little canning shed and necessary equipment are added to the farm assets and the housewife's skill becomes of commercial value. Most of these products of her skill and energy find a ready market near home.

The exposition boasted an astonishing number of these farm-canned products. From one housewife came an unusual display of candied apples, figs with great walnuts inside, tomatoes and beans in glass jars, and other specialties of her own devising. On other tables were dried figs, apples, and peaches that were the last word in appetizing appearance; figs in Christmas boxes, glacé fruits, prize persimmons, and big pomegranates. Another table showed a prize-winning display of preserved quinces, glacé apricots, and candied jujubes. Not the least was the gogutza, a striped and speckled giant Sicilian gourd containing an edible fiber without taste or flavor, but which, when cooked in concentrated fruit juice, becomes transformed into anything you want. Witness the metamorphosis wrought by one exhibitor who is making perfectly good maraschino cherries out of this humble product, glacé peaches and lemons, and other fruit-flavored dainties.

Everyone voted the exposition a great success, and the Orland project was proud to have had such a prominent place in it.

Of Interest to Project Mothers

In the case of growing boys and girls it is felt that there must be a definite allowance for protein and minerals in the

diet as well as for energy. Otherwise it might be possible for a diet to furnish sufficient energy but not enough body-building material. At certain ages boys and girls may need from one to one and a half times as much protein and mineral material as a man.

There is nothing astonishing in the phenomenon of the always hungry boy or girl between 9 and 18 years of age. This normal hunger, especially evident in the active boy between 14 and 18, needs to be appeased with foods which supply protein and minerals as well as energy, so the mother who provides plenty of milk, eggs, fresh vegetables, and fruits in the daily meals is wisely supplementing the bread and butter, cereals, potatoes, cookies, or other energy foods.

Village Planning Big Factor In Community Life

City planning as practiced in metropolitan centers has its counterpart in the development of villages that serve as social and trade centers for farming communities. The automobile affords the farmer a wider range of choice in selecting his recreation and in selling his products and buying supplies. Some of

the elements of good physical make-up of towns and villages are convenient and pleasing exits and entrances, broad tree-lined streets, a common or village green as a civic center, park and playground space, sanitation, good architecture in private dwellings, as well as in public buildings, which should be conveniently located, and all set back from the streets and surrounded with ample lawns and clean and attractive borders. Villages that do not minister to the needs of the farming communities are likely to complain of the drift to the cities and of ruinous competition. Villages that are attractive, as well as serviceable, also profit from the ever-increasing army of summer tourists.

Preventive planning, which foresees and prevents expensive mistakes in building, is recommended to village communities. As in the cities, rebuilding after a bad start may be expensive but cheaper in the long run. Village planning is in its infancy. It represents not a waste but a saving of money in forestalling the need to spend great sums in the future for reconstruction and in providing for the economic, social, and esthetic welfare of the 20,000,000 people who live in villages or small towns and of the 30,000,000 farm people who use them.



Paper shell pecan grove on the Valley division of the Yuma project, Arizona

Cooperative Dairying on the Minidoka Project, Idaho

BROOKS DARLINGTON, son of the superintendent of the Minidoka project, Idaho, has written an interesting article, printed in a recent issue of the Burley Bulletin, describing the work of the Mini-Cassia Cooperative Dairymen's Association, from which the following is taken:

Out on the fringes of the city is an industry about which few Burley people are informed. A modest-looking building, formerly the potato-flour plant, there houses the working base of the Mini-Cassia Cooperative Dairymen's Association.

In the cheerless dawn of morning a fleet of eight trucks may be seen "scooting" out along the country roads collecting burdens of milk and cream from members of the association. There are approximately 550 calls to make.

The fleet of trucks hurries back and deposits its cans of milk and cream at the Mini-Cassia plant in Burley. Each can bears a number, which indicates its owner. The daily shipments of each member producer are in that way accounted for. If the dairyman has already separated his milk, the cream is shipped direct to the Jerome Cooperative Creamery, with which the local unit is affiliated, where it is converted into butter, ice cream, and buttermilk. Each can of cream is worth about \$20.

The unseparated milk is first dumped into a big vat, then pumped up into a machine where spiral heated flanges

resolve through it, bringing the temperature to about 98° F. This is approximately the temperature at which it comes from the cow and is the most efficient heat for separation. The separation process is next. The cream flows from this big separator over a cooler and into waiting cans at the rate of \$3 a minute.

The cream obtained here is shipped to Jerome the same as that which is separated on the farm. The skim milk, heated to about 115°, flows into two huge vats, where the curdling process takes place. The heat has activated the bacteria in the milk, which causes precipitation of the curd. When the hard material has settled on the bottom the whey is drained off and returned to the producers to be used as swine food.

The curd is shoveled into burlap containers and a number of these are put under a press and subjected to enormous pressure, and behold, there is casein, that magic substance. The casein looks like "cottage cheese", but is harder and dryer. This, then, is casein in the making. This by-product of the dairy industry then goes to the Buhl plant where it is further dried, then shipped East to be converted into a multitude of articles and substances.

This cooperative dairying is more of an industry than most people think. There are 17 people employed in the plant alone. But the most surprising fact is that the Mini-Cassia Dairymen's Association pays

out about \$1,000 per day for cream and milk. Thirty thousand dollars a month pouring into the Minidoka project is a lump of gold not to be sniffed at.

The association, according to Fletcher Haynes, local manager, has this year shown an increase of approximately 25 per cent over 1927. This organization is one link in a big hook-up. Together with associations in Twin Falls, Wendell, and Buhl, it is affiliated with the Jerome Cooperative Creamery. The products of these groups are marketed through the Challenge Butter Association of Los Angeles, another cooperative organization. Challenge Butter is in turn affiliated with the Land O'Lakes Association in the Middle West and the East.

Facts such as the \$1,000 per day rolling into the farmers' pockets mean a good deal to the future of this region. A semi-monthly cream check is a guaranteed income for the producer, an insurance against poor crop years, a stable profit year by year. The great expansion of the Mini-Cassia Association in two years is proof that more and more settlers are coming to see the wisdom of keeping a dairy herd.

AT the end of November, 23,102 bales of cotton had been ginned on the Yuma project compared with 12,130 bales at the same date the year before. The price quoted was 20 cents a pound.



Purebred Holstein dairy cattle on the Minidoka project, Idaho

The Exhibit of the Bureau of Reclamation at Seville, Spain

From an article by Miss Leila Mechlin in the *Washington (D. C.) Sunday Star*, December 2, 1928

THE Bureau of Reclamation of the Department of the Interior has prepared an interesting and impressive pictorial showing of its work for our Government exhibit at the exposition to be held in Seville, Spain, in 1929. This exhibit, which has been prepared and planned by John H. Pellen, of the Bureau of Reclamation, comprises a large mural painting representing a typical reclamation project, an equally large model of a 40-acre irrigated farm, 12 transparencies, colored, showing different projects—dams, picturesque waterways, fields under cultivation, and the desert before and after reclamation; also 8 enlarged bromide prints colored by hand, showing different crops, the harvesting of crops, and other irrigation projects—the story of a great work told, and well told, in pictures.

The mural painting, which is at least 14 or 15 feet long, represents a typical irrigation project in an arid part of our

great Southwest, and depicts the conservation of water in the mountains for irrigation and electric power by the use of storage dams, a diversion dam, and a distributing system of canals and laterals, a scene designed somewhat after the Salt River irrigation project in the State of Arizona. In the foreground is the desert, with sagebrush and strange cactus growths, then comes a wide area which is like a green carpet unrolled on the desert's sandy floor at the base of the foothills, then the mountains towering high with a glimpse, in a midway gap, of cascades of water—three great falls like steps over three gigantic dams. Above the mountains is the blue sky, broken and made more beautiful by floating clouds tinted by the late afternoon sun. It is an extremely realistic scene, and yet one in which the painter, Frank J. McKenzie, has introduced more than a little poetic suggestion, using artistic freedom in expression. A photograph of a portion of the painting

is reproduced on the front cover of this issue of the ERA.

Mr. McKenzie is one of those scientific illustrators who find it possible to be both accurate and artistic. Certainly nothing could better exhibit to the people of Spain the methods which our Reclamation Bureau has taken to fulfill the old prophecy, "The desert shall blossom as the rose," than does his recent work here.

The model of the 40-acre irrigated farm tells the same story in a different form. Here a single homestead with its farm land is set forth; a bit of Mr. McKenzie's gigantic green carpet is seen at close range. This model was executed by Victor Mindeleff. The model was designed in this instance, however, by Mr. Pellen.

The transparencies and the large bromides were colored by hand by Mrs. Carrie B. Allen, of the Bureau of Reclamation, and they carry the story still further and over a wider range.

Washington Office Christmas Fund Society

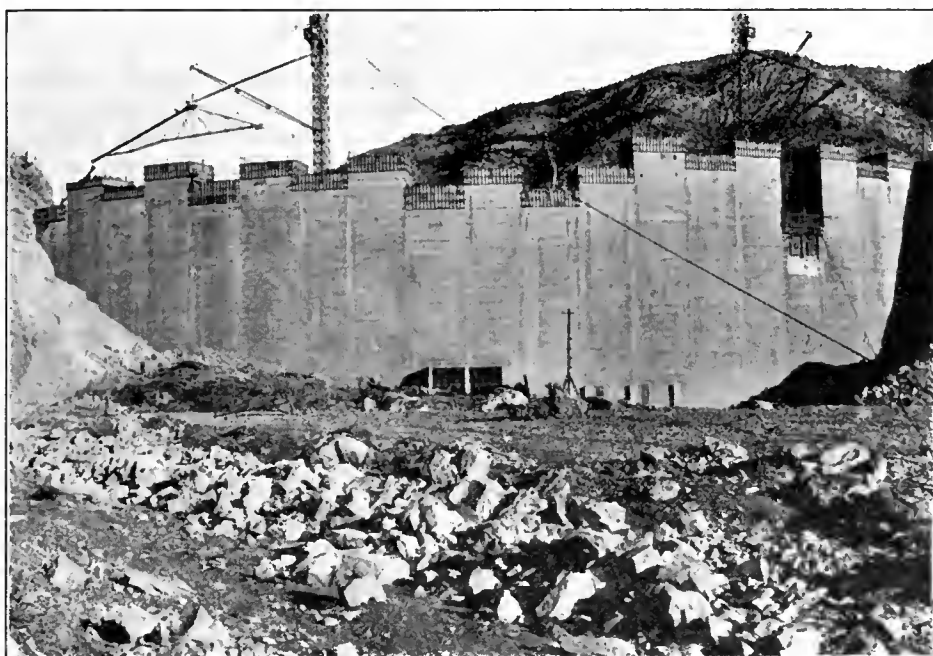
The Reclamation Christmas Fund Society was organized about 12 years ago by employees of the Washington office of the Bureau of Reclamation for the purpose of establishing a convenient form of saving of a fund with which to make Christmas purchases. The fiscal year of the society runs from December 1 to November 30: Shares are subscribed at the beginning of the fiscal year, each share representing an amount of \$1 per month to be paid into the fund. Payments are made semimonthly on each pay day and the entire fund with earnings matures on November 30 of each year. In addition to the savings feature of the society it has another important advantage in loaning money to its members during the year. Members are permitted to borrow approximately $1\frac{1}{2}$ times the amount they will pay in during the year, each loan being secured by the indorsement of two members of the society. Delinquencies in payments on shares are penalized 1 cent per share per day of delinquency after three days of grace.

During the year ending November 30, 1928, the 29 members paid in a total of \$2,916 in shares or approximately \$100 each. The earnings during the year amounted to \$82.46, made up of interest

at 6 per cent on loans to members, interest from the bank at 5 per cent on savings certificates amounting to \$700 and at 4 per cent on savings balance amounting to \$12.07, and \$4.85 in penalties. Earnings amounted to nearly 6 per cent on payments made to the society. The average interest on Christmas savings accounts in Washington, D. C., is approximately 3 per cent. At the end of

the year \$1,000 was outstanding in loans which was wiped out by amounts due the borrowers.

The affairs of the club are administered by a treasurer, which position changes hands every few years in order to distribute the work. In recognition of the work the treasurer is required to perform, a deduction is made of 25 per cent from the gross earnings as salary.



Upstream face of Gibson dam, Sun River project, Montana

Running the Farm by Electricity in Washington

By a westerner

I HOPE it will not be considered a cheap joke if I remark that the story in the September number of the *NEW RECLAMATION ERA* by J. F. Bruins was a bear.

Mr. Bruins is doing something for the world on his little Idaho ranch. And to all farmers and farmers' wives everywhere who read the tale of how electricity brought savings of time and so reduced costs of production as to become a sound investment there will come the vista of "our own home fixed up that way."

It isn't really fixing up. It is good economy to milk by electric machines, light the barns and all the other outbuildings, as well as the dwelling, with Edison magic, pump the water, and then distribute it over the plant for both human and animal comfort. Mr. Bruins is solving the problem of keeping farmers on the farm. He is making home life on his irrigated patch as attractive as under the bright lights of the city—and that is all there is to the problem of keeping the farm kids on the farm. Give them modern conveniences and modern social contacts and they will be content to stay put where they were born.

The writer has known several such farm plants as that described by the Idaho mau. One in particular is the famous Gallagher ranch near Stratford, Wash. Stratford will be hard to find on the map. It is only an agentless stop for the Great Northern "dinky" between Spokane and Wentachee, but if you are driving a car over the North Central Highway along the northern border of the desert, which is part of the proposed Columbia Basin irrigation project, just keep your eye peeled for a right turn off the road the west side of Wilson Creek that seems as well used as the highway itself. The Gallagher ranch is just a mile up the turn.

It is an oasis of green lawns, fruit trees, vineyards, flowers, bees, and gardens where life flows pleasantly and where hospitality is extended to from half a dozen to 50 guests each Sunday afternoon—not only the serving of tea and cake and ice cream by the delightful hostess, but going to the extent of setting tables on the porches around the big stone house for the serving of innumerable helpings of fried chicken with trimmings. That oasis is the product of electric pumps and water.

The story must go back to the beginning if you care to have it in all details as it appeals to me. Thirty years ago David E. Gallagher ran a band of sheep. He

wintered them on the open desert and at the hay stacks of the homesteaders who went into the Columbia Basin country to try to make a living by using ordinary farming methods and depending on natural conditions for moisture to grow crops. In the summer the sheep were driven to the open ranges in the adjoining mountains. A trained nurse came to the sanitarium at Soap Lake. You have guessed it. They met and became the Mr. and Mrs. Gallagher of present-day fame.

After spending a lot of money trying to raise feed for his sheep (the homesteaders having faded out of the picture) Mr. Gallagher filed on a homestead beside a living lake in Grant County. Nobody knows how the lake derives its waters, but it always contains plenty of water. They quit the sheep business and set out a 40-acre orchard. Electric pumps forced the water from the lake to the orchard and the trees thrived. While they were attaining the bearing stage the Gallaghers made money by keeping chickens and turkeys, as well as a few cows. The chicken runs often contained 2,500 hens, and in many years the former nurse marketed as many as 1,000 turkeys. Cows and pigs helped pay the bills while the orchards grew.

It was hard work from early morning until late at night. And not the least of it was neighboring with neighbors from 5 to 25 miles distant. In sickness or in death these desert dwellers do not measure distance. They go to the aid of those in need.

After the orchards began to yield their profits the poultry was allowed to depart, largely via the frying pan on hospitable days, and then the Gallaghers began the building of their home. It is a six-room house with porches on three sides, made of the basalt stone of the desert country and having walls 24 inches thick. The sun may beat unmercifully on the roof, but inside it is always as cool as a ring-side seat in an ice factory.

Next came a lighting system, also extended to the fruit packing plant and the barns. And after that came electrical equipment for the kitchen, the dressing table, the laundry, the separator, the churn, and the refrigerator. Mrs. Gallagher cooks on an electric stove that is big enough for a hotel, and she finds the cost to be less than coal for an old-fashioned stove. They even sort their apples at packing time by electrically operated machines.

And lastly has come the complete system of plumbing by which water is carried to every room in the house. If any reader has ever driven over a western desert all day, had his clothing covered with dust, and felt his skin to be a filthy mess of sweat and mud, then he can appreciate that bathroom at the Gallagher ranch, his tub filled with clear, soft water—and hot. A bathroom with tiled walls and floor, painted ceiling as white as snow, and a rack full of towels in easy reach.

The Gallaghers find it difficult to state what all this has cost. It has come gradually over a period of 18 years. They know that they pay an average of \$25 a year per acre for pumping water to their orchard lands of which there are about 40 acres, bordered by alfalfa fields that cut an average of 6 to 7 tons per acre. Some years there have been large profits and some years they have made only a little above expenses, just like other business concerns. But they have reached the point where they are pretty sure of a 10 per cent net return on a valuation of \$40,000 on a 96-acre ranch. When the returns go higher it is velvet. They ride in a sedan these days, but their first little car is still on the ranch and ready for service.

The writer understands that the Bruins and the Gallaghers are the exceptions to the rule among settlers on the western deserts, but he would like to point out that the same sunshine, rich soil, and long growing season belong to all alike. The Gallagher place is just north of the great desert which is included in the proposed Columbia Basin irrigation project. The tract of land in the proposed project has no lake from which to pump water. Water can not be raised from beneath the surface of the land as does Mr. Bruins in Idaho. Water for irrigation must be brought a distance of 134 miles in a ditch, but when the water is there the same magic that worked for Bruins and for Gallagher will work for equally efficient and industrious settlers who come along to occupy the lands.

HENRY SEMON, a Klamath project farmer, won first and second prizes for commercial Netted Gem potatoes at the Pacific Northwest Potato Show held at Spokane. This is the first year that Klamath County has sent exhibits to this show.

Colonization in South America

ARGENTINA

THE plan of colonization of immense areas of land in Argentina was approved by the boards of the various railroad companies in a consortium signed in London in May, 1927.

The need for systematic colonization has been felt for a long time, but heretofore the problem has not received the support of private enterprise.

It is planned to bring in immigrants in groups. They will not be thrown on their own resources, but the railroads will build homes, fence farms, and give long terms in the purchase of these farms. In addition to the house and fencing, sundry farm implements will be furnished. It is also planned to give instruction to the settlers in regard to the best crops to be grown.

The underlying plan is to create groups of independent small farmers, the railroads purchasing large tracts of land and dividing them into smaller tracts. If the newcomer desires he may work for others in the neighborhood until he has not only acquired experience but saved up sufficient money to take up one of the tracts of land as an independent farmer.

The Pacific Railway is the first of the companies to initiate this plan and it has already started to build farm houses and barns at Leguizamon. About 40 families from the north of Italy will be the first settlers. It is believed that the immigrants should arrive in November, when practicable, in order that they may work on neighboring farms through the summer and earn sufficient to start operating their own land by the following April or May. The group of farms mentioned will consist of about 100 hectares each, including besides a comfortable house, well, pump for drinking water, shade trees and necessary tools for working land. Further improvements may be made with the aid of "assistance credits" furnished through the consortium, and advances may be obtained by the colonists for the purchase of livestock, including cows and horses, fowls, and for seed. It is planned to have the payments for the purchase price extend over a period of 30 years, at the end of which period the farms become the property of the occupants. The colonists will be carefully selected as to their physical fitness and ability to overcome the hardships and pioneering difficulties.

PARAGUAY

Paraguay is now the goal of one of the greatest migrations in recent human history. Mennonites from various coun-

tries, including Canada, are establishing homesteads in the rich agricultural region west of the upper Paraguay River at a distance of about 1,700 miles from Buenos Aires and it is expected that within a few years more than 100,000 of these people will have settled on 3,000,000 acres that have been set aside for them in Paraguay.

This land is located along the twenty-second parallel of latitude, westward from Puerto Casado where there are three of the four essentials necessary for the success of a colonization project, namely, a fertile soil, plentiful sunshine and abundant water. The other essential, labor, will be supplied by the immigrants. The first Mennonites to settle in this region found oranges, bananas, and cotton growing wild and in the year in which thousands have been established they have produced two crops, including maize and almost every known kind of vegetable.

A base has been established at Puerto Casado on the Paraguay River. A hotel and several substantial community houses have been erected where the colonists are taken care of until they commence their journey into the interior of the country to take up their homesteads. Good roads have been established, and a railroad 100 kilometers long has been built into the region being settled.

BRAZIL

The Government of Brazil has offered to the South American Development Co. of Japan a tract of land of about two and a half million acres in the State of Para for the purpose of colonization of emigrants from Japan. The company plans

Improved Farms Sell Readily at Minidoka

A number of transfers of farm property have been reported recently from the Minidoka project, Idaho. Most of the farms sold were taken by outside residents. An 80-acre farm 3 miles northeast of Rupert sold for \$5,000 cash. An 80-acre farm 4 miles southeast of Rupert sold for \$9,000 and a similar farm west of Rupert sold for the same price with a substantial cash payment. A farm of 80 acres 4 miles north of Paul sold for \$9,000, and another 80-acre farm in the same vicinity sold for \$10,000. A highly improved 80-acre farm 4 miles southwest of Burley was reported sold at a high figure, and a 40-acre tract across the river was sold to an outside buyer.

to send 10,000 families from Japan to Brazil in the next 10 years and it is reported that the Japan-Brazil Association has been organized for this purpose. A training school has been established for a short 10-day course at Kobe, capable of handling 700 families, and the emigrants will there learn of the customs and local conditions before departure to Brazil.

The Japanese Government has granted subsidies in the past for financing emigrants going to Brazil, as follows:

Year	Amount	Number of emigrants
	Yen ¹	
1923.....	20,000	110
1924.....	600,000	3,164
1925.....	600,000	5,324
1926.....	1,000,000	7,359
1927.....	1,550,000	7,750

¹ Yen is equal to about 50 cents.

PERU

A large concession of land has been granted by the Peruvian Government to a representative of a Polish delegation which came to Peru in 1927. The area, which is located in the Department of Loreto, contains approximately 350,000 hectares. Under the terms of this concession, the representative of the Polish delegation is under obligation to bring from Europe settlers beginning with 50 families during 1928 when the representative will obtain 50,000 hectares of the area set aside for this colonization project. During 1929, it is expected that 180 families will arrive, and under the terms of the contract 60,000 additional hectares will be allotted to this representative. If by the end of 1930, 300 families have been established, he will be given 100,000 hectares additional and by the end of 1931, if 360 families have been established on the land, the remaining 140,000 hectares will be allotted to this representative of the Polish delegation.

The concessionaire must pay all transportation charges of the settlers and furnish camps, tools, seeds, etc. The Government will give each settler a freehold, ranging from 25 to 100 hectares and the balance of the land is given as a freehold to the concessionaire for his expense in the work of colonization. The Government of Peru realizes the advantage to be derived from colonization on such a scale by immigrants from Europe and it is believed that the acquisition of this number of settlers will aid in the development of Peru's national resources.

Discretionary Powers of Irrigation District Board of Directors

BROAD discretionary powers in the management of its business were held to be vested in the board of directors of an irrigation district formed under the laws of New Mexico, in a recent decision of the Supreme Court of New Mexico sustaining the board's action and denying a motion for rehearing in the case of *Sperry v. Elephant Butte Irrigation District*, 32 N. M.—, 270 Pac. —.

This was an injunction suit brought by landowners to restrain the board from including in its budget for the 1927 tax rolls, the estimated cost of operation and maintenance for the ensuing year on the ground that under the then prevailing practice the district would not disburse such amounts to the United States, under its contracts and annual notices, until the year following that in which the charges

were incurred or the second ensuing year from the one in which the budget in question was made. Laws of New Mexico, 1921, chapter 39, section 3, required the board to "estimate and determine the amount of funds required for the ensuing year."

The court sustained the action of the district upon its contention that it was, in the judgment of its board of directors, deemed sound business practice and expedient at the time to anticipate the estimated operation and maintenance cost for the ensuing year even though, under the practice then prevailing, such amount would not necessarily be disbursed by the district during that year.

After discussing the exercise of judgment by the district board in such matters and the question of the right of landowners

to require the board to show each item in its estimate as a positive "need" or an inescapable "obligation," the court said:

"We do not think that this district could operate practically or successfully under any such landowner surveillance or court dictation, and we therefore greatly doubt, at the outset, the intention of the legislature to impose it.

"In construing this statute, in view of the discretionary powers conferred upon the board (Laws, 1921, ch. 39, sec. 2), and without which the corporation could not successfully operate, we do not think we are bound to that strictness which applies when determining the powers of municipal corporations. See *Crawford v. Imperial Irrigation District*, 200 Cal. 318; 253 Pac. 726."—*H. J. S. Devries, District Counsel.*

Riparian Rights in California

IN 1850, the Legislature of the State of California adopted the common law rule of England, and in 1886 the Supreme Court of the State, in the case of *Lux v. Haggin* (10 Pac. 674), declared that the legislature had by such act adopted the English doctrine of riparian rights, that is, that the owner of land bordering on a stream could insist upon all of the waters of that stream being allowed to flow undiminished past his land. This rule

sanctioned great waste of natural resources, and was never adapted to the arid regions, but was reaffirmed by the Supreme Court in 1926 in the case of *Herminghaus et al. v. Southern California Edison Co.* (252 Pac. 607).

As a result of the ruling in the *Herminghaus* case, in 1927 the State legislature proposed an amendment to the State Constitution, which was adopted by the people at the election held November 6,

1928. Riparian owners in this State are now bound to rules of reasonableness in the use of water. The amendment follows:

SEC. 3. It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare. The right to water or to the use or flow of water in or from any natural stream or water course in this State is and shall be limited to such water as shall be reasonably required for the beneficial use to be served, and such right does not and shall not extend to the waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water. Riparian rights in a stream or water course attach to, but to no more than so much of the flow thereof as may be required or used consistently with this section, for the purposes for which such lands are, or may be made adaptable, in view of such reasonable and beneficial uses; *Provided, however,* that nothing herein contained shall be construed as depriving any riparian owner of the reasonable use of water of the stream to which his land is riparian under reasonable methods of diversion and use, or of depriving any appropriator of water to which he is lawfully entitled. This section shall be self-executing, and the legislature may also enact laws in the furtherance of the policy in this section contained.

—*R. J. Coffey, District Counsel.*



Gerber dam, Klamath project, Oregon-California

SIXTEEN earloads, containing 23,000 turkeys, were shipped from the Newlands project for the Thanksgiving market. The total value of the project turkey crop for 1928 is estimated at \$300,000.

Government Power Averts Sugar Factory Shutdown

The Holly Sugar Corporation has a large sugar factory at Torrington, Wyo., on the North Platte project which has been processing an exceptionally large quantity of sugar beets grown on 22,000 acres, reported to be the largest acreage for any sugar factory in the United States. Power for the operation of this factory is obtained from a steam power plant operated in connection with the factory in accordance with the usual practice.

A year ago some trouble was experienced with the steam turbine and the corporation was apprehensive about operating another year without a reserve power supply and was considering the question of installing a duplicate steam turbo-generator which would have involved a rather large investment. The United States has a high voltage transmission line which terminates near the sugar factory where power is delivered to the town of Torrington, and in lieu of installing additional generating capacity in its steam plant the corporation decided to enter into a contract with the United States for stand-by power service. The corporation provided a substation of 1,000 kv-a. capacity for receiving power at high voltage from the Government line which was completed and tested out on November 10.

The following day trouble developed in the corporation's steam turbine which necessitated taking it out of service for repairs and power was immediately secured from the system of the United States. The stand-by arrangement between the United States and the Holly Sugar Corporation has been mutually beneficial as the corporation has been saved an expensive and serious shutdown of its factory at the peak of the operating season and the United States has received \$5,482.50 additional revenue which it would not have received otherwise and with no increase in the cost of operation of its power system.

Breeding of Seed Corn Rio Grande Project

The breeding of seed corn in the Mesilla Valley, that land of cotton, corn, and alfalfa under the Rio Grande irrigation project, New Mexico-Texas, has brought results. N. M. Smith of Las Cruces, N. Mex., a former Kansas corn grower, working with the common Mexican June corn has brought the yield up

from 39 bushels an acre to a 5-year annual average of 80 bushels to the acre. This was accomplished through careful selection of seed in the field, based upon the type desired, selecting for desirable qualities, and rejecting for undesirable characteristics. Mr. Smith has worked up an excellent seed business, shipping last year over 2,000 pounds to Africa, 5,000 pounds to Mexico, and large quantities to seven States in this country.

Irrigated Lands

Out of the desert's ugliness has sprung

A clean green glory and a flame of bloom.

The old earth laps her eager, thirsty tongue

Through water doled from lateral and flume,

And gratefully gives back her song of praise

In wheat and corn, in barley and in rye,

In gold and scarlet fruit, in silver sprays

Of poplars tossed like fountains on the sky.

The rivers and the proud reluctant hills

Were forced to yield their waters to this land.

The scent of sage is lost; the valley fills

With shadows where great apple orchards stand,

And out of barren rocks and bitter loam

A garden springs—and man has called it home.

—Grace Noll Crowell, in the New York Times.

Land Bank Officials Note Belle Fourche Grain

Officials of the Federal Land Bank of Omaha visited the Belle Fourche project recently to check up on local conditions in connection with present and prospective loans. They appeared very favorably impressed with the improved conditions and the many evidences of prosperity.

As a result of the visit the Omaha bank will again make loans in this section, but at present only on the sandy loam areas and the better classes of farms on the heavy soils, and then only on farms which do not have seepage.

Loans will be on a basis of 50 per cent of the appraised valuation of the land and 20 per cent of the value of the insurable buildings, with a deduction for unpaid construction and drainage charges. With the new contract in operation, spreading the repayment of construction charges over a long period of years without interest, this deduction will be about half of the total unpaid charges, affording a much more favorable consideration than has been given heretofore. The action of the bank is a starting point in making this form of credit available and a stepping stone to increased activities in the future.

The harvesting season found the Nation with a full larder of agricultural products and the purchasing power of farm products in terms of other commodities within 12 per cent of the 1909-1914 pre-war average.

The total crop production last year in the United States was 7.6 per cent above the average of the last 10 years.



Mr. Smith's cornfield in the Elephant Butte Irrigation District, Rio Grande project, New Mexico-Texas. Estimated to yield 85 bushels per acre and 25 tons of silage per acre

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, has been invited to give an address in the near future on the functions and accomplishments of the bureau, over station WJSV, Washington, D. C.

George C. Kreutzer, director of reclamation economics, gave an address on the status of Federal reclamation work in the United States before the American Railway Development Association at their meeting in Chicago, December 7, 1928.

J. M. Hughes, land commissioner, and G. H. Plummer, western land agent, Northern Pacific Railway; and F. A. Kern, secretary of the Kittitas reclamation district, held a conference recently with the commissioner in the Washington office concerning the development of lands on the Kittitas division of the Yakima project.

The employees of the Washington office have become boosters for the Owyhee project apple. A box sent by E. C. Van Petten, of Ontario, to Doctor Mead was generously distributed by him around the office.

A. J. Wiley, consulting engineer, was struck by a passing automobile while inspecting the American Falls Dam recently. He was immediately removed to the hospital at American Falls, Idaho, where an examination disclosed a broken collar bone and a badly bruised head. Mr. Wiley was resting easily by the

Nevada Turkey Growers Association Organized

The Nevada Turkey Growers Association, including five counties in western Nevada, has been organized for marketing turkeys. In these counties are about 95,000 birds, of which 60,000 are on the Newlands project. Only No. 1 birds will be packed under the Nevada trade name, which is a diamond with a large "N" inside. At the upper corner is the word "Nevada," at the lower corner "Turkeys," at the left "Our," and at the right "Best." The "Diamond N Brand" is stenciled on the ends of the crates, the diamond being in red and the data surrounding, such as number of turkeys in the crate, the gross weight, tare, net, and by whom packed, as well as the name of the association, in black.

following day, and his speedy recovery is the earnest wish of all his friends.

D. Joseph Hunt, assistant engineer, and Wallace A. Waldorf, junior engineer, were detailed temporarily to the Denver office recently to expedite completion of the designs for the Kittitas division of the Yakima project, after which they will return to the Ellensburg office.

Recent visitors at the Washington office included A. P. Davis, former director; F. E. Weymouth, former chief engineer; and H. P. Seidemann, former chief accountant.

Shizuo Sugimura, reclamation engineer, professor in the Imperial University of Formosa, Taihoku, Formosa, Japan, spent several days in the Denver office studying irrigation construction.

R. J. Newell, superintendent of the Boise project, F. A. Banks, construction engineer on the Owyhee project, and Walker R. Young, construction engineer on the Kittitas division of the Yakima project, spent a day recently on the Vale project viewing the work in progress.

B. E. Hayden, reclamation economist, spent several days on the Minidoka project, summarizing the crop census and conferring with various officials and dealers concerning crop values.

Recent visitors on the Milk River project included R. V. McKenzie, traveling freight agent, E. B. Duncan and C. D. Greenfield, agricultural development agents of the Great Northern Railway Co. and I. D. O'Donnell, of the Montana State extension service.

Porter J. Preston, superintendent of the Yakima project, was on the Umatilla project recently in connection with his assignment as supervisor of the crop census for both the east and west divisions of the project.

Recent visitors on the Yuma project included Maj. C. P. Gross, district engineer, War Department; Sr. Adolfo Orive Alba, civil engineer, Mexico City; A. T. Mitchelson, irrigation engineer, and H. F. Blaney, associate irrigation engineer,

Department of Agriculture, Berkeley; and R. E. Blair, Department of Agriculture, State of California.

C. M. Day, mechanical engineer, Denver office, spent two days on the North Platte project making an inspection of the outlet works at the Pathfinder and Guernsey Reservoirs.

The Rio Grande project was visited recently by Hon. Louis C. Cránton, Member of Congress from Michigan; Francis C. Wilson, water commissioner for New Mexico; Ibrahim Moh. Zaki, assistant director of works for the Egyptian Government; and J. L. Savage, chief designing engineer of the Denver office.

Device Mixes Gypsum In Irrigation Water

In some irrigated districts of the West there is a saying that "soft water makes hard land and hard water soft land." This is a simple and practical statement drawn from experience. The irrigating farmer has found that under some conditions it is well to apply gypsum, which has a high calcium content, to land with a view to preventing or improving the condition of the relatively impervious "hard spots" or "hard lands."

It was believed that if gypsum could be applied in solution it would act more quickly and more effectively than by methods of spreading formerly in favor. A method of mixing gypsum with the irrigation water which is effective and economical has recently been perfected. The device provides a hopper for the gypsum, a paddle wheel operating in the irrigation ditch to provide power, a revolving feeding device which measures a given quantity of gypsum and dumps it into the water, and a submerged stirring and mixing cylinder which helps to dissolve a large proportion of the gypsum powder.

The apparatus has been tested at the field station at Fallon, Newlands project, Nevada, and gives satisfactory service.

Business men and farmers have come to realize that advantages follow from consolidation and cooperation through which large business units come into existence.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. ROY O. WEST, SECRETARY OF THE INTERIOR

**E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary**

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Knbach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wildo Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Ofutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; O. A. Lyman, Fiscal Inspector.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	J. P. Siebeneicher	J. P. Siebeneicher	Wm. J. Burke	Mitchell, Nebr.
Boise ¹	Boise, Idaho	R. J. Newell	W. L. Vernon		B. E. Stoutemyer	Portland, Oreg.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	W. C. Berger	W. C. Berger	H. J. S. Devries	El Paso, Tex.
Grand Valley	Grand Junction, Colo.	J. C. Page	W. J. Chiesman	W. J. Chiesman	J. R. Alexander	Montrose, Colo.
Huntley ²	Ballantine, Mont.	E. E. Lewis				
King Hill ³	King Hill, Idaho	F. L. Kinkaid				
Klamath	Klamath Falls, Oreg.	H. D. Newell	N. O. Wheeler	Joseph C. Avery	R. J. Coffey	Berkeley, Calif.
Lower Yellowstone	Savage, Mont.	H. A. Parker	E. R. Schepplmann	E. R. Schepplmann	E. E. Roddis	Billings, Mont.
Milk River	Malta, Mont.	H. H. Johnson	E. E. Chahot	E. E. Chahot	do.	Do.
Minidoka ⁴	Burley, Idaho	E. B. Darlington	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Newlands ⁵	Fallon, Nev.	A. W. Walker		Virgil E. Hubbell	R. J. Coffey	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.	H. C. Stetson	Virgil E. Hubbell	Miss E. M. Simmonds	Wm. J. Burke	Mitchell, Nebr.
Okanogan	Okanogan, Wash.	Calvin Casteel		N. D. Thorp	B. E. Stoutemyer	Portland, Oreg.
Orland	Orland, Calif.	R. C. E. Weber	C. H. Lillingston	C. H. Lillingston	R. J. Coffey	Berkeley, Calif.
Owyhee	Nyssa, Oreg.	F. A. Banks	H. N. Bickel	Frank P. Greene	B. E. Stoutemyer	Portland, Oreg.
Rio Grande	El Paso, Tex.	L. R. Flock		L. S. Kennicott	H. J. S. Devries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	R. B. Smith	R. B. Smith	Wm. J. Burke	Mitchell, Nebr.
Salt River ⁷	Phoenix, Ariz.	C. O. Cragin				
Shoshone ⁸	Powell, Wyo.	L. H. Mitchell	W. F. Sha		E. E. Roddis	Billings, Mont.
Strawberry Valley ⁹	Payson, Utah	Lee R. Taylor				
Sun River ¹⁰	Fairfield, Mont.	G. O. Sanford	H. W. Johnson	H. W. Johnson	E. E. Roddis	Do.
Umatilla ¹¹	Irrigon, Oreg.	A. C. Houghton				
Uncompagre	Hermiston, Oreg.	Enos D. Martin				
Vale	Montrose, Colo.	L. J. Foster	G. H. Bolt	F. D. Helm	J. R. Alexander	Montrose, Colo.
Yakima	Vale, Oreg.	H. W. Bashore	C. M. Voyer	C. M. Voyer	B. E. Stoutemyer	Portland, Oreg.
Yuma	Yakima, Wash.	P. J. Preston	R. K. Cunningham	J. C. Oawler	do.	Do.
	Yuma, Ariz.	R. M. Priest	H. R. Pasewalk	E. M. Philabaum	R. J. Coffey	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam	Coalville, Utah	F. F. Smith ¹²	C. F. Williams	C. F. Williams	J. R. Alexander	Montrose, Colo.
Kititas	Ellensburg, Wash.	Walker R. Young ¹³	E. R. Mills		B. E. Stoutemyer	Portland, Oreg.
Sun River, Gibson Dam	Augusta, Mont.	Ralph Lowry ¹⁴	F. C. Lewis	F. C. Lewis	E. E. Roddis	Billings, Mont.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Heart Mountain investigations	Powell, Wyo.	I. B. Hoag	State of Utah.
Utah investigations	Salt Lake City, Utah	E. O. Larson	
Truckee River investigations	Fallon, Nev.	A. W. Walker	
Yakima project extensions	Yakima, Wash.	P. J. Preston	



BLACK CANYON DAM SITE, WHERE THE BOULDER DAM WILL BE CONSTRUCTED
THE BILL PROVIDING FOR THE DEVELOPMENT OF THE COLORADO RIVER BASIN PASSED THE SENATE ON DECEMBER 14, THE HOUSE OF REPRESENTATIVES ON DECEMBER 18, AND WAS
APPROVED BY PRESIDENT COOLIDGE ON DECEMBER 21, 1928

NEW RECLAMATION ERA

VOL. 20

FEBRUARY, 1929

NO. 2



A 20-ACRE IRRIGATED FARM

AN ENLARGED VISION OF RECLAMATION

*W*ATER is to-day our greatest undeveloped resource. Our streams and rivers offer us a possible total of 55,000,000 horsepower and of this less than 11,000,000 has been developed. Of our 25,000 miles of possible inland waterways probably less than 7,000 are really modernized, and the utility of much of these 7,000 miles is minimized by their isolation into segments of what should be connected transportation systems.

We still have 30,000,000 acres of possible reclaimable and irrigable lands. And these water resources lie in every part of the union—the great basins of the Columbia, the Colorado, the Sacramento, the San Joaquin, the Mississippi, the Arkansas, the Platte, the Missouri, the Ohio, the Cumberland, the Tennessee, the Hudson, the Great Lakes, the Saint Lawrence, and many others.

True conservation of water is not the prevention of use. Every drop of water that runs to the sea without yielding its full commercial returns to the nation is an economic loss, and that loss in all its economic implications can be computed in billions.

I am not proposing that all these things should be done tomorrow. At this moment we could not make economic use of the whole of this power, or all this land, or all these inland waterways—but we will need the whole of it within half a generation. And at this moment we have the urgent need for beginning certain major projects which will require years for completion.

HERBERT HOOVER.

From an address delivered in 1926

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

ROY O. WEST
Secretary of the Interior

Price, 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

February, 1929

No. 2

Interesting High Lights on the Federal Reclamation Projects

THE Farmers' Market at Las Cruces, Rio Grande project, shipped recently the first carload of spinach ever sent out from this section to eastern markets, although large quantities have been shipped heretofore by express and truck. The Farmers' Market has also been shipping out cars of mixed vegetables, thus establishing an outlet for the surplus from the market gardens of Mesilla Valley.

AN IRRIGATED farm conference was held recently at Chinook, Milk River project. The results of 1928 were thoroughly reviewed and recommendations made for 1929 operations. If followed, these will tend to improve agricultural conditions on the project. Particular stress was laid on the value of stock feeding as a major part of the farm program.

THE State Highway Commission of Oregon has awarded a contract for grading and structures on 15.53 miles of highway which will provide convenient access to the irrigable lands of the Harper and Little Valley areas of the Vale project, for which it is expected that water will be available in 1930.

THE sugar factory on the Belle Fourche project sliced a total of 125,000 tons of beets from 10,500 acres, requiring 91 days of operation and producing 30,000,000 pounds of sugar. The average sugar content was 16.04 per cent.

A 6-YEAR-OLD registered Holstein cow belonging to Robert Girardell, of Rupert, Minidoka project, produced 2,466 pounds of milk and 84.8 pounds of butterfat during November, leading 217 cows of the Mini-Cassia Cow Testing Association. This cow produced 359 pounds of butterfat during the six months June to November.

THE South Dakota State superintendent of fisheries met recently with the Belle Fourche Commercial Club and outlined a plan for making the Belle Fourche reservoir a great bass fishing resort by planting vegetation on the lake bottom suitable for this species. The seining operations conducted for three months by this department resulted in removing 900,000 fish, mostly buffalo and carp.

CONSTRUCTION is about completed of the new cooperative creamery and cheese factory at Meridian, Boise project.

A COOPERATIVE credit association for the purpose of financing the purchase of dairy cows is in process of formation on the Minidoka project. A recent meeting was attended by the assistant manager of the Intermediate Credit Bank of Spokane, creamery directors, and local dairymen.

THE Fish and Game Commission of Nevada has appropriated \$1,000 for the improvement of grounds near the dam at Lahontan Reservoir, Newlands project.

FIVE hundred farms on the Newlands project have electric light and power service. The Truckee-Carson irrigation district is operating 175 miles of electric power lines.

YUMA, "the sunshine capital of the United States," reports that sunshine at that point for 1928 was 94 per cent of the total possible amount, with 263 days registering 100 per cent and no day in the year being without some sunshine.

LAST year's apple crop on the Okanagan project was the largest ever grown in the history of the project, amounting to 1,400,000 boxes.

THIRTY acres of new land on the Yuma Mesa are being prepared for citrus fruit planting, and it is expected that several additional units will be planted during the winter and spring months.

BUILDING permits issued by the city of Yakima for 1928 totaled \$1,058,895, and a carefully compiled statement of Yakima Valley products for the year, published by the Yakima Morning Herald, estimates shipments of all agricultural, dairy and livestock, and manufactured products at 55,799 cars, valued at \$43,668,147.

THE Kraft cheese factory at Montrose, Uncompahgre project, is now receiving approximately 6,500 pounds of milk produced in the territory adjacent to Montrose, which is being turned into about 650 pounds of cheese daily.

THE largest single payment ever made on Lower Yellowstone project charges was received recently from Irrigation District No. 1, amounting to \$33,873.18 and covering in full the construction payment of \$16,606.12 due December 31 and paying \$16,949.13 toward the operation and maintenance charge of \$18,393 due at the same date. Prior credits more than made up the difference, so that this district is paid up in full to date and has advances of \$317.93 on construction and \$6,511.90 on operation and maintenance.

BANKING conditions all over the Rio Grande project are very satisfactory. At Las Cruces the deposits in the First National Bank passed the \$1,000,000 mark and in the Mesilla Valley Bank deposits are close to the half-million mark. In the city of El Paso the banks report a gain in deposits in 1928 of \$2,692,826 over 1927.

Digest of the Boulder Canyon Project Act for the Development of the Colorado River Basin

Approved December 21, 1928

SECTION 1.—For flood control, improving navigation, and for storage and delivery of water for irrigation and domestic purposes, the Secretary of the Interior is authorized to construct, operate, and maintain (1) a dam and incidental works at Black or Boulder Canyon sufficient to store not less than 20,000,000 acre-feet of water, and (2) a main canal to supply water for the Imperial and Coachella Valleys in California. He is also authorized to construct, or cause to be constructed, at or near the dam, a power plant and incidental structures. All works are to be constructed and operated in conformity with the Colorado River Compact referred to in section 13 (a).

SEC. 2 (a).—A Colorado River fund is established, from which expenditures are to be made and into which revenues must be covered, all under the direction of the Secretary of the Interior

SEC. 2 (b).—The Secretary of the Treasury is authorized to advance to the Colorado River fund, as appropriations are made, such amounts as the Secretary of the Interior deems necessary, not to exceed \$165,000,000. Of this amount \$25,000,000 is to be allocated to flood control and is to be repaid out of 62½ per cent of the revenue received, if any, in excess of that necessary to meet payments during the amortization period of 50 years. If the \$25,000,000 is not repaid in full during this period, 62½ per cent of all net revenue shall be applied to payment of the remainder. Interest at 4 per cent upon amounts so advanced remaining unpaid is to be paid annually except as otherwise provided.

SEC. 2 (c).—No expenditures are to be made for operation and maintenance except from appropriations therefor.

SEC. 2 (d).—The Secretary of the Treasury, on June 30 of each year, is to charge the fund with the amount necessary for payment of interest at 4 per cent. If the fund is insufficient to make payment of interest, payment may be deferred and the amount so deferred is to bear interest at 4 per cent until paid.

SEC. 2 (e).—The Secretary of the Interior is to certify to the Secretary of the Treasury at the close of each fiscal year the amount of money in the fund in excess of that necessary for construction, operation, and maintenance and payment of interest. Upon receipt of such certificate the Secretary of the Interior shall charge

the fund with the amount so certified as a repayment of advances made, which amount shall be covered into the Treasury to the credit of miscellaneous receipts.

SEC. 3.—An appropriation of not to exceed \$165,000,000 is authorized.

SEC. 4 (a).—The act is not to take effect and nothing is to be done under it (1) until all of the seven States of the Colorado River Basin have ratified the Colorado River compact, and the President by proclamation shall have so declared, or (2) if the Colorado River compact is not ratified by all of the States within six months, until it is ratified by six of them, including California, provided California agrees that the use of water in that State shall not exceed 4,400,000 acre-feet of water plus not more than one-half of any excess unapportioned by the compact.

A subsidiary compact may be negotiated among the States of Arizona, California, and Nevada regarding division of the 7,500,000 acre-feet of water allocated by the compact to the lower basin.

SEC. 4 (b).—Before any money is appropriated or work done the Secretary of the Interior is to provide by contract for revenues adequate in his judgment to insure payment of all expenditures within 50 years from the date the works are completed, together with interest.

No work is to be done on the main canal until contracts are executed adequate in the judgment of the Secretary of the Interior to repay costs incurred for construction, operation, and maintenance as provided by the reclamation law.

If, during the period of amortization, revenues are received in excess of the amount necessary to meet periodical payments to the United States, as required by the act, immediately after settlement of such periodical payments the States of Arizona and Nevada shall each be paid 18¾ per cent of such excess.

SEC. 5.—The Secretary of the Interior is authorized to make contracts for storage of water in the reservoir and for its delivery on the main canal or at points on the river to be used for irrigation and domestic purposes. He is also authorized to contract for the generation of electrical energy and for the sale at the switchboard to States, municipal corporations, political subdivisions, and private corporations of electrical energy generated at the dam upon charges that will provide revenue which, in addition to other

revenues accruing under the reclamation law and under this act, will, in his judgment, cover all expense of operation and maintenance incurred, and meet the amortization payment described in section 4 (b).

After repayment to the United States of all moneys, with interest, the charges are to be on such basis as may be prescribed by Congress, and the revenues are to be kept in a separate fund to be expended within the Colorado River Basin.

SEC. 5 (a).—No contracts for electrical energy or for the generation thereof are to be of longer duration than 50 years after such energy is ready for delivery.

Contracts made pursuant to subdivision (a) of section 5 are to be made with a view to obtaining reasonable returns and are to contain provisions whereby at the end of 15 years from the date of their execution and every 10 years thereafter, there is to be a readjustment of the contracts upon demand of either party thereto, either upward or downward, as may be found justified by competitive conditions at distributing points.

SEC. 5 (b).—Any holder of a contract for electrical energy not in default is to be entitled to renewal upon such terms and conditions as may be required under the law then existing, unless the property of such holder shall be purchased or acquired.

SEC. 5 (c).—Contracts for the use of water and necessary privileges for the generation and distribution of electrical energy, or for the sale and delivery thereof, are to be made with responsible applicants who are to pay the price fixed by the Secretary of the Interior, with a view to meeting the revenues required by the act. In case of conflicting applications the conflicts are to be adjusted as provided in the Federal water-power act, except that preference is to be given to a State for the generation or purchase of electrical energy for use in that State, and the States of Arizona, California, and Nevada are to be given equal opportunity as such applicants.

SEC. 5 (d).—Any agency receiving contract for electrical energy equivalent to 100,000 firm horsepower or more may, when deemed feasible by the Secretary of the Interior, be required to permit any other agency having contracts for less than 25,000 horsepower to participate in the benefits and use of any main transmission

line upon payment of a reasonable share of the cost.

SEC. 6.—The dam and reservoir are to be used, first, for river regulation, improvement of navigation and flood control; second, for furnishing water for irrigation and domestic uses and in satisfaction of present perfected rights in pursuance of Article VIII of the Colorado River compact; and third, for power Title to the dam, reservoir, plant, and incidental works is to remain forever in the United States, which shall, until otherwise provided by Congress, control, manage, and operate the same except as otherwise provided.

The Secretary of the Interior may, in his discretion, execute contracts of lease of a unit or units of any Government-built plant with the right to generate electrical energy, or alternatively, may make contracts of lease of the use of water for the generation of electrical energy. In either event, the provisions of the act relating to revenue, term, renewal, determination of conflicting applications, and joint use of transmission lines, are to apply.

Rules and regulations respecting maintenance and operation of works are to be prescribed by the Secretary in conformity with the Federal water power act so far as applicable.

The Federal Water Power Commission is directed not to issue or approve any permits or licenses under said water power act affecting the Colorado River, or any of its tributaries, except the Gila, in any of the basin States until the act shall become effective.

SEC. 7.—When all payments have been made on account of the main canal title to the works, except the Laguna Dam and the main canal down to and including Siphon Drop, may be conveyed to the agencies participating, according to their respective capital investments. Agencies constructing the main canal may generate power in connection with it and receive revenues under certain conditions stated.

SEC. 8 (a).—The Colorado River compact is to control in the use of all water stored, diverted, and distributed.

SEC. 8 (b).—The use of water is to be governed also by any compact that may be made among the States of Arizona, California, and Nevada, or any two of them, subsidiary to the Colorado River compact.

SEC. 9.—All irrigable public lands are to be withdrawn and made subject to entry under reclamation law. Preference in entry of lands is to be given to soldiers, sailors, and marines, to whom also, so far as practicable, preference is to be given in employment.

SEC. 10.—The contract of October 23, 1918, between the United States and the Imperial Irrigation District is not to be regarded as modified by this act. Additional contracts may be made for the construction and operation of the main canal.

SEC. 11.—The Secretary of the Interior is authorized to make studies and investigations of the Parker-Gila Valley reclamation project, and to submit a report not later than December 10, 1931. Appropriation of necessary funds is authorized.

SEC. 12.—Definitions are given of the terminology employed.

SEC. 13 (a).—The Colorado River compact is approved by Congress subject to approval by the State of California and by at least five of the basin States.

SEC. 13 (b).—The rights of the United States and of all parties claiming under the United States, are to be subject to the Colorado River compact.

SEC. 13 (c).—All patents, contracts, grants, concessions, leases, etc., are to be subject to the compact.

SEC. 13 (d).—All conditions and covenants are to run with the land and be deemed for the benefit of and be available to the basin States in connection with any litigation that may arise.

SEC. 14.—This act is to be regarded as supplementary to the reclamation law.

SEC. 15.—The Secretary of the Interior is authorized to make investigations and reports regarding the use of water in the basin States. An appropriation of \$250,000 from the Colorado River dam fund is authorized for this purpose.

SEC. 16.—A commissioner from each of the basin States is authorized to cooperate with the Secretary of the Interior in the exercise of authority under the provisions of sections 4, 5, and 14 of the act. Such commissioner is to have access to all records of Federal agencies, with the privilege of obtaining copies of such records.

SEC. 17.—Claims of the United States arising out of any contract authorized by this act are to have priority over all others, secured or unsecured.

SEC. 18.—Nothing contained in this act is to be construed as interfering with such rights as the States now have, either to the water within their borders or to adopt laws that may be deemed proper regarding appropriation, control, and use of water, except as modified by the Colorado River compact.

SEC. 19.—The consent of Congress is given for the basin States to formulate and enter into such further compacts or agreements respecting the use of water as may be found necessary, subject to a representative of the United States cooperating in the formulation of such compacts, which are not to be binding until approved by the legislatures of the States and by Congress.

SEC. 20.—Nothing in the act is to be construed as a denial or a recognition of any right of Mexico to the use of the waters of the Colorado River system.

SEC. 21.—The short title of the act shall be Boulder Canyon Project Act.

Economic Problems of Reclamation

A report on economic problems of reclamation, issued recently by the Bureau of Reclamation, discusses more clearly and definitely than ever before the difficulties which confront settlers on the irrigated areas of the arid West and the economic problems which must be met in any well-thought-out plan for rehabilitating the agriculture of the South.

This discussion is embodied in two reports, the first on Economic Aspects of Certain Reclamation Projects, by Dr. Alvin Johnson, assistant editor Encyclopedia of Social Science, of Columbia University, and the second on Planned Colonies of Farm Owners, by Dr. E. C. Branson, Kenan Professor of Rural Social Economics, of the University of North Carolina. Both men are eminently fitted, by extensive training and experience, for the task of discussing comprehensively and constructively the intricate problems of settlement and planned rural development, and each has added materially in his report to our knowledge of these subjects.

To these reports is added a Foreword of Dr. Elwood Mead, Commissioner of the Bureau of Reclamation, in which he has summarized briefly some of the material, social, and economic results of reclamation as carried out under present laws. It is believed these laws can be improved so that settlers will be saved hardships, earning power increased, and the money returned to the reclamation fund much sooner than under present conditions.

Copies of the report may be obtained by addressing the Commissioner, Bureau of Reclamation, Washington, D. C.

ORLAND oranges are being sold in the Pacific Northwest where they are in demand as a result of previous years' established markets for the local fruit. The oranges are packed and marketed by the Orland Orange Growers, a local cooperative marketing organization.

THE 1929 wool crop on the Uncompahgre project is being contracted at various points at a price ranging around 37 cents a pound.

Soil Survey, the Foundation of Successful Reclamation Development

Address before the American Soil Survey Association, Washington, D. C., November 21, 1928

By George C. Kreutzer, Director of Reclamation Economics

THE Department of the Interior, through the Bureau of Reclamation, has been engaged in reclamation of arid lands since 1902. During this period 31 projects have been constructed. Of these, 24 projects are being operated and 4 were abandoned. At present three new projects are under construction.

EXTENT OF RECLAMATION

To-day, after a quarter of a century of experience in reclamation an inventory may be made of achievement and of losses or mistakes. Twenty-four projects embrace 1,956,910 irrigable acres of land, to which a full water supply is furnished, and 1,482,950 acres which receive supplementary water. The value of crops grown on the 2,504,050 acres cropped in 1927 on these projects amounted to \$133,207,200. This is almost equal to the cost of the projects which amounts to \$175,117,000. During the period these projects have been under irrigation the aggregate value of crops grown amounts to \$1,337,428,000. The projects are divided into 38,428 farms, on which live 143,227 persons. They include 207 towns and cities with a population of 429,683. In the towns on the projects are 685 schools, 683 churches, and 135 banks, with total deposits of \$137,487,000.

ENGINEERING WORKS

Large structures to store or divert water on the projects are among the

most notable in the world. Among these is the Arrowrock Dam on the Boise project, which is a concrete arch type structure 349 feet high and which until recently was the highest dam in the world. Other large structures are the Roosevelt Dam on the Salt River project in Arizona, the Elephant Butte Dam on the Rio Grande project and the Pathfinder Dam on the North Platte project. In all there are 38 large structures which, if failure occurred, would endanger life and property. In all this period not a single large structure has failed. These are monuments to the skill and ingenuity of the engineering profession. Our Federal reclamation works are substantially constructed and are as modern as any in the world.

ECONOMIC FACTORS

The data heretofore quoted gives some idea of social and economic importance of this work. Projects of good soils and long growing season with other favoring conditions have been among the most prosperous of any agricultural communities, while on others losses have occurred of both Government funds and settlers' capital. The reason for this is that not so much attention was given to factors affecting economic feasibility. These factors include soils, character of agriculture which can be developed under irrigation, size of and cost of developing farms, markets, transporta-

tion and whether the land can be settled with experienced settlers who can create the earning power to pay project costs and live.

Engineering details from investigations to construction were carefully worked out. In the early days of reclamation scientific information on economic factors was meager. The science of soil technology was in its infancy. Not so much was known of the relation of subsoil to irrigation or to the tolerance of plants to alkali. The behavior of soils under irrigation was an open book with little written on its pages. However, as early as 1903 the reports of the Reclamation Service made reference to first and second class land for agricultural purposes and lands which were regarded as non-agricultural and were therefore excluded from projects.

INCLUSION OF MARGINAL LAND

The passage of the reclamation act in 1902 brought a clamor from the West to initiate projects. Not all could be soil surveyed before construction began. As a result large areas of marginal land were included in some of the enterprises. In some cases the soils were hard and refractory, in others the irrigable area included sand with poor water-holding capacity and having practically no fertility. In some of these sandy soils 8 acre-feet of water an acre were required to grow a crop. In such soils the little fertility held in it was soon leached out by excessive irrigation. Soils which appeared satisfactory from surface indications were often underlain by strata heavily charged with mineral salts. The rise in the water table and subsequent evaporation changed these lands into desolate wastes devoid of vegetation. Settlers who attempted to farm soils with these disabilities failed, except in rare instances.

INCLUDING POOR SOIL AFFECTS SOLVENCY

The inclusion of poor soils in projects may be attributed to several causes, first by the lack of a proper soil survey before the works are built; second, by including all land in the vicinity regardless of fertility to keep down the acre cost of construction, and, thirdly, by making the irrigable area fit the available water supply.

The inclusion of land of low fertility seriously affects the solvency of projects



Hauling grain, Tule Lake division, Klamath project, Oregon-California

and the prosperity of settlers. It causes losses to both the development agency and the settlers. An illustration will be given. One privately financed project includes 32,000 acres. One-half of it is of good soil and the other half is unsuited to anything but pasture. The estimates showed that water could be provided for 16,000 acres at \$60 an acre. By doubling the size of the project the cost was reduced to \$40 an acre. The promoters doubled it in size by reason of the lower acre cost. The landowners voted the bond issue because they believed they could sell their land after the works were constructed. The water supply and canals were provided for 32,000 acres. Now, more than 10 years after the project was built, not a single acre of the poor land is irrigated. The main canal and laterals serving the good land pass through the poor land. The poor land has defaulted in its irrigation taxes, and through the operation of a joint liability obligation the good land is called upon to pay \$80 an acre. Furthermore, the good land must pay the operating expenses for canals which pass through the poor land. The annual operation and maintenance charges are probably 50 per cent more than they would be if the works had been built for 16,000 acres which included all the good land. If a careful soil survey had been made before the project was constructed and heed given to the conclusions reached, the result would have been a successful district of moderate cost.

EFFECT ON FEDERAL PROJECTS

Little was heard of poor soil on Federal projects until full construction charges were required under the law. These became due about the time that the slump in agriculture occurred following the war. This combination of difficulties brought forth requests for relief from water users on a large number of projects.

THE FACT FINDERS

To deal with this situation, Hon. Hubert Work, then Secretary of the Interior, appointed a committee of special advisers on reclamation. These included six experts familiar with the economics of irrigation. Among their recommendations, they advised that new projects or extensions of existing projects should be authorized only after full information has been secured concerning the water supply, engineering features, soils, crops, transportation, markets, land prices, probable acre cost of development and other facts on which the success of the project must depend. Regarding old projects, they recommended that a survey of construction cost and classification of soils be

made by a competent commission and that it be ascertained if the present construction cost per acre is more than some or all of the classes of land within a project can bear, a fair and equitable adjustment be made which will fix the charge per acre at a sum the land can reasonably bear. In this connection they recommended that the Secretary of the Interior secure information upon which project lands may be classified with respect to their power under a proper agricultural program of supporting the farmer and his family and of repaying the construction cost of the project. The survey, they stated, should be in sufficient detail to enable the grouping of the farm units under each project into divisions or zones, each of approximately equal productive power. All lands which do not possess a productive power sufficient to support the farmer's family and to repay construction costs should be grouped in one class and all lands which are just coming into agricultural production and not yet ready to begin repayment should be grouped in another class.

These recommendations resulted in the passage of what is commonly known as the fact finders act of December 5, 1924, which authorized the carrying out of the comprehensive surveys recommended by the fact finders.

THE BOARD OF SURVEY AND ADJUSTMENTS

A board of survey and adjustments was subsequently appointed to make these investigations. This meant that all of the lands on 19 reclamation projects were to be classified in accordance with their productive power under irrigation. The survey was intended to determine

for the project (a) the area of permanently or temporarily unproductive land and (b) the areas of land capable of supporting a family but of different productive power. The classification of productive lands was divided into four classes, the best lands as No. 1 and the poorest as No. 4, and the unproductive lands were grouped into two classes, those temporarily unproductive as No. 5 and those permanently unproductive as No. 6.

It was impossible to secure the services of a number of soil technologists to make these surveys and it was, therefore, decided that the land classifications be made by the farmers on the projects under competent supervision. The farmers selected were those who had had long practical experience with the soils in their locality, and they were instructed to go over each farm in detail and classify the land thereon in accordance with the program laid down by the board of survey and adjustments. The instructions to these land classifiers included the definitions of the various classes of land, as follows:

Class 1.—Lands that with sufficient water and under approved systems of tillage, produce the best crops on the project, and that have such even topography that they may be easily irrigated, with a minimum of leveling and labor under the approved system of irrigation practice for the project. These are the best lands on the project—of good soil and good topography.

Class 2.—Lands of the same productive power as those in class 1, but with a topography so uneven as to require more expense and more labor in the tillage and irrigation of the fields. Such lands because of their topographic difficulties are generally less capable of sustaining a completely diversified kind of agriculture. These are usually good lands of poor topography.



Harvesting sugar beets on the Belle Fourche project, South Dakota

Class 3.—Lands of lower fertility or productive power, even with ample water and under good systems of husbandry, than those of the above classes. These lands may have even topography, therefore easily irrigated, but are incapable of producing the yields of the lands under classes 1 and 2. The cause of this infertility may be inherent in the soil or may be due to alkali, gumbo, blow sand, shale, shallow or porous soil, or other factors characteristic of the project. These are poor lands, often of good topography.

Class 4.—Lands of poorer productivity than those of class 3, or of the same grade as class 3, but with such unfavorable topography as to increase the expense of cultivation and irrigation and to decrease the crop yield. These are poor lands of poor topography, often with excessive slopes.

Class 5.—Lands that are not at present susceptible of agricultural use, but which may gradually by tillage and under changing conditions be made sufficiently productive to justify cropping. Alkali and water-logged lands that may be improved by drainage; excessively heavy soils that may be improved by the incorporation of organic matter or indirect fertilizers; light, sandy soils that may be firm by plant roots; steep soils that may be leveled, and other such soils, should be included in this class.

Class 6.—Lands that appear to be permanently nonagricultural under the practices of irrigation farming.

Attached to each board of survey and adjustments was a soil technologist who had had long experience with western soils under irrigation. Mr. Macey H. Laphan, western soil inspector for the Bureau of Chemistry and Soils, was adviser to the board dealing with the projects in the southern half of the Western States, and Mr. A. T. Strahorn, soil surveyor of the same bureau, was adviser to the northern board. They made inspections of the work of the local classifiers and suggested changes. These classifications were then adopted by the board of survey and adjustments and enacted into law by the passage of the adjustment act of May 25, 1926. This act authorized the suspension of construction charges on 207,342 acres of temporarily unproductive land and eliminated from projects 174,448 acres of permanently unproductive lands. In other words, Congress authorized the definite write-off with respect to the exclusion of poor soils in projects of \$9,343,038 and the suspension of charges on lands having a construction debt on this account of \$12,593,329.

SOIL SURVEYS ON PROPOSED OR NEW PROJECTS

The recommendations of the fact finders are now followed in investigating proposed projects. The lands are soil surveyed and classified in advance of construction in order that future elimi-

nations will not be necessary and to protect the investment of settlers so that they will not be placed on lands which will not make a comfortable living and pay charges.

In this connection, all lands in proposed or new projects are classed in class 1 (good irrigable land); class 2 (fair irrigable land); all other lands are eliminated. Class 1 lands are soils of the project best suited to the type of agriculture to which the region is adapted; topography, smooth with slope less than 6 per cent and with reasonably large-sized areas sloping in the same plane; drainage conditions favorable, both present and prospective. Class 2 soil includes lands of relatively less value for irrigation farming, due to poorer soil, topography or drainage or a combination of these conditions. This includes slopes up to 12 per cent. Attention is given in these surveys to their possible behavior under irrigation. Hard lands that are only slowly permeable to water are, in the absence of modifying conditions, placed in the nonirrigation classes, since methods for the reclaiming of these lands have not been fully developed. Even areas of good soil where seepage is likely to develop are placed in Class 2. All lands are thrown out which have poor soil, rough or steep topography, or difficult drainage conditions.

SOIL SURVEYS REQUIRED FOR DRAINAGE

There are some decided differences in the principles which govern the design of drainage systems for irrigation projects as compared with drainage in the humid regions. Drainage for the humid region is required largely to relieve land of water which enters the soil from the surface. Rarely is water-logging caused by seepage through the subsoil from higher areas.

Water logging in the arid region is caused by the flow of underground water in an upward direction. These underground waters are developed from seepage from canals and the subsurface losses from irrigation water applied to the land. The water flows underground down the slope until forced to the surface by a dense subsoil which acts as an obstruction to the flow. As a result the underground reservoir becomes filled and the ground water table rises. Under such conditions shallow drainage ditches are not effective. The average depth of drains designed at present is about 9 feet. Design of drains depends on a knowledge of the source and amount of underground water. This is dependent on slope of land and nature of soil and subsoil.

Drainage on Federal projects began in 1912. At present we are constructing drains through many combinations of subsoil from coarse gravel to gumbo. The

results of these drains after construction can be definitely determined. Capillarity, percolation, and the movement of water through the soil can also be determined in the laboratory. There still remains to be done the correlation of results of laboratory experiments with results of drainage in the field. This information used in connection with soil surveys will greatly aid in coming to conclusions regarding the inclusion or exclusion of certain soils in projects.

DOUBTFUL SOILS ARE EXCLUDED

Where there is doubt concerning areas of soil, they are excluded as it is not desirable for the Government to expend its money in construction of canals for any land which may not, under ordinary conditions, produce satisfactory results. Furthermore, such areas often can be reclaimed later when the water duty for the project is increased through better methods of farming and irrigation with very small additional cost. In this way, the soils of potential value are not condemned forever, but are not undertaken for reclamation until more is known of their productiveness under irrigation and their drainage possibilities.

COOPERATION BY THE BUREAU OF CHEMISTRY AND SOILS

Throughout this period of more than 25 years, we have had the whole-hearted and complete cooperation of the Bureau of Chemistry and Soils. During that time they have aided us in making examinations of the soil in 22 States. They have examined the soils on as many as six potential or constructed projects in one State. I have not the figures on the area dealt with but it is in excess of 5,000,000 acres. Their services have played no little part in the success that has been achieved. We have found that soil surveys carefully carried out are the foundation of successful reclamation development. Without good soil, but with other economic conditions favorable, settlers face a long and difficult struggle. Now soil surveys are carried along at the same time that engineering investigations are being made and the feasibility of projects rests as much on the conclusions made by these technologists as upon the sufficiency of the water supply or the cost of providing a water right.

THE Currie Canning factory at Delta, Uncompahgre project, canned and shipped during the season of 1928 about 70 carloads of fruit and vegetables, having a total value of \$100,000. The output included 10 cars of cherries, 15 of canned beets, 2 of apricots, and 15 of string beans.

Reclamation Conference at Denver, Colo.

March 13-15, 1929

A CONFERENCE of superintendents, construction engineers, district counsel, and others, led by Dr. Elwood Mead, Commissioner of Reclamation, and including employees from the Washington and Denver offices of the Bureau of Reclamation, will be held at the Denver office beginning at 9 a. m. March 13, 1929, and closing in the afternoon of March 15.

The object of the conference is to discuss the engineering, economic, and social questions that require decisions on the leading projects of the bureau. The tentative program follows:

TENTATIVE PROGRAM

FIRST DAY, MARCH 13, 1929

9 a. m.—Registration of members of conference.

9.30 to 11 a. m.—Committee meetings and conferences:

1. Those having problems involving administration or policy, confer with Doctor Mead and Mr. Dent.

2. Those having problems involving engineering and construction, confer with Messrs. Walter, Harper, and Savage.

3. Those having problems of an economic nature, confer with Messrs. Kreutzer and Hayden.

4. Those having problems of accounting or clerical work, confer with Messrs. Kubach and Smith.

5. Those having legal problems, confer with Messrs. Offutt, Stoutemyer, Alexander, Coffey, Roddis, Burke, and Devries.

6. Those having problems of purchasing, personnel, or other matters, confer with those in the Denver office in charge of these branches of the work.

11.10 a. m.—General meeting at conference hall:

1. Introductory address—Present day aspects of Federal reclamation. Dr. Elwood Mead.

CONSTRUCTION, OPERATION, AND MAINTENANCE

R. F. WALTER, *chief engineer, chairman*

2. Résumé of work in progress during fiscal year 1929 and proposed for fiscal year 1930. R. F. Walter.

12.30 p. m.—Adjourn for lunch.

2 p. m.—Conference reconvenes at hall.

1. Problems in handling large construction work by contract. F. A. Banks.

2. Power development on Government projects—Present practice and proposed new policies. L. N. McClellan.

3. Drainage work. Comparative results by contract and by Government forces. J. R. Iakisch.

4. Standard specifications for classification of excavation. S. O. Harper.

5. Need for better concrete and how to obtain it. B. W. Steele.

6. Maintenance and care of reservoir outlet works and related structures. C. M. Day.

7. Open discussion.

SECOND DAY, MARCH 14, 1929

9 to 11 a. m.—Committee meetings and conferences:

1. Those having problems involving administration or policy, confer with Doctor Mead and Mr. Walter.

2. Conference of district counsel, with Mr. Dent.

3. Those having problems of an economic nature, confer with Messrs. Kreutzer and Hayden.

4. Those having problems of accounting or clerical work, confer with Messrs. Kubach and Smith.

5. Those having problems of purchasing, personnel, or other matters, confer with those in the Denver office in charge of these branches of the work.

11.10 a. m.—General meeting at conference hall:

LEGAL AND FINANCIAL

P. W. DENT, *assistant commissioner, chairman*

1. Legislation enacted during seventeenth Congress. P. W. Dent.

2. Legal relations with water users, organizations on transferred projects. B. E. Stoutemyer.

3. Accounting relations with water users, organizations on transferred projects. W. F. Kubach.

12.30 p. m.—Adjourn for lunch.

2 p. m.—Conference reconvenes at hall.

1. Standard method of cost keeping for construction work handled by contract. L. R. Smith.

2. Problems in connection with town sites on Government projects. E. B. Debler.

3. Procedure in connection with delays in completion of contracts for construction and supplies; orders for extras and changes. Armand Offutt.

4. Open discussion.

THIRD DAY, MARCH 15, 1929

9 to 11 a. m.—Committee meetings and conferences:

1. Those having problems involving administration or policy, confer with Doctor Mead and Mr. Dent.

2. Conference of construction engineers with Messrs. Walter, Harper, and Savage.

3. Conference of superintendents of Lower Yellowstone, Milk River, Belle Fourche, Orland, Uncompahgre and Grand Valley projects, with Messrs. Kreutzer and Hayden.

4. Those having problems of accounting or clerical work, confer with Messrs. Kubach and Smith.

5. Those having legal problems, confer with Messrs. Offutt, Stoutemyer, Alexander, Coffey, Roddis, Burke, and Devries.

6. Those having problems of purchasing, personnel or other matters, confer with those in the Denver office in charge of these branches of the work.

11.10 a. m.—General meeting at conference hall:

SETTLEMENT AND FARM DEVELOPMENT

GEORGE C. KREUTZER, *Director of Reclamation Economics, Chairman*

Introductory by Doctor Mead.

1. Settlement problems of Owyhee, Vale, and Kittitas projects. G. C. Kreutzer.

2. Classification and appraisal of land on new projects. W. W. Johnston.

12.30 p. m.—Adjourn for lunch.

2 p. m.—Conference reconvenes at hall:

1. Crop census problems. B. E. Hayden.

2. Settlement results and recommendations for future—

(a) On Belle Fourche project. F. C. Youngblutt.

(b) On Lower Yellowstone project. H. A. Parker.

(c) On Orland project. R. C. E. Weber.

3. Proposed plan for rehabilitation of the Stanfield district. B. E. Stoutemyer.

4. Future disposition of class 5 and class 6 lands. E. E. Roddis.

5. Open discussion.

Prosperity follows the dairy cow, and prosperity to the farmer means greater educational advantages, more pleasant and agreeable community life, more comforts and conveniences, better homes and better churches, and more money in the bank.

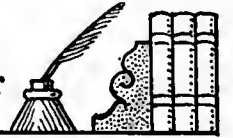


Apparatus used in placing concrete canal lining, Kittitas Main Canal, Kittitas division, Yakima project, Washington



Reclamation Project Women

By Mae A. Schnurr
Secretary to the Commissioner



Denmark—An Agricultural Example

IT WAS my privilege, during the past summer, to visit Denmark, among other countries, with a group of instructors, farmers, and business men of the South, and it is thought the following might be of interest to our readers:

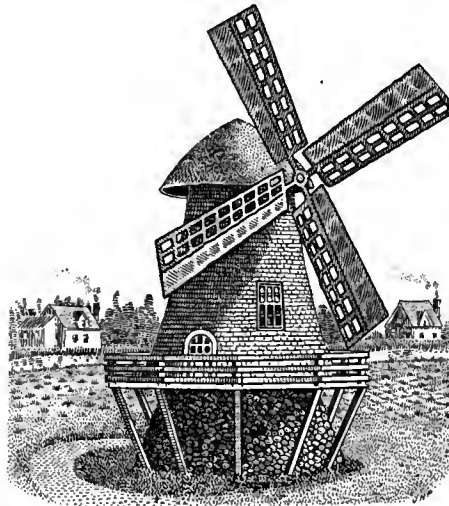
Denmark's population of 3,475,000 is principally engaged in agriculture and related occupations, 57 per cent being in the rural districts.

Ninety-three per cent of Denmark's farms are operated by owners. Land is divided into small holdings and land lying idle is practically unknown. Seventy-seven per cent is under cultivation and the balance represents mainly forestation projects.

Copenhagen, established as the capital of Denmark in 1443 is attractive and interesting. Its streets are cobbled and the popular means of transportation is the bicycle—there is a steady stream of them.

Denmark's farms are well ordered and the homes, with their thatched roofs on stone or frame buildings, are a delight to the eye.

Windmills are everywhere, and contrary to the common belief that these are used primarily for domestic purposes, I learned that they are used almost exclusively to pump water away from the farm land.



Electric and gasoline power have largely taken the place of the windmill, as they are more effective, and may be responsible for the eventual disappearance of the picturesque windmill.

Denmark is a combination of rolling and flat country. Open drains wind their paths through the farm land.

The dairy industry ranks first and the swine industry second in importance in point of agricultural exports.

The trade-mark "Lur Brand—Danish Butter" stands for quality and is guarded jealously. The word "Lur" is the old Danish name for war trumpets and the trade-mark shows two pairs of war trumpets interwoven.

Denmark has a special breed of cow. It is all brown and called "Koe."

At Odder, a small village in northern Denmark, a first-hand knowledge was obtained of the operations of the farm, the cooperative movement, the women's place in this scheme of things, the education of the children, and the training of boys on the farm.

I entered the home of Mr. and Mrs. Vlademar Petersen as their guest. The latter spent several years in the United States and could speak English. He is 38 years old and has been married about two years.

Mr. Petersen's story, as related to me, is like that of many other Danes. He was born in Denmark; all his forefathers were Danes and all owned their farms. As he and his brothers were growing up they were assigned to neighboring farms as stable boys and to help with the regular chores around the farm home. For this they received room and board and a small salary.

Mr. Petersen had a young boy of school age working for him. He had his duties to perform before and after school hours. There was a very apparent affection for this boy and an interest in his welfare. He lived on the Petersen farm. His home was not a very great distance and he was permitted to make frequent visits.

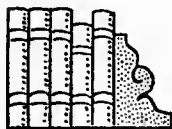
The Petersens own 10 acres. Their house, shown in the accompanying illustration, is a real home, typically Danish, the main portion containing living room and dining room, on one side, then center hall separating these from bedrooms, kitchen and laundry on the other side. It is 65 years old. Wings, added on each end of the house, constructed of brick, are 35 years old. One is a stable and the other a granary and tool house.

The farm is worked with horses, of which there are two. The farm imple-

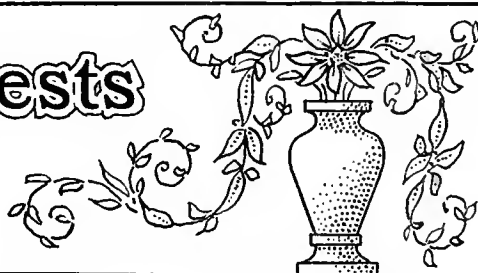


Petersen home; my "Home, Sweet Home" in Denmark

and Their Interests



and Associate Editor
New Reclamation Era



ments were in good condition and the other livestock consisted of 5 milch cows, 2 calves, 1 heifer, 4 sows, 10 pigs, and 50 chickens.

Some garden truck was raised for their own use. The money products handled through their cooperative association were milk, butter, cheese, and eggs. Mr. Petersen raised beets for the cows and hogs, and barley, oats, and wheat as money crops.

Members of the cooperative organization in Denmark are required to deliver eggs for market to the association. All eggs are stamped so that responsibility for poor quality can be placed where it belongs. Rules on frequency of collection, manner of keeping the eggs, frequency of delivery, and other needs, touching directly on the matter of quality of the eggs, are closely adhered to and are responsible for the success with which the association meets in marketing the product. Members agree to pay a fine if bad eggs are delivered.

Visits were made to the dairies, the bottling works, the stables containing blue ribbon work and riding horses and cows; also the mortgage-lifters (hogs) came in for their share of attention.

TEACHING DENMARK'S YOUTH

We met with leaders in school work, cooperative movements, administrative officials, and civic workers. They seemed pleased that we came over and anxious to afford us every opportunity to see what they are doing.

The Danish Ministry for Foreign Affairs and the Danish Statistical Department publish information on their school system that will bear reprinting for the information of the readers of this section. This is where we thought we would find the secret of just how Denmark's youth is kept on the land. While interest in agriculture was evidenced by heavy enrollment in the agricultural schools, the secret was not there. Love of the land was found inborn in the Dane. The compulsory school age is from 7 to 14.

The private schools are for the most part supported by the school fees of the parents, although they also receive large grants from the state and the municipali-

ties; but in the whole of the municipal popular school, education is free, and in the state and municipal examination schools, only those parents who have more than a certain average income pay for the education of their children.

As it will appear from the above, education involves heavy outlay for the state and the municipalities.

The University of Copenhagen, founded in 1479, is the only university in Denmark. It contains five faculties: Theology, law and economics, medicine, arts, and science (including mathematics). The university is a state institution, but self-governing, and, to a great extent, self-supporting, thanks to large endowments of bygone ages.

The number of students is about 4,400 including about 800 women, while the number of professors and instructors is 130.

AGRICULTURAL COLLEGES

The veterinary department was founded in 1775, and was, in 1858, extended into the Royal Veterinary and Agricultural College, now including the following departments: Veterinary, science, agriculture, forestry, surveying, horticulture, and dairying.

POPULAR ADULT EDUCATION

A special and prominent feature in Danish popular adult education is the people's high school (Folkehojskolen), as an institution of the greatest educational and cultural importance, which is almost exclusively frequented by the rural population.

Originating from the conceptions of N. F. S. Grundtvig, bishop, historian, and teacher, the first school was established in 1844, and in a short time a great number came into existence, all in the country districts. Their educational aim is, to quote Grundtvig, to give clear notions of the civic community and the conditions of its welfare, an appreciation of the national character, and the ability to express one's thoughts with ease and vigor, freedom and propriety.

The high schools are either people's high schools proper or agricultural colleges at which both agricultural and

subjects of a more general nature are taught. In 1926 there were 81 high schools and agricultural colleges, with a total of 9,700 students.

Special attention may be drawn to the International High School at Elsinore; one of its chief objects is to bridge the gulf of estrangement and suspicion which exists among the nations of the world. Foreigners here constitute a considerable proportion of the students.

The high educational and cultural standard prevailing in Denmark, and also to some extent its remarkable success in cooperative farming, is ascribed to the influence of the people's high schools, and foreigners in large numbers have made this type of education a subject of interested and detailed study.

For young men and women above school age, there are, both in the towns and in the country, 167 continuation schools with about 10,000 pupils, in which lessons are given during the daytime, and 813 night schools with a total of about 18,000 pupils. Most schools of these two kinds are municipal.

FACILITIES FOR FOREIGN STUDENTS

The study of Danish conditions in general, and even more so that of special Danish institutions, draws a good many foreigners to Denmark. For post-graduate study and research Denmark offers good opportunities.

English, German, and French, especially the first two languages, are widely spoken and understood in Denmark. The friendliness of the Danes is certainly contagious. To know them is to like them.

The women in the rural districts prefer to limit their interests to the home. As a result there is practically no club or political activity on their part. Homemaking is stressed in the training of the growing girls of the Scandinavian countries.

A country can be no better than its homes. Happiness, contentment, and comfort in the homes of a nation are bound to be reflected in that country as a whole.

American Falls Dam, Minidoka Project, Idaho

By Ioan E. Houk, Research Engineer, Denver Office, Bureau of Reclamation

THE American Falls dam, located on the Snake River near the city of American Falls, Idaho, was built for the purpose of supplying additional storage for irrigation in the Snake River Valley. It is a concrete gravity structure, with rolled earth-fill embankments at the ends, having a total length of approximately 1 mile, and a maximum height of 87 feet. The concrete sections of the dam are surmounted by a concrete highway bridge, built to replace the old timber bridge which crossed the river just above the dam and which was put out of service as soon as storage began. The dam was built by the Utah Construction Co. of Ogden, Utah, under a contract awarded January 23, 1925; and the bridge was built by the Lynch-Cannon Engineering Co. of Salt Lake City, Utah, under a separate contract awarded July 31, 1926. Construction operations were started in February, 1925, under the supervision of F. A. Banks, construction engineer of the Bureau of Reclamation, and the work was completed in September, 1927. Storage of water was begun in May, 1926, and the reservoir was filled for the first time in June, 1927.

The reservoir created by the construction of the dam is 25 miles long, 12 miles wide, has an average depth of 40 feet, a total area of 56,055 acres, and a total capacity of 1,700,000 acre-feet. It is filled by storing unused flood run-off and winter flow heretofore used by the Idaho Power Co., the right to store the latter being acquired by agreement with the power company. Stored water is used in augmenting the supply of numerous existing canals serving a total area of approximately 600,000 acres, located both above and below the reservoir, the lands above the reservoir being benefited through the exchange of American Falls storage for Jackson Lake storage. The American Falls storage will also supply approximately 170,000 acres of irrigable land included in the proposed gravity extension of the Minidoka project, also known as the Gooding project; in the proposed north side pumping extension of the Minidoka project; and in certain minor developments to be made by private enterprises.

The original plans for the construction of the dam contemplated a normal reservoir water surface elevation of 4,341.3 feet above mean sea level, with a corresponding reservoir capacity of 1,040,000 acre-feet and an average storage cost of \$7 per acre-foot. Half of the storage was to be reserved, and paid for, by the

United States; the remaining half to be contracted for, and paid for in cash, prior to the advertisement for bids, by irrigation districts, companies, and individuals desiring an additional water supply. However, alternative plans, providing for a normal reservoir level of 4,354.5 and a total storage capacity of 1,700,000 acre-feet, were included in the advertisement, together with a provision permitting the Government to adopt the plans for the higher dam any time before the completion of the river section to an elevation of 4,300. Contracts with the irrigation companies provided for adjustments of cost on a uniform basis, or allotments of additional storage, if desired, in case the alternative plans were adopted. In February, 1926, as additional storage subscribed for was sufficient to make up the \$950,000 difference in cost between the two plans, the contractor was notified to proceed with the construction of the high dam.

The construction of the American Falls dam involved a number of complicated right-of-way problems. It was necessary to move about three-fourths of the city of American Falls, including all of the business district; to relocate 2 miles of the main line of the Oregon Short Line Railroad, its depot, industrial tracks, and facilities; to relocate several miles of highway and construct new highway bridges; to acquire about 60,000 acres of rural lands, about half of which was located in the Fort Hall Indian Reservation and occupied by Indians; and to purchase a large part of the American Falls property of the Idaho Power Co., including more than a hundred town lots, several thousand acres of farm land, two small power plants, and a large part of their water-power rights. In fact the total cost of the right of way exceeded the cost of the dam by about 61 per cent.

An advisory board, selected by the various organizations which contracted for storage, was organized in the fall of 1920 for the purpose of assisting the representatives of the Bureau of Reclamation in outlining the work and in deciding various matters of policy. The board proved to be of great assistance in solving the complicated right-of-way problems. R. E. Shepherd, president of the American Falls Reservoir District, was chairman of the advisory board for a number of years. The American Falls Reservoir District contracted for a large part of the storage in the new reservoir and paid the Secretary of the Interior \$1,989,316 as their share of the cost in the fall of 1924, one of the checks presented being drawn in

the amount of \$1,274,991 and being the largest ever paid the Government for such an enterprise.

PRELIMINARY INVESTIGATIONS

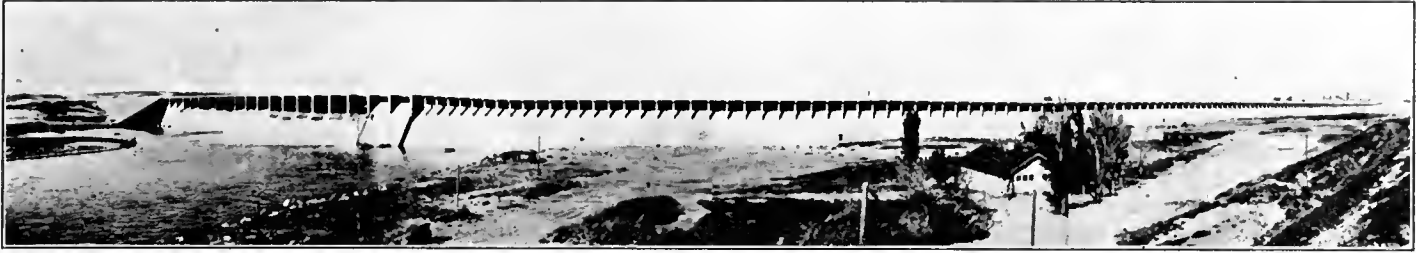
Preliminary investigations looking toward the construction of a reservoir at American Falls were begun many years prior to the beginning of work by the Bureau of Reclamation, but the project was found to be too large and complicated to be developed by private enterprise. The most conspicuous of the early efforts was that of interests connected with the development of the Twin Falls canals. These interests made a complete topographic survey and proposed tentative plans.

Active preliminary work was begun by the Bureau of Reclamation in the summer of 1918 when a field party began taking topography of the damsite and the town. From that time on the investigations were continued more or less spasmodically. Further topographic surveys, right-of-way surveys, measurements of ground water levels, studies of water supply, foundation drilling, studies of dam design, and estimates of cost were carried on as time permitted and as money for the investigations became available.

On January 15, 1920, W. O. Crosby, geologist, made a detailed report on the geology of the dam site and reservoir site. The letter of transmittal accompanying his report stated, "I am glad to be able to report that this project, although not free from geologic defects and complexities, is, in my opinion, entirely and economically feasible. In other words, a tight and stable dam on the proposed site and a reasonably tight reservoir appear to be safe predictions." He reported that an obvious fault, trending in a west-northwest direction, crossed the damsite near the west side of the river, but that it need not be regarded as a serious menace to the stability or tightness of the dam.

Beginning in October, 1920, a thorough exploration of the foundation was made with well-drilling outfits, soil augers, and by digging test pits. Three rows of holes spaced about 300 feet apart each way formed the basis of the drilling plan. These were supplemented by additional holes and test pits as needed to develop special features of the formation. The foundation was found to consist of excellent basalt rock extending to a depth of about 60 feet in the river section.

In January, 1924, the Denver office of the Bureau of Reclamation completed an



American Falls dam on the Snake River, Idaho

elaborate study of the cost of building different types of dams at the American Falls site. The profile along the site was divided into six parts from west to east, designated as the right embankment section, right penstock section, spillway section, left penstock section, left abutment section, and left embankment section. For the right and left embankment sections only earth-fill dams were considered; but for the other sections alternative plans and estimates were prepared for concrete gravity dams, multiple arch dams, Ambursen dams, and Turner dams. Plans and estimates were also prepared for an earth dam in the left abutment section, for the use of either radial or drum gates in the spillway section; for different heights of dam, and for the initial construction of comparatively low dams with ultimate developments to take care of future increased demand on storage. Total costs were compiled for eighteen different combinations of designs in the different sections and for three different plans of development, involving a total of a hundred and sixty-two separate estimates of cost of the entire dam.

The results of these studies indicated that on the basis of radial gate installations the combination of a concrete gravity dam in the spillway and penstock sections with an earth dam in the left abutment and embankment sections would be least expensive in all cases but one, the exception being the designs for a full initial development of 3,000,000 acre feet. The studies also indicated that for the plan finally adopted the increase in cost due to the selection of a concrete gravity dam for the left abutment section, instead of an earth dam, would amount to approximately \$237,000.

On August 2, 1924, a board of engineers, consisting of R. E. Shepherd, W. G. Swendsen, Louis C. Hill, A. J. Wiley, F. A. Banks, J. L. Savage and F. T. Crowe, recommended that the concrete gravity type of dam be adopted for all but the embankment sections. This recommendation was made because of the uncertainty regarding the available supply of suitable material for an earth dam, the greater safety of the concrete design as regards reservoir wave action, the lower maintenance expense required

for the concrete type, and the proximity of the dam to the city of American Falls, the main east and west highway, and the main line of the Oregon Short Line Railroad.

DESIGN OF DAM

The right embankment section is approximately 504 feet long, the right penstock section 108 feet long, the spillway section 540 feet long, the left penstock section 72 feet long, the left abutment section 2,376 feet long, and the left embankment section approximately 1,600 feet long, giving a total length of dam of approximately 5,200 feet. Reinforced concrete, counterforted, retaining walls separate the earth embankment sections from the concrete gravity left abutment and right penstock sections, the right embankment wall having a maximum height of 82 feet and a total length of nearly 400 feet. It was not considered advisable to extend the concrete gravity section to the right of the river channel because of the fault in the rock formations near the west bank of the river.

The spillway section is provided with 15 radial gates, each 33 feet long and 11 feet 4 inches high, raising the elevation of the crest from 4,343.2 feet to 4,354.5 feet when the gates are closed and providing a total spillway discharge of approximately 60,000 second feet when open. Three 5-foot by 5-foot hydraulically operated slide gates are located at the level of the river bed near the east end of the spillway section and 17 similar gates are located in the left abutment section just beyond the left penstock section. These gates will discharge approximately 20,000 second feet when fully open under full reservoir head. Six 15-foot circular penstocks, for future power developments, were installed in the penstock sections, two being placed in the left penstock section and four in the right penstock section.

The penstock and left abutment sections have a freeboard of 5 feet above the normal water surface elevation of 4,354.5; the earth embankment sections have a freeboard of 12 feet. The parapet on the embankment and left abutment sections constitutes an additional freeboard of 4 feet. A drainage gallery, 5 feet wide and

7 feet high, traverses the entire length of the concrete sections of the dam and provides access to the machinery for operating the slide gates; a radial gate gallery at a higher elevation traverses the length of the spillway section and provides access to the radial gate operating machinery. Transverse galleries connect the longitudinal galleries with convenient adits at the downstream face of the dam and with steps leading up the downstream face to the tops of the penstock sections. A 12-inch cast iron water main, to supply the city of American Falls, was carried across the river through the drainage gallery.

The embankment sections are provided with a reinforced concrete core wall founded on sound rock. The upstream face of the earth sections was built on a slope of 3 to 1 and was paved with hand-laid rock placed on a 12-inch layer of gravel. The downstream face was built on a slope of 2 to 1, was provided with a thickness of dumped rock, and was also paved with hand-laid rock. The tops of the embankments were provided with a 24-foot roadway, surfaced with 18 inches of gravel; the highway bridge over the concrete sections of the dam was provided with an 18-foot roadway, paved with a 2-inch layer of sheet asphalt.

A concrete cut-off was provided under the upstream edge of the concrete sections of the dam. Grout holes, 5 feet apart, were drilled into the foundation, to depths of approximately 17 feet, along the bottom of the cut-off and under the core wall of the right embankment section. These holes were grouted under pressures of 90 to 100 pounds per square inch. Drain holes, 5 feet apart and approximately 20 feet deep, were located downstream from the grout holes and under the upstream edge of the drainage gallery to which they were connected by vertical 3-inch wrought-iron pipe risers. A vertical well and a 15-inch cross drain in the spillway section of the dam conduct the drainage to the downstream edge of the spillway.

Concrete sections of the dam were designed for assumed uplift pressures, varying from full reservoir intensity at the upstream side to tail-water pressures at the downstream side, acting over one-

third the area of the base; for an assumed reservoir water surface 5 feet higher than the normal water level; and with a sliding factor of 0.65.

Vertical expansion joints were provided in the concrete sections of the dam, at intervals averaging 36 feet, the concrete being poured in alternate panels and intermediate panels filled in later. Each joint is provided with a 20-gauge, copper seal, placed near the upstream face of the dam and extending from the base to the top of the structure; also with vertical keyways, 3 feet wide by 9 inches deep, spaced 3 feet apart.

CONSTRUCTION OPERATIONS

Construction operations were started at the east side of the river channel a few weeks after the contract was awarded. A timber crib cofferdam was built from the east bank so as to include all of the high-pressure gates and the two 15-foot penstocks in the left penstock section. Concreting was started in July, 1925, and as soon as this part of the dam was carried up to elevation 4,300 the river was turned through the gate openings and the two penstocks, thus permitting work to be carried on in the remaining section of the river.

A timber railroad trestle was built across the river just below the dam, and by means of suitable switch backs on the west side the contractor was able to maintain the track along the top of the right embankment section until it had reached its full height. Most of the concrete, steel, rock riprap, and other materials were handled from this trestle.

The screening and mixing plant was located on the east side of the river below the dam. Endless belt conveyors carried the aggregate from the unloading pit to the revolving screens, where it was separated into sand, gravel, and cobbles; from the screens to convenient stock piles; and from the stock piles to suitable bins at the top of the mixing tower from which it could be chuted to the two 2-yard concrete mixers as desired. The mixers discharged into bottom dump skips, loaded on flat cars which were hauled to the dam by dinkey engines, picked up by cranes, and dumped. Two independent mixing plants, equipped with two ½-yard mixers, were used in constructing the west retaining wall and the right embankment core wall, material being supplied by trucks. Aggregate was obtained from the Michaud pit, located on the Oregon Short Line Railroad about 15 miles east of American Falls, some sand from the Mary Franklin pit near American Falls being added as needed.

The winter of 1925 and 1926 was unusually mild so that concreting from the

TABLE I.—Cost of American Falls Dam

Class of work	Quantity	Unit	Total cost	Unit cost
River diversion.....	Lump sum		\$135,000	-----
Excavation, class 1; stripping for embankments.....	4,432	Cu. yds.	1,773	\$0.40
Excavation, class 1; stripping for base of dam.....	53,844	do	24,229	.45
Excavation, class 1; core wall and trenches, open cut.....	3,359	do	1,848	.55
Trench excavation for core wall; timbered.....	2,308	do	13,847	6.00
Trench excavation for core wall, classes 1 and 2; not timbered.....	215	do	430	2.00
Trench excavation for core wall, class 3; not timbered.....	728	do	6,532	9.00
Excavation, class 3; dam and retaining wall base.....	35,440	do	141,761	4.00
Excavation, class 3; cut-off trench.....	3,995	do	23,972	6.00
Rock blanket on downstream face of dam.....	3,972	do	5,958	1.50
Back fill of retaining walls.....	10,034	do	8,027	.80
Dry back fill, downstream face of gravity section.....	11,021	do	6,613	.60
Puddled back fill, downstream face of gravity section.....	13,596	do	13,596	1.00
Rock fill in drain trenches.....	4,676	do	7,328	1.57
Embankments, sprinkled and rolled.....	105,594	do	79,196	.75
Gravel on embankment slopes.....	7,509	do	13,141	1.75
Hand-laid rock paving.....	14,791	do	44,424	3.00
Drilling grout holes.....	15,166	Lin. ft.	28,132	1.85
Drilling drainage holes.....	10,805	do	23,729	2.19
Grout hole pipe connections.....	877	Holes.....	3,744	4.27
Drain hole pipe connections.....	571	do	5,029	8.80
Pressure grouting.....	477	Cu. yds.	31,777	66.68
Placing drain tile in dam.....	217	Lin. ft.	188	.87
Concrete in core wall, forms not required.....	2,900	Cu. yds.	36,745	12.67
Concrete in core wall, forms required.....	3,397	do	71,567	21.07
Concrete in retaining walls.....	4,670	do	117,261	25.11
Concrete in gravity sections.....	163,953	do	1,406,319	8.58
Concrete in trash rack structure.....	1,253	do	41,295	32.93
Concrete in trash rack floor and cut-off.....	538	do	7,602	14.13
Concrete in radial gate piers and training walls.....	1,042	do	23,794	22.84
Reinforcing steel, bending and placing.....	1,432,370	Pounds.....	128,647	.020
Structural steel in trash racks, installed and painted.....	152,260	do	8,157	.053
Radial gates and hoisting mechanism, installed and painted.....	587,005	do	63,954	.109
Slide gates, installed and painted.....	1,319,190	do	177,597	.135
Structural steel pen stock gates, frames, and connections.....	450,478	do	37,908	.084
Electrical conduit, fittings, and boxes, installed.....	14,041	Lin. ft.	11,023	.785
Placing contraction joints in concrete.....			5,654	-----
Installing reservoir gauges.....			953	-----
Drains for seepage water.....			5,010	-----
Placing 36-inch pipe through dam for Neeley project.....			686	-----
Metal doors and tunnel house.....			2,849	-----
Roadway to tunnel house and level below dam.....			2,433	-----
Cottage, 5-room, frame.....			6,146	-----
Clearing reservoir site.....			249	-----
Freight refunds.....			\$ 15,508	-----
Adjusted compensation per article 45 of contract.....			\$ 40,000	-----
Total cost of dam.....			2,592,214	-----

¹ \$28,401 included in other items.

² Credit items.

main plant could be carried on with very little delay. A battery of two horizontal boilers heated the mixing water during the colder weather; and whenever necessary, the fresh concrete was covered with tarpaulins and live steam from the dinkey engines applied until the concrete was well set.

Most of the material for the right embankment section was obtained from the slope of the hill lying directly west of the dam site; the material for the left embankment section was obtained from a borrow pit at the east end of the dam. Both embankments were constructed by depositing the earth in 6-inch layers, sprinkling, and rolling with a 10-ton roller. Rock for riprapping the embankments was obtained from the excavation for the base of the left abutment section, the excavated material being stored in piles in front of the dam until needed. To facilitate handling the material a 36-foot panel of the dam was left open until the other work was practically completed, and a railroad track laid through the opening so that trains could run through the gap.

Highway traffic across the river was maintained during the greater part of the construction period by building a tem-

porary bridge across the river just below the dam. This was washed out during the spring flood of 1927 and from that time until the bridge over the dam was completed traffic was maintained by operating a cable ferry boat, the boat being built on pontoons and having a deck 45 feet long and 26 feet wide. The deck had a capacity of 9 automobiles and from 200 to 700 cars were transported daily.

Construction of the permanent bridge over the dam was begun in February, 1927, the work being started at both ends and proceeding toward the center.

The construction plant, consisting of a ½-yard concrete mixer, a circular saw for cutting forms, and a hoisting tower, was placed near the center of the left abutment section; and the concrete was delivered to the forms by Ford trucks, running along the 8-foot top of the dam. Practically all exposed concrete was poured in metal-lined forms, thus obtaining a smooth finish. Concrete work was finished August 30, 1927, the asphalt pavement was completed September 14, and the bridge was opened to traffic September 24, 1927.

Preparations for moving the city of American Falls to a new site near the east

end of the dam were begun in the fall of 1923. The Bureau of Reclamation acquired the new town site; subdivided it into lots, parks, industrial areas, etc.; graded and graveled the principal streets; installed sidewalks, water pipes, a sewer system and street culverts; and set more than 3,300 trees and shrubs in the parks and along the streets. None of this work was included in the contract for the dam. Some of it was done by separate contract, the remainder by Government forces. In the spring of 1925 the people began moving their houses to the new town. Nearly all buildings were carried on trucks, using the so-called three-point method of suspension; that is, with one set of trucks at the front of the house and two sets at the rear. Practically all moving was completed by the end of 1926.

COST DATA

Table 1 gives the quantities, total costs, and unit costs of the various items included in the construction of the dam; Table 2 gives similar data for the highway bridge. The contractor's profit amounted to about 14.1 per cent of the total in the case of the dam, and to about 6.8 per cent of the total in the case of the bridge. The contractor cooperated with the engineers in keeping accurate detailed records of cost of all classes of work. Wages paid by the contractor were from \$3.60 to \$4.80 per day for common labor, from \$4.80 to \$8 per day for skilled labor, from \$125 to \$250 per month for miscellaneous employees on a monthly rate of pay, and from \$125 to \$500 per month for foremen and superintendents.

Table 3 gives the principal items of cost involved in the entire reservoir project, including preliminary investigations, right-of-way items, and various items of overhead. Quantities are given in percentages of the total cost as well as in absolute values. It will be noticed that the cost of the dam alone amounted to only about 35 per cent of the total cost of the reservoir. The expense incurred because of the fact that the city of American Falls was originally built in the reservoir site amounted to about 23 per cent of the total, the expenditures for rural property affected to about 12.4 per cent, the expenditures for Indian land adjustments to about 9.8 per cent, and the expenditures made to cover the interests of the Idaho Power Co. to about 8.7 per cent. The total cost of the reservoir to date is \$7,355,315, which is \$541,685 less than the engineers' estimate, and an average of only \$4.33 per acre-foot.

TABLE 2.—Cost of bridge at American Falls dam

Class of work	Quantity	Unit	Total cost	Unit cost
Concrete bridge deck and girders	1,282	Cu. yd.	\$36,696	\$28.62
Concrete bents and recesses in dam	683	do.	24,785	36.30
Concrete parapet on left abutment section, including curb	404	do.	10,337	25.60
Concrete curb on embankment sections of dam	178	do.	4,157	23.32
Concrete pedestals for lamp posts	10	Units	533	53.30
Railing panels on concrete dam, installed and painted	212	do.	8,010	37.78
Railing panels on embankments, installed and painted	122	do.	5,219	42.76
Cutting, bending, and placing reinforcing steel	297,740	Pounds	15,211	.0175
Structural steel beams, installed and painted	546,343	do.	27,145	.049
Angles and bearing plates, installed and painted	28,176	do.	3,689	.131
Cast-iron road drains	86	Units	891	10.37
Cast-iron manholes	16	do.	399	24.93
Metal lamp posts, installed and painted	75	do.	3,527	47.03
Electrical conduits, fittings, and boxes, installed	3,069	Lin. ft.	1,596	.52
Electrical wiring	Lump sum		1,671	
Asphalt road surface, laid	6,262	Sq. yds.	18,479	2.95
Bridge approaches	179	Cu. yds.	990	5.53
Miscellaneous work			246	
Total cost of bridge			148,370	

¹ \$5,211 included in other items.

TABLE 3.—Cost of American Falls reservoir

Feature	Cost	Per cent of total cost
Surveys, investigations, and testing	\$127,925	1.74
City property; purchases, damages, appraisals, and miscellaneous	1,685,128	22.91
Rural property; purchases, damages, appraisals, and miscellaneous	912,515	12.41
Indian lands; purchases, field investigations, appraisals, etc.	720,398	9.79
Highway changes; easements, construction, bridges, and ferry	83,892	1.14
Idaho Power Co.; purchases, damages, easements, etc.	640,194	8.70
Oregon Short Line R. R. Co.; purchases, damages, etc.	142,288	1.93
American Falls dam, construction of	2,592,214	35.24
Bridge across dam, construction of	148,370	2.02
Camp maintenance	3,388	.05
Engineering and inspection	102,006	1.39
Superintendence and accounts	23,601	.32
General expense	173,396	2.36
Total cost of dam and reservoir	7,355,315	100.00
Total estimated cost of dam and reservoir	7,897,000	
Net saving in cost	541,685	



A wheat field on the Tule Lake division of the Klamath project, Oregon-California

A Practical Demonstration of Aided and Directed Settlement

THE activities of Winston Bros. Co. on the Zurich Irrigation District of the Chinook Division of the Milk River project, Montana, afford a practical demonstration of what financially aided and directed settlement will do in curing a sick project. The history of their work follows:

District bonds were taken by the company in payment for construction of the canal system. As time went on these bonds were depreciating in value, district taxes were becoming increasingly delinquent, interest payments were not being made promptly or in full, there was little if any agricultural development, several farms had been practically abandoned, the remaining landowners as a rule were disheartened, and the future prospect was rather discouraging. The company considered disposing of the bonds at a substantial discount, but after a thorough study of the situation decided rather to endeavor to enhance the value of the securities by investing additional funds in a development and rehabilitation program.

An extremely competent local business man who was also secretary of the district and very familiar with conditions generally and individually was placed in charge of the project. Action was immediately started to obtain title to the delinquent lands by tax deed, and in this manner nine farms varying in size from

40 to 320 acres were acquired. The revenue to the district from the purchase of tax-sale certificates by the company resulted in improving its financial condition to such an extent that it was possible to liquidate an indebtedness of about \$20,000 represented by registered warrants, placing the project on practically a cash basis. The district was then able to finance a badly needed drainage program, now practically complete, which will ultimately render productive a considerable area of land previously either flooded or water-logged.

Two of the farms acquired by the company were immediately redeemed by the owners, who produced crops during 1928 for the first time in several years. During the past year six new settlers were placed upon the remaining tracts. These settlers were carefully chosen by the local agent and were men experienced in irrigated farming. In most cases there were no improvements on the farms and it was necessary to construct small but adequate and permanent farm buildings for the new settlers. Also assistance in improving the farm was given by paying \$2 per acre to the tenant for the land broken from sod, and other financial aid rendered to such settlers as were considered needy and worthy. Assistance, of course, was under the strict supervision of the local

agent and was limited to \$2,000 per 160-acre farm for improvements such as buildings.

The selling price fixed for the land was based on tax acreage and is very low, not in excess of the price paid by the company in acquiring title, which payment, together with cash advances, is spread over a long period with a reasonable interest rate. It is the usual policy to lease for one or two years to the new settler with option to buy at the end of the period if conditions are satisfactory to both parties. In cases, however, where direct purchase has been made only a small down payment is asked, which is never of such an amount as to cripple the purchaser in his improvement of the farm.

Although this project has been in operation but one year, the general result to the district has been extremely beneficial. The spirit among the landowners has changed from despondency to optimism. Some farmers who have for several years past allowed their lands to lie practically idle have paid up delinquent taxes and are now actively engaged in improving their holdings and placing them on a paying basis. Tax delinquencies have dropped from approximately 20 per cent to 4 per cent, the total delinquency in payment of the first half of 1928 taxes being approximately \$1,400, \$1,150 of which will be paid within the next 30 days. The general obligation of the district, aside from the bonded indebtedness, has been reduced from around \$28,000 to less than \$10,000, and the prospect now is that the district will continue as a successful irrigation venture.



Purebred dairy cattle on Minidoka project, Idaho

State Engineer of Utah Makes Biennial Report

A copy of the report of George M. Bacon, State engineer of Utah, covering the biennium 1927-28, has been received by Dr. Elwood Mead, commissioner of reclamation, and might serve as a model for other similar reports. It is well printed, constructive, and readable. The frontispiece is a map showing the location of the cooperative investigations in Utah carried on by the Utah Water Storage Commission and the Bureau of Reclamation. Especially interesting are the chapters discussing the appropriation of water, the distribution of water, the adjudication of water rights, and the work of the Utah Water Storage Commission.

Immediately upon organizing, this commission appointed a Colorado River Data Committee which has brought to gether a large amount of data on the relation of Utah to the proposed development of the Colorado River Basin. Another matter of particular interest to the Bureau of Reclamation is the work of the commission in cooperative investigations of Utah projects, including the Salt Lake Basin, Provo River, Utah Lake, Cache Valley, Blanding, Tooele-Rush Lake, and Moon Lake projects. Requests for investigations have been made and study will later be given to the Paradise Park, Ouray, Price River, and Gooseberry projects.

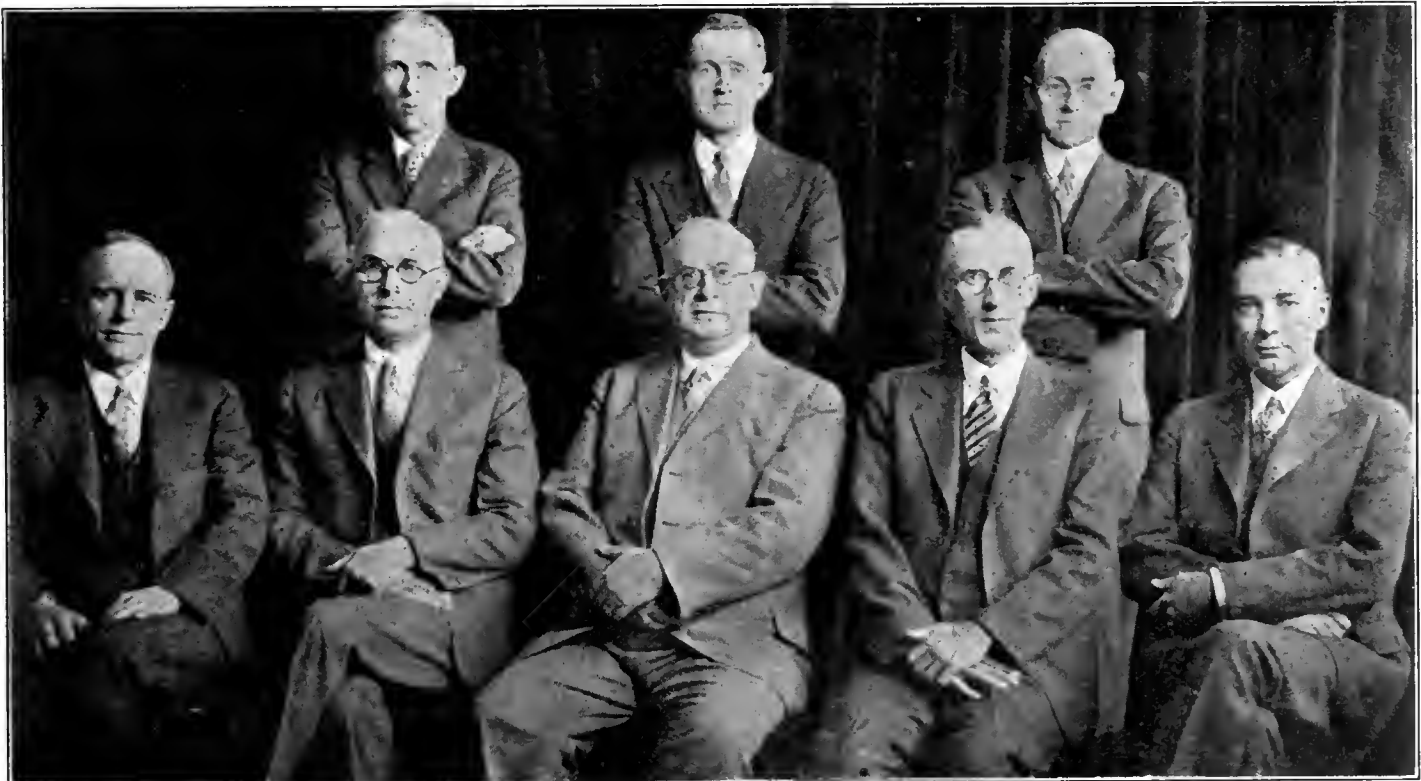
Irrigation and Freight Tonnage

By B. E. Stoutemeyer, District Counsel

DURING the year 1927 there were 6,437 carloads of freight shipped out from the various stations on the Minidoka project, Idaho, and large additional amounts shipped in, all this from a territory which was a sagebrush desert before the project was built. How irrigation development has served to produce tonnage for the transcontinental railroads is illustrated by the fact that the Minidoka branch, from the town of Minidoka to the town of Buhl and serving the Minidoka and Twin Falls projects, now produces more tonnage than the Union Pacific System received from the entire State of Idaho before these two projects were built. This freight from the irrigation projects helps to pay the operating expenses and fixed charges of the transcontinental railroads and makes it practical to maintain lower rates than would be at all possible if these roads were obliged to operate through a thousand miles of unproductive territory and to depend entirely upon the through traffic and the insignificant amount of freight that would be produced in an arid

section without irrigation. There are seven transcontinental railroads between the Middle West and the Pacific coast. Without irrigation each of these roads would have about a thousand miles of line through the arid region of the intermountain section which would be a kind of bridge, so far as traffic is concerned, requiring heavy expense for upkeep and producing very little revenue.

The importance which railroad men attach to irrigation as a source of permanent railroad business is illustrated by the statement which is frequently heard in railroad circles in the West, that "the railroad will build to a hay stack but will not build to a mine." The irrigation projects are the link which connects the settlements of the Middle West with the settlements of the Pacific coast and makes this country an undivided whole. No one who is interested in the transcontinental railroads, either as a stockholder desiring dividends or as a shipper desiring good service and reasonable rates, can be indifferent to the irrigation development which is such a large element in the success of these roads.



DENVER OFFICE ENGINEERING ORGANIZATION

Left to right, standing: Byram W. Steele, designing engineer on dams; William H. Nalder, assistant chief designing engineer; Charles M. Day, mechanical engineer. Sitting: Erdman B. Debler, hydrographic engineer; John L. Savage, chief designing engineer; Raymond F. Walter, chief engineer; Sinclair O. Harper, superintendent of construction; Leslie N. McClellan, electrical engineer

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, attended the annual dinner of the American Engineering Council at the Mayflower Hotel, Washington, D. C., on January 14; and on January 16 to 19, in company with George C. Kreutzer, director of reclamation economies, he attended the annual meeting of the American Society of Civil Engineers in New York City.

FR. F. Walter, chief engineer of the Bureau of Reclamation, never lost his unruffled calm under the newspaper selection of the genial chief of the Denver office to be in active charge of the construction of Boulder Dam. His characteristic comment was, "Is that so? First I've heard of it."

According to figures published recently by the California quarantine station at Yuma, which inspects all cars westbound, the traffic for 1928 showed an increase of 25 per cent over that of the previous year. Allowing three passengers to each of the 71,423 cars inspected, 214,269 tourists passed through Yuma westbound, and the amount of eastbound traffic was probably only slightly less.

Recent visitors on the Minidoka project included A. J. Wiley, consulting engineer, and F. A. Banks, construction engineer, in connection with an inspection of the river bed below American Falls Dam; W. J. Martin, assistant supervisor of agriculture, Union Pacific System; and M. H. Coffin, water master of the Salmon River project.

L. S. Oakes, president of Winston Bros. Construction Co., and J. M. Bruce, general superintendent of the Derbon Construction Co., spent several days on the gravity extension unit of the Minidoka project.

M. L. Wilson, head of the department of agricultural economies of Montana State Agricultural College; I. D. O'Donnell, of the State extension service; and C. D. Greenfield, agricultural development agent of the Great Northern Railway, were recent visitors on the Milk River project.

Miss Maryden Dahlstrom, clerk on the Sun River project, has resigned.

Recent visitors on the Belle Fourche project included S. O. Harper, general superintendent of construction, to inspect drains and other construction work and to advise on engineering repairs; N. E. Fordham, master mechanic, to inspect the riveting and calking on Lang Siphon; and W. D. Fisher, secretary, Custer Battlefield Highway Association.

The services of Otto C. Batch, associate reclamation economist, Belle Fourche project, have been discontinued, effective December 31.

H. D. Fowler, Seattle representative of the Pittsburgh-Des Moines Steel Co., visited the Kittitas division of the Yakima project recently.

Associate Engineer Arthur Ruetters has been transferred from the Kittitas division of the Yakima project to the Denver office to assist with Kittitas designing work. Assistant Engineer George C. Imrie succeeds Mr. Ruetters as office engineer.

Assistant Engineer Claude W. Wood, Kittitas division of the Yakima project, has resigned to accept employment with the General Construction Co. on the Owyhee Dam contract.

L. N. McClellan, electrical engineer from the Denver office, spent several days on the Riverton project, and was also on the North Platte project for two days inspecting the Lingle and Guernsey power plants.

Adolfo Orive Alba, Mexican engineer, designated by the Mexican Government to study irrigation in the United States, paid the Rio Grande project a brief visit on his way back to Mexico.

V. G. Evans has resigned as chief clerk of the Rio Grande project, and H. H. Berryhill has been designated as acting chief clerk.

H. T. Cory was a recent visitor at the Washington office. He was accompanied by Sr. Isodoro Fontana and Sr. Carlos Mendoza, civil engineers from Madrid, sent to the United States by royal decree from the Spanish Government to study and report on concrete construction in general, and on dams and highways in particular. Mr. Cory is accompanying them on a personally conducted trip to New York, Washington, Chicago, and Los Angeles.

Edward L. Sutherland, junior engineer, and Charles S. Hale, chief of party, Carlsbad project, have been transferred to the Owyhee project.

James E. Golladay, associate attorney in the Washington office, died on January 23, 1929, at Yuma, Ariz., where he had been temporarily assigned since November 15, 1928. Mr. Golladay had been continuously in the employ of the Bureau of Reclamation since October 1, 1900.



Field of alfalfa grown by W. R. Reeve, Tieton division, Yakima project, Washington

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. ROY O. WEST, SECRETARY OF THE INTERIOR

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					Name	Office
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Milk River	Malta, Mont.	H. H. Johnson	E. E. Chabot	E. E. Chabot	do	Do.
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Newlands ⁵	Fallon, Nev.	A. W. Walker		Miss E. M. Simmonds	R. J. Coffey	Barkley, Calif.
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Okanogan ⁷	Okanogan, Wash.	Joe C. Iddings			B. E. Stoutemyer	Portland, Oreg.
Orland	Orland, Calif.	R. C. E. Weber	C. H. Lillingston	C. H. Lillingston	R. J. Coffey	Barkley, Calif.
Owyhee	Nyssa, Oreg.	F. A. Banks	H. N. Bickel	Frank P. Greene	B. E. Stoutemyer	Portland, Oreg.
Rio Granda	El Paso, Tex.	L. R. Flock		L. S. Kinnicott	H. J. S. Devries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	R. B. Smith	R. B. Smith	Wm. J. Burke	Mitchell, Nebr.
Salt River ⁸	Phoenix, Ariz.	C. C. Cragin				
Shoshone ⁹	Powell, Wyo.	L. H. Mitchell	W. F. Sha		E. E. Roddis	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah	Lee R. Taylor				
Sun River ¹¹	Fairfield, Mont.	G. O. Sanford	H. W. Johnson	H. W. Johnson	E. E. Roddis	Do.
Umatilla ¹²	Irrigon, Oreg.	A. C. Houghton				
Uncompahgre	Hermiston, Oreg.	Enos D. Martin				
Vale	Montrose, Colo.	L. J. Foster	G. H. Bolt	F. D. Helm	J. R. Alexander	Montrose, Colo.
Yakima	Vale, Oreg.	H. W. Bashore	C. M. Voyer	C. M. Voyer	B. E. Stoutemyer	Portland, Oreg.
Yuma	Yakima, Wash.	P. J. Preston	R. K. Cunningham	J. C. Gawler	do	Do.
Yuma	Yuma, Ariz.	R. M. Priest	H. R. Pasewalk	E. M. Phlebaum	R. J. Coffey	Barkley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam	Coalville, Utah	F. F. Smith ¹³	C. F. Williams		J. R. Alexander	Montrose, Colo.
Kitititas	Ellensburg, Wash.	Walker R. Young ¹³	E. R. Mills		B. E. Stoutemyer	Portland, Oreg.
Sun River, Gibson Dam	Augusta, Mont.	Ralph Lowry ¹³	F. C. Lewis	F. C. Lewis	E. E. Roddis	Billings, Mont.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshan Irrigation District and Gering and Fort Laramia Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928.

⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹³ Construction engineer.

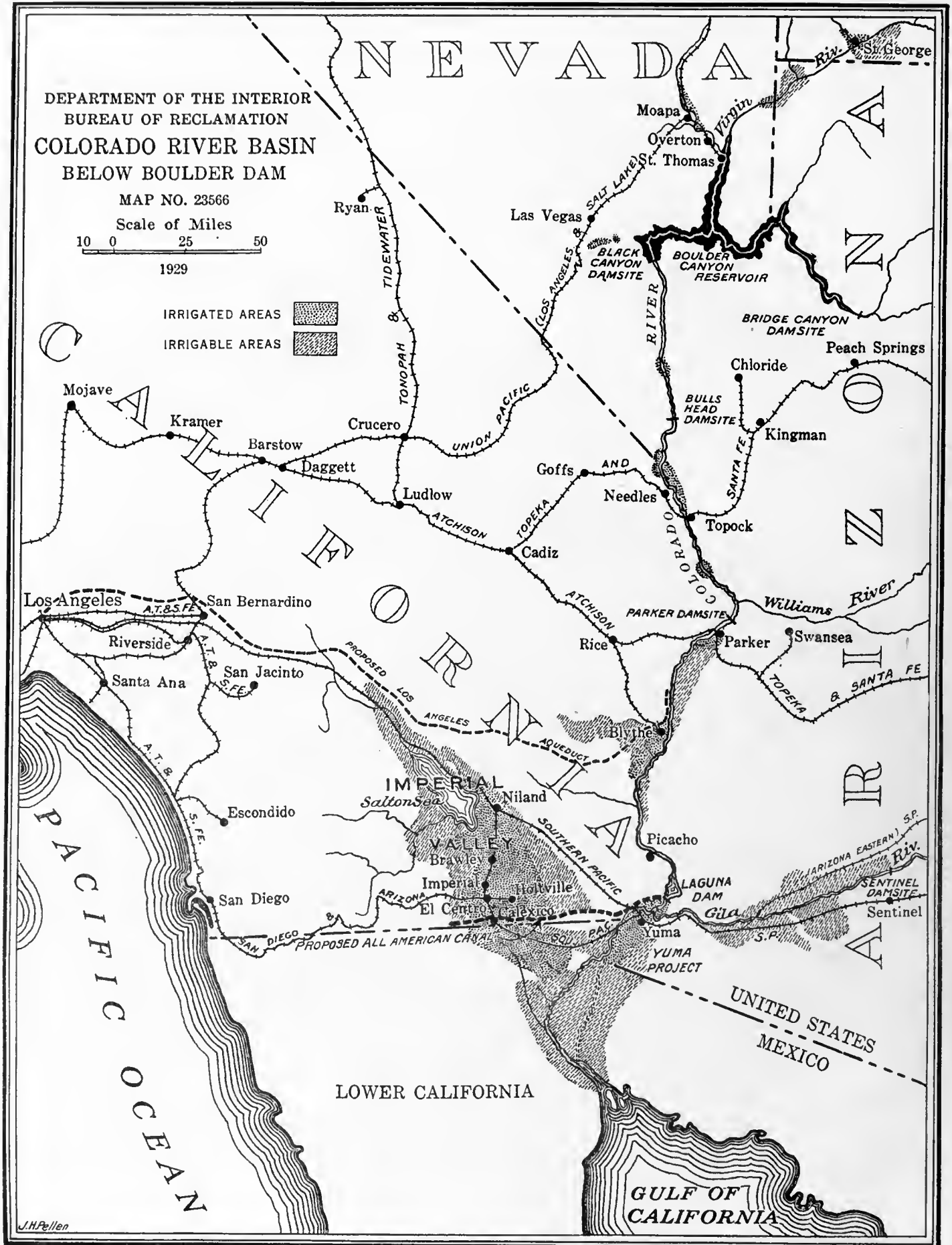
Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Heart Mountain investigations	Powell, Wyo.	I. B. Hosig	State of Utah.
Utah investigations	Salt Lake City, Utah	E. O. Larson	
Truckee River investigations	Fallon, Nev.	A. W. Walker	
Yakima project extensions	Yakima, Wash.	P. J. Preston	

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO RIVER BASIN
BELOW BOULDER DAM

MAP NO. 23566
Scale of Miles
10 0 25 50
1929

IRRIGATED AREAS [stippled pattern]
IRRIGABLE AREAS [cross-hatched pattern]



J.H.Pellen

NEW RECLAMATION ERA

VOL. 20

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NO. 3



Photo. by J. E. Stimson, Cheyenne, Wyo.

GANNETT PEAK AND GLACIER, WIND RIVER RANGE, WYOMING, ONE OF THE SOURCES OF THE COLORADO RIVER

THE modern conception of reclamation includes experts in agricultural practices and the business of agriculture as well as expert engineers. People drawn from widely separated parts of the country must be brought to know each other and work together, in order that they may cooperate in doing things which the community can do better than the individual. These include the purchase of livestock, material for houses, the working out of an agricultural program that will lead to the planting of crops suited to the soil and climate, teamwork in buying, and arranging for marketing of their products in such manner that the man on 40 acres inside the project can do business on equal terms with the man with 1,000 acres outside. These are not fanciful theories; they are a part of modern methods and modern progress in building up prosperous and successful communities under irrigation in other countries. The reclaimed areas of the arid West afford one of the finest opportunities for their introduction into this country



NEW RECLAMATION ERA

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ROY O. WEST
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

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March, 1929

No. 3

Interesting High Lights on the Federal Reclamation Projects

ON THE Yuma project practically all the cotton except bollies has been picked, and these in many instances are being plowed under owing to the scarcity of pickers. There has been an increase of 11,000 bales in the amount of cotton ginned this year, 28,955 bales being this year's record as against 17,900 to the same date last year.

SOME damage to early cantaloupe plantings was evidenced by the heavy frosts during the latter part of the month on the Yuma project, but this damage will not seriously affect the season's crop, it is understood.

IN CONNECTION with the building up of truck gardening and growing of winter vegetables on the Yuma project experiments have been made with carrots, beets, and other types of vegetables. The results obtained have been satisfactory and the acreage will possibly be increased next year.

OWING to the increased price of feed locally, which has reached 12½ to 15 cents per head per day, only a few cattle have been shipped into the Yuma project for fattening purposes during the past month. However, the shipping out of fattened cattle to the coast markets has increased.

SEVERAL 10-acre units are being prepared for planting to trees on the Mesa division of the Yuma project. This work consists of clearing, leveling, and planting, which will continue until late in May.

REMODELING of the Royal Hotel at Orland has been started, in connection with which extensive improvements, consisting of installation of steam heat and other modern facilities, are planned.

PRELIMINARY plans have been formulated at Orland for a cooperative organization of turkey raisers of five Sacramento Valley counties in the vicinity of Glenn County for the purpose of stabilizing prices to the extent of bringing the growers remunerative returns. The movement had its inception with the Orland Grange.

THE Orland project has been in the grip of an unusually cold winter, and according to local records, with the exception of the years 1910 and 1922, the temperature has reached the lowest point since 1883, but no damage to any project crops has resulted.

SURVEYS are being made by the El Paso Natural Gas Co. to determine the feasibility of extending their construction to include Las Cruces. A charter has been granted by the city of Las Cruces to this company for supplying gas, providing that it is found feasible.

AT THE California Livestock and Baby Beef Show in San Francisco, six Nevada calves of 4-H Boys' and Girls' Club brought \$4,540, or an average of \$756 per animal. This is believed to be a world's record average price for 4-H Club calves sold at auction. The average price was 89 cents per pound.

A NEW book on turkey production, containing over 300 pages and 30 illustrations, has been written by L. E. Cline, Churchill County agricultural extension agent. Turkey experts have pronounced this book a real contribution to literature on this subject.

WITH the advent of electric power to the farms on the Newlands project there is a marked tendency to materially improve rural living conditions.

AT THE recent annual meeting in Reno of the Nevada State Farm Bureau agricultural problems of the State were discussed. Sam H. Thompson, president of the American Farm Bureau Federation, an outstanding figure in agriculture, stressed the fact that responsibility for much of the inequality that now burdens the agricultural industry is due to lack of organization on the part of the farmers.

AT THE recent annual meeting of the Minidoka County Beet Growers' Association action was taken looking to the securing of an agreement with the Amalgamated Sugar Co. to operate the Rupert-Paul factory during the coming season.

THE Yuma Mesa Fruit Growers' Association is marketing fruit under its own trade names through the packing plant at Highland Park, Calif. The latest recorded price was 4½ cents per pound for grapefruit, which forms the major crop of the Mesa division of the project.

RENEWED activity is being manifested in the subdivisions adjoining the city of Yuma. These are usually split up into ½-acre to 5-acre tracts, and are used mainly for residential purposes. Additional road bonds for more paving through the valley division of the project will be voted upon in the near future, and, if carried, will provide good roads leading within 1 to 2 miles of each holding in this division.

ON THE Uncompahgre project excellent prices are being received for cattle shipped to market. The 1929 wool crop is being contracted at prices ranging around 37 cents per pound or better, and many sheepmen are holding out for a prospective increased price at the time of shearing.

The Problems and Accomplishments of the Bureau of Reclamation

Speech of Dr. Elwood Mead, Commissioner of Reclamation, broadcast by Station WJSV, Washington, D. C., February 5, 1929

THE Reclamation Bureau was created to build irrigation works and make homes on the unpeopled deserts of the arid region. In urging this policy, President Roosevelt said that the reclamation and settlement of these lands would enrich every portion of the country; that home-making was but another name for nation-building.

The operation of the act has amply sustained the President's forecast. More than 600,000 people live on the Federal reclamation projects that dot the thousand-mile zone of scanty and uncertain rainfall that once separated the humid east from the cities and farms of the Pacific coast. They sustain 685 schools and 683 churches. The crops grown in 1928 were worth \$135,000,000, which amount is almost sufficient to pay off in a single year the entire indebtedness of the projects to the Government amounting to \$166,000,000. The farms, gardens, and orchards give fresh cheap food to mining districts and help keep mines in operation. The policy has strengthened the range stock industry by providing winter feed for stock, which without they would have starved. It has cheapened freight rates by giving an immense amount of local business to transcontinental roads.

One or two illustrations will show this. In one Federal irrigation district where 25 years ago the only livestock was jack rabbits and coyotes, a single town paid the Burlington Railroad last year \$800,000 in freight charges. More freight was carried over the Union Pacific to and from two Government projects on Snake River in Idaho than came from the entire State before these projects were built.

THE WHOLE COUNTRY BENEFITS

These reclaimed areas are supplying this country with numerous valuable products which can not be grown elsewhere and they supply our markets with fresh vegetables at seasons of the year when climate suspends production in other sections. Dates can only be grown in the arid irrigated Southwest. Sugar beets, rice, and long-staple cotton lessen the amount of money we have to send abroad. Federal irrigated areas furnish an immense and stable market for eastern factories. Automobiles, farm machinery, clothing, and other articles manufactured in the East fill the warehouses of western towns. Providing these things gives employment to thousands of workers and creates larger local demands for the products of eastern farms. Because so

many of the crops of western reclamation do not compete with those of humid sections, and because of the support they give to eastern industries, Federal reclamation has not injured eastern agriculture. On the contrary it has helped it.

DEVELOPMENT BY PRIVATE ENTERPRISE AIDED AND EXTENDED

In nearly every large valley of the arid region the reclamation policy has acted as a life-saver for communities begun by private enterprise. The settlers in Salt River Valley, Ariz., living under half a dozen privately built canals, found themselves unable to obtain means to complete their works or build the reservoir needed to regulate the river's discharge. By taking over and rebuilding these works and building the Roosevelt Reservoir it made of this valley one of the richest agricultural districts in the West and one of Arizona's greatest economic assets. In a valley where no agricultural crop can be grown without irrigation, the crops taken from its irrigated fields in 1928 were worth \$26,100,000.

Similar aid in extending and safeguarding private development, by building great storage works and larger and more substantial canals, has exerted its beneficent influence on the irrigated communities of the Rio Grande, Yakima, Snake, Missouri, and North Platte Rivers. No other investment of the Government has brought greater social or economic returns and, because of the local need for this development, none other has been of greater national advantage.

ALL MONEY SPENT COMES FROM THE ARID REGION

There is a widespread belief that the money spent on reclamation comes from taxes, and that the farmers of the humid section pay these taxes. Nothing of the kind occurs. The original act provided that development would be limited to the money made available from the sales of public land and from the income obtained from the sale of these works to water users, when built. This income from the payment of construction costs was to be a revolving fund and be available for building other works. The water users' construction payments are now the chief source of money for building new works. The revolving fund is revolving. Last year settlers' payments amounted to more than \$5,000,000. The payments from a single project reached the huge total of \$1,765,000. In addition

to the income from land sales and water users' payments, some revenue comes from oil and other mineral leases, and the revenues from power plants. In all, about \$11,500,000 was appropriated for construction in 1929.

ECONOMIC AND SOCIAL ASPECTS OF IRRIGATION

Conquering the desert requires more than canals and reservoirs. Before satisfactory results from irrigation can be secured, soil baked for centuries must be subdued. The surface has to be leveled so that water will flow over it easily. Thousands of farmhouses and other farm buildings have to be built; equipment and livestock have to be provided. The amount of money required for these things is far greater than has been realized, and the obstacles which confront settlers are so serious that organization and direction are needed in overcoming them.

The importance of planning settlement and farm development has only begun to be realized. The greatest progress in reclamation in recent years has come through the attention paid to its social and economic problems. Not all these problems have been solved. Better credit in farm development is needed, broader and more comprehensive plans for determining what crops can be grown and for efficient marketing of products are required.

In addition to the above there is needed closer cooperation between the Federal and State Governments. State interest in the projects located within its borders should be manifested by lessening taxes during the development period, giving aid and advice in making farm improvements, and helping these new communities to organize for business and social affairs.

Then there are legal problems. On many streams the irrigated farms line the banks for hundreds of miles. The rights to water and the protection of these rights when rivers are low and water is scarce are essential to the prosperity of farmers and the stability and value of irrigation properties. These rights, thus far, are established and protected under State laws and by State authorities, which is sufficient where streams rise and are used within a State's boundaries. But large rivers cross State boundaries. The watershed of the Colorado includes parts of 7 States. The Columbia includes 5 and the Missouri 6. Federal reclamation works are being operated in 15 of these States. Contracts with settlers have to

conform to these laws and to numerous amendments of the original act by Congress. The legal and accounting branches of the Reclamation Bureau confront many difficult problems.

THE WEST URGES NEW DEVELOPMENT

The pressure by localities and States for new works and to complete old ones was never greater than at present. Some now being built have a size and cost not regarded as possible when Federal reclamation began. The Owyhee Dam, now building, will be 405 feet high and will impound water for 125,000 acres of land in Oregon and Idaho. The dam and canals will cost \$18,000,000. The Boulder Dam in the Colorado, recently approved by Congress, will be 700 feet high and will impound water enough to cover the State of Maine to a depth of 1 foot. It will hold the entire flow of the river for a year and a half. Both dams are higher than any now existing. Both, when completed, will be monumental engineering achievements.

The agricultural depression following the Great War caused extreme hardship and loss to settlers on reclamation projects where farms were not fully improved and earning power had not been established. In sections of the country where farms were improved and markets near by, farmers lost money and many were unable to meet their obligations. Doing this was still more difficult on reclamation farms, where land still needed to be leveled, where buildings had to be erected and more equipment bought. Financial difficulties of Federal reclamation project farmers led to an investigation in 1924, and to a writing off of \$14,000,000 of the construction indebtedness to the Government. This is about 7 per cent of the total expenditure on reclamation. The payment of \$12,000,000 was deferred. Many believed that the deferred payments would also be lost, but some is being paid, and recent events give reason to expect that a considerable part will be.

PROJECTS ARE MEETING THEIR PAYMENTS TO THE GOVERNMENT

The generous action of the Government had a valuable moral effect. It improved the financial outlook of settlers and restored hope and confidence. As a result, the payments in 1927 were \$1,000,000 more than those in 1926, and those of 1928 were \$1,000,000 more than those in 1927. On 11 of the projects, 87 to 100 per cent of the construction payments due have been made. On 5 others, the percentage ranges from 76 to 84, and there are only 2 projects where less than half the payments due are still owing.

Government Subsidy in Settlement

DR. H. SCHILDKNECHT, of Switzerland, has called attention to recent action by foreign governments in subsidizing the settlement and development of idle land.

ITALY

In a recent issue of the Paris edition of the New York Herald the statement appears that within less than two years 132,500 acres of boggy, useless land have been reclaimed and placed under cultivation. In this area there have been created modern villages and 226 separate farms, inhabited by people who have migrated from other overpopulated sections of the country. A population at the start of 9,360 persons has grown to 15,000. Whereas in 1922 this area supported only 10,000 head of cattle, it supports to-day more than double that number. About 80,000 acres of the total are devoted to the growing of grain, as against 25,000 before the reclamation work was begun.

The Italian Government has now prepared a bill calling for the reclamation by drainage and irrigation of a huge area of land which now either lies under stagnant water or is otherwise untillable. Under the terms of the bill, the work must be accomplished within 14 years at the outside at a total cost of 7,500,000,000 lire. Of this sum the State will contribute 3,800,000,000 lire, in annual payments spread over a period of 30 years, and the proprietors of the land to be reclaimed will contribute the rest.

Much of the land to be reclaimed lies along the valley of the River Po and in other parts of central and northern Italy, but perhaps the greatest amount of work is to be done in southern Italy. It is estimated that 91 per cent of the land in the Basilicata section alone is subject to reclamation.

GERMANY

By an act of the German Government of November 11, 1926, loans are made to

On 17 projects between 92 and 100 per cent of all the operation payments have been met, and on none of them has less than half of the operation payments been made, and on only 3 are the payments less than 90 per cent.

Each year farms become better improved. Each year cultivation becomes more skillful and scientific. The average crop return per acre is now more than two and a half times that of the country as a whole. Reclamation has justified itself by the wealth it has produced, and by the influence it has exerted to build up a sound and prosperous life on what, without it, would be unpeopled deserts.

subsidize reclamation and settlement. Of a total sum of 60,000,000 reichsmark, one-fourth is provided for settlement in reclaimed areas. The loans are made for a period of 5 years and the interest ranges between 4 and 4½ per cent. By a later act the Government spends up to 1931, 6,000,000 reichsmark as subsidies to lower the interest rate of the above loans in reclamation and settlement.—*Abstract from Der Kulturtechniker.*

CZECHOSLOVAKIA

From 1919 to 1925 the Department of Agriculture of Czechoslovakia spent the sum of 54,241,502 kroner for subsidies in reclamation, mainly drainage and settlement.

COLOMBIA

The lack of immigrants or colonists has been given serious study by the Government of Colombia and encouragement has been given for foreigners to take up agricultural lands in the Republic.

One of the most important steps taken has been the execution of two contracts in May, 1927, between the National Government and two Colombian companies for colonizing the Sierra Nevada region around Santa Marta. One contract was with the Compania General de Negocios, S. A. (General Business Co. (Inc.)) of Barranquilla, and the other with the Compania Colonizadora en la Sierra Nevada, S. A. (Sierra Nevada Colonization Co. (Inc.)) of Santa Marta. The tracts of land comprised under the contracts are approximately 125,000 acres each, and are located in the mountain regions where climatic conditions are more suitable for European colonists. It is planned to furnish each colonist with about 60 acres of land and in accordance with the contract not less than 2,000 colonists must settle on each of the tracts of land under consideration.

In the early part of 1928, the President of the Republic signed a decree for the development of agricultural conditions on public lands. Under the terms of the decree the Minister of Industry is directed to organize agricultural colonies for the people of Colombia as well as immigrants for areas around the Pacific Ocean and other designated areas. In each colony it is planned to establish a church, hospital, schools, and a municipal house and an area of 300 hectares is to be set aside for an agricultural experiment station. Each colony is to maintain a commissary to be operated on a cooperative basis and each colonist shall be entitled to a piece of land ranging from 25 to 175 acres.



Reclamation Project Women

By Mae A. Schnurr
Secretary to the Commissioner



Facts About the Success of German Agriculture

DESERVES BEST THOUGHT AND ATTENTION

TWENTY-SIX years, with reclamation by irrigation as a Federal policy of the United States, has taught many things. Among them is the fact that irrigation farming is a highly specialized enterprise. No longer can anyone say that all one needs to get results are good soil and brawn, or that all the Government needs to make a successful project are irrigation works and good growing conditions and that these will be inducement enough to attract the right kind of farmer. Both of these versions have been refuted by experience.

The very purpose of the reclamation act, which offered the opportunity for making homes on the desert wastes of the arid and semiarid region, is defeated if additional irrigation works are built without a definite program of settlement and intensified farm development, and that means bringing to Federal projects the kind of people, with sufficient capital and experience to make success possible. The increased cost of new projects means taking precautions for increased earning power that were not taken with earlier projects built.

If the established farmer can not make a go of it, what incentive is there for the growing boys and girls of our projects to enter into the spirit of farming and select agriculture as a vocation?

WHAT ARE OLDER COUNTRIES DOING?

Foreign countries had the vision long ago to discourage or provide through education for the drift from agricultural pursuits, and every opportunity was afforded for the study of agriculture, not only by the growing boy but by adults as well. Better and cheaper methods of doing things have increased the earning power of the farmer. Thus we find, in countries like Denmark and Germany, that generation after generation boasts of following agricultural pursuits.

In America the movement to train the young in this field is gaining impetus and, by cooperative funds of the States and Federal Government, progress has been made in the development of teachers of vocational education who form the nucleus of the force which spreads the gospel of "special training for farming" the same as for any trade.



Village of Wendleben, Germany, and surrounding country

In Europe this movement is so far ahead of America that each year delegations from the States and Federal Government study its methods on the ground. I was privileged to do this last summer, going as delegate from the Interior Department with a party of educators, farmers, and business men.

Our attention was naturally focused on Denmark and Germany. A short account on Denmark appeared in the February issue of the "Era."

AGRICULTURAL TRAINING

Much has been heard about the practical training of the younger generation in trades in Europe and reference is always made to Germany's effective system of apprenticeship.

In going through Germany I availed myself of every opportunity to inquire about the subject and observe the system in operation, where possible, with particular reference to agricultural apprenticeship. From various sources the following information on the subject was gathered:

A great deal of Germany's land is in large holdings and handled as estates. The crying need is for agricultural managers, and thorough apprenticeship is devised to lead to these better positions. Apprenticeship in Germany is sponsored by private interests.

Approximately 90 per cent of Germany's farms, up to 100 acres, 70 per cent of those over 100 and less than 500 acres, and 25 per cent of those farms of 500 upwards to 3,000 acres or more, are operated by owners.

AGRICULTURAL WINTER SCHOOLS

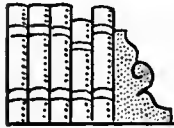
Prior to 1908 the traditional home training of the German peasant-type of farmer was supplemented by the agricultural winter schools. Thus they represented the agricultural college of the peasant farmer. These were usually conducted at the county seats by the county administration (Kreisaemter or Oberaemter). Theoretical instruction of an elementary nature in problems of farm management was emphasized in these schools.

Out of this grew the desire for organized apprenticeship.

INAUGURATION OF ORGANIZED APPRENTICESHIP

Agricultural apprenticeship was first organized in the Prussian Province of Saxony in 1908 by the Deutsche Landwirtschafts Gesellschaft (German Agricultural Society); for brevity hereafter to be

and Their Interests



and Associate Editor
New Reclamation Era



referred to as D. L. G. This society has a committee for agricultural apprenticeship.

The cooperating federal agency is the federal economic council and through its educational committee suggestions are made to the D. L. G. Under State secretaries of agriculture, agricultural agents are employed and the expense of this service is met cooperatively from State and Federal funds.

The D. L. G. investigates and selects the training farms, of which there are 230, according to the latest statistics on the subject, located in all sections of Germany. These recognized training farms are subjected to periodic check-ups as to their standard and also as to the apprentices assigned. Candidates are accepted from the age of 15 and up, and the minimum education is grammar school only.

There is no authority of law for the apprenticeship system in Germany. An agricultural apprentice candidate signs a written contract for two years training, which states the curriculum. A nominal salary of probably \$5 per month is paid and board and lodging furnished by the owner of the farm to which he is assigned.

His training is systematically arranged so that every phase of the operation of a farm is explained as he is trained in the business of farming. These include chemical analysis of the soil and its suitability for certain crops, preparation of the soil for planting, selection of seed, the rotation of crops and the use of commercial fertilizer to promote fertility, drainage, protection of hillside slopes from erosion, the use of modern farm equipment and machinery and its repair, care of livestock and poultry, veterinary practices, operation of incubators, dairying, etc.

Apprentices classed as agricultural juniors have as their goal positions as agricultural managers. Those classed as agricultural assistants have the ambition of applying their training to a small farm of their own.

After the training period, assembled written examinations and practical tests are given to those who apply. Eligibles for the examination are those who have completed the required two years of training. Since the inauguration of the apprenticeship system (1908) and up to

1924, latest data available, 1,000 of such examinations have been held.

Extensive truck farming, dairying on a large scale, operating a distillery, and cattle raising, especially breeding, are considered industrial agriculture and are controlled by industrial laws. Selection as apprenticeship members is limited to those holding certificates by the State chamber.

In 1921 the cooperating body with the private interests sponsoring agricultural



System of locks and canals throughout Germany for water transportation

apprenticeship, made comments and suggestions for the betterment of the movement. Some of which are:

Encourage the training of young people going professionally into agriculture, or of adults already in agriculture.

For agriculture, mental as well as manual versatility is needed, therefore ample time is needed to study the subject thoroughly.

Designation of more training farms and arousing to interest the chambers of agriculture, farm owners, and tenants of large holdings to create opportunities to educate farmers.

Pressure should be brought to bear on all those who shift from nonagricultural to agricultural pursuits to start their work on training farms.

Closer check should be made, by authorized committees of chambers of agriculture, of progress of apprentices and methods employed by training farms, i. e., to see that the trainee is progressively covering the various steps of training in his apprenticeship contract.

Farms to be disapproved as training farms on a showing of breach of apprenticeship contracts.

Those who have completed apprenticeship should be urged to go into specialized or diversified farming for several years immediately following the training period.

Continuation schools in agricultural districts should, in their curriculum, emphasize preparation for agricultural careers.

Education of adults by special lectures and demonstrations should be encouraged and financed by chambers of agriculture, by employers' associations, and by farm labor unions.

Important agricultural posts, such as managers of large estates, should be filled by those best qualified for such positions without regard to family or wealth.

Number of apprentices assigned to a farm should be in proportion to the size of the farm.

Federal laws should be enacted in regard to supervision of apprentices, listing of training farms, requirements of an examination, and listing eligibles who have passed examinations.

Such Federal law should make the State department of agriculture responsible for apprenticeship.

TEACHING HOME ECONOMICS IN GERMANY

This is being accomplished on a big scale all over Germany. In the thickly populated communities regular courses are established in the schools and colleges and, in the sparsely settled sections, traveling schools are resorted to, where theoretical and practical instruction is given.

The vocational bureaus have been urging the passing of a law making it compulsory for young women who contemplate marriage to study home eco-

nomics. This movement met with failure; likewise the one contemplated which would require special training of servants.

FURTHER ASSURANCES FOR HIGHER RETURNS

All of this foresightedness in the training of the young in Germany is supplemented by using only the best quality of seeds and material.

We visited one of Germany's oldest and largest firms of seed breeders, Hoerning Bros. (Ltd.), Rossleben, Germany.

The firm controls 10 estates of 12,500 acres. Sixty professional assistants and 1,000 workmen are employed. Two hundred horses, 100 mules, 350 oxen, 800 other head of cattle, 6,000 sheep, and 600 pigs are on the 10 estates.

Driving into their Rossleben estate the first thing we noticed were the cherry trees, laden with fruit, on each side of the road. Our first view of their grounds was to me a wonderful sight. The experimental fields and neat grouping of buildings immediately gave one the feeling of orderliness and efficiency.

This is naturally drained country, gently rolling. The average rainfall over a period of 20 years is only 19 inches. This is due to what is called the "rain shadow" of the Harz Mountains. The roads could be located from quite a distance by the rows of fruit trees lining them on each side.

We walked through a portion of the estate and visited the administrative office, laboratory, selection shed, museum, meteorological station, etc. No effort was spared to inform us as to what goes into the exact duty of proper seed breeding. The preparation of the soil, rotation of crops, artificial isolation of exceptionally good specimens, scientific crossing, testing, etc., were painstakingly explained. These were visualized to us by a film showing all operations. This section is particularly adapted to the production of sugar beets and the firm of Hoerning Bros. (Ltd.), has an international reputation for high-grade sugar-beet seed.

Here, as in Sweden, women are employed in great numbers for field and laboratory work. A typical working costume would be a three-cornered scarf around the head, a large apron over a dark dress, and wooden shoes. They work in groups of 20 or more, each under a man supervisor.

From a vantage point two photos were taken showing the character of the country we enjoyed. Note the lock and canals for transportation by water and the little village of Wendleben. This picture was snapped from the ruins of an old castle 1,000 years old, which served as a lookout station and protection from van-

dals of this small village, the nucleus of which was a monastery.

GERMANY'S EXPERIENCE TEACHES US

A better understanding of agriculture, by training, will instill "love of the land" in the young generation. Their training will effect changes in methods of doing things on the established farm. How many instances are there where a young chap of the household is sent away to an agricultural college and returns to show "old dad" new and better ways to increase farm production and incidentally raise the family income?

Encouragement of vocational agricultural training can not be overdone. It is one of the ways of keeping the boy on the farm.

Rio Grande Farmers Offered Cash Prizes

The Dona Ana County Farm Bureau on the Rio Grande project, New Mexico-Texas, has offered prizes totaling \$260 to the farmers who raised the best cotton

The economic problems confronting the farmer of to-day are different and more numerous than they were when Federal reclamation was inaugurated due mainly to the increased cost of production.

The social problem confronting project women is a more serious one. They are wide awake to the responsibility and taking advantage of the means at their disposal to solve the problems as they present themselves. In this they deserve all the help and encouragement any agency can extend to make farm life as attractive as city life and offer as many advantages for ease, comfort, and material advancement in the country as are offered in the towns.

during 1928. Four prizes are being offered, one of \$60 to the farmer who raised the best field of cotton on 5 acres or more; a second of \$140 to the farmer who had the largest average yield of an entire farm based on acreage; a third, designed to encourage the keeping of cost records, of \$25 to the farmer scoring the most points on completeness, accuracy, and economy in production as shown by acreage cost, and cost of a 500-pound bale; and a fourth prize of \$10 for the best sample of lint cotton of not less than 1 pound. In addition to these prizes a silver medal will be given to each farmer who grows an average of 2 bales to the acre on the entire acreage of his farm, entitling him also to membership in the 2-bale-an-acre club.

Lamb Feeding Tests on Sun River Project

On the Sun River project, Montana, lamb feeding demonstrations were carried on by two local boys, who have shown that the fattening of lambs can be carried on profitably upon project farms. Each of the boys received 54 lambs, the average weight being 68.1 pounds. After feeding for 90 days the gain in weight was 19.6 pounds per animal, 2.21 pounds of hay and 1.29 pounds of grain having been fed to each animal daily. The lambs were purchased at a cost of 10½ cents per pound, and the total cost of the animals, feed, salt, etc., was \$995.34. The contracted selling price was 12 cents, bringing a total of \$1,117.20 for 106 head, 2 of the original number having died. The net profit amounted to \$121.86, or \$1.13 per animal. The market value of the lambs at time of selling was 14 cents, and a larger profit would have been realized if the contract to sell at 12 cents had not been accepted.

Tule Lake Opening March 18, 1929

The Department of the Interior has announced another opening to entry of public land on the Tule Lake Division of the Klamath Federal irrigation project, Oregon-California. On March 18, 28 farm units will be thrown open, water for which will be available beginning with the irrigation season of 1929.

Until June 18, 1929, these units will be open to entry only by officers, soldiers, sailors, or marines who have served in the Army or Navy of the United States in the war with Germany, and have been honorably discharged or separated therefrom, or placed in the regular Army or Naval Reserve: Provided, however, That they must be qualified to make entry under the homestead laws and also possess the qualifications as to industry, experience, character, and capital required of all applicants for public land. After June 18, 1929, any units which remain unentered will be subject to entry by the general public.

Copies of the public notice are now available and, with application blanks, may be obtained by addressing the Commissioner, Bureau of Reclamation, Washington, D. C., or the Superintendent, Klamath Irrigation Project, Klamath Falls, Oreg.

Growing Almonds on the Orland Irrigation Project, California

By R. C. E. Weber, Superintendent

ALTHOUGH native to the countries bordering the Mediterranean Sea, the almond is especially well adapted to California as a whole, trees growing in nearly every county of the State. The Sacramento and San Joaquin Valleys together with the adjacent foothill areas, however, constitute the major portion of the State's commercial producing area. Almond trees are found in a number of eastern States, but California, produces about 99 per cent of the entire crop raised in the United States.

The almond is somewhat similar to the peach in manner of growth and character of blossoms and leaves. The wood, however, is much harder and under similar conditions the tree is much longer lived. The useful life of the almond at Orland is rather indeterminate, there being project orchards 40 to 45 years of age, which are still producing profitable crops under proper cultural methods. A peculiar characteristic of the tree is its very short period of winter dormancy, it being among the last of the deciduous trees to shed its leaves in the fall and the first to start growth and come into bloom in the spring.

SOIL REQUIREMENTS

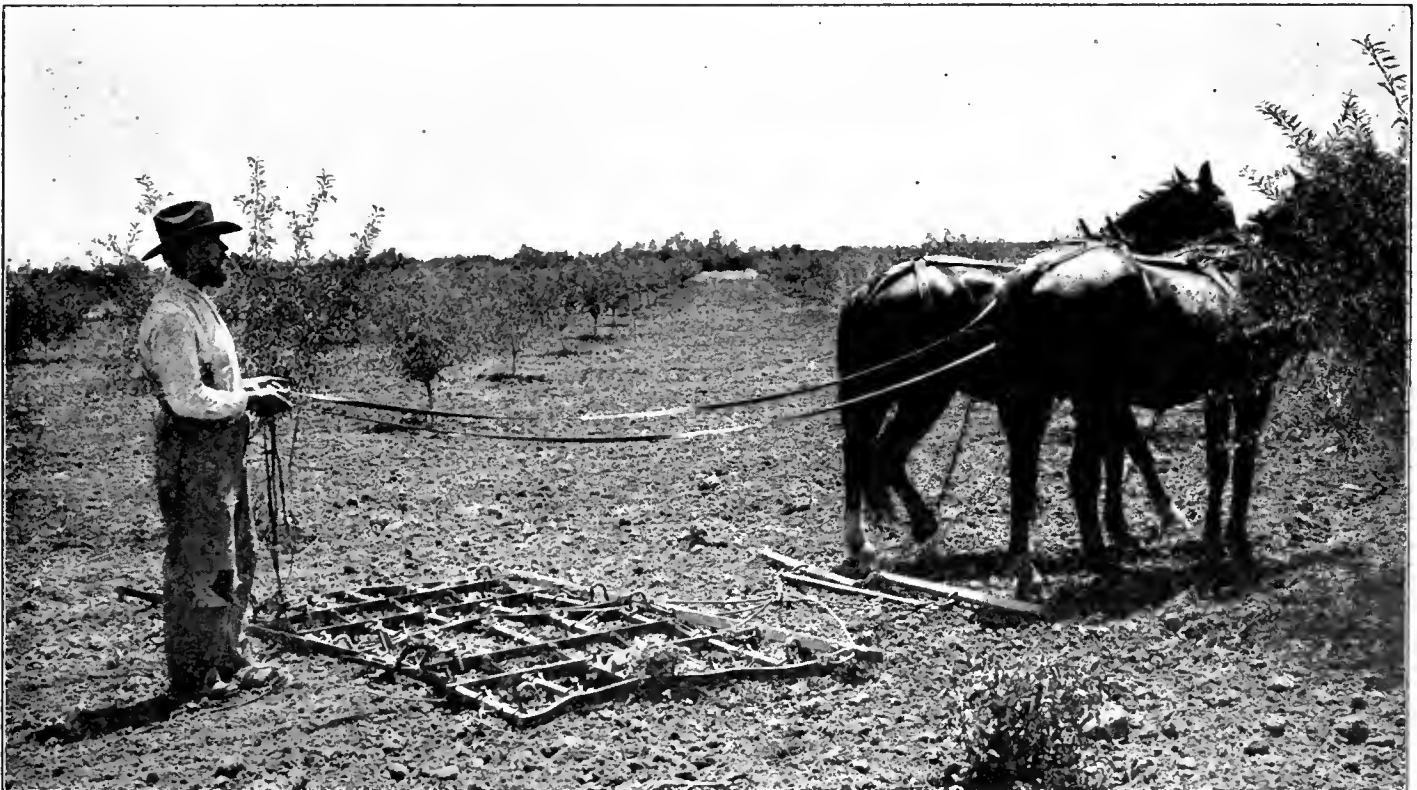
The soil requirements of the almond are those of depth, fertility, and good

drainage, both surface and subsurface. The drainage requirement is particularly essential and for this reason the gravelly loam soils of the Orland project are best adapted and are most extensively utilized for raising almonds. The moderate winter temperatures prevailing at Orland especially during February and March—the blossoming period during which the crop is most susceptible to injury from low temperatures—render the industry practically free from frost damage without resorting to expensive smudging operations, quite generally necessary for the successful production of almonds elsewhere in California. Under proper pruning for protection against sunburn, together with an adequate water supply, the almond flourishes in the high summer temperatures prevailing in the Sacramento Valley.

An abundant supply of humus in the soil is essential for the successful production of almonds, and for this reason the best trees on the project are on areas, which, prior to planting almonds, were devoted to alfalfa. For the growing trees, the natural and volunteer cover crops, consisting of native grasses, such as burr clover and filerie, which flourish during the winter and spring months, supply the required humus, although the use of barnyard manure is desirable, especially on the more gravelly class of soil.

BLOSSOMING AND POLLINATION

The blossoming period of the almond on the project is during the latter part of February and continues into the first week or 10 days of March. Unlike the typical deciduous fruit tree, the almond is rather distinctive in that the blossom precedes the appearance of the leaves. For this reason, an almond orchard in full bloom presents an attractive picture of solid white blossoms. Setting of the blossoms in the form of the almond soon follows blossoming and pollination. To obtain cross-pollination, it is necessary to plant different varieties in alternate rows throughout the orchard with the wind and bees (mainly the latter) acting as the principle agencies for disseminating and intermixing the pollen of the several varieties. This period of blossoming and development of the young nut is most critical and is the time when the crop is most susceptible to injury by frost. In this connection, adequate air drainage plays an important part in bringing the young buds safely through the critical stage. Orchards in the Orland project, by reason of their location upon the delta cone of Stony Creek at a slight but distinctly advantageous elevation above the general level of the floor of the Sacramento Valley, are less susceptible to frost damage,



A 15-month-old almond orchard, Orland project, California

as the colder, and consequently heavier, air drains away to the lower surrounding levels.

There are about 60 different varieties of almonds, which are classified into 2 general kinds—the hard and the paper shell. There are some 20 kinds of almonds listed among those raised for experimental purposes at the University of California farm at Davis, Calif. The leading varieties, however, produced on the Orland project are the NePlus, I. X. L., Nonpareil, Drake, Texas, and Peerless.

IRRIGATION AND CULTURE

The irrigation requirements of almonds on the project are relatively small, from two to three irrigations during the summer being sufficient to produce crops, provided the orchard is plowed and cultivated in the spring in time to conserve the moisture from the winter precipitation. For the most part, orchards are irrigated by the furrow system. It is important to cultivate after each irrigation in order to produce a top mulch of the soil, which conserves the moisture and reduces the number of irrigations during the summer. Spraying is essentially necessary for the control of insect pests, the worst of which is the red spider with which the almond grower is regularly confronted. A liquid spray of lime and sulphur is most generally used on project orchards. Pruning is required annually to provide not only adequate shade as protection against sunburn but also to admit sufficient sunlight into the interior branches of the tree for a uniform and maximum yield of nuts. Almonds are fully matured and ready for harvesting during the latter part of July or early in August.

HARVESTING AND HULLING

A typical arrangement for the harvesting of almonds at Orland is that of a



A bunch of ripe almonds, Orland project

canvas, attached to a sled which is drawn through the orchard by a team. The canvas area is sufficient in extent to include the entire spread of one tree and is divided into two sections to permit its being laid on each side of the trunk of the tree with sufficient overlap at the seam. The nuts are knocked from the branches by means of light poles. A new and recent development in this operation consists of a heavy rubber club or mallet with which the limbs are tapped without damage to the bark of the tree, thus jarring the nuts from the branches quite rapidly. After the almonds are knocked, the loose ends of the two sections of the canvas are folded up with the nuts rolling ahead of the canvas thus folded until they reach the sled, where they are shoveled into sacks.

After harvesting, the almonds and the hulls (inclosing the nuts) are taken to the huller where the hulls are separated from the nuts. A huller represents a considerable outlay of expenditure and for this reason it is impossible for every grower to have his own huller. There are, however, a number of hullers in the Orland vicinity where the smaller grower can have his almonds hulled at a reasonable cost. Immediately after hulling, the nuts are spread in trays and exposed to the sun for drying. The dry summer heat of the Sacramento Valley accomplishes the drying operation in a few days, after which the nuts are sacked and ready for shipment. Shipment is made by rail in carload lots, each car containing from 55,000 to 65,000 pounds of nuts.

Growth of the almond industry, Orland project, California

Year	Area in acres	Yield in pounds						Production values					
		Current year	Total to date	Per acre			Average to date	Per pound		Current year	Total to date	Per acre	
				Maximum	Minimum	Average		Current year	Average to date			Current year	Average to date
1914	90	65,000	65,000	1,010	200	721	721	\$0.168	\$0.168	\$10,922	\$10,922	\$121.35	\$121.35
1915	130	72,900	137,900	800	100	561	627	.103	.134	7,512	18,434	57.78	83.80
1916	160	98,900	236,800	1,668	110	618	623	.165	.147	16,324	34,758	102.02	91.30
1917	161	30,960	267,760	600	40	192	491	.170	.150	5,263	40,021	32.69	74.10
1918	266	106,400	374,160	1,000	80	400	463	.225	.171	23,940	63,961	90.00	79.20
1919	303	151,500	525,660	1,100	150	500	474	.300	.208	45,450	109,411	150.00	98.60
1920	513	140,000	665,660	800	100	275	410	.200	.206	28,000	137,411	54.60	84.70
1921	760	234,500	900,160	1,500	50	308	377	.200	.204	46,900	184,311	61.60	77.30
1922	957	287,960	1,188,120	2,100	40	300	356	.175	.197	50,393	234,704	52.70	70.30
1923	1,119	374,250	1,562,370	2,000	25	335	351	.150	.186	56,138	290,842	50.20	65.20
1924	1,125	228,850	1,791,220	1,500	(1)	203	321	.110	.176	25,174	316,016	22.40	56.70
1925	1,153	195,780	1,987,000	1,140	(1)	170	295	.220	.180	43,072	359,088	37.40	53.30
1926	1,189	574,490	2,561,490	1,250	66	483	323	.210	.187	120,643	479,731	101.47	60.53
1927	1,195	497,000	3,058,490	1,000	(1)	416	335	.200	.189	99,409	579,140	83.18	63.50
1928	1,222	525,000	3,582,490	1,334	(1)	430	346	.190	.189	99,750	678,890	81.63	65.65

¹ No crop.

MARKETING

The marketing of the Orland almonds is mainly through the medium of a local association, which is a branch of the California Almond Growers' Exchange, a state-wide cooperative organization engaged in marketing the major portion of the almonds produced in California. The expansion of the exchange is worthy of mention. Beginning operations in 1910 and consisting of 9 local associations with a membership of 230 growers, the initial business was started on a \$1,000 capital. At the present time, the exchange comprises 22 local associations with 3,600 members and has property investments valued at \$500,000, the largest item of which is the Sacramento, Calif., plant to which Orland almonds are shipped. There the almonds are prepared for the trade in a variety of forms, both shelled and unshelled, under the Blue Diamond Brand trade-mark of the exchange.

Almonds constitute by far the largest crop in point of acreage produced on the Orland project. In 1928, there were 1,222 acres of producing trees reported in the project crop census. Apricots follow next with 621 acres of bearing trees. Almonds constitute nearly one-third of the project acreage devoted to orchards. The present acreage represents the development of the almond industry since 1912, at which time there were 77½ acres of bearing trees on the project. These were then mature trees, which had been producing fairly profitable crops under dry-farming methods together with such irrigation water as was available from the natural flow of Stony Creek, which was usually depleted early in July. To the irrigation supply afforded by the project system, the trees responded with larger and surer crops. The expansion of the acreage to its present proportions is the direct result of the construction of the project irrigation works. The growth of the industry on the project is represented by the statistics contained in the accompanying table.

COST OF DEVELOPMENT

A producing almond grove on the Orland project is valued at \$550 to \$750 per acre, the variation being due to location of the property as well as the quality of the soil and the condition and age of the trees. This valuation is derived from the following computation relative to the cost of bringing an almond orchard into bearing, in connection with which the following basic assumptions are made:

Interest on investment, 6 per cent.
Six years' time in which to bring trees into profitable bearing, during which the average annual cost per acre (exclusive of interest on investment) is:

Construction and operation and maintenance charges.....	\$5.00	
Taxes.....	2.50	
Pruning and spraying.....	6.00	
Spring plowing and cultivating.....	3.50	
Summer irrigating and culture.....	15.00	
Total.....	32.00	
<i>Original investment per acre</i>		
Cost of unimproved land.....	125.00	
Cost of land leveling and farm irrigation structures and laterals.....	40.00	
Cost of trees (average 75 per acre).....	15.00	
Cost of planting.....	12.00	
Total.....	192.00	
<i>Investment at end of first year</i>		
Original investment.....	192.00	
Current year's operating cost.....	32.00	
Interest on original investment.....	11.52	
Total.....	235.52	
<i>Investment at end of second year</i>		
Investment at beginning of year.....	235.52	
Current year's operating cost.....	32.00	
Interest on investment at beginning of year.....	14.13	
Total.....	281.65	
<i>Investment at end of third year</i>		
Investment at beginning of year.....	281.65	
Current year's operating cost.....	32.00	
Interest on investment at beginning of year.....	16.90	
Total.....	330.55	
<i>Investment at end of fourth year</i>		
Investment at beginning of year.....	330.55	
Current year's operating cost.....	32.00	
Interest on investment at beginning of year.....	19.83	
Total.....	382.38	
<i>Investment at end of fifth year</i>		
Investment at beginning of year.....	382.38	
Current year's operating cost.....	32.00	
Interest on investment at beginning of year.....	22.94	
Total.....	437.32	
<i>Investment at end of sixth year</i>		
Investment at beginning of year.....	437.32	
Current year's operating cost.....	32.00	
Interest on investment at beginning of year.....	26.24	
Total.....	495.56	

Elements of costs entering into the production of almonds are contained in the accompanying table:

Items of cost	Amount	
	Per acre	Per hundred-weight of almonds
Spring plowing and cultivating.....	\$4.00	\$0.40
Pruning and spraying.....	10.00	1.00
Summer irrigating and culture.....	17.50	1.75
Harvesting and hulling.....	40.00	4.00
Hauling to cars (Orland).....	2.50	.25
Construction and operation and maintenance charges.....	5.00	.50
Taxes.....	2.50	.25
6 per cent interest on \$500 valuation.....	30.00	3.00
Total.....	111.50	11.15

In connection with the above tabulation the average yield of a mature orchard in prime bearing and operated under proper farming methods is assumed to be 1,000 pounds per acre. The cost of marketing through the cooperative marketing organization (approximately 3 cents per pound) is not included in the foregoing table, as it is deducted by the exchange from the amount otherwise due the grower. Applying a price of 19 cents which growers receive (after deduction of exchange selling charges), the gross return is \$190 per acre against a production and carrying cost of \$111.50 per acre, leaving a net profit of \$78.50 per acre. This represents the returns which may reasonably be anticipated in connection with the growing of almonds from thrifty orchards, intelligently farmed to obtain the maximum yields, which may be produced from the combination of natural climatic and soil conditions at Orland, together with the irrigation facilities afforded by the project works of the Bureau of Reclamation.

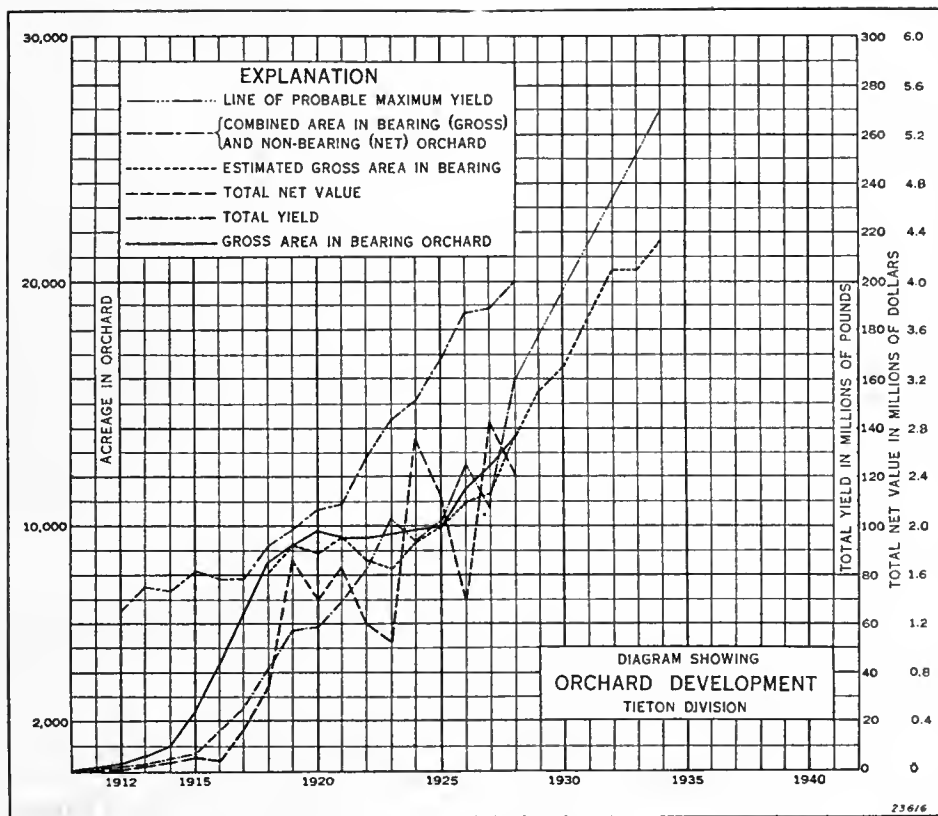
The Making and Feeding of Silage

Silage is the best and cheapest form in which to store succulent feed. Many forage crops can be made into silage, but corn, where it can be grown successfully, makes the best silage.

Silage is suited for feeding to all livestock. Dairy cows, not on good pasture, need it perhaps more than other classes of animals, because the succulence it supplies is helpful in the production of large quantities of milk. It is a cheap and economical feed for beef cattle, from breeding cow to fattening steer. Sheep like it and it is well suited to their needs. Even horses and mules may be fed limited quantities of good silage with good results.

A method of making silage, known as the Ronning method, has come into use in the last few years, and is considered the easiest known method of making silage. The standing corn is harvested and cut into proper lengths for the silo by a machine drawn and operated by a tractor. The cut corn is delivered to a wagon box drawn alongside. It is then hauled to the silo and pushed off into a blower which elevates it into the silo. When a pit silo is used the work of filling is still less. Making silage by the Ronning method requires approximately the same size crew as when a harvester and bundle elevator are used, but the advantage lies in saving the labor of handling the heavy bundles.

More details will be found in Farmers' Bulletin No. 578-F.



1913, and 1914, while for the other years from 1915 to 1923, inclusive, use was made of the tabulation of crop data as revised and corrected to correspond with the present basis of reckoning for consideration by the Board of Survey and Adjustments in May, 1925.

As a preliminary to attempting a forecast the increases in acreage of bearing orchard for the next few years I have combined the figures for gross area in bearing with the area in nonbearing orchard for the same year, the latter being, however, on a net basis, and plotted the

graph at the top. This shows a total of 20,065 acres for 1928. The estimated gross area in bearing orchard is then arrived at by advancing six years along the horizontal scale and increasing the total areas by 25 per cent of the nonbearing portion, which is taken on a net basis, in order to reduce to gross figures comparable with the graph of acreage in bearing. The 6-year period is taken as being a fair general average to allow for all fruits to reach the bearing stage. The 25 per cent increase eliminates the duplication of two kinds of nonbearing fruit on the

same area of ground and at the same time allows for reduction in area due to removal of fillers and the poorer varieties as well as those orchards in districts more subject to frost.

By this process the estimated gross area of bearing orchard for 1934 is found to be 21,690 acres. It may develop, however, that the duplication will be reduced during the next few years at a higher rate than heretofore through the removal of a larger area of soft fruit fillers from the older apple orchards, in which event the total by 1934 would probably fall somewhere between 20,000 and 21,690 acres. The low point in the curve of estimated area for the year 1923 is not clearly understood. I have attributed the departure from the actual at this point and probably in 1920, 1922, and 1927 to errors or omissions in the record of nonbearing orchard for 1914, 1916, 1917, and 1921 on which they are based in the order of occurrence.

The nonbearing acreage is given together with the bearing and the total for each year, as follows:

Bearing and nonbearing acreage, 1912-1928

Year	Bearing	Non-bearing	Total
1912	211	6,295	6,506
1913	670	6,740	7,410
1914	1,007	6,280	7,287
1915	2,268	5,840	8,108
1916	4,196	3,645	7,841
1917	6,358	1,520	7,878
1918	8,412	745	9,157
1919	9,159	650	9,809
1920	9,681	950	10,631
1921	9,483	1,442	10,925
1922	9,500	3,190	12,690
1923	9,625	4,725	14,350
1924	9,822	5,355	15,177
1925	9,985	6,800	16,785
1926	11,445	7,295	18,740
1927	12,308	6,555	18,863
1928	13,565	6,500	20,065

Summary of total crop yields and values, Tieton division, 1912 to 1928

Year	Hay and forage			Cereals			Fruits			Potatoes			Pasture and miscellaneous		Value	
	Total yield	Value	Per cent of total	Total yield	Value	Per cent of total	Total yield	Value	Per cent of total	Total yield	Value	Per cent of total	Value	Per cent of total	Total	Average per acre
1912	<i>Tons</i> 8,389	\$62,800	23.1	<i>Bushels</i> 66,270	\$29,000	10.7	<i>Pounds</i> 1,719,000	\$23,400	8.6	447,300	\$113,630	41.7	\$43,240	15.9	\$272,070	\$28.00
1913	15,560	107,616	25.4	67,991	39,719	9.4	2,586,505	45,719	10.8	408,200	168,158	39.8	61,738	14.6	422,950	33.60
1914	22,620	134,020	28.4	112,950	82,030	17.3	4,730,400	69,460	14.7	400,400	120,120	25.4	67,060	14.2	473,590	29.75
1915	26,251	67,432	14.5	164,580	105,650	22.8	6,475,500	105,122	22.7	301,800	105,630	22.8	79,524	17.2	463,358	25.60
1916	31,523	166,909	24.8	240,170	175,112	26.1	15,859,350	85,584	12.7	196,300	137,550	20.4	107,629	16.0	672,784	32.04
1917	35,491	445,729	32.0	139,944	207,214	14.8	24,474,122	317,054	22.7	284,275	198,992	14.3	226,024	16.2	1,395,013	57.11
1918	45,699	654,456	34.1	162,888	268,636	14.0	58,849,985	679,831	35.5	195,866	146,899	7.7	166,367	8.7	1,916,189	74.14
1919	52,345	879,510	27.4	154,949	273,005	8.5	57,625,545	1,739,872	54.2	117,700	135,355	4.2	182,309	5.7	3,210,051	122.05
1920	60,672	499,061	20.3	161,034	215,215	8.8	40,612,570	679,831	35.5	127,875	108,694	4.4	227,349	9.2	2,461,965	90.63
1921	44,194	177,777	8.0	124,424	86,835	3.9	68,470,108	1,668,837	75.1	247,286	148,372	6.7	140,433	6.3	2,222,254	81.70
1922	38,458	183,284	11.1	96,940	80,043	4.8	81,895,095	1,187,729	71.6	339,825	110,443	6.7	95,866	5.8	1,657,365	62.78
1923	33,583	231,295	14.7	112,035	80,247	5.1	102,891,572	1,052,091	67.2	246,108	98,443	6.3	105,522	6.7	1,567,598	61.35
1924	29,072	223,314	7.0	88,782	89,087	2.8	93,251,530	2,684,775	84.0	169,230	93,076	2.9	104,571	3.3	3,194,823	130.16
1925	20,457	201,111	6.7	134,529	131,682	4.3	101,392,948	2,246,190	74.2	244,167	317,417	10.5	128,901	4.3	3,025,301	130.97
1926	17,609	166,201	8.1	83,399	83,344	4.0	125,115,130	1,399,624	67.9	342,125	307,912	15.0	102,874	5.0	2,059,955	89.18
1927	15,018	140,518	4.2	79,028	73,821	2.2	107,363,703	2,858,859	84.7	557,917	200,850	5.9	99,808	3.0	3,379,856	150.22
1928	11,582	109,684	3.9	78,775	71,869	2.6	159,376,275	2,405,531	86.7	344,800	103,440	3.7	85,249	3.1	2,775,770	124.75

NOTE.—Values for 1912, 1913, and 1914 are gross figures; those for 1915 to 1923 are revised to conform to the method used in the original reports for the years 1924 to 1928, inclusive, i. e., excluding the cost of grading, packing, storing, and containers.

Dairy Show on the Belle Fourche Project, South Dakota

By F. C. Youngblutt, Superintendent

THE first project dairy show held at Newell, S. Dak., on January 6 to 16, has added a new feature to stimulate the development of this important branch of irrigation farming. The 7-day test of 11 selected milk cows of various breeds, conducted under uniform feeding and suitable housing conditions, has clearly demonstrated that a good cow is a source of profit and that testing of the herd is necessary to weed out the boarders and bring the real producers to the front.

The show closed with a big meeting and banquet on the 16th attended by

Orchard Development on Tieton Division

(Continued from page 43)

The record of the areas of nonbearing orchard of different ages, as taken for the first time in connection with the 1928 census, is as follows:

Nonbearing orchard acreage, by age of trees

Age	Apples, gross	Soft fruit, net	Total
1.....	717	743	1,460
2.....	456	644	1,100
3.....	928	1,314	2,242
4.....	616	684	1,300
5.....	502	183	685
6 or over.....	214	64	278
	3,433	3,632	7,065

The gross area in bearing is seen to have increased little during the 7-year period from 1919 to 1925. This is due to a decline in the planting of young orchard during the period of high prices for hay, grain, and other general farm crops beginning about the year 1916. A rapid increase had been made during the 7 years preceding this period, and it is a striking coincidence that the graph indicates a break in the present high rate of increase at the end of the third 7-year period in 1932.

It necessarily follows that the acreage must begin to taper off before many years after the more desirable lands are planted to fruit and as the ultimate area is approached. It is estimated that this ultimate gross area will be about 27,000 acres. The production on this acreage is largely a matter of guess, but it will undoubtedly amount to from two to two and one-half times the total for the past year. In any event the development of the orchards on this division will continue to be of interest for a number of years.

some 250 guests. A free picture show in the evening brought entertainment to the crowd and furnished instructive lessons on means of improving the dairy herds. Speakers of prominence took part in both the afternoon and evening programs to stress some advantageous feature of dairying as it relates to conditions on the irrigation project. W. D. Buchholz, acting as toastmaster, welcomed the guests and expressed appreciation of the cooperation received from the various project towns, the Chicago & North Western Railway Co., and others who helped to make the show a success. A letter of regret from Dr. Elwood Mead, Commissioner of Reclamation, was read and also one from State Secretary of Agriculture Crill, who were unable to be present.

MARKET BULKY CROPS THROUGH THE COW

Dean Larsen of the State Agricultural College spoke of his occasional visits to this section and complimented the people on their community spirit and their ability to stick together for the development of agriculture which in 25 years has grown from the raw prairie to intensive farming, including beet raising, alfalfa, and livestock activities of no small proportion. The right grade of cow, he observed, is the proper machine for marketing bulky crops, especially in this section

where feeds are relatively cheap and where pastures are kept green by means of irrigation. Feed plenty and feed a balanced ration, was his advice, especially in the winter when cows are deprived of green pastures. Man selects his fats, starches, and fruits according to seasons and to his tastes, but a cow must obtain the necessary balance from the limited variety placed in the manger. Professor Larsen dealt with supply and demand which affect many of our farm products adversely. In the case of milk, butter, and cheese, however, there is an increasing importation which insures market stability and good prices. Cows should freshen in the fall, he stated, when other farm work is not pressing, so that the herd can be given the needed extra attention and the farmers will have the benefit of winter prices.

INCREASE THE CREAM CHECKS

The Chicago & North Western Railway Co. assisted the show both financially and through the presence of their representatives. H. E. Dickinson, general manager of lines west of the Missouri River, together with his staff, spent several days in Newell in the interest of dairying and to meet the people of the valley who deliver to this transportation company about 20,000 cans of cream per year. In addressing the gathering Mr.



Newell Dairy Show. Holstein, second place; Ayrshire, third place; Guernsey, fifth place

Dickinson stated that cream business provided a regular daily income to the railroad company the same as to individuals and expressed his desire to cooperate in promoting any line of endeavor that would be of benefit in building up the agriculture of this section. He urged the purchase of purebred sires as a means of building up the dairy herd rather than to invest heavily in the purchase of unacclimated cows.

C. H. McNie, of the livestock shipping department of the Northwestern, and Mr. Weger, of the dairying department, spoke briefly of the need of every farmer engaging in some livestock activity in order to keep up soil fertility. A balanced ration for the land is just as important as balanced rations for the cows, said Mr. McNie.

D. B. Pratt, manager of the Utah-Idaho Sugar Co., stressed the fertility requirements for growing sugar beets and how dairying and the sugar industry are inseparably connected. The by-products of an acre of beets have a feed value equal to an acre of corn, said Mr. Pratt, and by engaging in dairying there is established the cycle of more beets, more cows, more beets.

THE PRIZE AWARDS

The evening program was given over to awarding the prizes and imparting information on the records of the cows entered in the show. At this meeting J. C. Milne, of Belle Fourche, brought out the real purpose of the show and spoke of the advantages of more cows, how they might be secured and means by which purchases could be financed. The testing and tabulation of results were directed by County Agent Ellison, who prepared the accompanying data on feed consumption, production, and profit.

Prizes were awarded entirely on the basis of butterfat produced, and no consideration was given to time of freshening or to the age of the various cows. Honors went to the Red Durham, this being a family cow just fresh and in her home surroundings, although not considered the best type and bred for general dairy purposes. Second prize was carried off by a Holstein from one of the best dairy herds on the project. The Ayrshire taking third place represents a breed that is fast coming into favor as a dual purpose strain well suited to the rigor of western winters. An interesting feature was the fact that practically every cow increased her milk flow from January 6 to 16 under the balanced feeding and care given the cows during the show.

Beyer Aune, of the United States experiment farm, was superintendent of the dairy show. O. C. Batch, formerly

associate reclamation economist, in the Reclamation Bureau, had charge of the feeding, milking, and weighing. This demonstration has added the needed zest to the dairy business, and already the com-

mittee has orders for about three carloads of young stock to be purchased in the dairy centers of the Middle West. The show will be made an annual affair, alternating at the various project towns.

Production record of cows entered in project dairy show held at Newell, S. Dak., January 6 to 16, 1929

Awarded prize No.	Breed of cow	Owner and address in South Dakota	Cost of feed	Milk produced	Average test	Skim milk value	Butterfat	Value of products	Profit	Profit per day
				Pounds						
1	Red Durham	Henry Roberts, Newell	\$2.28	335.2	3.67	\$1.13	12.3	\$6.54	\$4.26	\$0.61
2	Holstein	H. W. Roswell, Arpan	2.89	314.6	3.83	1.06	12.05	6.36	3.47	.49
3	Ayrshire	John Theil, Newell	2.79	314.2	3.68	1.06	11.56	6.15	3.36	.48
4	Roan Short-horn	C. I. Parks, Nisland	2.75	293.0	3.68	.99	10.78	5.73	2.98	.43
5	Guernsey	R. B. Wondelken, Belle Fourche	2.95	239.5	4.47	.80	10.7	5.51	2.56	.37
6	Ayrshire	Eli W. Long, Newell	2.63	284.5	3.73	.96	10.61	5.63	3.00	.43
7	Holstein	P. W. O'Conner, Arpan	2.73	282.2	3.72	.95	10.5	5.57	2.84	.41
8	Brown Swiss	C. P. Cleveland, Belle Fourche	2.32	221.7	4.57	.74	10.13	5.20	2.88	.41
9	Jersey	Doctor Lloyd, Nisland	2.25	184.1	4.97	.61	9.15	4.64	2.39	.34
10	Holstein	Harold Richman, Newell	2.94	252.1	3.45	.85	8.7	4.68	1.74	.25
11	Red Poll	O. G. Westro, Newell	2.49	244.0	3.43	.83	8.37	4.51	2.02	.29

NOTE.—Record for 7 days, January 9 to 15, inclusive. Prices: Butterfat, 44 cents per pound; alfalfa, \$10 a ton; beet pulp, dry, \$1 per hundredweight; grain, \$1.50 per hundredweight; linseed meal, \$3.25 per hundredweight; mangels, \$5 per ton; ensilage, \$4 per ton. Labor not entered in cost.



Miss Lillian Cox, Tieton division, Yakima project, Washington

Yakima Girl Wins First Prize for Corn

Miss Lillian Cox, 15-year old daughter of Mr. and Mrs. John M. Cox, pioneers on the Tieton division of the Yakima irrigation project, Washington, won the first prize at the recent Tieton Community Fair for the best six ears of corn. She was the only girl participant in a field of activity in which the boys usually shine. Miss Cox has been in 4-H Club work for five years, is a prize-winning swimmer, an excellent dancer, and a leader in Tieton High School activities.

Mr. and Mrs. Cox now have 50 acres of diversified crops in the Tieton division, their original farm of 30 acres having been acquired in 1911. There are 5 children in the family, 2 boys and 3 girls, whose ages range from 12 to 25 years, and all have been active in 4-H Club work.

Irrigated Areas Will Not Be Abandoned

Fear has often been expressed that in irrigated regions things may in time go from bad to worse, and that man eventually may be compelled to give up the fight and see his farms revert to the wild state in which he found them. Such a pessimistic view, however, is not warranted.

Soil studies recently completed in the Arkansas Valley of Colorado furnish a basis for more optimistic conclusions. The enormous yield of farm crops in the valley, which approximates an annual value of \$11,000,000, could be increased at least 10 per cent, according to A. T. Sweet, associate soil scientist of the Bureau of Chemistry and Soils, Department of Agriculture, by a complete use of better lands, adjustment of crops to soils, utilization of water without waste, control of alkali, and preservation of the soil in a high condition of tilth and state of productiveness. These specific recommendations should prove of value to farmers of this area and also to others with similar characteristics of soil and climate.

Purebred Sheep on the Minidoka Project

By B. E. Kuhns, County Extension Agent

RAISING purebred sheep is rapidly becoming an important and profitable industry on the Minidoka irrigation project. This phase of the sheep enterprise is distinctly different from the raising of ordinary farm and range sheep in that the principal income from the flock is derived from the sale of breeding stock rather than from the sale of wool and mutton. The constantly increasing demand by the range sheep owners for a high quality of mutton type ram is largely responsible for the development of this type of sheep husbandry. They prefer the large mutton breeds, principally the Hampshire and Suffolk for use in their crossbred flocks of range ewes for the production of early maturing market lambs.

There are more than 20 flocks of Hampshires on the project, ranging in size from 30 to 200 head. Also there are 4 flocks of registered Suffolks and 2 flocks of Rambouillets.

The rams are marketed chiefly through the two annual ram sales held at Filer and Pocatello, Idaho. These sales are conducted by the Idaho Wool Growers Association.

Exceptionally good prices were received by Minidoka project breeders at these sales this past season. Yearling Hampshire rams brought from \$39 to \$62.50, yearling Suffolk rams \$50 to \$82.50, Suffolk ram lambs from \$50 to \$105, and Rambouillet rams from \$34 to \$50 each. In 1927 two carloads of Hampshire ewes

and rams were purchased by the Russian Government.

An instance of the profit to be obtained from purebreds is illustrated by the experience of Gus Meuleman, a Rupert farmer. At the beginning of the 1928 season Mr. Meuleman's flock consisted of 30 purebred Hampshire ewes of breeding age, 28 ewe lambs, and a high class stud ram with a total value of \$1,700. From this flock wool valued at \$268 was sold and from aged ewes and ram lambs \$1,600 was realized. The flock left on hand at the end of the season consisted of 13 aged ewes, 26 yearling ewes, and 23 ewe lambs conservatively valued at \$2,020 or an increase in the inventory value of \$260, bringing this year's gain on the flock to \$2,128. This is only one of many examples of success with purebred sheep on the Minidoka project.

The Lloyd Dam, Bhatgar, India

A RECENT report from Alan S. Rogers, American Vice Consul at Bombay, India, gives some interesting information concerning the Lloyd Dam, which was formally opened on October 27, 1928, by Sir Leslie Wilson, Governor of Bombay Presidency. The dam was begun 15 years ago and cost approximately \$6,278,000. Its dimensions are as follows: Crest length, 5,333 feet; height, 190 feet above lowest foundation; depth of water above lowest sluices, 143 feet; length of lake, 17 miles; perimeter of lake, 46 miles; area of lake, 14½ square miles; capacity of lake, 460,000 acre-feet; catchment area, 128

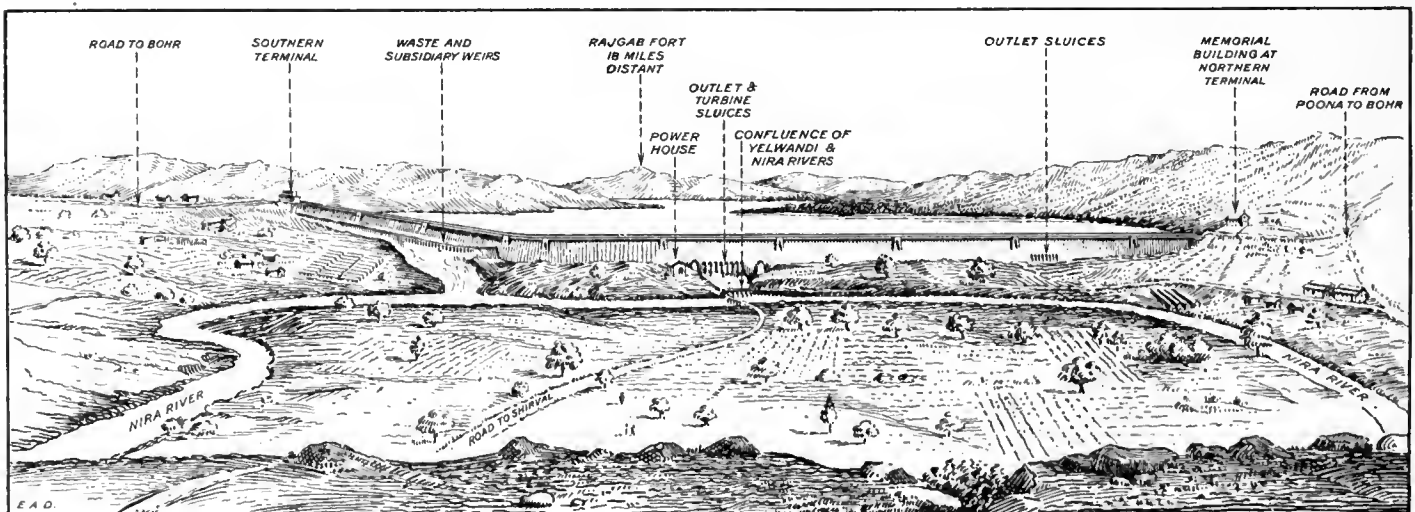
square miles; volume of masonry, 797,000 cubic yards.

The Lloyd Dam will collect the rains of the monsoon period, and the water supply thus accumulated will be carried through 2 canals, 100 and 106 miles in length, respectively, throughout an area of approximately 834,000 acres, of which 202,000 acres will be irrigated annually. The annual value of crops which it is expected will be grown on the irrigated area is \$11,689,500.

Although it is not intended at first to use the water from the sluices to generate electric power, it is nevertheless pointed

out that the turbine sluices already installed as outlets could provide sufficient water to generate 2,100 electric horsepower continuously. There are 81 gates in the waste weir for the regulation and control of the flood level of the lake, of which 45 are automatic. Every stage of the work was conducted with great precaution, the mortar and rubble were tested periodically, and a safety factor of at least 5 was given.

C. B. Pooley, the superintendent engineer in charge of the construction of the dam, states that the great Assuan Dam in Egypt, although smaller than the Lloyd Dam by half a million cubic feet in volume, required nevertheless an expenditure greater by 50 per cent. The materials employed in the construction of the Lloyd Dam were practically all obtained in the locality.



The Lloyd Dam at Bhatgar, India. Length, 5,333 feet; height, 190 feet

Sulphur Fertilizer Trial

THE following is from an article by Prof. W. L. Powers, of the Oregon Agricultural Experiment Station, on the Relation of Fertility to Water Requirement of Plants, printed in the Journal of the American Society of Agronomy:

A field fertilizer experiment was arranged on the University of California irrigation experiment field near Delhi. This trial was designed to test laboratory and greenhouse results as applied to field conditions, to provide a field source of samples for laboratory studies from treated soils, to measure the value of sulphur in increased crop yields, and to determine the effect of fertilizer applied on irrigation requirement and water requirement.

Sulphur and sulphates increased alfalfa yields substantially, the gain running from 1 to 2 tons an acre over the yields

from untreated plats. The maximum yield was secured with calcium sulphate. Calcium alone in amounts equivalent to that obtained from calcium sulphate caused a moderate increase in yield. The increase in yield from sulphur alone was a little less than that secured with calcium sulphate and slightly less than that secured with potassium sulphate. There was little advantage during the first season from supplying sulphur at the rate of 200 pounds an acre as compared with the 100-pound application. Treated plats gave larger dry-matter yields, with lower water requirement per unit dry matter produced. All plats treated with sulphur or sulphate produced alfalfa with deep green color which made a vigorous growth throughout the season. Alfalfa on untreated plats had a yellowish color

and made less rapid or vigorous growth. Calcium alone caused a lighter green color, especially early and late in the season. Superphosphate failed to maintain more vigorous growth than untreated plats late in the season. Application of 200 pounds an acre of sulphur did not produce materially more alfalfa than was obtained from a 100-pound treatment. There was some evidence that calcium was obtained more readily in the presence of sulphate.

Sulphur-oxidation products may greatly increase the supply of reactive calcium; or improve the reaction of arid soils for alfalfa nutrition; or on certain soils and at certain seasons may result in a more favorable sulphate concentration for legumes. In general, the effect of sulphur that will be paramount may depend upon the characteristics of the soil at hand, its reaction, physical condition, chemical composition, or microorganic flora. The increased yield from this fertilizer has generally been secured at a reduced water cost.

Cooperatives Improve Farm Products Quality

Improvement of the quality of farm products is one of the outstanding results of farmers' cooperative marketing organizations, according to Chris L. Christensen, of the Department of Agriculture.

"Cooperative associations have influenced the marketing of agricultural products because they represent the producer. They have brought the producers' point of view into marketing and, on the other hand, they have brought a knowledge of market demands back to the producer. They have effected improvements in grading and handling farm products, and have brought about also definite improvements in production. Events have demonstrated that local associations, although still performing valuable and necessary services, can not give their members complete marketing service and that large-scale cooperatives are necessary. Thus the trend at the present time is toward the federation and consolidation of existing associations and toward the undertaking of more complete and therefore more complex marketing services."

A COMPANY has been formed to develop and market the extensive salt deposits lying south and east of Fallon on the Newlands project.

Proper Implements Help Sugar-Beet Growers

Man labor is by far the largest item of expense in sugar-beet production, but this item of expense is being reduced in many districts by the use of larger equipment that enables more work to be done per man in a given time.

In many districts plowing is done with a unit consisting of a single-bottom plow, 1 man and 2 horses. If the work were done with a 2-bottom, 4-horse plow and

1 man, twice as much ground could be covered by 1 man in the same time. The same comparison is true of a number of other operations in sugar-beet production, such as cultivating, harrowing, lifting, and hauling. Larger units and more power than commonly employed could be used in many instances with the result that more work could be done by one man. Farm management specialists tell in Farmers' Bulletin No. 1042-F how man labor can be saved and production speeded up through the use of large machines and large units of power.



Cutting fourth crop of alfalfa, Orland project, California

Reclamation Organization Activities and Project Visitors

AT the invitation of the National Drainage Association Doctor Mead attended sessions of the annual national drainage congress at the Peabody Hotel, Memphis, Tenn., February 19-21, and addressed the assembly on the subject of Boulder Dam on February 20.

J. C. Whitney, for many years construction superintendent connected with the larger features on the Salt River, Yuma, Grand Valley, Belle Fourche, King Hill, Klamath, and other projects, died suddenly at Pabellon, Mexico, on January 18.

R. F. Walter, chief engineer; J. L. Savage, chief designing engineer; and L. N. McClellan, electrical engineer, had a recent conference in Las Vegas, Nev., with railroad and power company engineers in connection with transportation and power investigations for the Boulder Canyon Dam. On their return to Denver, Messrs. Walter and Savage paid a short visit to the Salt Lake Basin project at Coalville, Utah, and Mr. McClellan returned to Denver by way of Boise, where he made an inspection of the power and pumping plant at Black Canyon Dam.

E. B. Debler, hydrographic engineer, has been given a temporary assignment as special advisor to the Government representative on the Rio Grande Compact Commission with headquarters at Santa Fe, N. Mex.

E. G. Harlan, assistant secretary, Oregon State Chamber of Commerce, visited the Vale project on a recent date, looking over the lands in the vicinity and in the Little Valley and Harper areas, for which it is hoped water will be available in 1930.

Reclamation Economist B. E. Hayden, who was in the hospital in Denver until the latter part of January, left for Washington a week later and is now engaged in preparing plans of inexpensive farm houses, barns, and hog and chicken houses.

Ethelbert Ward, assistant attorney general of the United States, visited the Denver office recently in connection with the Newlands project.

Examiner C. A. Lyman was an official visitor on the Riverton project for several days.

Hugh A. Brown, Assistant Director of Reclamation Economics, was detailed recently for two weeks to the office of the Secretary of the Interior to act as Assistant to the Secretary in the absence of E. K. Burlew, administrative assistant.

Among the Denver office employees recently called to the field were Master Mechanic T. S. Martin, who visited Portland on an inspection of the drum gate for the Easton diversion dam, going from there to Seattle to inspect miscellaneous metal work; and Master Mechanic N. E. Fordham, who was sent to Omaha to inspect the 60-inch differential needle valves for the Echo, Gibson, and Coolidge Dams, and later to Chicago and vicinity to inspect gate hoists for operation of radial gates on the main canal of the Kittitas division, and the operation of the hinged weir gates at Harper diversion dam, Vale project.

I. M. Zaki, assistant director of public works, Egypt, was among the recent visitors to the Yuma project.

District Counsel B. E. Stoutemyer spent several days on the Boise project in connection with the adjudication of the Boise water rights. Later he was in conference with project and district officials on the Minidoka project, after which he visited the Vale project.

E. G. Harlan, assistant secretary, Oregon State Chamber of Commerce, visited the Vale project on January 15, looking over the lands in the vicinity and in the Little Valley and Harper areas for which it is hoped water will be available in 1930.

Among the recent visitors to Kittitas division of the Yakima project were G. H. Plummer, western land agent, Northern Pacific Railway, and Asahel Curtis, president, Washington Irrigation Institute.

Mr. Olson, of the California-Oregon Power Co., has called at the Klamath Falls office several times recently in connection with studies of water supply conditions.

F. E. Weymouth, former chief engineer of the Bureau of Reclamation, who for the past several years has been in the employ of J. G. White & Co., in charge of the construction of a number of dams in Mexico, has resigned to accept the position of assistant chief engineer of the Los Angeles Bureau of Public Works.

George A. Ward, former attorney in the Bureau of Reclamation, died February 20, 1929. Mr. Ward resigned from the bureau on September 17, 1923, and was appointed as an attorney in the Federal Trade Commission, where he was employed at the time of his death.



The largest pickle-salting station in the world, Nisland, Belle Fourche project, South Dakota

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. ROY O. WEST, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner P. W. Dent, Assistant Commissioner George C. Kreutzer, Director of Reclamation Economics

W. F. Kubach, Chief Accountant C. A. Bissell, Chief of Engineering Division Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCullech, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Fiscal Inspector.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....	J. P. Siebeneicher.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	W. C. Berger.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	W. J. Chiesman.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....				
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....				
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larsen.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....		Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.....	Joe C. Iddings.....			B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Owyhee, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	Henry H. Berryhill.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Cemstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁸	Phoenix, Ariz.....	C. C. Cragin.....				
Shoshone ⁹	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....		E. E. Roddis.....	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah.....	Leo R. Taylor.....				
Sun River ¹¹	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Billings, Mont.
Umatilla ¹²	Irrigon, Oreg.....	A. C. Houghten.....				
Uncompahgre.....	Hermiston, Oreg.....	Enos D. Martin.....				
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyen.....	C. M. Voyen.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹³	C. F. Williams.....		J. R. Alexander.....	Montrose, Colo.
Kitittas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....		B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gibsen Dam.....	Augusta, Mont.....	Ralph Lowry ¹³	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928.

⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	State of Utah.
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	
Truckee River investigations.....	Fallen, Nev.....	A. W. Walker.....	
Yakima project extensions.....	Yakima, Wash.....	P. J. Preston.....	



A TULE LAKE HOMESTEAD, KLAMATH PROJECT, OREGON-CALIFORNIA

NEW RECLAMATION ERA

VOL. 20

APRIL, 1929

NO. 4



STONY GORGE DAM AND RESERVOIR FROM NORTH SIDE, ORLAND PROJECT, CALIFORNIA

RAY LYMAN WILBUR

SECRETARY OF THE INTERIOR



DR. RAY LYMAN WILBUR, newly appointed Secretary of the Interior, was born at Boonesboro, Iowa, April 13, 1875. He graduated from Stanford University with the degree of A. B. in 1896, receiving his master's degree the following year, and the degree of M. D. from Cooper Medical College, San Francisco, in 1899. From 1903 to 1904 he was a student at Frankfort-on-the-Main and at London, and from 1909 to 1910 at the University of Munich. He received the degree of LL. D. from the University of California in 1919, from the University of Arizona in the same year, and from the University of Pennsylvania in 1925. Syracuse University gave him the degree of Sc. D. in 1924.

Doctor Wilbur has been an instructor in physiology, assistant professor of physiology, professor of medicine, dean of the Medical School, and president of Stanford University, and a lecturer at Cooper Medical College. He was chief of the conservation division of the United States Food Administration in 1917; member of the California State Council of Defense, 1917; regional educational director, Students' Army Training Corps, District No. 11, 1918; president of the California State Conference of Social Agencies, 1919; Council of Social and Health Agencies, San Francisco, 1922-1925; vice president of the San Francisco Community Chest; delegate to the Sixth Pan American Conference in Habana, 1928; a member of the State Park Commission of California; and has been since 1923 a trustee of the Rockefeller Foundation.

Doctor Wilbur is a fellow of the American Association for the Advancement of Science; member of the American Academy of Medicine, of which he was president 1912-1913; American Medical Association council on medical education and hospitals, of which he was president 1923-1924; Association of American Medical Colleges, of which he was president in 1924; California Academy of Medicine, of which he was president 1917-1918; Phi Beta Kappa and Sigma Xi Societies. He has been chairman since 1924 of the medical council of the United States Veterans' Bureau; chairman since 1925 of the Institute of Pacific Relations, Honolulu; and chairman of the executive committee, Survey of Race Relations on the Pacific Coast.

NEW RECLAMATION ERA

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RAY LYMAN WILBUR
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

April, 1929

No. 4

Interesting High Lights on the Federal Reclamation Projects

PRELIMINARY designs and estimates for the Cle Elum Dam, Yakima project, Washington, and consideration of various schemes for the outlet works have been completed. Final designs for this dam on a basis of storage capacity of 417,000 acre-feet and a spillway capacity of 35,000 second-feet with the water surface at the top of the dam have been prepared. The outlet works and spillway are combined in a single structure.

TYPICAL designs have been prepared for weirs, drops, chutes, culverts, and turnouts to be included in specifications for the construction of the Harper Valley lateral system on the Vale project Oregon. Specifications for the construction of this system and that of the Chieken Creek siphon on the Vale Main Canal are in progress of preparation.

ON the Yuma project during a recent month shipments of fattened beef cattle by rail and truck were the heaviest this season, with 46 carloads shipped by rail and 97 head by trucks. In addition, 292 head of hogs were also shipped to the Pacific coast markets by truck.

LAND transfers on the Yuma project have shown an increase since the first of the year. This is encouraging as land sales have moved very slowly during the past year or two.

DRILLING and blasting in the rock quarry above Echo Dam, Salt Lake Basin project, have been carried on continuously, and the dam is practically 30 per cent completed.

ON THE Kittitas division of the Yakima project work continued under nine contracts on the construction of Easton Dam, about 6 miles of main canal, south branch canal, and the first 11 miles of the north branch canal.

THE Yuma Mesa Grapefruit Syndicate, which recently completed the picking of this season's crop, marketed their fruit in pools through the Imperial Valley Grapefruit Growers' Association. This association marketed practically the entire crop for unit B in 1927 with satisfactory results.

THE Churchill County Poultrymen (Inc.) are trying to have the State legislature pass a bill making it unlawful to transport poultry on public roads between the hours of sundown and sunrise without a written permit from the sheriff of the county or counties through which the poultry is to be moved, the purpose being to curb poultry stealing.

THE Lahontan Valley, Nev., offers a wonderful opportunity for the dairyman. The outstanding advantages are the climatic conditions, cheap feed, abundance of water, adequate marketing system, and a group of farmers who believe in organization. The greatest opportunity for profit in dairying is not increasing the number of cows, but in increasing the production of each cow. A high-producing cow requires no more time to care for than a poor one, eats but little more feed, and makes very much more profit.

ON the west extension district of the Umatilla project dairy cattle and sheep are in demand. Fair dairy cows are selling for \$100 to \$125 each and beef prices are excellent, cull cows bringing a price of \$65 to \$80.

THE water supply for the Orland project will depend upon the early spring rains. On the Klamath project a curve of minimum lake elevations was submitted to the California-Oregon Power Co. in order that no shortage will occur under the upper Klamath Lake.

STEADY progress is now being made in the settlement and development of the Yuma auxiliary project, and it seems certain that when citrus men and prospective investors realize the advantages in the absence of killing frosts, assured water supply, and other features peculiar to this project, development will be more rapid than at present.

THE onion market on the Uncompahgre project, Colorado, showed steady improvement, the price offered ranging around \$4.25 per hundredweight. Forty carloads were awaiting shipment to market at the latest report from the project.

FIVE carloads of cheese having a total value of \$30,000 have been shipped from the Uncompahgre project, Colorado, since the first of the year.

THE culling of poultry on the Grand Valley project, Colorado, is becoming a rather prominent side line. During this season it is probable that a demonstration farm patterned after the plant at Coalville, Utah, described in a recent issue of the Era, will be started near Grand Junction. This plant will be financed by local people, and it is believed it will serve to increase the production to a point where carload shipments of eggs will be possible, thus realizing benefits not now received.

CONFERENCES of irrigation farmers have been held at Saeco, Malta, and Chinook, stressing improved and standardized farming methods, particularly in connection with sugar-beet culture on the Milk River project, Montana. Considerable interest was displayed by the farmers, especially on the Chinook division, and a bulletin is being prepared by the county agents outlining the practices in irrigated agriculture which have given the best results generally in the production of the principal project crops.

Resumé of Work in Progress During Present Fiscal Year and Proposed for Fiscal Year 1930¹

By R. F. Walter, Chief Engineer, Bureau of Reclamation

I HAVE been assigned the same subject as at the last biennial conference in March, 1927. No new projects have been inaugurated during this period, therefore I assume that a discussion is desired of the progress that has been made during the past two years in carrying out the plans then contemplated, and of changes that have been made, if any, in such program; in other words, a brief keynote statement for the purpose of guidance of future operations.

NO NEW PROJECTS AUTHORIZED

The appropriations made by Congress for the fiscal year 1928 substituted the Gooding division under the designation of the North Side gravity extension unit of the Minidoka project, for the North Side pumping unit, which was included in the 10-year program, as the next unit of the Minidoka project to be constructed. This made advisable the postponement of the proposed power development at the American Falls Dam, for which an appropriation had already been made, as little of this power, which was largely to be used in connection with the latter development, would be needed and a frozen investment would have resulted. A favorable adjustment by which the small amount of this power that was needed by the project during the next 10 years could be secured without cost, as well as some revenue from the surplus American Falls storage, was worked out with the Idaho Power Co., but on account of protests of certain interests, has not, except as to the revenues secured during the past year for rental of the surplus capacity during 1928, been made effective.

Congress made no appropriations for new projects from the reclamation fund during the past two years, and it is not anticipated that any will be made until the 10-year program period for completion of present projects is concluded. All the available resources of the fund will be required for this purpose.

THE BUREAU PROGRAM

Appropriations for construction and operation and maintenance, authorized from the reclamation fund by the last Congress which has recently adjourned, for the next fiscal year aggregate \$13,014,472, of which \$9,361,400 is new and \$3,653,072 carry over appropriations, as compared with a total of \$15,572,687 for the fiscal year 1929, of which

\$12,894,000 was direct and \$2,678,687 reappropriation. In addition to the above appropriations Congress authorized the expenditure of commercial power revenues to the extent of \$190,000 for the operation and maintenance of five power plants on as many projects during 1929 and \$315,000 for the same purpose and transmission line extensions during 1930. Authorization was also provided, each year, for refund of construction charges paid on class 6 lands.

BOULDER CANYON LEGISLATION

The most important new legislation by Congress affecting the Bureau of Reclamation, although not the reclamation fund, during the past biennial period, is the Boulder Canyon act, which was signed by the President on December 21, 1928, and authorizes appropriations from the General Treasury as distinguished from the reclamation fund to the extent of \$165,000,000. Certain conditions attached to the act, requiring State legislation on the distribution of the waters of the Colorado River and execution of contracts for sale of power or power privileges and water sufficient to repay the cost of the dam and power plant, with interest, in 50 years and the cost of the all-American canal in 40 years are required before appropriations will be made therefor. This will require at best from six months to a year and may require a much longer period before this work can be actively initiated. In the meantime only preliminary work and some investigations of irrigation projects in the Colorado River Basin, for which an expenditure of \$250,000 is authorized in the act, is possible. The passage of this act greatly increased the work of the Denver office, as letters of inquiry often requiring considerable time of some one to compile the information requested, were received and had to be read and answered at a rate of over 100 some days. This extra work had to be absorbed by the regular office force owing to the limitation included in the appropriation acts on the expenditure for salaries in the Chief Engineer's office. This limitation should be sufficiently elastic to provide for increase in force when large additional duties not contemplated or foreseen when the limitation is fixed, are added by subsequent legislation by Congress.

STATUS OF THE RECLAMATION FUND

It is expected that, with the continuation of reasonably prompt repayment of

construction charges on completed project developments, the reclamation fund will be able to meet the appropriations made which are dependent thereon during the fiscal years 1929 and 1930 but with the demand on the fund in connection with the many large contracts now in force and likely to be made during this calendar year, it is quite probable that the appropriations for 1931 must be curtailed or allotments therefrom limited to less than 100 per cent of the appropriations. Contract obligations and operation and maintenance costs, where not advanced by the water users, must be provided for first and the new work to be undertaken curtailed if necessary. It is probable that this condition will continue for five years at least, or until the construction of the projects provided for in the 10-year program are completed. Any new projects that might be authorized by Congress during this period would disarrange the program and be disastrous to our ambitions for the orderly and early completion of the present projects.

FOUR DAMS COMPLETED

At the time of the last biennial conference, it was stated that three large storage reservoirs would soon be completed. These were completed, as well as the Stony Gorge Dam, which was then just started, and have since been in successful operation. The estimated and actual costs upon completion are as follows:

	Estimated cost	Actual cost
American Falls Reservoir.....	\$8,000,000	\$7,356,000
McKay Reservoir	2,500,000	2,115,000
Guernsey Reservoir and power plant.....	2,350,000	2,341,000
Stony Gorge Reservoir.....	1,250,000	1,253,000

I will not undertake to enumerate here the many problems that were met and solved during the construction. Suffice to say, however, that the construction engineer on each of these dams is to be congratulated on the success with which the construction of these four large dams was carried out and completed within the estimates and within contract time in each case, and without any undue friction between the contractors and the Government engineering forces. To do this is all that can be asked of any engineer.

CONSTRUCTION OF THREE DAMS IN PROGRESS

The Gibson Dam in the Sun River Canyon in Montana, estimated to cost \$2,785,000, has been under construction

¹ Address delivered at the Denver Conference, Mar. 13, 1929.

during the past two years, is 82 per cent completed at this time, and I can confidently predict that it will be successfully completed early during the present summer, within the estimated cost and time limit, and the name of the construction engineer on this dam will be placed on the roll of honor along with the four above referred to.

The construction of the \$6,000,000 Owyhee Dam in Oregon which will, perhaps for a short time only, be the highest dam in existence, as several higher dams are now in course of construction or planned, was delayed for some time, owing to the necessity for additional and extensive foundation explorations before the plans could be completed. During the period of enforced delay, however, the 24-mile construction railroad needed to transport concrete aggregates from the nearest satisfactory gravel deposit and the construction power transmission line to furnish power from the Government power plant at the Black Canyon Dam, were completed by the Bureau of Reclamation, thus permitting the contractor to begin active construction on the dam immediately upon the award of the contract. This contract was awarded at a price well within the estimate on June 16, 1928. This program no doubt saved one year's time. Good progress is being made in construction of the large diversion tunnel and excavation for foundation. The actual placing of concrete in the dam will, without doubt, be possible before the present summer is over.

Both of the above dams and the incidental conditions encountered were described by me at the conference two



Seining carp from Belle Fourche Reservoir, Belle Fourche project, South Dakota

years ago and also have been published in the Reclamation Era, and except for new developments not heretofore described I will endeavor to cut out as much static of this kind as possible.

ECHO DAM

The Echo Dam which has been contracted since the last conference, will form a reservoir having a capacity of 74,000 acre-feet, is now under construction across the Weber River Valley about 45 miles above Ogden, Utah. Contracts for relocation of that part of the Park City branch of the Union Pacific Railroad and the Lincoln Highway that will be flooded by the reservoir, were awarded on November 9, 1927. The relocation of the railroad and highway have been completed and the construction of the dam is about one-third completed at this time.

The type of dam under construction is that of a rolled embankment about 1,900 feet long and 130 feet maximum height, with concrete cut-off wall extending into bed rock and rock protection on the water slope. The control works are in a rock lined tunnel. The spillway is a concrete lined chute. The estimated cost of the reservoir is \$2,750,000 and for a diversion canal from the Weber to the Provo valley, \$250,000 additional.

THREE NEW DAMS TO BE CONSTRUCTED

Plans and specifications are in course of preparation for three new storage dams needed to complete present projects and for which appropriations have been provided by Congress. All three of these dams will be advertised during the present fiscal year and if satisfactory bids are received, early construction of all will be in progress.

DEADWOOD DAM

The Deadwood Dam will be located on the Deadwood River, a branch of the Payette, some 50 miles north of Boise, Idaho. The reservoir formed by the dam will have a capacity of 150,000 acre-feet, and this storage will ultimately be required for the proposed Payette division of the Boise project. At this time, however, its immediate requirement, pending the completion of the Owyhee project, will be storage for power development at the Black Canyon power plant required by the Gem irrigation district lands where 30,000 acres of old developed land, which will ultimately have a gravity water supply from the Owyhee project, are dependent on a pumped water supply.



Cotton grown on the Carlsbad project, New Mexico

The cost of the dam, as well as the Black Canyon power plant, it is hoped will be repaid from the power revenues during the next 15 years. If this cost is thus liquidated, it is expected that the construction of the Payette division, which would otherwise have to repay this cost, may be made feasible. This dam will be of concrete arch design 600 feet long and 160 feet maximum height. It will contain 50,000 cubic yards of concrete, for which the aggregates available at the site are excellent. The foundation is in granite formation. The estimated cost is \$1,200,000 and two summer seasons will be required for the completion. Owing to its isolated location and deep snow on the adjacent roads, it probably will not be possible for prospective bidders to visit the site prior to June.

AVALON DAM

In order to insure the water supply of the Carlsbad project in New Mexico, it is proposed to increase the storage in Avalon Reservoir on the Pecos River from 7,000 to 50,000 acre-feet by raising the present water surface 22 feet.

On account of the presence of gypsum and limestone, there is considerable doubt if this reservoir, when completed, will be tight, but as this is the best site available near the project the water users have elected to assume this risk, and in doing this they have voted supplemental construction funds for repayment of the estimated cost of \$1,412,000.

This construction will consist of a main earthen embankment 1,000 feet long and

about 65 feet maximum height with concrete by-pass for regulation. There are additional low embankments aggregating 7,500 feet in length. Spillway capacity of 250,000 second-feet will be available with 6 feet encroachment on the freeboard of the embankments.

Relocation of four miles of the Pecos Valley branch of the Santa Fe Railroad through the site at an estimated cost of \$200,000 is necessary. The Santa Fe Railroad Co. has agreed to assume one-half of this cost.

CLE ELUM DAM

It has long been planned, as development of additional units of the Yakima project increases the demand for water, to construct a dam at the outlet of Lake Cle Elum on the Cle Elum River, an important branch of the Yakima River.

With development of the Kittitas division during the next few years, additional storage will be needed.

There is at present a temporary crib dam at this site with a present storage capacity of 24,000 acre-feet. This will be increased by the construction of an earth dam 750 feet long on top and 130 feet maximum height, increasing the storage capacity to 417,000 acre-feet. An additional 83,000 acre-feet of capacity can be secured, if and when needed, by drawing off about 45 feet of the present low water of the lake by means of a 2½-mile tunnel outlet. This will be more expensive storage. The estimated cost of the present development of the Cle Elum Reservoir is \$2,500,000, of which \$175,000 has al-

ready been expended for investigations, purchase of flooded lands, etc., which will be repaid by the Kittitas division under construction, and other new divisions of the Yakima project proposed for construction.

INSPECTION OF DAMS CONSTRUCTED BY THE BUREAU

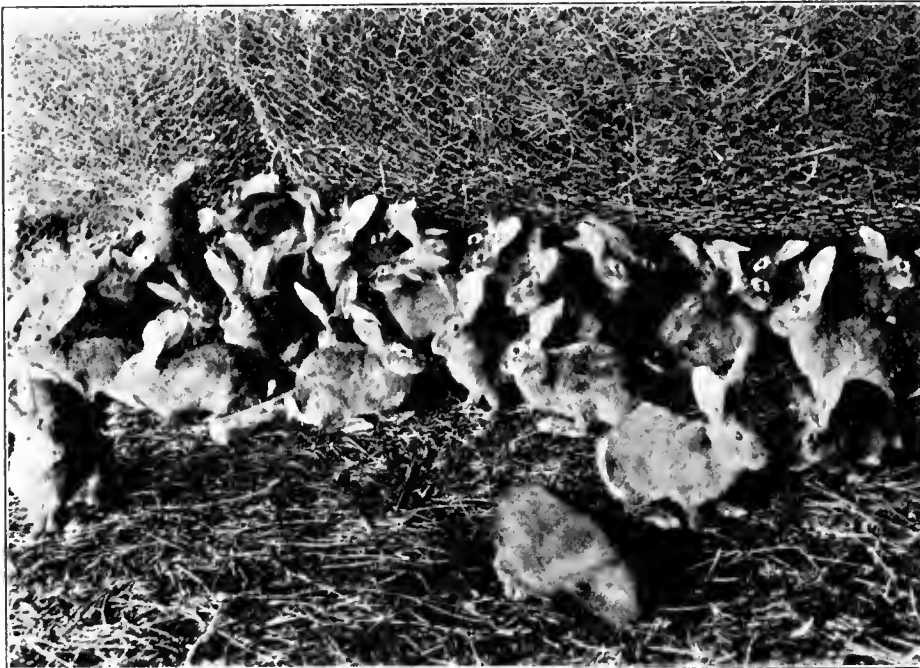
Two independent inspections of all dams constructed by the Bureau of Reclamation were made during the past summer, one by the bureau consulting engineers, D. C. Henny and A. J. Wiley; and a second by engineers detailed from the Engineer Corps of the War Department. Reports have been received on all but one dam inspected by the first engineers, and all but five inspected by the Army engineers. The reports received show all dams to have been well constructed and properly maintained. Some valuable suggestions for minor betterments were, however, included for further consideration, but all dams reported on to date have been declared safe.

PROGRESS OF CANAL CONSTRUCTION

While the construction of great dams always impresses the layman, on account of their more spectacular appearance, we can not all be dam engineers. There is another phase of our work which is most important and often requires greater forethought and engineering ability than does the construction of dams. The proper location and construction of large canals, with their appurtenant diversion dams, tunnels, turnouts, wasteways, and high-pressure conduits, such as are necessary on the more difficult projects which are now left for construction, requires the most careful study and greatest ingenuity of the designing and construction engineers.

THE KITTITAS PROJECT

With the appropriations now available, the Kittitas main canal, which is perhaps the most difficult of any large irrigation canal ever constructed, and laterals will be completed for the irrigation of some 40,000 acres or over half of this project. The construction of the Yakima River crossing, bids for which were recently opened at Ellensburg, Wash., will complete the last large structure on this canal. This structure, which has been estimated to cost nearly one-half million dollars, is necessary to carry the water for 55,000 acres of the project across the Yakima River, along which two transcontinental railroads are located. Bids were requested on alternate plans, consisting of 111-inch diameter



Raising rabbits on Newlands project, Nevada—a profitable industry

riveted steel-plate inverted siphon on concrete piers, with bridge substructure over the river, 3,300 feet long, under a maximum head of 306 feet; and a concrete pressure tunnel under the river 9 feet 3 inches in diameter, 3,215 feet long, under a maximum head of 510 feet.

The result of the advertisement, which does not include the cost of cement, shows the lowest bid to be \$345,878 for the pressure tunnel, which is \$35,000 under the engineer's estimate. The cost of the steel siphon, considering the low bid of \$369,129, which is only \$5,000 less than the engineer's estimate, would make the tunnel the most economical construction by far.

With the completion of the present year's construction program, water will be available under the main canal and south branch canal for 17,500 acres, and with the completion of the Yakima River crossing and distribution system now planned, and for which funds are available, water will be available for over 20,000 acres additional under the north branch canal in 1931. This will give the landowners under this project, ample opportunity to demonstrate their claims for rapid and successful settlement.

The result of recent advertisement of small lateral construction on this project demonstrates that we must look to the smaller contractors with a few teams or small drag lines to construct these works, as the larger contractors, who are accustomed to heavy construction work and have few teams available, will not bid on such work, or if they do the bids will be unreasonably high.

THE VALE PROJECT

The diversion works and first 20 miles of the main canal, including 1½ miles of tunnel, are completed or under contract, and with the funds available it is proposed to extend the main canal 20 miles to a point on the Bully Creek bench about 2 miles northwest of the town of Vale, Oreg. This canal crosses Bully Creek by a steel siphon 10 feet in diameter and 6,800 feet long, under a maximum head of 200 feet, which will require a large part of the 1930 appropriation to construct. The balance will be used for additional canal and for lateral system. By 1931, if the construction proceeds without undue interruption, the canal should be completed across Bully Creek and water become available for some 14,000 acres, or over half of the project area. Settlement on this part of the project will then demonstrate if it is advisable to make further expenditure to extend the irrigable area at this time.

THE OWYHEE PROJECT

Construction of the canal system of this project will be inaugurated in the near

future by advertisement of the 3½-mile reservoir outlet tunnel. In order to deliver water to lands on this project, except supplemental water to 12,000 acres under the Owyhee Canal, when the Owyhee Dam should be completed in 1933, it will be necessary to expend \$3,000,000 per year for five years on this project for construction of the main canal and distribution system and payments on the Owyhee Dam contract, in order that water can be delivered to project lands in 1934, when the storage will become available. This will be a larger program than yet undertaken on any project.

THE GOODING PROJECT

On account of the fact that over one-half of the irrigable lands on this project are located in the Little Wood River Valley, settled under an old project, for which there is an inadequate water supply from the Wood River, the construction procedure for this project, of not developing the units as the canal construction proceeds, differs from the customary procedure on most projects. Storage water is now available in the American Falls Reservoir and the 60-mile main canal will be rushed to completion as fast as surveys are completed and contracts can be let, and before any attention is given to development of the 36,000 acres of new land under the upper section of the canal.

The first 3½ miles of the main canal, which includes difficult and expensive rock excavation, is under construction. This section is being constructed to additional capacity for use of and with cooperation of the North Side Twin Falls project. Advertisement is pending for the next 20 miles, and as soon as surveys and designs can be completed the balance of the 60 miles of main canal, for which appropriation has just become available, will be advertised. It will require an exceedingly ambitious program to complete this canal and deliver water to Little Wood River by 1932.

RIVERTON PROJECT

By renewing appropriations for this project during the fiscal year 1929, Congress provided for construction of the Pilot division of 40,000 acres, regardless of the fact that practically no settlement had been made on the 20,000 acres of Government land in the Pavillion division, for which distribution system had been completed and water was available. Congress also departed from its customary procedure by providing that the work should be done by Government forces rather than by contract.

During the past year the work has proceeded in an orderly manner, with one gas

and three electric drag lines, using the power supply subsequently developed on the project.

The 1929 appropriation will complete about one-half of the main canal and distribution system and the 1930 appropriation the balance; therefore by 1931 this division should be completed except for drainage and 40,000 additional acres added to the already relatively large unsettled area of this project. Drainage will have to be provided as settlement proceeds. Unless agricultural conditions are improved, or some plan is worked out for aided settlement, this project will become a greater liability on the bureau than any other project yet constructed.

SUN RIVER PROJECT

Congress has provided for the completion of the main canal for the Greenfields area, for which the distribution system for 42,000 acres has been completed. This consists of the enlargement of the Greenfields bench canal and construction of about 5 miles on an alternate location, thus avoiding a section of unstable side hill canal where much difficulty has been experienced in past operations.

The alternate canal will be advertised as soon as surveys and plans can be completed, and the enlargement of the balance of the Greenfields Canal will proceed in an orderly manner, with at least two drag lines, while the other work is in progress. This work should all be completed during 1929 and 1930 calendar years. Congress has provided that the operation and maintenance of this unit shall be assumed in 1931 by the irrigation district. Five hundred thousand dollars are available for this work.

NEW LANDS TO BE OPENED ON THE KLAMATH AND SHOSHONE PROJECTS

On the Tule Lake division of the Klamath project and the Willwood division of the Shoshone project the construction of distribution and drainage works should proceed in an orderly manner by Government forces and through small contracts, in order that additional areas of land may be made available for entry in small units from time to time as these works are completed, and there is demand therefor.

PROGRESS OF DRAINAGE CONSTRUCTION

Appropriations made by Congress have been expended each year in an orderly manner toward completion of the drainage of irrigable lands on various projects affected by high-water tables.

During the past year the drainage works for the Newlands, Huntley, and Warm Springs division of the Vale projects have been successfully completed. In each case the estimates and funds voted permitted the construction of additional

drains or the work was completed with surplus funds remaining unexpended.

A small amount of drainage work has been authorized and remains to be done, generally as seepage conditions make the same necessary, under public notices issued or contracts made with irrigation districts and water users associations, on the Boise, Yuma, Rio Grande, and Grand Valley projects. This work will be continued during the coming year, or until funds provided are expended.

The drainage funds provided in contracts with the irrigation districts on the Shoshone and Lower Yellowstone projects are all provided by 1930 appropriations and work on these projects should be completed during the coming fiscal year.

The construction of the drainage system for the Belle Fourche project, where 10,000 acres are affected by the high-water table, requiring the excavation of 143 miles of drain, at an estimated cost of \$1,000,000, has been in progress by contract during the past year. This work should be so planned that it will all be completed by the end of the calendar year 1932, at the end of which the Belle Fourche Valley irrigation district is scheduled to assume the operation and maintenance of the project.

Satisfactory bids have been received for drainage construction on both the Lower Yellowstone and Belle Fourche projects, and this work on both projects is being done by contract.

PROGRESS IN COMPLETING OLD PROJECTS

Seventeen projects or project divisions have been completed and the works transferred, in whole or in part, for operation and maintenance to the respective project irrigation district or water users' association organizations.

Eight projects or divisions are being operated and maintained with funds advanced by the water users, pending final completion of drainage or other features, and transfer at some stated future date.

Ten additional projects or project divisions, with which no adjustment contracts were made, are still being operated and maintained under public notices or contracts, requiring annual appropriations for operation and maintenance. With the exception of the Greenfields division of the Sun River project, which it is proposed to complete and transfer to the irrigation district thereon, by 1931; and the Carlsbad project, for which the construction of additional storage is proposed, construction on all has been practically completed, and they may be transferred to the water users at their option.

The Denver Conference *March 13-15, 1929*

MEMBERS of the engineering, operating, legal, and economic forces of the Bureau of Reclamation met in Denver on March 13 for a 3-day conference on the many problems pressing for solution. The program, as already printed in the February issue of the New Reclamation Era, called for committee meetings and conferences from 9.30 to 11 o'clock each morning, followed from 11.10 a. m. to 12.30 p. m. and from 2 to 5 p. m. by general meetings in the conference hall for the delivery of prepared papers and general discussion.

The first day's general meeting was called to order by Dr. Elwood Mead, commissioner, who discussed the present-day aspects of Federal reclamation. He touched on the question of the pressure for new projects and the limitations on our revenues, pointing out that the continuation of payments is of more than usual importance if we are to maintain the rate at which we are carrying on the work. Doctor Mead stated that during the past year we have had the usual requests for postponement of payments or complete writing off of debts. On some projects there is real difficulty in meeting obligations, not so much to the Government, as taxes, store bills, and other debts. In all such cases we have stated that the law does not give the Secretary any discretionary power to modify the contracts.

During the coming summer, on those projects where it is believed conditions could be bettered, it is planned to make an economic survey and report to Congress;

such a survey to comprise a cross section of conditions through a personal investigation of, say, 50 representative farmers on each such project. This should give us a fair idea of economic conditions on the less prosperous projects.

Doctor Mead stated that the engineering operations of reclamation are pretty well thought out; but that we are still drifting in our attention to those things that bring contentment and earning power. He spoke of the erroneous idea that the reclamation projects add to the surplus, when, as a matter of fact, they create a demand for eastern farm and industrial products, adding that we are planning to make up a complete report of the commerce of the projects to show what they buy and what they sell. "We must begin to be educators along this line," he said.

Doctor Mead was followed by Chief Engineer Walter, who gave a résumé of construction work in progress during the fiscal year 1929, and proposed work for the fiscal year 1930. Mr. Walter's address appears in this issue.

The first day's program was given over to addresses and discussion by the engineers, with Mr. Walter presiding; the second day to the legal and financial forces, with Mr. Dent, assistant commissioner, presiding; and the third to the settlement and farm development organization, with Doctor Brown, assistant director of reclamation economies, presiding.

Other papers presented at the conference will appear from time to time in future issues of the Era.

SECONDARY PROJECT INVESTIGATIONS

Congress has very liberally provided \$225,000 for secondary project investigations and about \$70,000 reappropriation for economic investigations. Of the former \$80,000 is for expenditure in the Colorado River Basin when certain conditions of the Boulder Dam act have been met. In general it may be said, and this is supported by the discussions in Congress when the appropriation was under consideration, that expenditures from this fund for investigation of new projects should be limited to those where the States or local interests advance funds to an amount of at least one-half the estimated cost.

Utah Acts on Boulder Dam Legislation

The Utah Legislature under date of March 5, 1929, passed Senate Concurrent Memorial No. 3, which was signed by Governor Dern, memorializing the Secretary of the Interior to survey and classify agricultural lands in the upper basin of the Colorado River system, taking in the States of Wyoming, Colorado, Utah, and New Mexico, with a view to dividing intelligently and equitably the 7,500,000 acre feet of water allocated to the upper-basin States under the terms of the Boulder Dam act. Ratification of the compact by Utah took place about the same time.

Appropriations for the Bureau of Reclamation for the Fiscal Year Ending June 30, 1930

Act approved March 4, 1929

THE following sums are appropriated out of the special fund in the Treasury of the United States created by the act of June 17, 1902, and therein designated "the reclamation fund," to be available immediately:

Commissioner of Reclamation, \$10,000; and other personal services in the District of Columbia, \$140,000; for office expenses in the District of Columbia, \$23,000; in all, \$173,000.

For expenses, except membership fees, of attendance upon meetings of technical and professional societies required in connection with official work of the bureau, \$1,000 of the unexpended balance of appropriations for this purpose for the fiscal year 1929 is continued available for the fiscal year 1930.

For all expenditures authorized by the act of June 17, 1902 (32 Stat., p. 388), and acts amendatory thereof or supplementary thereto, known as the reclamation law, and all other acts under which expenditures from said fund are authorized, including not to exceed \$178,000 for personal services and \$27,000 for other expenses in the office of the chief engineer, \$25,000 for telegraph, telephone, and other communication service, \$8,000 for photographing and making photographic prints, \$54,000 for personal services, and \$12,000 for other expenses in the field legal offices; examination of estimates for appropriations in the field; refunds of overcollections and deposits for other purposes; not to exceed \$20,000 for lithographing, engraving, printing, and binding; purchase of ice; purchase of rubber boots for official use by employees; maintenance and operation of horse-drawn and motor-propelled passenger-carrying vehicles; not to exceed \$40,000 for purchase of horse-drawn and motor-propelled passenger-carrying vehicles; packing, crating, and transportation (including drayage) of personal effects of employees upon permanent change of station, under regulations to be prescribed by the Secretary of the Interior; payment of damages caused to the owners of lands or other private property of any kind by reason of the operations of the United States, its officers or employees, in the survey, construction, operation, or maintenance of irrigation works, and which may be compromised by agreement between the claimant and the Secretary of the Interior, or such officers as he may designate; payment for official telephone service in the field hereafter incurred in case of official telephones in-

stalled in private houses when authorized under regulations established by the Secretary of the Interior: *Provided*, That no part of said appropriations may be used for maintenance of headquarters for the Bureau of Reclamation outside the District of Columbia except for an office for the chief engineer and staff and for certain field officers of the division of reclamation economies: *Provided further*, That the Secretary of the Interior in his administration of the Bureau of Reclamation is authorized to contract for medical attention and service for employees and to make necessary pay-roll deductions agreed to by the employees therefor: *Provided further*, That no part of any sum provided for in this act for operation and maintenance of any project or division of a project by the Bureau of Reclamation shall be used for the irrigation of any lands within the boundaries of an irrigation district which has contracted with the Bureau of Reclamation and which is in arrears for more than twelve months in the payment of any charges due the United States, and no part of any sum provided for in this act for such purpose shall be used for the irrigation of any lands which have contracted with the Bureau of Reclamation and which are in arrears for more than twelve months in the payment of any charges due from said lands to the United States.

Examination and inspection of projects: For examination of accounts and inspection of the works of various projects and divisions of projects operated and maintained by irrigation districts or water users' associations, and bookkeeping, accounting, clerical, legal, and other expenses incurred in accordance with contract provisions for the repayment of such expenses by the districts or associations, \$40,000.

For operation and maintenance of the reserved works of a project or division of a project when irrigation districts, water-users' associations, or Warren Act contractors have contracted to pay in advance but have failed to pay their proportionate share of the cost of such operation and maintenance, to be expended under regulations to be prescribed by the Secretary of the Interior, the unexpended balance of the appropriation for this purpose for the fiscal year 1929 is continued available for the same purpose for the fiscal year 1930.

Yuma project, Arizona-California: For operation and maintenance, \$275,000; for continuation of construction of drainage,

\$20,000; in all, \$295,000: *Provided*, That not to exceed \$25,000 from the power revenues shall be available during the fiscal year 1930 for the operation and maintenance of the commercial system.

Orland project, California: For operation and maintenance, \$38,000.

Grand Valley project, Colorado: Not to exceed \$15,000 of the unexpended balance of the appropriation of \$75,000, for the fiscal year 1929, is hereby made available for continuation of construction during the fiscal year 1930.

Boise project, Idaho: The unexpended balance of the appropriation of \$400,000 for continuation of investigations and construction, Payette division, for the fiscal year 1928 and of the appropriation of \$400,000 for continuation of construction for the fiscal year 1929 shall continue available during the fiscal year 1930 for construction of the Payette division, and of the unexpended balance of the appropriation for this project for the fiscal year 1927 there is reappropriated for operation and maintenance, Payette division, \$20,000; for examination and surveys, Payette division, \$6,000; for continuation of construction, Arrowrock division, \$60,000: *Provided* That all net revenues derived from the operation of the Black Canyon power plant shall be applied to the repayment of the construction cost: First, of the Deadwood Reservoir; second, the Black Canyon power plant and power system; and third, one-half the cost of the Black Canyon Dam, until the United States shall have been reimbursed for all expenditures made incident thereto. Thereafter, all net revenues shall be covered into the reclamation fund unless and until otherwise directed by Congress. No charge shall be made against any irrigation district for the cost of construction of the said Deadwood Reservoir, the Black Canyon power plant and power system, or more than one-half the cost of the Black Canyon Dam.

Minidoka project, Idaho: For operation and maintenance, reserved works, \$45,000; continuation of construction, gravity extension unit, \$300,000, together with \$1,200,000 of the unexpended balances of the appropriations for the fiscal years 1928 and 1929 for construction of power plant at American Falls: *Provided*, That not to exceed \$50,000 from the power revenues shall be available during the fiscal year 1930, for the operation of the commercial system; and not to exceed \$175,000 from power revenues shall be available during

the fiscal year 1930 for continuation of construction, South Side Division, and for enlargement of the power system; in all, \$345,000.

Milk River project, Montana: For operation and maintenance, Chinook and Malta divisions, \$17,000; continuation of construction, \$17,000; in all, \$34,000.

Sun River project, Montana: For operation and maintenance, \$20,000 continuation of construction, \$500,000; in all, \$520,000: *Provided*, That the appropriation for continuation of construction for the fiscal year 1929 shall remain available for the fiscal year 1930, for the purposes for which originally appropriated: *Provided further*, That on or before July 1, 1929, notice shall be given by the Secretary of the Interior requiring the water users to assume the control of the constructed works on January 1, 1931, and to commence payment of construction charges in accordance with the contract of June 22, 1926, between the United States and the Greenfields irrigation district.

Lower Yellowstone project, Montana-North Dakota: For completion of drainage system, \$195,000.

North Platte project, Nebraska-Wyoming: Not to exceed \$75,000 from the power revenues shall be available during the fiscal year 1930 for the operation and maintenance of the commercial system.

Newlands project, Nevada: That such portion as may be necessary of the unexpended balance of the appropriation of \$50,000 for the survey and examination of water storage reservoir sites on the headwaters of the Truckee and Carson Rivers, made available under the provisions of the second deficiency act, 1928 (Public, Numbered 563, Session Laws, first session, Seventieth Congress, page 902, Newlands project, Nevada), shall also be available for the boring of test wells in the Truckee Meadows, Washoe County, near the city of Reno, Nevada.

Carlsbad project, New Mexico: For operation and maintenance, \$50,000: *Provided*, That no part of the appropriation of \$250,000 contained in the act of May 29, 1928 (45 Stat., p. 902), for beginning the enlargement of Avalon Reservoir shall be available until contract is entered into between the Secretary of the Interior and the Atchison, Topeka and Santa Fe Railway System, whereby said system agrees to pay one-half of the cost of relocating the tracks and right of way of said system where made necessary by said enlargement of the reservoir. Such appropriation of \$250,000 shall continue available for the fiscal year 1930.

Rio Grande project, New Mexico-Texas: For operation and maintenance, \$250,000,

together with \$125,000 of the unexpended balances of the appropriations available for continuation of construction during the fiscal year 1929.

Owyhee project, Oregon: For continuation of construction, \$2,000,000.

Baker project, Oregon: The unexpended balance of the appropriation for this project for the fiscal year 1929 is reappropriated and made available for the same purpose for the fiscal year 1930.

Vale project, Oregon: For operation and maintenance, \$6,000; for the purchase of a proportionate interest in the existing storage reservoir of the Warm Springs project, \$230,000; in all, \$236,000.

Klamath project, Oregon-California: For operation and maintenance, \$40,000; continuation of construction, \$301,000: *Provided*, That the unexpended balance of the appropriation of \$30,000 for the fiscal year 1929 for refunds to lessees of marginal lands, Tule Lake, which lands because of flooding could not be seeded prior to June 1, 1927, and/or June 1, 1928, shall remain available for the same purposes for the fiscal year 1930, and shall also be available for like refunds for lands which could not be seeded prior to June 1, 1929; in all, \$341,000.

Belle Fourche project, South Dakota: For continuation of construction, \$335,000.

Salt Lake Basin project, Utah, first division: The unexpended balance of the appropriation of \$1,750,000 for construction of Echo Reservoir and Weber-Provo Canal, for the fiscal year 1929, shall remain available for the same purposes for the fiscal year 1930.

Yakima project, Washington: For operation and maintenance, \$295,000; continuation of construction, \$1,000,000; in all, \$1,295,000.

Yakima project (Kittitas division), Washington: For operation and maintenance, \$20,000; for continuation of construction, \$1,112,000: *Provided*, That the unexpended balance of \$138,000 of the appropriation of \$1,500,000 contained in the act making appropriations for the Department of the Interior for the fiscal year 1929 (45 Stat., p. 277), shall remain available during the fiscal year 1930 for such continuation of construction; in all, \$1,132,000.

Riverton project, Wyoming: For operation and maintenance, \$50,000; continuation of construction under force account, \$511,000; *Provided*, That the unexpended balance of the appropriation for continuation of construction, for the fiscal year 1929, shall remain available for the fiscal year 1930: *Provided further*, That not to exceed \$20,000 from the power revenues shall be available during the fiscal year 1930 for the operation and maintenance of the commercial system; in all, \$561,000.

Shoshone project, Wyoming: For continuation of construction, Willwood division, \$44,000; for operation and maintenance, Frannie division, \$3,000; Willwood division, \$16,000; in all, \$63,000: *Provided*, That the unexpended balance of the appropriation for drainage construction, Willwood division, for the fiscal year 1929, shall remain available for the same purpose for the fiscal year 1930: *Provided further*, That the unexpended balances of the appropriations for drainage construction, Garland division, for the fiscal years 1927, 1928, and 1929, shall remain available for the same purpose for the fiscal year 1930: *Provided further*, That not to exceed \$20,000 from power revenues shall be available during the fiscal year 1930 for the operation and maintenance of the commercial system; and not to exceed \$25,000 from power revenues shall be available during the fiscal year 1930 for the construction of transmission lines: *Provided further*, That the net revenues from the operation of the Shoshone power plant shall be applied, first, to the repayment of the construction cost of the power system; second, to the repayment of the construction cost of the Shoshone Dam; and third, thereafter such net revenues shall be covered into the reclamation funds.

Secondary projects: For cooperative and general investigations, \$75,000.

The unexpended balance of the appropriation of \$100,000 for the fiscal year 1928 for investigations necessary to determine the economic conditions and financial feasibility of new projects and for investigations and other activities relating to the reorganization, settlement of lands, and financial adjustments of existing projects, including examination of soils, classification of land, land-settlement activities, including advertising in newspapers and other publications, and obtaining general economic and settlement data, is hereby made available for the same purposes for the fiscal year 1930: *Provided*, That the expenditures, from this appropriation for any reclamation project shall be considered as supplementary to the appropriation for that project and shall be accounted for and returned to the reclamation fund as other expenditures under the reclamation act.

Refunds of construction charges: The unexpended balance of the appropriation of \$100,000 contained in the first deficiency act, fiscal year 1928, for refunds of construction charges theretofore paid on permanently unproductive lands excluded from the Federal reclamation projects specified in the Act approved May 25, 1926 (U. S. C., Supp. I, p. 265, sec. 423a), in accordance with section 42 of said act.

is hereby made available for the same purposes for the fiscal year 1930.

That the Secretary of the Interior be, and he hereby is, authorized and directed to credit the Farmers' Irrigation District with the sum of \$2,376.45, as of January 1, 1927, which represents 50 per cent of the expenses incurred by said district in operating and maintaining the Nine Mile Drain from January 1 to June 30, 1926, under contract with said district dated June 16, 1917, in connection with the North Platte project, Nebraska-Wyoming.

Under the provisions of this act no greater sum shall be expended, nor shall the United States be obligated to expend during the fiscal year 1930, on any reclamation project appropriated for herein, an amount in excess of the sum herein appropriated therefor, nor shall the whole expenditures or obligations incurred for all of such projects for the fiscal year 1930 exceed the whole amount in the "reclamation fund" for the fiscal year.

Ten per centum of the foregoing amounts shall be available interchangeably for expenditures on the reclamation projects named; but not more than 10

per centum shall be added to the amount appropriated for any one of said projects, except that, should existing works or the water supply for lands under cultivation be endangered by floods or other unusual conditions, an amount sufficient to make necessary emergency repairs shall become available for expenditure by further transfer of appropriation from any of said projects upon approval of the Secretary of the Interior.

Whenever, during the fiscal year ending June 30, 1930, the Commissioner of the Bureau of Reclamation shall find that the expenses of travel, including the local transportation of employees to and from their homes to the places where they are engaged on construction or operation and maintenance work, can be reduced thereby, he may authorize the payment of not to exceed 3 cents per mile for a motor cycle or 7 cents per mile for an automobile used for necessary official business.

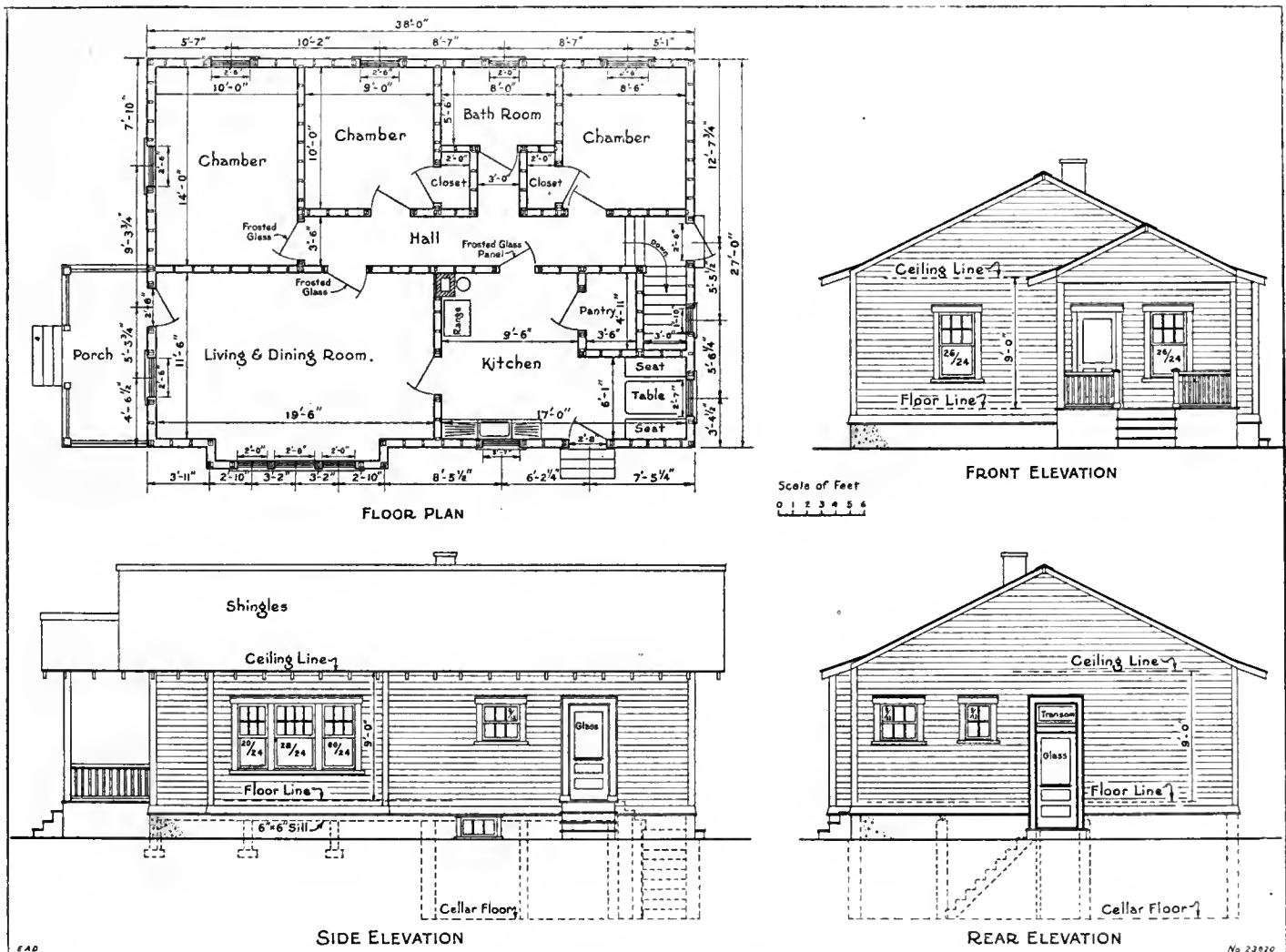
Total, from reclamation fund, \$7,978,000.

To defray the cost of operating and maintaining the Colorado River front

work and levee system adjacent to the Yuma Federal irrigation project in Arizona and California, subject only to section 4 of the act entitled "An act authorizing the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," approved January 21, 1927 (44 Stat. p. 1010), \$100,000, to be immediately available.

ANNOUNCEMENT has been made that the terminal facilities of the Union Pacific Railroad at Gering, North Platte project, Nebraska, will be greatly increased. Construction work on the terminal facilities was begun last season, but it is announced that the amount of work now contemplated is greatly in excess of that originally proposed.

THE Great Northern Railway has filed application with the Interstate Commerce Commission for the extension of its line from Klamath Falls, Oreg., to connect with the proposed extension of the Western Pacific in northern California.



Design of 5-room cottage for reclamation project settlers

Electric Power Development on the Newlands Project, Nevada

By A. W. Walker, Superintendent

At the close of December, 1928, approximately 500 farms on the Newlands project, Nevada, were being supplied with electric power. To furnish this service the Truckee-Carson irrigation district, which took over the operation and maintenance of the project on January 1, 1927, has built and acquired and is operating 175 miles of electric transmission lines.

The irrigation district builds and operates its electric lines through authority and power granted by section 49½ of the Nevada irrigation district act. The project lands or farm units are divided into several improvement districts formed when sentiment in a particular locality becomes ripe for securing electric service, at which time the terms of the act are complied with and construction soon follows. Three months are entailed from the time of formation of a district to the beginning of construction.

In the apportionment of benefits or costs, those interested in the improvement districts expressed a preference to having the distribution of construction charges made on a unit rather than on an acreage basis, as it may readily be understood that the occupant of a 40-acre farm might use and require fully as much electricity as his neighbor on a 160-acre tract, depending on the nature of the agriculture in which each is engaged.

To date the necessary lines and construction have been built for five improvement districts and the town of Fernley. Thirty-one miles of individual lines constructed by individual farmers

several years ago have been acquired by the district, which operates and maintains them. Preparations and plans for the proposed construction and extension of lines to three additional improvement districts and the town of Wadsworth are well underway. With one exception the measures as subjected to vote have carried by large majorities in the improvement districts organized.

COST OF CONSTRUCTION

The total cost of construction of electric lines to February 1, 1929, was \$145,252.12. Funds for financing this construction were provided by the sale of improvement district bonds, interest bearing warrants issued by the Truckee-Carson irrigation district, and funds advanced by the district. The faith of the community in this venture is evidenced by the facts that the funds were provided as follows:

Paid in cash by landowners ..	\$4,712.78
Bonds purchased by local individuals	32,200.00
Bonds purchased by local bank	86,400.00
Interest-bearing warrants purchased by local bank	15,000.00
Funds advanced by district ..	6,939.34
Total	145,252.12

The bonds which carry 6 per cent were all sold at par plus accrued interest and are issued in \$100 and \$500 denominations. The bonds are to be retired in 12 years, installment payments to be

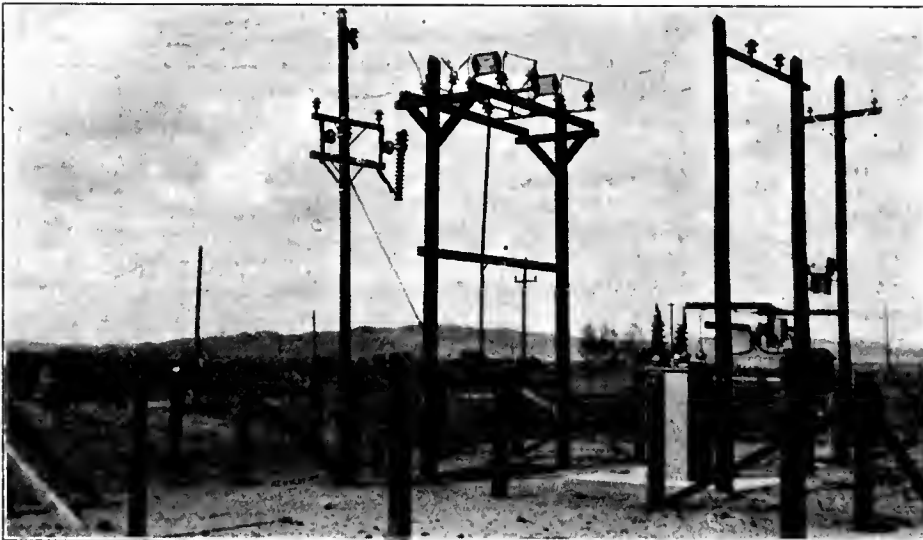
collected under apportionment of benefits as taxes by the county treasurer. Only interest is collected the first two years.

The cost of constructing all of the power lines to date averages about \$850 per mile, which includes necessary substations, transformers, and an average of two consumers' units per mile. Cost of energy to the farmers is 5 cents per kilowatt-hour for the first 30 kilowatt-hours per meter per month, which provides a minimum monthly charge of \$1.50. The next 30 kilowatt-hours is at the rate of 4 cents per kilowatt-hour and all over 60 kilowatt-hours at 3 cents per kilowatt-hour. During the month of December, 1928, the average individual farm consumption was 65 kilowatt-hours, which at current rates gives an average charge of \$2.85 per month. These meters have been operating a comparatively short time and present indications point to a much larger average use as soon as the consumers purchase contemplated additional equipment. A private concern is preparing a 115-horse-power alfalfa-meal mill, operation of which began about March 1, operating 20 hours per day. The average cost to the individual consumer for lines, transformer, meters, etc., installed, is approximately \$400 per installation.

The district has expended approximately \$22,000 to provide substations and a small portion of the main distribution system to provide electricity at distribution voltage to which the various local improvement districts can connect.

Construction in the improvement districts was done by contract, after advertisement, etc., as required by the irrigation district act, under definite plans and specifications issued by the Truckee-Carson irrigation district, which employs a special engineer to supervise the power line extensions and distribution system. The improvement districts have received material benefits by having the work done by contract as a result of competitive bidding. After construction is completed in each improvement district the operation and maintenance is transferred to the Truckee-Carson irrigation district, which assumes the position of a public utility.

Consumers' units are constructed according to standard plans, which provide complete transformer and meter equipment from which unit a farmer can obtain 110 or 220 volt, single-phase power. It has been determined by past experience that a 5-kilovolt-ampere transformer will



Single-phase substation, electric power system, Truckee-Carson Irrigation district

supply the requirements of the average farm on this project.

TYPE OF CONSTRUCTION

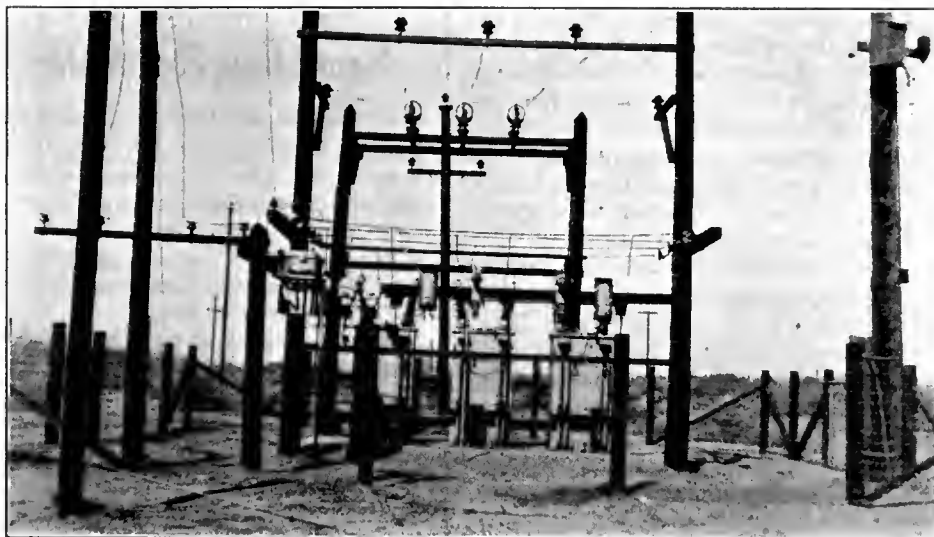
The entire distribution system is typical of the usual wood pole line. Poles average 20 to the mile and are butt treated (1/2 inch guaranteed penetration), 30, 35, and 40 feet in length, having 6, 7, and 8 inch top diameters. Western red cedar cross arms are standard and conform to National Electric Light Association's specifications. All conductors are copper wire; those larger than No. 8 B. and S. gauge are stranded. Metallic return circuit on the Y connected system is used and all pole-line hardware is standard galvanized. Lines constructed and in operation include 20 miles of 3-phase, 4-wire, 11950/6900-volt line using No. 6, 3-strand, bare, hard-drawn, copper wire, also 16 miles of 3-phase, 3-wire, 6600-volt line using No. 4, 7-strand, bare, hard-drawn, copper wire. The tap lines, all of which are single phase (2-wire), are constructed using No. 8 solid copper wire, unless, owing to length, voltage, and future requirements, larger wire is necessary.

The Truckee-Carson irrigation district is subject to the rules and regulations of the Public Service Commission of Nevada, and as such may be classed as a public utility. The certificate of public convenience and necessity granted to the district by the Public Service Commission of Nevada designates "The territory embraced in said Newlands reclamation project * * * including the towns of Fernley and Wadsworth and the vicinity thereof."

Power for the district is obtained from the Nevada Valleys Power Co. which maintains a 33,000-volt transmission line, about 16 miles in length, extending from the power plant at Lahontan Dam to a substation directly south of the town of Fallon. Delivery of power is taken at four points on this transmission line and also at the power company's Hazen substation, which is on a transmission line from Lahontan Dam to Lovelock.

The above data were secured from D. S. Stuver, district manager, and M. S. Huggins, electrical engineer of the district. A great deal of credit is due them for the successful electrical development on the project.

EXCAVATION of the Owyhee Dam abutment keyway has been confined to the east side of the canyon, where considerable progress has been made. The southwest abutment work will be resumed after danger of choking the river channel with debris is past.



Three-phase substation, electric power system, Truckee-Carson irrigation district

Irrigation in Foreign Countries

FOREIGN markets for irrigation machinery. Trade Promotion Series No. 73, industrial machinery division, Bureau of Foreign and Domestic Commerce, Department of Commerce. Illustrated; 156 pages, with introduction by Elwood Mead, Commissioner of Reclamation, on significance of irrigation. This report includes a description of irrigation in about 100 countries, together with tables of data giving area, population, and area irrigated. Price, 30 cents. Superintendent of Documents, Government Printing Office, Washington, D. C.

This publication was compiled by W. I. Swanton, assistant engineer in the engineering division of the Washington office of the Bureau of Reclamation in cooperation with the industrial machinery division of the Bureau of Foreign and Domestic Commerce, from reports received from United States consuls and trade commissioners in the various countries. It contains a brief introductory article by Commissioner Elwood Mead on the significance of irrigation and a foreword by Director Julius Klein, of the Bureau of Foreign and Domestic Commerce.

The bulletin is arranged in six parts, one for each of the continents of the world, and a brief description is given of each country, its agricultural and climatic conditions, crops raised, irrigation projects, Government supervision, irrigation by wells, financing and costs, methods of irrigation, plans for future irrigation and opportunities for sale of machinery and equipment.

The entire area irrigated at the present time throughout the world is estimated to be about 200,000,000 acres, which is briefly summarized as follows:

Continent	Area	Population	Area irrigated
	<i>Square miles</i>		<i>Acres</i>
North America...	8,685,833	157,450,526	26,834,000
South America...	7,169,587	69,749,645	6,613,000
Europe.....	3,723,081	477,560,161	14,800,000
Asia.....	16,217,166	1,037,854,722	140,754,000
Africa.....	11,514,050	143,335,419	10,310,000
Oceania.....	3,307,940	9,029,300	1,270,000
Total.....	50,617,657	1,894,979,773	200,581,000

A table is included for each continent, giving the area and population of each country and area irrigated.

A large number of illustrations of irrigation in foreign countries and dams built and under construction and views of machinery of various types in use are also included.

While the bulletin was compiled primarily for the purpose of aiding in the machinery export business of the United States, the report should prove of interest to engineers and to students of economies and irrigation.

The Bureau of Reclamation has a limited number of copies of this bulletin available for free distribution to persons interested as long as the supply lasts.

The following foreword to the publication was prepared by Commissioner Mead:

Significance of Irrigation

BY ELWOOD MEAD, COMMISSIONER,
BUREAU OF RECLAMATION

The practice of irrigation is older than recorded history. Civilizations of which we have the earliest written records grew and flourished on the banks of irrigation canals, and the most ancient records of these far-distant civilizations bear unmis-

takable evidence that the practice of irrigation had even then resulted in the crystallization of laws, rules, and regulations concerning the use and distribution of water. Four thousand years ago Hammurabi, perhaps the most renowned of Babylon's great rulers, promulgated a code of laws relating to irrigation, from which the following extracts are taken:

"If anyone is too lazy to keep his dikes in order and fails to do so, and if a breach is made in his dike and the fields have been flooded with water, the man in whose dike the breach was opened shall replace the grain which he has destroyed.

"If he is not able to replace the grain, he and his property shall be sold, and the people whose grain the water carried off shall share the proceeds.

"If anyone opens his irrigation canals to let in water, but is careless and the water floods the field of his neighbor, he shall measure out grain to the latter in proportion to the yield of the neighboring field."

At the time when most of Europe and the high plains of Asia were the abode of half-clad nomadic, barbaric tribes, with little cohesion save that of the family unit, the splendor of the civilizations on the banks of the Tigris, the Euphrates, and the Nile was being written in cuneiform and hieroglyphics to astound the archeologist of later centuries.

The foundation of this comparatively high civilization was irrigation. Its decline and fall may readily be attributed to a score of causes, but throughout it all, like a silver thread, ran the irrigation canal, under whose benign influence cooperation flourished and individual effort was coordinated.

From these relatively small beginnings irrigation to-day is a world force to be reckoned with in every appraisal of the factors involved in economic advancement. On every continent and on many isles of the sea irrigation is practiced, and wherever it is practiced the general level of civilization, from the standpoint of the cooperative relations of individual with individual, is higher than on adjacent nonirrigated land. This cooperation is the normal result of the use of irrigation systems which are not adapted to individual construction and operation. Pioneers in irrigation from the earliest times have found that the irrigation canal imposed of necessity cooperation in their agricultural and industrial organization.

To-day the irrigated area throughout the world comprises some 200,000,000 acres. Of the continents, Asia stands first with more than 140,000,000 acres, or 70 per cent of the total, followed by North America with nearly 27,000,000 acres, of which the United States is responsible for more than 20,000,000 acres.

New Maps Available

A map of the Owyhee irrigation project, Oregon, has just come from the press in three colors, showing in addition to the usual features, seven irrigation districts, a cross section of the Owyhee Dam and topography of the dam site. This project map is issued in two sizes, No. 23300, 10½ by 17 inches at 10 cents per copy, and No. 23300-A, 21 by 33 inches at 25 cents.

A map of the Lower Colorado River Imperial Valley, and Boulder Canyon Reservoir, No. 23530-A, size 16 by 35 inches, scale 9 miles to 1 inch, price 25 cents. This map has a red overprint giving considerable data on various features of the Boulder Canyon project.

On the basis of irrigated acreage per 100 square miles of territory, Asia again ranks first with 868 acres, followed by Europe with 398 acres, and North America with 310. On the basis of irrigated acreage per 1,000 population North America leads the continents of the world with 170 acres, and the United States is even higher, with 175 acres of irrigated land to every 1,000 persons in its population.

What the future holds in store we can only surmise. The history of civilization has been closely bound up with the growth and extent of irrigation. Arid lands, otherwise incapable of producing crops, have become, through irrigation, the centers of flourishing agricultural and industrial development, which have left an enduring stamp on the economic life of nations. Increasing population calls insistently for increasing means of producing an adequate food supply. At the present time this necessity is discounted by our agricultural surplus. But the world, and the United States in particular, if we are to retain a commanding position in the economic life of the great nations of the world, must take stock of the future and be fully prepared to meet this necessity when it arises. Better methods of agriculture, better machinery, more efficient handling of the problems of crop rotation will answer the need for a time. but in the light of present-day knowledge the promise of the future lies in the irrigation canal as a means of extending our potentially productive area and keeping pace with the demands of an ever-increasing population.

Hammurabi wrote on a clay cylinder his views of the importance of irrigation in the economic life of Babylon. His message is as pertinent to-day as it was

4,000 years ago. It may also stand as a prophecy for the future.

"I have made water flow in the dry channels and have given an unfailing supply to the people. I have changed desert plains into well-watered land. I have given them fertility and plenty and made them the abode of happiness." *From Trade Promotion Bulletin No. 73, Department of Commerce.*

Group Effort by Farmers in Buying and Selling

Group action is required in certain phases of the farmers' business to-day. Any forward-looking program must consider efficient production, economical marketing and purchasing, and better living, according to Chris L. Christensen, of the Department of Agriculture.

Farm production under present-day agricultural conditions is primarily an individual act, but marketing farm products and purchasing farm supplies can be done most effectively through group action. The American farm of to-day is no longer a self-sufficing unit. Many farmers are specializing in the production of a single crop, and must purchase most of their food. Cash outlays for feed, fertilizers, farm machinery, and seed also form a large part of the expense of operating many farms. Group action is required in both the purchase of supplies and the marketing of products.

Cooperative organization enables farmers to apply modern business methods to the assembling, grading, financing, distributing, and selling of farm products. The farmer as an individual has no control over the conditions under which his crops or livestock products are sold, whereas farmers associated in groups are in a position to exert such control and to secure the results of more efficient marketing.

DURING the winter there has been a noticeable increase in the demand for Belle Fourche farms, coming mostly from prospective tenants desirous of raising sugar beets or engaging in livestock farming, and all places with suitable buildings have been taken. This demand will no doubt lead to further building operations, which heretofore have been somewhat slow.

CONSIDERABLE alfalfa seed will be sown on the Willwood division of the Shoshone project this spring. The farmers have pooled their order. They will need about a ton of alfalfa seed and are going to plant seed grown in Argentina.



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor *New Reclamation Era*



Agricultural Facts on Sweden

FORTY per cent of Sweden's population, of over 6,000,000, is engaged in agriculture, about 240,000 being owners and 57,000 tenants of the land they cultivate. The average individual holding is 25 hektar.

The agricultural land is mostly in the southern part of Sweden, central Sweden having some mining, and northern Sweden being practically devoted to forestation projects of pine, birch, and fir, principally. These projects make possible a thriving industry of wood pulp and paper, which are chief exports.

In general appearance Sweden is very much like its neighboring country Denmark. Here, too, there is considerable dairying, but Sweden has Holstein herds exclusively.

Women are engaged in agricultural pursuits. The Swedish woman and her daughter who posed with the writer are employees of the plant culture firm of W. Weibull of Landskrona, southern Sweden, where the photograph, which is reproduced here, was taken last summer on the occasion of the visit to the plant of a party of agricultural and home economics teachers, farmers, and business men from the United States. Such exacting and patience-trying duties as transplanting of tiny sprouts in hotbeds are performed by women. They work for small pay. These two are typical natives, friendly and obliging always.

A very instructive tour of the plant and experimental fields was led by Dr. Carl Hallquist, one of the firm's specialists. The educational campaigns carried on by the staff of trained specialists of this firm have done much to bring about more intelligent farming in Sweden, with consequent larger and better crops. Success of the farmer meant expansion and a healthy financial condition for the plant culture firm.

HOME ECONOMICS TRAINING IN SWEDEN

For the benefit principally of the home economics teachers, a trip was made to a home economics school organized on a practical plan. A building, very similar to a home, with added space for grouping of pupils for lectures and study periods, surrounded by land for outdoor work and play, was inspected.

The girls are admitted to instruction at the age of 15. The course includes



Two typical agricultural workers in Sweden

housekeeping in all its phases, planning of meals, cooking, budgeting, child care, etc. Each girl is required to assume the responsibility of a section of the house set up as an apartment for a family of four.

The nursery was found attended by pupils, under the care of child specialists. This is in the class of our regular day nurseries; i. e., children of mothers who are employed during the day are left at the nursery, and thus the opportunity is afforded the pupils to observe how to care for them.

Care of poultry, milking of cows, and gardening are taught. The experimental plots surrounding the school were small and well kept. Competition was keen in vieing for first honors in appearance and results of assigned plots. The future home makers seemed happy in training.

MANY baby chicks, forerunners of early laying hens, have been ordered by the poultrymen of the Newlands project, and several shipments have already arrived. Poultry business on this project is on a firmer basis than ever, and many growers plan increases in flocks.

"YAKIMA BEAUTY"

That is the designation won by this Rhode Island Red pullet at the poultry show held in Yakima, Wash., December 31, 1928, to January 5, 1929. She scored 91¼ points and was judged by Mr. C. A. Greenfield of Butte, Mont. The proud owner of this champion of Yakima County is Mr. J. B. Harness.

A novel feature of the show was the offering of a special prize to the lady whose hair came the nearest to matching the color of "Yakima Beauty." Eleven red-haired ladies competed and the prize was won by Miss Louise Shea of Yakima, shown in the picture. In her selection Mr. L. B. Kelly, president of the Yakima Chamber of Commerce, was the judge.



Champion bird of Yakima County—J. B. Harness, Yakima

Rio Grande Project Advertised on KOB

The advantages of the Elephant Butte irrigated district, Rio Grande project, New Mexico-Texas, and its opportunities for the up-and-coming farmer are being broadcast from radio station KOB, in a series of lectures given by Professor Breland, of the New Mexico College of Agriculture, sponsored by the Las Cruces Chamber of Commerce. These lectures are planned to interest the tourist, the homeseeker, and the school children in New Mexico—"The State Nobody Knows."

Paper-Shell Pecan Development on the Yuma Project, Arizona-California

By R. M. Priest, Superintendent

THE growing of paper-shell pecans on the Yuma project has great possibilities of developing into one of the major crops of the project. The growing of this nut is beyond the experimental stage. It has been demonstrated that the soil and climate are well adapted to the satisfactory production in commercial quantities of the paper-shell pecan. There are some seedlings in Yuma Valley that are 35 years old and are in healthy, vigorous condition. Additional acreage is being prepared and planted each year, with groves scattered over the project and growing satisfactorily. At present more than 500 acres are planted to this crop, of which 170 produced this past year.

The exceptional quality, large crops, and attractive returns will make the growing of pecans a very desirable business on this project. The cost of developing a pecan orchard is nominal compared with that of other similar crops. Nursery stock is being grown on the project for anticipated plantings, but the demand has been so great that California stock has been imported at prices of \$2.50 to \$3.50 per tree. These trees usually have a 3-year-old root system and are from 3 to 4 feet tall. As the pecan land on the Yuma project has been leveled, ditched, and prepared for the growing of other crops, little additional expense is neces-

sary to arrange it for pecan planting. Therefore, this cost is nominal.

BEST VARIETIES FOR YUMA

The propagation of the trees has reached a point where some varieties are known to be well adapted to this climate and soil. It is folly to plant the seed and expect to have the tree come true to type. The proper method to pursue is to procure from a reliable nursery budded stock of the proper variety and be assured that when the age of production is reached it will produce quality and quantity of a commercial value.

The varieties that have been proven so far on this project to meet the requirements from a commercial standpoint are the Halbert, Kincaid, Burkett, and Success. These, out of 12 varieties experimented with in the past seven years, have shown by their growth, production, and quality of product to be the best adapted to this locality. At the annual pecan show of the Brazos Valley Pecan Growers' Association held at Eastland, Tex., in November, 1927, with an exhibit of six varieties from Yuma Valley, Ariz., prizes won by the project included two firsts, one second, one third, and the champion prize. The significant part of this is that the Yuma project exhibit was from trees in competition with their parent trees in Texas. The four varieties

of the paper-shell pecan mentioned above are in reality soft shelled, no difficulty is had in removing the shell from the meat of the nut, and they are found to be fully developed and filled. Three of them end to end measure 5 inches, and 28 weigh 1 pound.

HOW TO PLANT

Pecan trees are long lived and will grow to a height of 40 to 60 feet with a spread of 50 to 75 feet. They, therefore, should not be planted closer together than 50 or 60 feet. This spacing plants from 12 to 17 trees per acre, which makes this cost nominal. The months of December and January are the best planting months. This early planting gives the root growth sufficient time to get well started before the foliage comes on. Therefore, the tree is assured of enough strength to support the foliage put on in the spring. The location of each tree should be carefully measured and marked with a stake to insure perfect alignment. Holes should be dug about 2½ feet in diameter and 2½ to 3 feet deep. Before digging the holes the ground should have been irrigated 10 days in advance. Care in planting must be exercised so that none of the roots are left exposed. It is important that the trees have plenty of water during the first season so that sufficient moisture is supplied to the roots in order that a healthy and vigorous growth will be assured. As it has been found that some varieties are sterile, it is advisable to interplant two or more varieties to insure proper pollination. This may not be necessary in this climate, but it is good insurance. Attention should be given to the proper cultivation of the soil around the trees. All weed growth should be prevented and the soil kept open for the easy penetration of air and moisture. Alfalfa straw, green manure crops, or other fertilizers, though not necessary in our soils, constitute good practice for insuring rapid growth. If fertilizers are applied this should be done in the late fall.

Owing to the few trees planted per acre, a considerable revenue can be obtained by planting between the rows. This gives the pecan grower a revenue from a large proportion of his land while his grove is coming to production. Cotton and alfalfa are the usual crops for this purpose, alfalfa being the most desirable on account of its soil building qualities. Care must be exercised in intercropping so that it will not be detrimental to the trees, for as they grow larger more space is required.



Seven-year-old pecan grove, Yuma project, Arizona-California

YIELD AND HARVESTING

It is not uncommon for trees that make a good growth the first two years to bear a few nuts the third and fourth years, but yields in commercial quantities can not be expected until the sixth or seventh year. Records of the yield of one tree are as follows: Fourth year, 20 pounds; fifth year, 55 pounds; sixth year, 105 pounds; seventh year, 145 pounds; eighth year, 196 pounds. It is estimated that a 10-year-old tree may produce 500 pounds of nuts. The results obtained from any one tree can only give an idea of what may be expected.

The cost of planting a pecan grove will run from \$30 to \$50 per acre, depending largely upon the price paid for nursery stock. In view of the fact that intercropping is practicable, it can be assumed that the intercrop will show a balance above the costs of caring for the pecan grove until it is a commercial producer.

The crop is harvested by spreading a large canvas on the ground underneath

the tree to catch the nuts as they are dropped from the tree. They are then sacked and taken to the packing house where they are sized and picked over, after which they are sacked for the market.

It is estimated that only a small per cent of the market in the United States has ever been supplied with the paper-shell pecan, and that the foreign market is virgin territory for this product, as these nuts are grown only in the United States and Mexico. Therefore, no difficulty is anticipated in marketing this crop at lucrative price. Nuts produced so far have sold at 50 to 75 cents per pound.

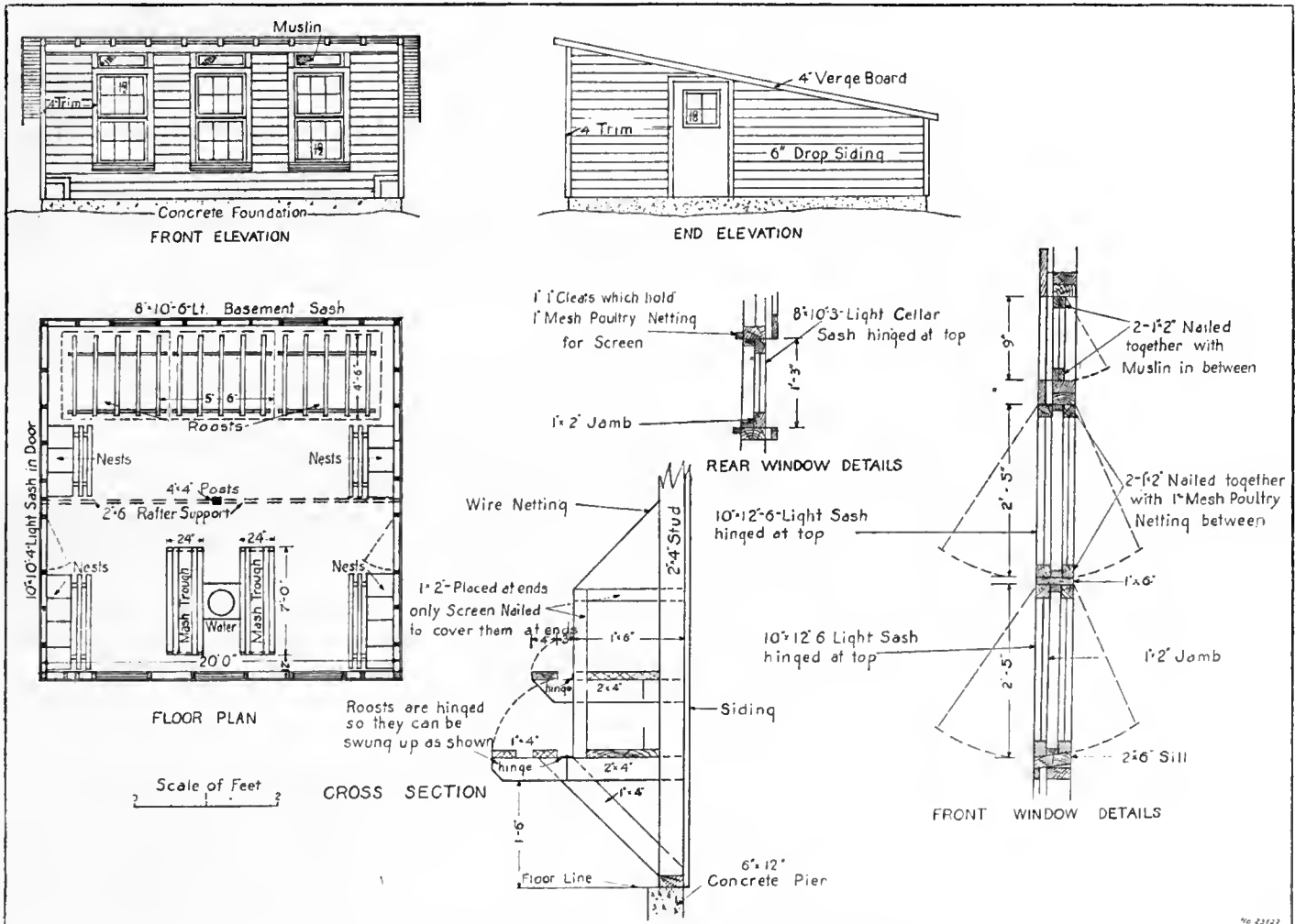
It is difficult at this time to estimate the net returns that can be expected from the paper-shell pecan on this project, but there is no doubt that trees 8 to 10 years old will net the grower a handsome return.

The meat in the Yuma project product is 67 per cent, with 33 per cent of shell. This is almost twice as much as is contained in the best of walnuts. The pecan

usually found on the market contains but 20 per cent of meat.

The American Nut Journal quotes Luther Burbank as having said "If I were young again I would devote my life to propagating new species of pecans. Walnut culture is the leading horticultural product in California, makes more money for us, makes it easier than anything else, yet the paper-shell pecan is superior to our walnut. The longevity of pecan orchards and their immense earning power make them one of the most profitable and permanent of agricultural investments."

As a result of a sparrow-poisoning campaign recently conducted by the county agent on the Minidoka project, 5,375 sparrow heads were brought in by the Smith-Hughes boys. The county agent's office furnished the poison for this campaign and gave demonstrations in mixing the poison with wheat, as well as instructions in using it.



Design of chicken house for use by settlers on irrigation projects

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, and Dr. H. A. Brown, assistant director of reclamation economies, left Washington on March 8 to attend the Denver conference March 13-15. They were joined en route by P. W. Dent, assistant commissioner, and W. F. Kubach, chief accountant. On the way to Denver Doctor Mead stopped at the University of Illinois and the University of Iowa, and on his return to Washington at Purdue and De Pauw Universities to address engineering societies and others on the proposed development of the Colorado River Basin and the construction of Boulder Dam. The commissioner returned to the Washington office on March 23.

During the absence of Commissioner Mead and Assistant Commissioner Dent at the Denver conference the Washington office was in charge of C. A. Bissell, chief of the engineering division.

At their recent annual meeting the shareholders of the Orland Unit Water Users' Association elected the following directors for the ensuing year: George W. Sturm, C. A. Templeton, J. N. Cook, Joseph Simon, C. W. Kirk, Hein. de Vries, and W. E. Downey. At the regular March meeting of the board the following officials were chosen for the year: George W. Sturm, president; C. A. Templeton, vice president; Veryl Vanderford, secretary; First National Bank, treasurer.

Mr. Bunkichi Okazaki, chief engineer of the Upper Liao River Conservancy, Newchang, China, was among the recent visitors to the Yuma project.

George C. Kreutzer, Director of Reclamation Economics, spent one day at the Orland project, at which time he visited Stony Gorge Dam.

Fred O. Arnold, a representative of the Associated Seed Growers (Inc.), with headquarters at Powell, Wyo., was a recent visitor on the Huntley project, Montana. He was looking the field over with the view to placing some contracts for growing seed beans. The price offered ranged from 6 to 7 cents per pound according to the variety.

E. K. Burlew, administrative assistant to the Secretary of the Interior, and Judge Louis Warner, member of the Federal Land Board of Santa Fe, N. Mex., visited Carlsbad and were shown over the project by Superintendent Foster. While in the vicinity they also visited the Carlsbad Caverns.

J. L. Burkholder, chief engineer of the Middle Rio Grande conservancy district, and a committee of bankers interested in the sale of bonds for the Middle Rio Grande district were recent visitors on the Rio Grande project.

Dams and Control Works

"Dams and Control Works" is a 164-page publication just issued by the Bureau of Reclamation, which contains a description of representative storage and diversion dams and high-pressure reservoir outlet works constructed by the Bureau of Reclamation. There are numerous photographs and drawings and the appendix includes specifications for the Echo and Owyhee Dams, a table of reclamation dams, and a bibliography. It is planned to give this booklet wide distribution among engineers and others interested in reclamation. Copies may be obtained by addressing the Commissioner, Bureau of Reclamation, Washington, D. C.

News has reached the bureau of the death, on March 14, of Mr. Dwight B. Heard, owner and publisher of the Arizona Republican. He has always been prominently identified in movements concerning Arizona's welfare, and up to the time of his death took a prominent part in endeavoring to reach some agreement on the Colorado River compact.

Oscar E. Bradfute, former president of the American Farm Bureau Federation and a member of former Secretary Work's Committee of Special Advisers on Reclamation, died on March 26, 1929.

L. M. Lawson, International Boundary Commissioner, with headquarters at El Paso, was in Washington the latter part of March on official business for the commission, which is under the State Department, and during his short stay in the city paid a call on his friends in the Bureau of Reclamation.

Rio Grande Project Has Prosperous Year

Pat Campbell, vice president of the Mesilla Valley Bank, Rio Grande project, as quoted in a recent issue of the Rio Grande Farmer, says that "This year (1928) has without question been the most prosperous year the whole of the Mesilla Valley has ever enjoyed.

"Our farmers have especially prospered due to the fact that their yield has been away above the average, and they have received most satisfactory returns in dollars and cents for all their farm products. This being true has enabled them to liquidate their bank notes, pay up their merchants, leaving them money on deposit with the banks to use in financing for another year."

As an indication of the trend of prices for the better farm lands on the project, a 134-acre farm in the Canutillo district brought \$50,000, an average of \$374 per acre, in a transfer executed recently.

The Dairy Farmer's Goal

The dairy farmer of the future will own a modern farm home. He will be supported by a high-producing herd of well-bred dairy cattle, which will be fed largely from luxuriant, home-grown crops, raised on well-tilled fertile soil. In short, the dairy farmer of the future will know how to live better and will live up to the best that he knows. That is the prophecy of J. C. McDowell, of the Bureau of Dairy Industry, United States Department of Agriculture.

The dairy farmer of to-day is progressive, but in many cases he is passively progressive. He knows what to do but he does not always do it. The farmer of the future will never allow one cow to eat up the profits another cow is making. He will allow only high-producing and profitable dairy cows on his fertile farm.

A MOVEMENT is on foot to institute a general paint-up campaign on the Belle Fourche project under which all farm buildings are to be given a covering of sprayed paint. Negotiations are now under way to interest several owners of spray machines, and it is planned to purchase paint in large lots through community efforts.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

Jos. M. Dixon, First Assistant Secretary; **John H. Edwards**, Assistant Secretary; **E. C. Finney**, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary and Budget Officer;
Ernest W. Sawyer, Special Executive Officer;
Northcutt Ely, Executive Assistant

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner P. W. Dent, Assistant Commissioner George C. Kreutzer, Director of Reclamation Economics
W. F. Kubach, Chief Accountant C. A. Bissell, Chief of Engineering Division Hugh A. Brown, Assistant Director of Reclamation Economics
C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Fiscal Inspector.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....	J. P. Siebeneicher.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	W. J. Chiesman.....	J. R. Alexander.....	Mentrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....	.....	.....	.....	.....
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	.....	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.....	Joe C. Iddings.....	.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Owyhee, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Fiock.....	Henry H. Berryhill.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁸	Phoenix, Ariz.....	C. C. Cragin.....	.....	.....	.....	.....
Shoshone ⁹	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah.....	Lee R. Taylor.....	.....	.....	.....	.....
Sun River ¹¹	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹²	Irrigon, Oreg.....	A. C. Houghton.....	.....	.....	.....	.....
Uncompagre.....	Hermiston, Oreg.....	Enos D. Martin.....	.....	.....	.....	.....
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Eche Dam.....	Coalville, Utah.....	F. F. Smith ¹³	C. F. Williams.....	.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gibson Dam.....	Augusta, Mont.....	Ralph Lowry ¹³	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.

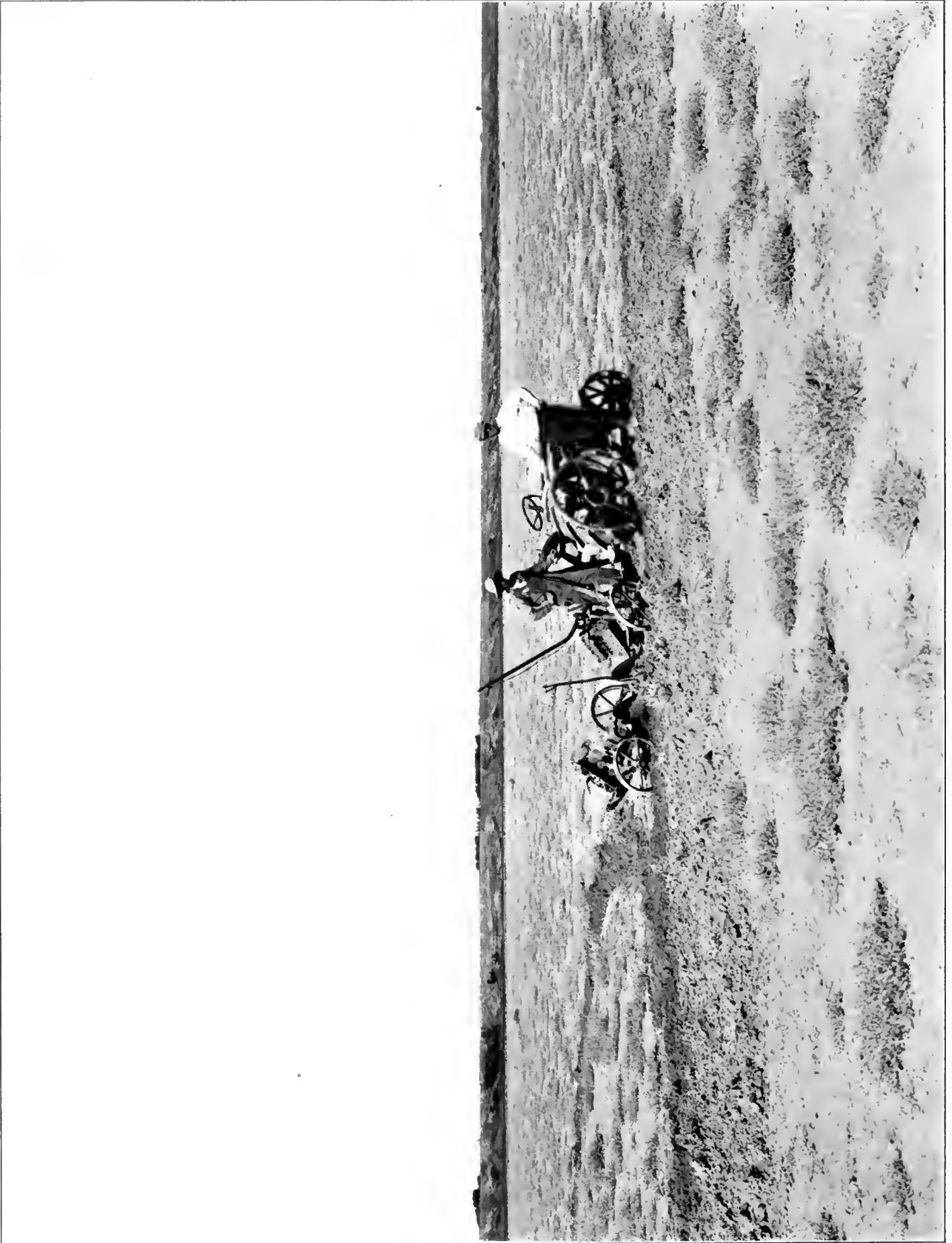
¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.
² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.
³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.
⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.
⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.
⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928.
⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.
⁹ Operation of Garland Division assumed by Sheshone Irrigation District on Dec. 31, 1926.
¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.
¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.
¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.
¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	State of Utah.
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	
Yakima project extensions.....	Yakima, Wash.....	P. J. Preston.....	

HUGH A. BROWN, *Editor.*



PLOWING RAW LAND, SHOSHONE PROJECT, WYOMING

NEW RECLAMATION ERA

VOL. 20

MAY, 1929

NO. 5



HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

BOULDER CANYON PROJECT ACT

PUBLIC No. 642, 70th CONGRESS
APPROVED DECEMBER 21, 1928

CONDITIONS
1.-Not effective until the Colorado River Compact has been ratified by the 7 basin States or after 6 months by California and 5 others. *Sec. 4 (a)*
2.-Not effective until California agrees to limit her annual consumptive use of Colorado River water to 4,400,000 acre feet plus one-half of any surplus waters unapportioned by the Colorado River Compact. *Sec. 4 (a)*
3.-No appropriation is to be made for construction until the Secretary of the Interior shall provide by contract for revenues adequate to pay operation and maintenance expenses and meet repayment requirements. *Sec. 4 (b)*
4.-All operations are to be subject to the Colorado River Compact. *Sec. 8*
5.-The Act shall be deemed a supplement to the Reclamation Law. *Sec. 14*

PURPOSES
1. CONTROL OF FLOODS
2. IMPROVEMENT OF NAVIGATION
3. REGULATION OF FLOW
4. IRRIGATION DEVELOPMENT
5. DOMESTIC WATER SUPPLY
6. GENERATION OF POWER

BOULDER CANYON PROJECT
Authorizes the Secretary of the Interior to construct the Boulder Canyon Project. *Section 1*

COLORADO RIVER DAM FUND
Establishes the Colorado River Dam Fund for carrying out the provisions of the Act. *Section 2*

COLORADO RIVER COMPACT
Ratifies the Colorado River Compact and makes other provisions. *Section 13*

BOULDER DAM

PURPOSES
1. River regulation, improvement of navigation and flood control.
2. Irrigation and domestic water supply. *Section 6*

Location:
Boulder or Black Canyon.
Capacity:
Not less than 20,000,000 acre feet. *Section 1*

Irrigable public lands shall be withdrawn to be opened to entry under Reclamation Law, with preference to ex-soldiers, sailors and marines. *Section 9*

Title to works shall forever remain in the United States. *Section 6*

ALL-AMERICAN CANAL

To connect Laguna or another suitable diversion dam with Imperial and Coachella Valleys. *Sec. 1*

Cost to be reimbursable in accordance with terms of the Reclamation Law. *Section 4 (b)*

Title with certain exceptions may be transferred to districts or other agencies after all repayments are made. *Section 7*

No charge shall be made for water for irrigation or potable purposes in Imperial and Coachella Valleys. *Section 1*

Districts may utilize power possibilities on the canal and be credited with net proceeds. *Section 7*

POWER DEVELOPMENT

ALTERNATIVES
The Secretary of the Interior (a) may build a plant *Sec. 1* and deliver energy at the switchboard *Section 5* (b) lease one or more units of the Gov't built plant *Sec 6* (c) lease water for generation of power in plants to be built by lessees. *Sec. 6*

Rules and regulations shall conform to requirements and policies of the Federal Water Power Act. *Section 6*

Rates shall assure reasonable returns and may be readjusted periodically as justified by competitive conditions. *Section 5 (a)*

CONTRACTS
No contract shall be for longer duration than 50 years, with right of renewal at expiration under then existing laws and regulations. *Section 5 (a) and (b)*
Conflicting applications for contracts to be resolved in conformity with policy of Federal Water Power Act, except that preference shall be given to a State for energy for use in the State. *Section 5 (c)*
Any contractor for 100,000 h. p. or more may be required to permit any contractor for less than 25,000 h. p. to share his transmission lines. *Section 5 (d)*

REVENUES
All revenues shall be paid into the Colorado River Dam Fund. *Section 2 (a)*
Balance available for repayment shall be determined at close of each fiscal year and covered into the U.S. Treasury. *Section 2 (c)*

EXCESS REVENUES
Revenues in excess of amortization requirements 62 1/2 % to flood control repayment. *Section 2 (b)*
18 1/2 % to State of Arizona. *Section 4 (b)*
18 1/2 % to State of Nevada. *Section 4 (b)*

After repayment to U. S. of all money advanced, with interest, revenues shall be kept in separate fund and expended within the Colorado River Basin as prescribed by Congress. *Sec. 5*

APPROPRIATIONS
Appropriations not to exceed \$165,000,000 in the aggregate are authorized. *Section 2 (b)*

Amounts deemed necessary by Secretary of the Interior shall be advanced to the Fund by Secretary of the Treasury, within appropriation limits. Interest to be charged annually at 4% on amounts advanced. *Section 2 (b)*
Operation and maintenance expenses to be paid only from appropriations therefor. *Section 2 (c)*

REPAYMENTS
All amounts advanced for operation and maintenance and for construction of the dam and power plant to be repaid with interest within 50 years. *Section 4 (b)*
Expenditures on All-American Canal, including O. and M. to be repaid in manner provided in the Reclamation Law. *Sec. 4*

FLOOD CONTROL
\$25,000,000 is allocated to flood control and is to be repaid from revenues in excess of amortization requirements. *Section 2 (b)*

INVESTIGATIONS

Authorizes the appropriation of \$250,000 for investigations to formulate a comprehensive plan for the utilization of Colorado River. *Section 15*

Authorizes investigations of the Parker-Gila Valley reclamation project. *Sec. 11*

WATER RIGHTS

All rights of the U. S. and its grantees to waters of the Colorado River shall be subject to the Colorado River Compact. *Section 13 (b)*

Nothing in the Act shall be construed as a denial or recognition of any rights in Mexico to the use of waters of the Colorado River. *Section 20*

INTERSTATE COMPACTS

Ratifies Colorado River Compact on behalf of the U. S., 6 or 7 State basis. *Section 13 (c)*

Authorizes negotiation of interstate compacts supplemental to the Colorado River Compact. *Section 19*

Authorizes tri-state compact between Arizona, California and Nevada. *Section 4 (a)*

POWER LICENSES

Federal Power Commission is not to issue licenses except on Gila River until the Act becomes effective. *Sec. 6*

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

Price, 75 cents a year

RAY LYMAN WILBUR
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

May, 1929

No. 5

Interesting High Lights on the Federal Irrigation Projects

CONTRACT has been entered into for the purchase of 20,000 barrels of cement to be used in the construction of the tunnels and diversion dam of Vale Main Canal, Vale project, Oregon.

CONSTRUCTION plans at Owyhee dam site, Owyhee project, Oregon-Idaho, include excavation of the northeast abutment, work on the penstock tunnel, the placing of concrete lining in the spillway and diversion tunnel, and preliminary work on the main cofferdams.

ALL livestock on the Uncompahgre project are reported to be in excellent condition, and good prices prevailed during the entire month for sheep and cattle shipped to market.

AVIGOROUS campaign has been conducted by the Amalgamated Sugar Co. to induce farmers on the Minidoka project to plant a large acreage of beets. As a result about 2,500 acres have been contracted for on the pumping division and 1,800 acres on the gravity division. This is more than double the area cropped in 1928, which totaled only 1,733 acres.

HAVEN LEIGH, of Burley, Idaho, on the Minidoka project, has again taken first place in the Minni-Cassia Cow Testing Association, having 5 cows with an average butterfat production of 42.3 per cent, and 52.7 pounds per cow. The association comprises 21 herds and 266 cows.

THE local chapters of the Izaak Walton League on the North Platte project have sponsored the construction by the State league of a nursing pond at the edge of the seepage channel from Minatare Dam and just below the dam. Eighty thousand Loch Laven trout will be shipped from the Benkleman hatcheries and placed in the nursing pond.

THE Burley-Deelo Bull Association, Minidoka project, has purchased a high-grade Holstein bull from a herd at Weiser. This bull is from a dam with a butterfat record of 948 pounds and which is State champion in class B butterfat and milk production.

THE committee on the Orland project appointed early in the year for reporting on a cooperative organization of turkey growers met at Orland recently and submitted a plan formulated in cooperation with the office of the California State Market Director. The plan contemplates a Sacramento Valley wide organization with at least 50 per cent of the turkeys raised in the area included in the cooperative. No permanent organization will be effected until this percentage is signed up.

NINETY-FOUR applications had been received up to March 27 for the 28 public-land farm units opened to entry on March 18 on the Tule Lake division of the Klamath project.

DURING the 10-day period, March 18 to March 27, 14 applications were received for the five public-land farm units on the North Platte project opened to entry on March 18.

THE town of Lyman, Nebr., North Platte project, has voted bonds in the amount of \$95,000 for the construction of a new schoolhouse.

ADDITIONAL building construction is planned on several Belle Fourche project farms, particularly on the State rural credit holdings. Painting of old buildings will be a feature of the season's activities. One paint sprayer is already on the job around Belle Fourche, and efforts are being made to secure another for the eastern part of the project.

ALARGE acreage of chili is being planted on the Rio Grande project, 1,800 acres having signed up under a recently formed association. The crop will be shipped to California markets.

AHOLSTEIN cow owned by the Price's dairy farm at Vinton, Rio Grande project, recently won the Texas State championship for cows of all breeds and ages through the production in 365 days of 925.72 pounds of butterfat (1,157.2 pounds of butter) in 25,545.6 pounds of milk.

LIVESTOCK operators on the Klamath project have organized the Southern Oregon Livestock Association. The organization has a signed membership of 46 and represents 30,000 head of cattle.

THE sugar company on the Belle Fourche project reports favorable progress in securing beet contracts for 1929, and about 11,000 acres have already been signed up. It is expected that nearly 12,000 acres will be planted tributary to the Belle Fourche factory, of which about two-thirds are on the project.

MORE than 6,000 acres of sugar beets have been signed up on the Lower Yellowstone project, and it is expected that this will be increased to 7,000 acres by planting time.

THE railroads and the Holly Sugar Co. have decided to continue the work of obtaining settlers for the Lower Yellowstone project, carried on last year by the bureau, and are sending a man into the Colorado territory for prospects.

APEAR cannery of the Oregon Packing Co. has been assured for the Yakima Valley by the signing up of approximately 3,000 tons of pears at a minimum price of \$27.50, with the average price existing any one season to be paid in case market prices are higher.

Idaho's Interest in the Columbia Basin Project

By T. S. Kerr, Professor of Political Science, School of Business Administration, University of Idaho

(Notes at end of article)

TO understand Idaho's interest in the Columbia Basin project it is necessary first to know something of this reclamation plan in general and its effect upon Idaho. The project itself is a reclamation scheme of gigantic proportions providing for the irrigation of approximately 1,883,000 acres, or 2,942 square miles¹ of land west of Spokane, Wash. Numerous studies and surveys have been undertaken during the past seven years, the more important ones being made by the Federal Government, the State of Washington, and the Columbia Basin League. The reports submitted as a result of these investigations all agree as to the feasibility of the project from an engineering standpoint. Already a half million dollars have been spent for this preliminary work.

TWO PLANS CONSIDERED

Two plans have been considered: One known as the pumping project; the other, the gravity project. The first of these plans provides for the pumping of water from the Columbia River under a very high lift from 432 to 474 feet at a point near the area to be irrigated. Should this plan be adopted there would be practically no interstate problems for consideration. The gravity project seems to be the favored plan. It was recommended by the late Gen. George W. Goethals, of the United States Government, in his 1922 report; by the United States Bureau of Reclamation; by the reviewing board appointed by the late President Harding; and by the Columbia Basin League itself. The particular gravity plan favored by these investigations contemplates the diversion of water from the Pend Oreille River in north Idaho, with storage in Pend Oreille Lake and Priest Lake, both in north Idaho.

Estimates have been made by the Columbia Basin League that the first unit of this project, or about one-fourth of the total acreage, will be ready for cultivation after 8 years of construction work, and that 15 years will be required to complete the project. It is claimed that by the time the land is ready for use the demand for food products due to the normal increase of population will more than absorb the surplus production that results from reclaiming this vast area. The league asserts that when completed this reclaimed land will add \$600,000,000 to the Nation's wealth, that it will support

24,500 families, and will yield \$200,000,000 of farm products annually.

It is not the purpose of this article to dwell on the merits or demerits of this reclamation project. There is no doubt that economic conditions, if not ripe at present, will be in the future for the reclamation of this land in Washington, but if the plan adopted involves diversion of water from Idaho streams it is unquestionably the sovereign right and the duty of the State of Idaho to safeguard the interests of her people now living and of the generations to follow. At the eighteenth session of the legislature a bill was passed denying to the reclamation officer the right to grant any permits involving the diversion of water from certain rivers in Idaho to or for use upon land outside of the State. This action followed receipt of a report from the allocation board² that sufficient data was not available to make recommendations as to the damage to Idaho if the proposed gravity project should be carried out. Prompted, however, by a desire for fair play, the Idaho legislature³ appropriated \$11,500 to be used for further investigation of this problem that more data might be available for the succeeding legislature.

HOW IS IDAHO AFFECTED?

How will the gravity plan of diversion from the Pend Oreille River affect Idaho? This plan will necessitate a dam on the Pend Oreille River at Albany Falls, Idaho,⁴ high enough to impound 2,260,500 acre-feet of storage water in Pend Oreille Lake and from 432,000 to 600,000 acre-feet in Priest Lake. This would mean raising the elevation of Pend Oreille Lake to 2,075 feet and that of Priest Lake to about 2,460 feet, or an annual fluctuation somewhere between 18 and 25 feet in each case. Pend Oreille Lake is approximately 86,000 acres in area and Priest Lake 23,680 acres. Both lakes are surrounded by agricultural and timbered lands. The principal towns and cities affected are Sandpoint, Hope, Clark Fork, and Bayview on the shores of Lake Pend Oreille, and Priest River situated on the Pend Oreille River below the lake. These towns have a total population of approximately 9,000. The shore line of the two lakes is about 130 miles in length, and the lands adjacent are owned by the Federal Government, the State of Idaho, and private individuals. It has been estimated that to raise the level of the lakes for a

sufficient amount of storage water would interfere with the drainage and sewerage of the towns referred to, especially Sandpoint, the largest of the group. New shore lines would be created, with the result that many summer homes and recreational centers already established would be destroyed. In addition, agricultural land variously estimated up to 10,000 acres would be submerged, thereby reducing very materially the present agricultural area of Bonner County. With the loss of this amount of taxable property, the people of the county would necessarily have a higher tax rate. The individual property owners could be compensated by a monetary consideration, or, in the failure to reach an agreement, the power of eminent domain could be applied. But what about the permanent loss suffered by the county as a result of a specific portion of its taxable property being forever submerged?

The proposed dam to be constructed at Albany Falls, Idaho, must, of course, be financed by the Federal Government, and the title to the same would be vested in the United States Government for many years, if not permanently. A general rule of taxation is that Federal property¹ can not be taxed without the consent of Congress. In recent years the State of Wyoming and two of its counties attempted to tax Federal irrigation projects. Their claim was upheld by the Federal District Court, but recently reversed by the Circuit Court of Appeals.⁵ The final outcome of this litigation may have a decided bearing on the tax problem involved in the Columbia Basin project. It is possible that the Supreme Court may uphold the decision of the Circuit Court of Appeals, especially in view of a provision in the Wyoming constitution⁶ which states: "The following article shall be irrevocable without the consent of the United States and the people of the State * * *. That no taxes shall be imposed by this State on lands or property therein belonging to or which may hereafter be purchased by the United States or reserved for its use." As no such tax restriction is found in the Idaho constitution, there is a possibility that a taxing plan could be applied to the Columbia Basin project and sanctioned by the United States Government whereby Bonner County would have permanent compensation for its loss of taxable wealth. No attempt to date has been made to solve this problem.

FUTURE IRRIGATION NEEDS AFFECTED

In addition to these injuries which would accrue immediately upon the operation of the project, a potential loss exists in the future irrigation needs of the county. Preliminary studies show about 200,000 acres in Bonner County which eventually can be tilled. Of this amount 60 per cent is suitable for agriculture, under irrigation. It is also estimated that 70,000 acres across the line in Kootenai County will, in the not too distant future, require irrigation to supplement the rainfall. Unless some provision is made to reserve water for this future agricultural need, the people of north Idaho will be unable to use the water flowing through their own land.

Another possible injury to be reckoned with is the need for power. North Idaho, with its varied lumbering and mining possibilities, should carefully guard the development of its potential power. If the water of the Pend Oreille River is diverted at Albany Falls it can not be used for power, owing to the fact that the main diversion canal will head at this point. Some provision is made for power development in the gravity project plan permitting 7,000 second-feet to be released at Albany Falls for power. This is slightly in excess of the lowest normal quantity now flowing and is approximately one-third of the power possibilities at that place. The problem of providing for Idaho's future power needs is one of the most important in connection with the Columbia Basin project, as it is a matter that will affect Idaho for all time to come.

ADJUDICATION OF INTERSTATE RIGHTS

With these real and potential dangers facing Idaho upon the completion of the Columbia Basin project, it is apparent that a satisfactory adjudication of the interstate rights involved is a vital issue. These rights can be determined in either of two ways—by a compact between the States of Washington and Idaho to which the Federal Congress may consent, or by a decision of the Supreme Court of the United States interpreting present or future laws. The compact method of procedure is certainly the one to be recommended if years of litigation are to be avoided. Its basis rests on a clause in the Federal Constitution⁷ which provides that "no State shall, without the consent to Congress, enter into any agreement or compact with another State." Acting under this authority, Congress has approved a number of interstate compacts from 1820 to 1925.⁸ None of these compacts has ever been attacked in the

Supreme Court, and no State could expect the court to set aside or modify an agreement to which it was a party.

But what would be the effect of a Federal statute authorizing the diversion of water from the Pend Oreille River, Idaho, for the Columbia Basin project without the consent of the State of Idaho? That the national Congress would attempt to interfere in any way with the sovereign rights of Idaho over its rivers, other than navigable waters, is extremely doubtful. Congress has consistently by its legislation recognized the validity of local customs and laws governing the appropriation of water for irrigation, mining, power, and domestic uses.

The reclamation act of June 17, 1902,⁹ in its eighth section provides "that nothing in this act shall be construed as affecting or intending to affect or in any way interfere with the laws of any State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder * * *."

In section 11 of the act of December 19, 1913,¹⁰ granting the Hetch Hetchy Dam site to the city of San Francisco, Congress provided: "That this act is a grant upon certain express conditions specifically set forth herein, and nothing herein contained shall be construed as affecting or intending to affect or in any way to interfere with the laws of the State of California relating to the control, appropriation, use, or distribution of water used in irrigation or for municipal or other uses or any vested right acquired thereunder, and the Secretary of the Interior in carrying out the provisions of this act shall proceed in conformity with the laws of said State."

The Federal water-power act of 1920¹¹ provides "that nothing herein contained shall be construed as affecting or intending to affect or in any way to interfere with the laws of the respective States relating to the control, appropriation, use, or distribution of water used in irrigation, or for municipal or other uses or any vested right acquired therein."¹²

But the question still remains, Has the Federal Congress the right to enact legislation in this matter without the consent of all States affected? Would such legislation be within the power of the central Government? To answer this it is necessary to recall that our National Government, according to repeated decisions of the Supreme Court, is one of the delegated and enumerated powers. This being the case, it naturally follows that all powers not surrendered by the thirteen sovereign independent States to the National Government were reserved to these States. What rights were surrendered to the

Federal Government affecting the waters of the thirteen original States? In section 8, article 1 of the Constitution, the central Government is given power "to regulate commerce with foreign nations, and among the several States, and with the Indian tribes." Chief Justice John Marshall, in the famous case of *Gibbon v. Ogden*,¹³ held that the word "commerce" as used in this section included navigation. Subject, then, to the control of navigation by the National Government, all other rights, privileges, and advantages in the waters of the separate States were reserved to the people therein to be used for their exclusive benefit and advantage. Accordingly, the people of the new States having been admitted into the Union on a footing of equality with the thirteen original States, have the same rights in their waters as were possessed by the people of the thirteen original States on the adoption of the Constitution of the United States.

Many decisions of the Supreme Court might be cited to corroborate these principles and to establish the fact that the people of each separate State have a property right in the water resources of their State.

In the case of *Martin v. Waddell*¹⁴ the court said: "For when the Revolution took place the people of each State became themselves sovereign; and in that character hold the absolute right to all their navigable waters and the soils under them, for their own common use, subject only to the rights since surrendered by the Constitution to the General Government."

Again, in *Pollard v. Hagan*,¹⁵ the court said: "The shores of navigable waters and the soils under them were not granted by the Constitution to the United States but were reserved to the States respectively. The new States have the same rights, sovereignty, and jurisdiction over this subject as the original States."

In *Scott v. Lattig*,¹⁶ Justice Van Devanter, in speaking of the State's control over its water, said: "Each new State upon its admission to the Union becomes endowed with the same rights and powers in their regard as the older ones."

In the case of *Kansas v. Colorado*,¹⁷ the court said: "The Government of the United States is one of enumerated powers; that it has no inherent powers of sovereignty * * * while Congress has general legislative jurisdiction over the Territories and may control the flow of waters in their streams, it has no power to control a like flow within the limits of a State except to preserve or improve the navigability of the stream; that the full control over those waters is, subject to the exceptions named, vested in the State."

In *United States v. Cross*,¹⁸ decided March 12, 1917, Justice Pitney states: "The States have authority to establish for themselves such rules of property as they may deem expedient with respect to the streams of water within their borders, both navigable and nonnavigable, and the ownership of the lands forming the beds and banks, subject, however, in the case of navigable streams, to the paramount authority of Congress to control the navigation, so far as may be necessary for the regulation of commerce among the States and with foreign nations."¹⁹

The right of a State to change the common-law rule of riparian rights and permit appropriation of flowing water for such purposes as it deems wise, subject to the right of the National Government over navigation, has been aptly stated by Justice Brewer in the case of *United States v. Rio Grande Dam and Irrigation Co.*:²⁰ "Notwithstanding the unquestioned rule of the common law in reference to the right of a lower riparian proprietor to insist upon the continuous flow of the stream as it was, and although there has been in all the Western States an adoption or recognition of the common law, it was early developed in their history that the mining industry in certain States, the reclamation of arid lands in others, compelled a departure from the common law rule and justified an appropriation of flowing waters both for mining purposes and for the reclamation of arid lands, and there has come to be recognized in those States, by custom and by State legislation, a different rule—a rule which permits, under certain circumstances, the appropriation of the waters of a flowing stream for other than domestic purposes."

The problem of interstate rights may be approached from another angle. The Idaho constitution definitely states that the appropriation of all water of the State

shall be a public use and under State control.²¹ This constitution was adopted August 5, 1889, and confirmed by act of Congress July 3, 1890. The Federal Government in accepting the constitution undoubtedly sanctioned this provision as well as the other provisions of the Idaho constitution. Under what right, then, can the National Government repudiate its act of 1890?

Acting under the authority of the constitution of the State of Idaho with respect to control of its waters, the legislature at its last session declared certain waters, including Pend Oreille Lake and Priest Lake, to be in trust for the people of the State in their present condition. The exact provision follows:²²

The governor is hereby authorized and directed to appropriate in trust for the people of the State of Idaho all the unappropriated water of Priest, Pend Oreille, and Coeur d'Alene Lakes or so much thereof as may be necessary to preserve said lakes in their present condition. The preservation, of said water in said lakes for scenic beauty, health, recreation, transportation, and commercial purposes necessary and desirable for all the inhabitants of the State is hereby declared to be a beneficial use of such water. * * * Each succeeding governor in office shall be deemed to be a holder of such permit in trust for the people of the State. The lands belonging to the State of Idaho between high and low water mark at said lakes, as well as all other lands of the State adjacent to said lakes, until the same are disposed of by the State board of land commissioners, are hereby declared to be devoted to a public use in connection with the preservation of said lakes in their present condition as a health resort and recreation place for the inhabitants of the State, and said public use is hereby declared to be a more necessary use than the use of said lands as a storage reservoir for irrigation or power purposes.

The Columbia Basin project, then, if carried to a successful conclusion, involves the settlement of a complicated set

of interstate rights. The compensation of private-property owners for damages suffered, compensation to Bonner County for the permanent loss of a part of its taxable property, and provision for the future power needs of north Idaho—these are the outstanding problems to be solved. While the State of Idaho has a sympathetic attitude toward reclamation in general, it is not unmindful of its sovereign powers nor is it negligent of its duty in making adequate provision for its own protection.

NOTES

1. Equal approximately to the combined area of Rhode Island and Delaware.

2. The allocation board consisted of members appointed by the Governors of Washington, Idaho, Montana, and Oregon, and representatives from the Department of Interior and the Department of War. This board made a report in January, 1925.

3. Chapter 175, Session Laws of Idaho, 1925.

4. Albany Falls, Idaho, is one-half mile from the Washington-Idaho line.

5. *Twin Falls Canal Co. v. Wyoming Board of Equalization*; *Twin Falls Canal Co. v. Teton County* and the taxing officers thereof; *Twin Falls North Side Canal Co. v. State Board of Equalization of Wyoming*; *Twin Falls North Side Canal Co. v. Teton and Lincoln Counties* and the taxing officers thereof.

6. Section 3. Ordinances.

7. Art. 1, sec. 10, and p. 2.

8. These compacts include the following: Boundary conventions: Kentucky and Tennessee, May 12, 1820—Stat. L., vol. 3, p. 609; New York and New Jersey, June 28, 1834—Stat. L., vol. 4, pp. 708 ff.; Virginia and Maryland, Mar. 3, 1879—Stat. L., vol. 20, pp. 481 ff.; New York and Vermont, Apr. 7, 1880—Stat. L., vol. 21, p. 72; New York and Connecticut, Feb. 26, 1881—Stat. L., vol. 21, pp. 351 ff.; Connecticut and Rhode Island, Oct. 12, 1883—Stat. L., vol. 25, p. 553; New York and Pennsylvania, Aug. 19, 1890—Stat. L., vol. 26, pp. 329 ff.; Protection of fish in boundary waters: Oregon and Washington, Apr. 8, 1918—Stat. L., vol. 40 p. 515. Jurisdiction over boundary waters for specific purposes: North Dakota, South Dakota, Minnesota, Wisconsin, Iowa, and Nebraska, Mar. 4, 1921—Stat. L., vol. 41, pp. 1447 ff. Construction and operation of tunnels: New York and New Jersey, July 11, 1919—Stat. L., vol. 41, p. 158. Development of the port of New York: New York and New Jersey, Aug. 23, 1921—Stat. L., vol. 42, pp. 17 and ff.; New York and New Jersey, July 1, 1922—Stat. L., vol. 42, pp. 822 ff. Erection and maintenance and operation of waterworks: Kansas and Missouri, Sept. 22, 1922—Stat. L., vol. 42, p. 1058 ff. Apportionment of the waters of an interstate stream: Colorado and New Mexico, the La Plata River compact, Jan. 29, 1925—Stat. L., vol. 43, p. 796 ff.

9. 32 Stat. 388.

10. 38 Stat. 242.

11. 41 Stat. 1063, sec. 27.

12. Other congressional acts have conveyed this same attitude on the part of Congress (sec. 9 of act of July 26, 1866—14 Stat. 266—now sec. 2399, Rev. Stats.; desertland act of Mar. 3, 1887—19 Stats. 377; sec. 18 of the act of Mar. 3, 1891—26 Stat. 1085).

13. 9 Wheat. 1.

14. 41 U. S. 410.

15. 3 How. 229.

16. 227 U. S. 229, 242.

17. 206 U. S. 46.

18. 243 U. S. 316.

19. Other decisions supporting this doctrine: *Barney v. Keokuk*, 94 U. S. 324-338; *Packer v. Bird*, 137 U. S. 661-671; *Shively v. Bowlby*, 152 U. S. 1, 40, 58; *St. Anthony Falls Water Power Co. v. Water Commissioner*, 168 U. S. 349, 358; *Hardin v. Jordan*, 140 U. S. 371, 382.

20. 174 U. S. 690, 702-706.

21. Idaho constitution—Art. XV, sec. 1; also State supreme court decision, 16 Idaho, 707.

22. This bill became effective Jan. 24, 1927.



Sheep feeding on Newlands project, Nevada

And a Reply by the Columbia Basin Chairman

By Roy R. Gill, Chairman Executive Committee, Columbia Basin Irrigation League

PROPOSERS of the Columbia Basin reclamation project most cordially welcome the study and discussion of "Idaho's interest in the Columbia Basin Project," by Professor Kerr, of the University of Idaho. He has approached the subject in a temperate and altogether admirable manner. Professor Kerr is apparently seeking to ascertain and understand just how the building of this great irrigation project within the drainage of the Columbia River and its tributaries will affect, adversely as well as beneficially, the interest of the two States (Montana and Idaho) which lie "up the river" from the land to be watered.

In presenting a reply to the discussion by the Idaho educator we intend to match the even-tempered attitude displayed by Professor Kerr. It is only by developing this matter in a spirit of fair dealing between friends and neighbors that an understanding can be reached.

In doing so we shall use data which evidently were not available to Professor Kerr, evidenced, for instance, by his using a long since abandoned plan for storage of Columbia Basin irrigation water, in Priest Lake, northern Idaho. Latest engineering plans for the Columbia Basin project contemplate asking Idaho for storage rights in Pend Oreille Lake alone.

COMPLETE UNDERSTANDING ESSENTIAL

That a complete understanding may be had, we have attempted to discuss the matter, which in reality means an allocation compact between the northwest States, under various district divisions, as follows:

1. Lake Pend Oreille is the only place in Idaho now being considered by engineers as a storage reservoir for the benefit of the Columbia Basin irrigation project if the gravity system for the irrigation of the land shall be adopted. We believe the gravity system to be the most practical.

The Columbia River Board of Control, created by Federal and State authority, has definitely abandoned the use of both Priest Lake and Lake Coeur d'Alene as reservoirs for the Columbia Basin project. Furthermore, the report by Warren G. Swendsen, then commissioner of reclamation for the State of Idaho (January 12, 1927) definitely limited the studies of reservoir-storage possibilities in Idaho for the benefit of Columbia Basin to Lake Pend Oreille. Since that report was made

to the Idaho Legislature a mass of information has been accumulated regarding damages and benefits to Idaho from using such storage (Lake Pend Oreille) and has been supplied to Mr. G. N. Carter the successor to Mr. Swendsen.

Therefore, any further reference to the use of any storage other than Pend Oreille may be omitted.

2. In negotiations and discussions between members of the Columbia River Board of Control, looking to the arrangements of an agreement for dividing the waters of the Columbia River watershed between the interested States, the State of Washington has relinquished all claims or intent to the storage of water in Lake Pend Oreille above elevation 2,070 over the sea. Storage up to elevation 2,070 will provide all the water that the farmers on the project will ever require.

Elevation 2,070 would place the lake slightly lower than the average high-water mark in recent years.

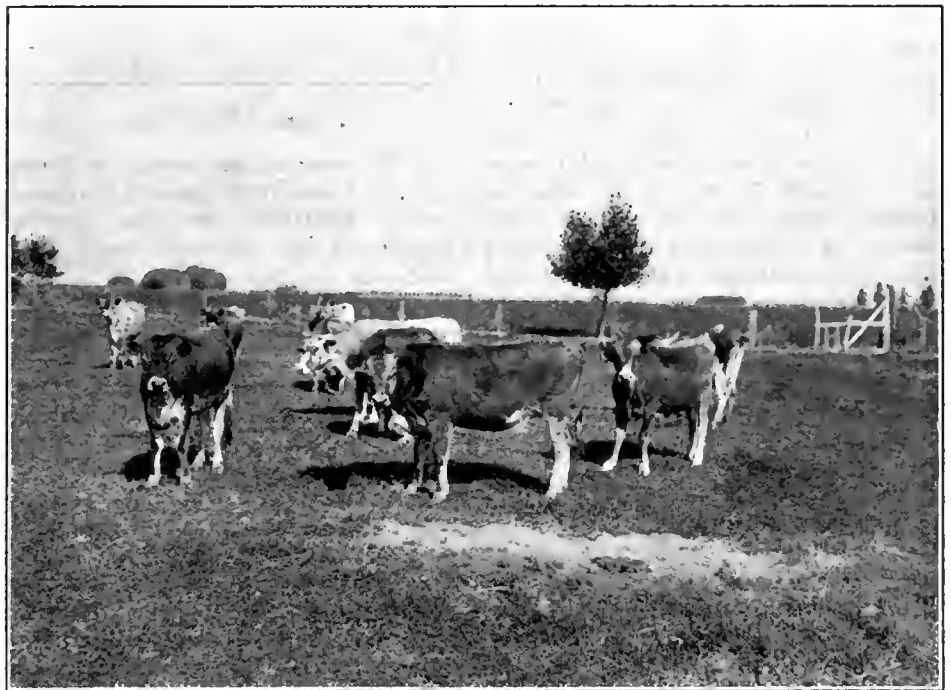
A survey of the lands bordering the Clarks Fork River, the lake, and Pend Oreille River between Albany Falls and the outlet of the lake, as made by the War Department in 1927, together with a comparison with the tax records of Bonners County, Idaho, indicate that approximately 14,000 acres of taxable land would be flooded if the lake were held at elevation 2,070. Of the 14,000 acres *only* 3,700

are farmed or subject to cultivation. None of the lands that would be flooded carry improvements of any character, save fencing.

The War Department survey above referred to also demonstrates that in using elevation 2070 not a single assessed tract of Bonner County land would be entirely flooded; *by elevating the lake to 2070 it will flood small fractions of land only in each assessed farm tract, the main body of land in each case remaining intact and on the tax rolls of the county.* Thus the county will not witness an exodus of its farm citizens as soon as they receive settlement for those fractions of land. It is more likely to see them use the money they will receive for their flooded acres to improve their remaining lands, and lost tax values will be thereby somewhat equalized. The fractions that will be flooded average about 27 acres per tract of assessable land. They run along mostly from 2 to 4 or 5 acres out of each tract.

Data and maps showing the exact acreage in each tract that will be flooded at elevation 2070 have been supplied to the Idaho Commissioner of Reclamation.

With the exception of the cellars under a few homes in the southwest part of the city of Sandpoint, that city is built entirely above elevation 2070. Thus it has been ascertained by the engineers that the use of the lake up to 2070 does not menace the sewage system of Sandpoint.



Jersey dairy herd in pasture, Minidoka project, Idaho

However, it has been proposed that the Columbia Basin reclamation project shall finance and construct a sea wall along the lake front that will entirely and completely protect property in that city from damages, if any result from elevating the lake to 2070. The wall will be several feet higher than that elevation to afford ample protection.

The Hungry Horse Reservoir, in the State of Montana, which plan has been adopted by the proponents of the project, will be filled from flood waters. Our engineers believe this reservoir will lower the annual flood level at Sandpoint from 1 to 2 feet each year.

It is well understood that the island and narrow bottle neck in the river at Albany Falls comprise the chief cause of the floods at Sandpoint. Columbia Basin proposes to widen the outlet, remove the island as an obstruction, and put in a type of dam that can be opened up to allow the floods unobstructed escape down the river.

3. Very few summer cottages are to be found along the shore line of Pend Oreille. Such as are there are well above level 2070 and would be benefited rather than injured by maintenance of a steady lake level.

Such beaches as exist are now established at high-water level, which runs from 2070 to 2071. The league would be entirely willing to pump sand for the building of a finer and better beach at Sandpoint or at any other locality which might feel injured in this respect.

4. The use of Pend Oreille for Columbia Basin storage does not conflict in the slightest degree with the development and utilization of any power sites in the State of Idaho. On the contrary, it will increase potential power in that State.

Above Albany Falls, in Idaho, are only two possible power developments—one on the Priest River and the other at Cabinet Rapids on the Clarks Fork. Neither of these sites would be flooded if Lake Pend Oreille is elevated to level 2070. It is conceivable that the construction of Columbia Basin would create a market justifying their development at a much earlier date than otherwise, with consequent benefits to Idaho.

At Albany Falls only a small power development can ever be had. If it is occupied by the Columbia Basin project dam, proposed to be approximately 35 feet in height, it would permit the generation of only 15,000 horsepower. But that amount of power would be important to Idaho and Bonner County, because Washington is agreeable that it should be ceded to them as compensation for the taxable property destroyed. No doubt that amount of cheap power would be helpful in expanding Sandpoint's industrial center and pay rolls.

Project Water Supply

During the early part of March stream flow was generally low, owing to low temperatures. Later in the month precipitation at the lower altitudes swelled the streams. Snow pack is at or above normal in the Rocky Mountain ranges and materially below normal in the Pacific coast ranges. Snow cover is more abundant than usual in the lower altitudes of each drainage area, pointing to early and, in some cases, heavy floods.

Late-season flow will be deficient, except on the Rio Grande, with such deficiency likely to be pronounced in Pacific coast streams. The more western reservoirs which are dependent on annual flows are unlikely to fill, but reservoirs with large hold-over capacity will generally be well filled on account of good hold over from 1928.

Minor irrigation shortages are anticipated on the Yakima and Umatilla projects. More severe shortages may occur on the Okanogan, Orland, and Boise projects, and on the Truckee lands of the Newlands project. A heavy shortage has been averted on the Salt River project by the extensive well-construction program carried out in recent years.

For reservoirs with concurrent data the storage on hand on March 31, 1929, was 5,105,000 acre-feet, as compared with 6,285,000 acre-feet for the same date in 1928.

TAX REVENUES

5. The total annual revenue to Bonner County, Idaho, from taxation is approximately \$600,000; the taxes assessed against all the privately-owned lands bordering the lake amount to approximately \$25,000; the total amount of taxes assessed against the fractions of land which would be covered by water at elevation 2070 is approximately \$8,000. These figures include taxes for all purposes. We have not attempted to segregate them to show just how many dollars would be lost to the State, county, or school districts. The amounts would be relatively small as compared with the total revenue of the county.

With only small fractions of each taxable area around the lake flooded, however, and with the owners given substantial remuneration, money they would undoubtedly expend in equipping their farms with livestock or improvements of some character, there is little likelihood of the county, school district, or State suffering

any loss in taxation. Certainly there would not be a material increase in the tax rate.

6. If, as Professor Kerr alleges, there are 200,000 acres in Bonner County which eventually can be tilled, and of that amount 60 per cent, or 120,000 acres, can be irrigated, we hope he will agree that the situation as regards the reclamation of those lands can not be injured by making a storage reservoir of Lake Pend Oreille.

If any of those lands are to be irrigated by pumping, a dam must be built. The Columbia Basin Dam at Albany Falls would be in place to create and maintain at a steady level the water basin to supply such pumps.

AMPLE WATER FOR ALL

We want to impress Professor Kerr and all other citizens of Idaho with the fact that proponents of Columbia Basin are not trying to sneak in under the tent and take away from Idaho any gallon of water of which she can make a beneficial use.

There is water enough in the Pend Oreille and its branches to answer any demand that Montana, Idaho, or Washington will ever make on it.

We of Washington are urging a compact to be agreed upon between the States that will forever reserve to Idaho all the water she can use—and a large reserve amount on top of that.

We are willing to concede to Idaho that she can use our reservoir at Lake Pend Oreille to store water to be pumped or sent by gravity to any lands that can be reclaimed by its use. We will build and maintain the reservoir without any charge to Idaho for such privileges.

7. Professor Kerr's discussion of the legal question, as to whether Congress has the power to interfere in any way with the sovereign rights of the State of Idaho over its rivers, is interesting but entirely beside the point. No one that we know of is claiming that Congress can override the rights of the State of Idaho in that regard. Professor Kerr's discussion of the matter naturally leads to the opinion that such an attempt is being made. No such attempt has been or will be made by Columbia Basin proponents.

We are quite sure that such friendly discussions as these serve to disseminate the facts among the people, and as they are better understood it is sure to follow that the formulation of an allocation compact among the northwest States will appear necessary, and the sooner it is completed the better for all concerned.

Washington is willing.

All Washington asks of Idaho is the same courteous and neighborly treatment that Wyoming gave to Idaho a few years ago—storage privileges that have enabled a large part of the irrigated land of southern Idaho to become productive.

A Working Example of Financing Settlers on Irrigation Projects

By E. C. Van Pelten, Ontario, Oreg.

THE question of furnishing settlers on Federal reclamation projects with money at a lower rate and on more liberal terms of payment than commercial banks are able or willing to give has been a matter of concern for several years to the management of the Reclamation Bureau.

When appropriations were made for the construction of the Owyhee and Vale irrigation projects in eastern Oregon and western Idaho the business interests of the towns on and around these projects pledged themselves to capitalize an agricultural corporation to loan intermediate credit bank money to the farmers. In order that this institution might be in working condition, and to test the actual value of such a concern to an irrigated country, we did not wait until the projects were ready to deliver gravity water, but organized the corporation early in the spring of 1927. The business office is handled in connection with the Farmers' Cooperative Creamery Co. at Payette, Idaho.

The connection of the loaning corporation, known as the Intermountain Agricultural Credit Corporation, with the creamery has had much to do with the success of the corporation, although the loan company is a separate organization from the creamery, which stands only as one of the subscribers to its capital stock. The creamery inspectors also watch loans and help sellers and buyers of dairy cattle. The Payette creamery does an immense business with a branch butter manufacturing plant at Weiser, Idaho, and an ice-

cream factory at Ontario, Oreg., which made over 30,000 gallons of ice cream in 1928. In 1928 the creamery manufactured 4,000,000 pounds of butter and 800,000 pounds of condensed buttermilk. It has developed a large poultry and egg business and operates 21 trucks on milk routes. Its assets are \$325,000, with no indebtedness, and it is a part owner of the Challenge Butter Association of Los Angeles, a cooperative selling concern. In 1928 the creamery paid its members 89 cents of the consumer's dollar. Such a concern is a strong background for our loaning corporation.

The credit corporation made its first loans in May, 1927. Loans are made on 40 to 60 per cent of the appraised value of the stock, and 3 to 5 per cent of the loan must be liquidated each month out of cream checks for cream delivered to the Payette creamery. In 20 months the corporation made 472 loans.

The annual report for the business year of 1928 showed that 388 loans were made during the year, totaling \$181,407.61. A most surprising result was that \$86,524.04 in loans had been repaid in 1928. On January 31, 1929, the company had \$134,181.56 outstanding in loans. During 1928 the inspectors and the corporation had aided 129 dairymen to select and purchase 827 dairy cows. The corporation so far has not foreclosed a mortgage or taken a cow away from a borrower.

The beneficial effects of this corporation have far surpassed our expectations. In former years the coast cities and California were heavy buyers of dairy stock in

this section. Now, when a desirable dairy cow is for sale, a buyer at home is found and financed, if necessary, by the corporation.

By our 3 to 5 per cent plan of monthly repayments out of the cream checks we have set a considerable number of small farmers on their feet financially and are making substantial citizens out of them. This money can be loaned for dairy cattle and all other livestock and to finance buildings for housing them. We expect to enlarge the loaning capital as the country grows. At this time it is meeting the needs of 45,000 acres of electric pumping lands under the Owyhee project, as well as the Warm Springs lands adjacent to the Vale project.

After a year and a half of actual experience we are very much impressed with the necessity and success of our plan of loaning intermediate credit bank money through a corporation organized for that purpose. Any community which is a good dairy country can do it successfully. At first it is necessary to obtain initial capital from the business interests. Later the corporation will run under its own power. In the early stages local banks may not be friendly, but later they will find the plan a decided help to them by building up prosperous farmers out of poor risks. The work of a creamery in connection with the loaning company is very valuable but not an absolute necessity.

It is a grand work to take a man with a family who is making a bare living and set his feet along a prosperous path.



Hay stack 665 feet long, containing 660 tons, grown on 91 acres, by C. P. Overstreet, near Nyssa, Oreg., Owyhee project



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor *New Reclamation Era*



Club Activities of Project Women

WITH very few exceptions, club work is in evidence on all of our projects.

Recently an inquiry was made as to the extent of club work on Federal reclamation projects and this prompted the sending out of a general inquiry to all projects.

In some cases photographs of club houses were proudly submitted, in others there was an expressed determination to have their own club houses in the very near future, but in back of it all is the same spirit of service, civic pride, and the urge to help make their communities more attractive and a better place to live in.

This banding of women in such a praiseworthy cause earns the commendation of all those connected with the administration of project affairs as to the important part these activities play in the everyday life of project women.

BELLE FOURCHE PROJECT, SOUTH DAKOTA

Club work among the women of the Belle Fourche project is carried on at the present time in five organizations, the locations of the clubs being Newell, Vale, Empire, South Hilan, and Horse Creek. Their programs for this year include a series of seven demonstrations sponsored by the South Dakota Home Extension Department; and, in addition, a Butte County program of kitchen-improvement work and testing circles of kitchen equipment.

The State program includes Christmas gift demonstrations, food needs for health, health values of foods, growth foods for health, regulating and coordinating health factors, food and waste carriers for health, and the beautification of home grounds.

The Butte County kitchen-improvement work will be open to all women in the county, regardless of whether they are club members or not, and will be in the nature of a contest. The kitchens are to be scored on their original arrangement, and then again, at the close, to determine who has made the greatest improvement in new arrangement.

In the testing circle each club will be furnished with a piece of equipment, test it out, and report on its findings. The consolidated reports from all clubs will then be available for each club in the county covering all the equipment tested.

With the exception of the Horse Creek Club, the club meetings on the Belle

Fourche project are held in the various homes of the club members. In the Horse Creek section two rooms of their schoolhouse are so arranged so that they can be thrown into one large room, where demonstrations are given and the club's programs carried out.

BOISE PROJECT, IDAHO-OREGON

In collecting data on club activities on this project it is well to note that the clubs in the city of Boise and in Parma can hardly be said to be purely project activities, but the project makes up so great a part of the Boise Valley and all the interests and activities in the valley are so tied up with and dependent on the project that the Boise project and the Boise Valley are considered as being synonymous.

It boasts six fine buildings dedicated to the cause. Not only their existence but the type of buildings reflect a prosperous community.

The Columbian Club in Boise is a woman's organization with a wide sphere of influence and a history covering many years.

The Boise Country Club is purely a sports club, as the name implies.

The Kuna community clubhouse, while largely supported by the women of Kuna, is used for all manner of community purposes.

The same description will apply to the Marble Front and Parma clubhouses.

In the Big Bend district, which is in Oregon, a small park termed the "Big Bend Park" is maintained with ball

Books for Farmers on The Rio Grande Project

The Dona Ana County Farm Bureau, New Mexico, is maintaining a circulating library for the benefit of the farmers of its farm bureau locals. These books are mainly on the subject of agricultural methods and the latest scientific discoveries that can be used by the farmer to improve his crop returns. This is believed to be the only circulating library in the United States run by a farm bureau, and the people of the Elephant Butte irrigation district, Rio Grande project, New Mexico-Texas, where this organization is located, feel proud of the progressive spirit of their locality.

grounds, shade and lawn for picnic purposes, and the clubhouse shown in the picture for all manner of community meetings. This park and clubhouse are the center of the social life of the Big Bend district, which is somewhat remote from towns of any size and fill a real need.

HUNTLEY PROJECT, MONTANA

This project has provided for community gatherings. The Ballantine hall was constructed by the people in Ballantine and community in 1922 at a cost of \$3,500 for materials. The labor was practically all donated. The main part of this building is 52 by 60 feet, with a stage 16 by 40 feet added on the east end.

The Osborn hall was constructed last summer by the Project Pioneer Picnic Association at a cost of \$4,000, and is intended for project gatherings of all kinds. It is a timber structure, substantially built. Dimensions 42 by 80 feet.

NORTH PLATTE PROJECT, NEBRASKA-WYOMING

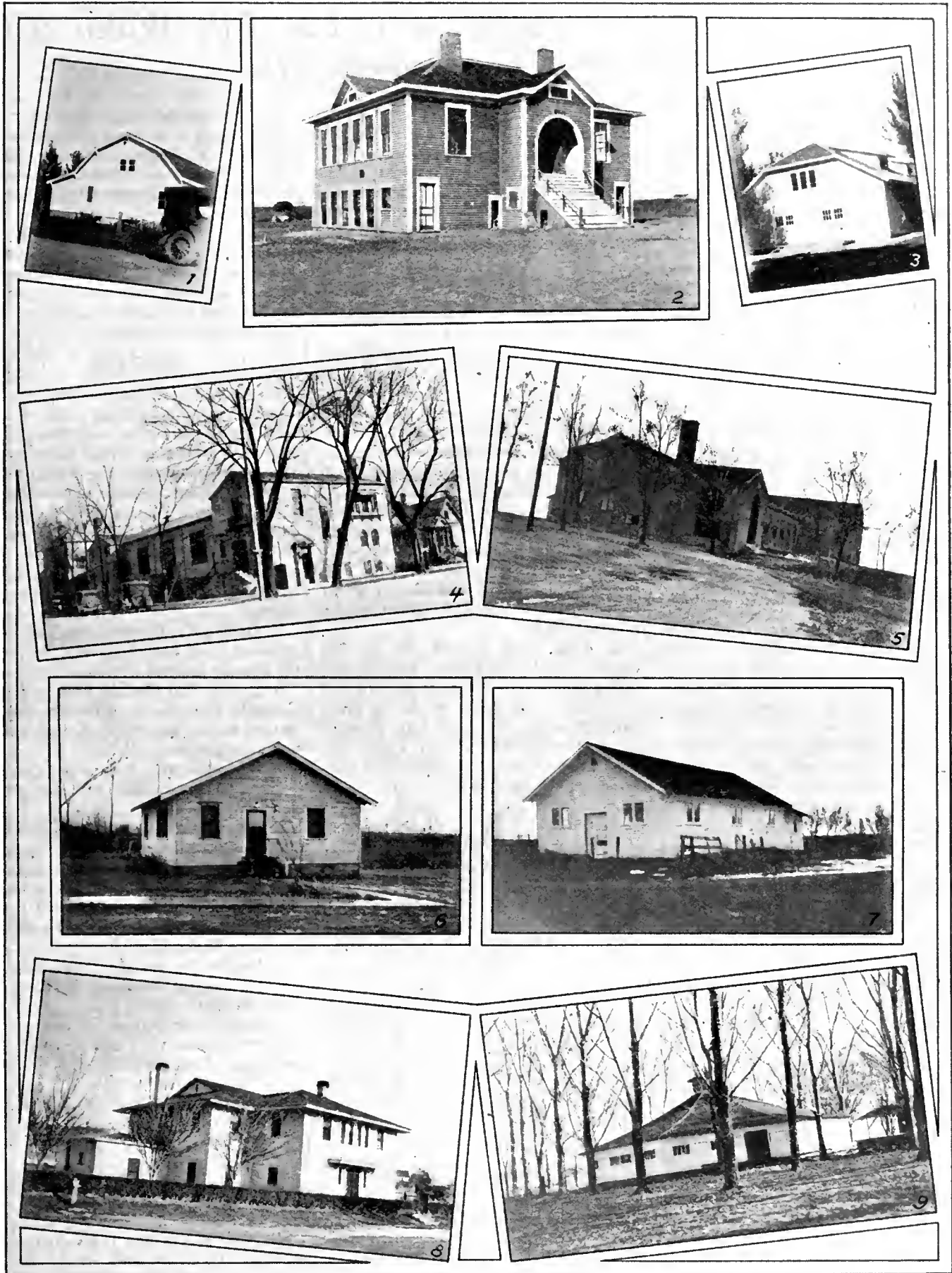
This project has no club buildings. A number of women's clubs have been organized and club meetings are held in schoolhouses or at the different farm homes.

There are three reserves on the project set aside for public playgrounds and community center purposes.

UMATILLA PROJECT, OREGON

Two live clubs exist in the west extension irrigation district of this project, the Women's Grange and Community Clubs. They have no club buildings. The members meet once a month at members' homes. They work, in cooperation, to send boys and girls to the State fair in club work, and, generally, for the good of the community in many forward movements. Money for their activities is raised through the sale of needlework and banquets or lunches put on by the clubs.

CONSIDERABLE activity is apparent on the Grand Valley project in the desire for information on beautifying premises. The Mesa County Improvement Association has been formed as a clearing house for literature and for the distribution of trees and plants. Illustrated lectures on the subject are also being given in many rural districts.



1. Community Hall, Ballantine, Huntley project, Montana 2. Horse Creek School, Belle Fourche project, South Dakota. 3. Community Club, Osborn, Huntley project. 4. Columbian Club, Boise, Boise project. 5. Bois Country Club, Boise project. 6. Community Club, Kuna, Boise project. 7. Good Cheer Club in Marble Front District, near Caldwell, Boise project. 8. Community Club House, Parma, Boise project. 9. Club House, Big Bend Community Park, Boise project.

Rio Grande Compact With Respect to the Use of the Waters of the River Above Fort Quitman, Tex.

THE State of Colorado, the State of New Mexico, and the State of Texas, desiring to remove all causes of present and future controversy among these States and between citizens of one of these States and citizens of another State with respect to the use of the waters of the Rio Grande above Fort Quitman, Tex., and being moved by considerations of interstate comity, have resolved to conclude a compact for the attainment of these purposes, and to that end, through their respective governors, have named as their respective commissioners:

For the State of Colorado, Delph E. Carpenter;

For the State of New Mexico, Francis C. Wilson;

For the State of Texas, T. H. McGregor; who, after negotiations participated in by William J. Donovan, appointed by the President as the representative of the United States of America, have agreed upon the following articles, to wit:

ARTICLE I

(a) The State of Colorado, the State of New Mexico, the State of Texas, and the United States of America, are hereinafter designated "Colorado," "New Mexico," "Texas," and the "United States," respectively.

(b) The term "Rio Grande Basin" means all of the territory drained by the Rio Grande and its tributaries in Colorado, New Mexico, and Texas, above Fort Quitman, Tex.

(c) The term "tributary" means any watercourse the waters of which naturally flow into the channel of the Rio Grande.

(d) The "closed basin" means that part of the San Luis Valley in Colorado where the streams and waters naturally flow and drain into the San Luis lakes and adjacent territory and the waters of which are not tributary to the Rio Grande.

(e) Domestic use of water has the significance which attaches to the word "domestic" in that sense at common law. Municipal use means the use of water by or through waterworks serving the public. Agricultural use means the use of water for the irrigation of land.

(f) The term "power" as applied to the use of water means all uses of water, direct or indirect, for the generation of energy.

(g) Spill or waste of water at a reservoir means the flowage of water over the spillway or the release of water through outlet structures other than for domestic, municipal, or agricultural uses, and losses, incident thereto.

The provisions hereof binding each signatory State shall include and bind its citizens, agents, and corporations, and all others engaged in, or interested in, the diversion, storage, or use of the water of the Rio Grande in Colorado or New Mexico or in Texas above Fort Quitman.

ARTICLE I

The States of Colorado, New Mexico, and Texas hereby declare:

(a) That they recognize the paramount right and duty of the United States, in the interests of international peace and harmony, to determine and settle international controversies and claims by treaty and that when those purposes are accomplished by that means, the treaty becomes the supreme law of the Nation.

(b) That since the benefits which flow from the wise exercise of that authority and the just performance of that duty accrue to all the people, it follows as a corollary that the Nation should defray the cost of the discharge of any obligation thus assumed.

(c) That with respect to the Rio Grande, the United States, without obligation imposed by international law and "being moved by considerations of international comity," entered into a treaty dated May 21, 1906 (34 Stat. 2953), with the United States of Mexico which obligated the United States of America to deliver from the Rio Grande to the United States of Mexico 60,000 acre-feet of water annually and forever, whereby in order to fulfill that promise the United States of America in effect drew upon the States of Colorado, New Mexico, and Texas a draft worth to them many millions of dollars, and thereby there was cast upon them an obligation which should be borne by the Nation.

(d) That for the economic development and conservation of the waters of the Rio Grande Basin and for the fullest realization of the purposes recited in the preamble to this compact, it is of primary importance that the area in Colorado known as the closed basin, be drained, and the water thus recovered be added to the flow of the river, and that a reservoir be constructed in Colorado upon the river at or near the site generally described as the State line reservoir site. The installation of the drain will materially augment the flow of the river and the construction of the reservoir will so regulate the flow as to remove forever the principal causes of the difficulties between the States signatory hereto.

(e) That in alleviation of the heavy burden so placed upon them it is the earnest conviction of these States that, without cost to them, the United States should construct the closed basin drain and the State line reservoir.

The signatory States agree that approval by Congress of this compact shall not be construed as constituting an acceptance or approval, directly, indirectly, or impliedly, of any statement or conclusion appearing in this article.

ARTICLE III

(a) Colorado, under the direction and administration of its State engineer, shall cause to be maintained and operated an automatic recording stream gauging station at each of the following points, to wit:

1. On the Rio Grande near Del Norte at the station now maintained, known and designated herein as the Del Norte gauging station. (The water records from this station to include the flow diverted into the canal of the Del Norte irrigation system.)

2. On the Rio Conejos near Mogote, a station known and designated herein as the Mogote gauging station.

3. On the Rio Grande at or near the Colorado-New Mexico interstate line, a station known and designated herein as the interstate gauging station.

4. Such other station or stations as may be necessary to comply with the provisions of this compact.

(b) New Mexico, under the direction and administration of its State engineer, shall cause to be maintained and operated an automatic stream gauging station at each of the following points, to wit:

1. On the Rio Grande at the station known as Buckman.

2. On the Rio Grande at San Marcial.

3. On the Rio Grande at the Elephant Butte Reservoir outlet.

4. Such other station or stations as may be necessary to comply with the provisions of this compact.

(c) Texas, under the direction and administration of its duly constituted official, shall cause to be maintained and operated an automatic stream gauging station at each of the following points, to wit:

1. On the Rio Grande at Courchesne.

2. On the Rio Grande at Tornillo.

3. On the Rio Grande at Fort Quitman.

(d) New Mexico and Texas shall establish and maintain such other gauging station or stations as may be necessary for ascertaining and recording the release, flow, distribution, waste, and other disposition of water at all points between

the Elephant Butte Reservoir and the lower end of the Rio Grande project, both inclusive: *Provided, however,* That when the United States shall maintain and operate, through any of its agencies, an automatic gauging station at any of the points herein designated, it shall not be necessary for the State within which said station is located to maintain a duplicate gauging station at such point, whenever the records of such Government stations are available to the authorities of the several States.

(e) The officials in charge of all of the gauging stations herein provided for shall exchange records and data obtained at such stations for monthly periods through the operation thereof, or at such other intervals as they may jointly determine, and said officials shall provide for check ratings and such other hydrographic work at the designated stations as may be necessary for the accuracy of the records obtained at such stations and to that end may establish rules and regulations from time to time.

ARTICLE IV

The State engineer of Colorado, the State engineer of New Mexico, and such officer of Texas as the governor thereof may designate shall constitute a committee which may employ such engineering and clerical aid as may be authorized by the respective State legislatures, and the jurisdiction of the committee shall extend only to the ascertainment of the flow of the river, to the prevention of waste of water, and to findings of fact reached only by unanimous agreement. It shall communicate its findings of fact to the officers of the respective States charged with the performance of duties under this compact. Its findings of fact shall not be conclusive in any court or other tribunal which may be called upon to interpret or enforce this compact. Annual reports compiled for each calendar year shall be made by the committee and transmitted to the governors of the signatory States on or before February 1 following the year covered by such report.

ARTICLE V

It is agreed that to and until the construction of the closed basin drain and the State line reservoir herein described but not subsequent to June 1, 1935, or such other date as the signatory States may hereafter fix by acts of their respective State legislatures, Colorado will not cause or suffer the water supply at the interstate gauging station to be impaired by new or increased diversions or storage within the limits of Colorado unless and until such depletion is offset by increase of drainage return.

ARTICLE VI

To the end that the maximum use of the waters of the Rio Grande may be made, it is agreed that at such times as the State engineer of New Mexico, under the supervision and control of the committee, shall find that spill at Elephant Butte Dam is anticipated he shall forthwith give notice to Colorado and New Mexico of the estimated amount of such spill and of the time at which water may be impounded or diverted above San Marcial, and thereupon Colorado and New Mexico may use in equal portions the amount of such estimated spill so found by the State engineer of New Mexico, and on notice from the said State engineer of New Mexico that the period of said spill, or estimated spill, is terminated, Colorado and New Mexico shall desist from such increased use.

ARTICLE VII

(a) On or before the completion of the closed basin drain and the State line reservoir, and in any event not later than June 1, 1935, a commission of three members shall be constituted to which the governor of each of the signatory States shall appoint a commissioner for the purpose of concluding a compact among the signatory States and providing for the equitable apportionment of the use of the waters of the Rio Grande among said States. The governors of said States shall request the President of the United States to name a representative to sit with said commission.

(b) The commission so named shall equitably apportion the waters of the Rio Grande as of conditions obtaining on the river and within the Rio Grande Basin at the time of the signing of this compact and no advantage or right shall accrue or be asserted by reason of construction of works, reclamation of land, or other change in conditions or in use of water within the Rio Grande Basin or the closed basin during the time intervening between the signing of this compact and the concluding of such subsequent compact to the end that the rights and equities of each State may be preserved unimpaired: *Provided, however,* That Colorado shall not be denied the right to divert, store, and/or use water in additional amounts equivalent to the flow into the river from the drain from the closed basin.

(c) Any compact concluded by said commission shall be of no force or effect until ratified by the legislature of each of the signatory States and approved by the Congress of the United States.

ARTICLE VIII

(a) Subject to the provisions of this article, Colorado consents to the con-

struction and use of a reservoir by the United States and/or New Mexico, and/or Texas, as the case may be, by the erection of a dam across the channel of the Rio Grande at a suitable point in the Canyon below the lower State bridge, and grants to the United States and/or to said States or to either thereof, the right to acquire by purchase, prescription, or the exercise of eminent domain such rights of way, easements, and/or lands as may be necessary or convenient for the construction, maintenance, and operation of said reservoir and the storage and release of waters.

(b) Said reservoir shall be so constructed and operated that the storage and release of waters therefrom and the flowage of water over the spillway shall not impede or interfere with the operation, maintenance, and uninterrupted use of drainage works in the San Luis Valley in Colorado or with the flow and discharge of waters therefrom.

(c) The construction and/or operation of said reservoir and the storage and regulation of flow of waters thereby for beneficial uses or otherwise shall not become the basis or hereafter give rise to any claim or appropriation of waters or of any prior, preferred, or superior right to the use of any such waters. The purpose of said reservoir shall be to store and regulate the flow of the river.

(d) The United States, or the signatory States, as the case may be, shall control the storage and release of water from said reservoir and the management and operation thereof, subject to a compact between the signatory States.

(e) Colorado reserves jurisdiction and control over said reservoir for game, fish, and all other purposes not herein relinquished.

(f) Colorado waives rights of taxation of said reservoir and appurtenant structures and all lands by it occupied.

ARTICLE IX

Nothing in this compact shall be construed as affecting the obligations of the United States of America to the United States of Mexico, or to the Indian Tribes, or as impairing the rights of the Indian Tribes.

ARTICLE X

It is declared by the States signatory hereto to be the policy of all parties hereto to avoid waste of waters, and to that end the officials charged with the performance of duties hereunder shall use their utmost efforts to prevent wastage of waters.

ARTICLE XI

Subject to the provisions of this compact, water of the Rio Grande or any of

its tributaries, may be impounded and used for the generation of power, but such impounding and use shall always be subservient to the use and consumption of such waters for domestic, municipal, and agricultural purposes. Water shall not be stored, detained, nor discharged so as to prevent or impair use for such dominant purposes.

ARTICLE XII

New Mexico agrees with Texas with the understanding that prior vested rights above and below Elephant Butte Reservoir shall never be impaired hereby, that she will not cause or suffer the water supply of the Elephant Butte Reservoir to be impaired by new or increased diversion or storage within the limits of New Mexico unless and until such depletion is offset by increase of drainage return.

ARTICLE XIII

The physical and other conditions characteristic of the Rio Grande and peculiar to the territory drained and served thereby, and to the development thereof, have actuated this compact and none of the signatory States admits that any provision herein contained establishes any general principle or precedent applicable to other interstate streams.

ARTICLE XIV

This compact may be terminated or extended at any time by the unanimous legislative action of all of the signatory States, and in that event all rights established under it shall remain and continue unimpaired.

ARTICLE XV

Nothing herein contained shall prevent the adjustment or settlement of any claim or controversy between these States by direct legislative action of the interested States, nor shall anything herein contained be construed to limit the right of any State to invoke the jurisdiction of any court of competent jurisdiction for the protection of any right secured to such State by the provisions of this compact, or to enforce any provision thereof.

ARTICLE XVI

Nothing in this compact shall be considered or construed as recognizing, establishing, or fixing any status of the river or the accuracy of any data or records or the rights or equities of any of the signatories or as a recognition, acceptance or acknowledgment of any plan or principle or of any claim or assertion made or advanced by either of the signatories or hereafter construed as in any manner establishing any principle or precedent as regards future equitable apportionment of the water of the Rio Grande. The signatories agree that the plan herein adopted for administration of the water of the Rio Grande is merely a temporary expedient to be applied during the period of time in this compact specified, is a compromise temporary in nature and shall have no other force or interpretation and that the plan adopted as a basis therefor is not to be construed as in any manner establishing, acknowledging, or defining any status, condition, or principle at this or any other time.

ARTICLE XVII

The signatories consent and agree to the extension of time for construction of reservoirs on sites covered by approved applications during the time of this compact and for a reasonable time thereafter.

ARTICLE XVIII

This compact shall become operative when approved by the legislature of each of the signatory States and by the Congress of the United States. Notice of approval shall be given by the governor of each State to the governors of the other States and to the President of the United States, and the President of the United States is requested to give notice to the governors of each of the signatory States of its approval by the Congress of the United States.

In witness whereof the commissioners have signed this compact, in quadruplicate original, one of which shall be deposited in the archives of the Department of State of the United States of America and shall be deemed the authoritative original, and of which a duly certified copy shall be forwarded to the governor of each of the signatory States.

Done at the city of Santa Fe, in the State of New Mexico, on the 12th day of February, in the year of our Lord, one thousand nine hundred and twenty-nine.

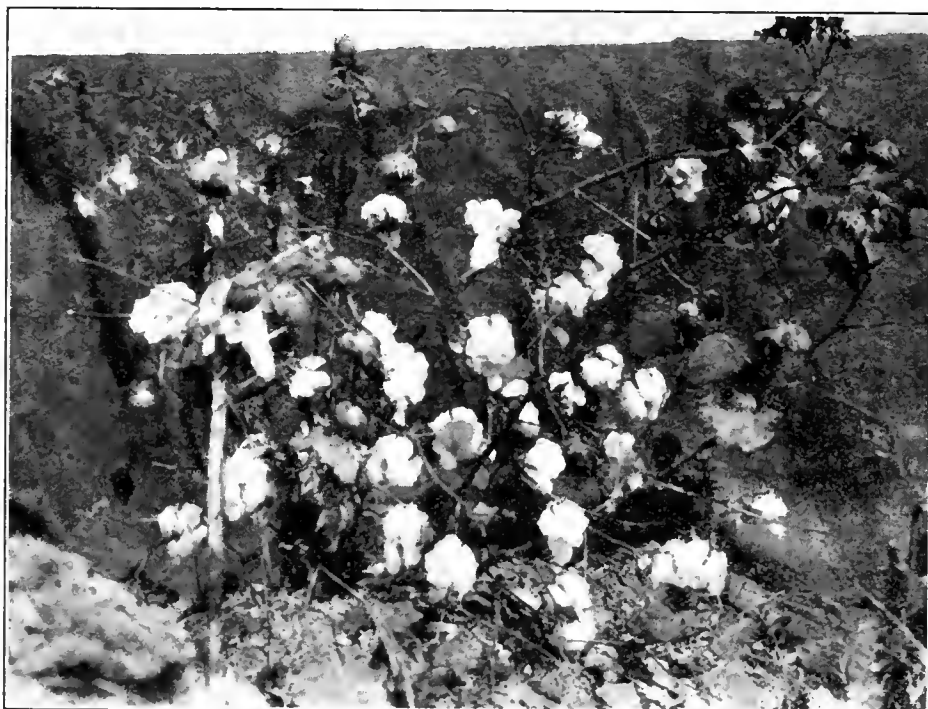
DELPH E. CARPENTER.

FRANCIS C. WILSON.

T. H. MCGREGOR.

Approved.

WILLIAM J. DONOVAN.



Cotton grown on Schutz Bros. ranch, Yuma project, Arizona

Two Bales an Acre on Yuma Cotton Farm

An average slightly in excess of 2 bales of cotton per acre was shown in final figures received recently by Schutz Bros., of Somerton, Ariz., on the Yuma Federal irrigation project, from the cotton gin which handled their crop the past season. Their 150 acres produced 330 bales of 500 pounds each. The accompanying illustration shows where the 2 bales an acre came from.

CONSTRUCTION of a cold-storage plant on the Yakima project at a cost of \$110,000 has been started by the buying agents for the Olympic Packing Co. The plant is being constructed primarily for the storage of cannery pears, and when this fruit has been removed the space will be used for the storage of apples.

Vale and Owyhee Settlement Meeting

At a mass meeting held in Vale, Oreg., recently, at which about 100 persons interested in the settlement of the Vale and Owyhee projects were present, including George C. Kreutzer, Director of Reclamation Economics, and officials representing the Union Pacific Railroad, the Oregon Agricultural College, the State Chamber of Commerce, and the Portland Chamber of Commerce, plans were formulated for the organization of the Vale-Owyhee Government Projects Land Settlement Association. The object of the association is to promote the settlement and development of the Vale and Owyhee irrigation district lands. A temporary organization was formed at that time and later a permanent organization was perfected consisting of the three directors of the Vale (Oreg.) irrigation district, the three directors of the Owyhee irrigation district, and one representative each of the commercial clubs of Ontario, Nyssa, Harper, and Vale, Oreg. J. D. Fairman, of Harper, was elected president; C. H. Oxman, of Ontario, vice president; and Estes Morton, of Harper, secretary-treasurer, all of whom are to serve for a period of one year.

Citrus Development in the Lower Rio Grande Valley, Texas

By Harry Sexton, Brownsville, Tex.

ORANGES and grapefruit have been grown under irrigation in the lower Rio Grande Valley of Texas since the establishment of the Spanish colonies in 1750, but the industry was not placed upon a commercial scale until 1920, following exhaustive tests by Government experts and others to determine the proper rootstock. Heavy plantings began in 1921, a census completed in the summer of 1928 showing 477,000 trees planted between 1920 and 1923. By 1926 the annual plantings had been increased to 645,000, and the peak of plantings was attained in 1927-28 with 1,204,000 trees set in the orchard rows. The 1928-29 plantings are expected to show approximately the same as the preceding season. With approximately 4,400,000 trees planted, development is proceeding rapidly, although less than 15 per cent of the total number of trees are bearing. Approximately 80 per cent of the past season's plantings are grapefruit.

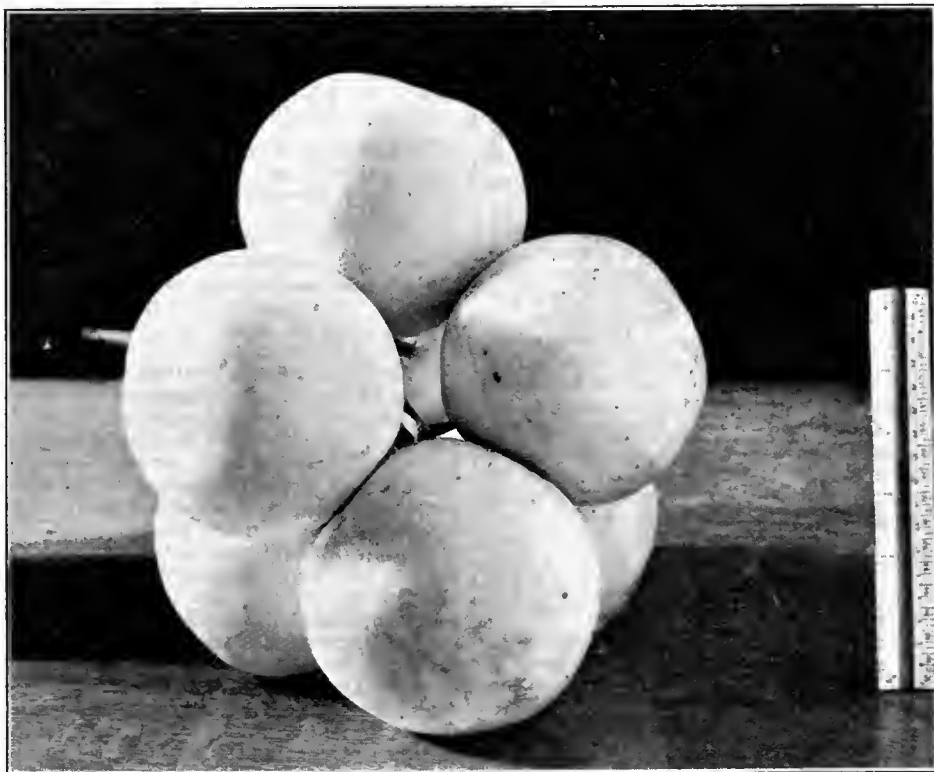
The Marsh Seedless is the favored variety, representing approximately 70 per cent of the plantings. Duncan, Foster, and Wolters are the seeded varieties, and both Foster and Marsh Pinks are being planted extensively. Valencias, Pason Browns, Pineapple, and Temples are the favored varieties for the orange plantings.

Lower Rio Grande Valley grapefruit is in heavy demand in the central markets, owing to its fine flavor and high sugar content. The sizes are approximately the same as the Florida and California varieties. The distinctive flavor is believed to be due to the long summer season, equable temperature, and high fertility of the soil, which requires no fertilizer under ordinary conditions though many growers are beginning to use fertilizer in small quantities with excellent results.

Shipments from the valley in 1927-28, comprising the fruit of the earliest plantings, totaled 1,600 cars, and were increased to 2,200 cars in the 1928-29 season, closing April 1. According to estimates based on plantings, the 1929-30 shipments will be approximately 5,000 cars, with an increase of 10,000 cars in 1930-31. The present acreage will not come into full bearing for five years, indicating that the 1934-35 movement of citrus fruits will range between 25,000 and 30,000 cars.

The extent to which the citrus-fruit industry may be developed in the lower Rio Grande Valley depends entirely upon consumption and development of markets. Approximately 75,000 acres have been planted. Citrus fruit can, however, be grown on practically all lands in the valley, which now has over 350,000 acres producing citrus, winter vegetables, and staple crops under irrigation.

Practically all major development projects under way in the lower border county country are devoted almost exclusively to citrus fruits. During the past year four additional irrigation projects have been organized in Cameron County and two in Hidalgo, and the major part of the new acreage will be planted to fruit within two years.



Grapefruit (Duncan variety) grown in orchard of L. B. Mayer, San Benito, Tex., Lower Rio Grande Valley

Legislation Relating to the Federal Irrigation Projects

Town Sites

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is hereby authorized, in his discretion, to appraise and sell, at public auction, to the highest bidder, from time to time, for cash, any or all of the unplatted portions of Government town sites created under the act of April 16, 1906 (Thirty-fourth Statutes, page 116), on any irrigation project constructed under the act of June 17, 1902 (Thirty-second Statutes, page 388), or acts amendatory thereof or supplementary thereto; Provided, That any land so offered for sale and not disposed of may afterwards be sold, at not less than the appraised value, at private sale, under such regulations as the Secretary of the Interior may prescribe. Patents made in pursuance of such sale shall convey all the right, title, and interest of the United States in or to the land so sold.

SEC. 2. The net proceeds of such sales after deducting all expenditures on account of such lands, and the project construction charge, for the irrigable area of the lands so sold where irrigation or drainage works have been constructed or are proposed to be constructed, shall be disposed of as provided in Subsection I of section 4 of the act of December 5, 1924 (Forty-third Statutes, page 672). Where the project construction charge shall not have been fixed at the date of any such sale same shall be estimated by the Secretary of the Interior.

SEC. 3. Reclamation funds are authorized to be appropriated for use in defraying the necessary expenses of appraisal and sale of the lands herein authorized to be sold, and the Secretary of the Interior is authorized to perform any and all acts and to make such rules and regulations as, in his opinion, may be necessary and proper for carrying out the purposes of this act.

Approved, March 2, 1929.

Compacts or Agreements for Water Apportionment

ARKANSAS RIVER

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the States of Colorado, Oklahoma, and Kansas to negotiate and enter into compacts or agreements providing for an equitable division and apportionment between such States of the water supply of the Arkansas River and of the streams tributary thereto and of all other streams in which such States are jointly interested.

SEC. 2. Such consent is given upon condition that a representative of the United States from any department of the United States Government, to be appointed by the President, shall participate in the negotiations and shall make report to Congress of the proceedings and of any compact or agreement entered into. Other than the compensation and expenses of such representative the United

States shall not be liable for any expenses in connection with such negotiations, compact, or agreement. The payment of such expenses of such representative is authorized to be paid from the appropriations for cooperative and general investigations for the Bureau of Reclamation.

SEC. 3. No such compact or agreement shall be binding or obligatory upon either of such States unless and until it has been approved by the legislature of each of such States and by the Congress of the United States.

SEC. 4. The right to alter, amend, or repeal this act is herewith expressly reserved.

Approved, March 2, 1929.

GILA AND SAN FRANCISCO RIVERS

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the States of New Mexico and Arizona to negotiate and enter into compacts or agreements providing for an equitable division and apportionment between such States of the water supply of the Gila and San Francisco Rivers and of the streams tributary thereto and of all other streams in which such States are jointly interested.

SEC. 2. Such consent is given upon condition that a representative of the United States from the Department of the Interior, to be appointed by the President, shall participate in the negotiations and shall make report to Congress of the proceedings and of any compact or agreement entered into. Other than the compensation and expenses of such representative the United States shall not be liable for any expenses in connection with such negotiations, compact, or agreement. The payment of such expenses of such representative are authorized to be paid from the appropriations for cooperative and general investigations for the Bureau of Reclamation.

SEC. 3. No such compact or agreement shall be binding or obligatory upon either of such States unless and until it has been approved by the legislature of each of such States and by the Congress of the United States.

SEC. 4. The right to alter, amend, or repeal this act is hereby expressly reserved.

Approved, March 2, 1929.

CIMARRON RIVER

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the States of New Mexico and Oklahoma to negotiate and enter into compacts or agreements providing for an equitable division and apportionment between such States of the water supply of the Cimarron River and of the streams tributary thereto and of all other streams in which such States are jointly interested.

(Secs. 2, 3, and 4 same as in preceding act.)

Approved, March 2, 1929.

RIO GRANDE, PECOS, AND CANADIAN OR RED RIVERS

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the States of New Mexico, Oklahoma, and Texas to negotiate and enter into compacts or agreements providing for an equitable division and apportionment between such States of the water supply of the Rio Grande, Pecos, and Canadian or Red Rivers, and of the streams tributary thereto, and of all other streams in which such States are jointly interested.

(Secs. 2, 3, and 4 same as in preceding act.)

Approved, March 2, 1929.

RIO GRANDE, SAN JUAN, AND LAS ANIMAS RIVERS

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the States of Colorado and New Mexico to negotiate and enter into compacts or agreements providing for an equitable division and apportionment between such States of the water supply of the Rio Grande, San Juan, and Las Animas Rivers and of the streams tributary thereto and of all other streams in which such States are jointly interested.

(Secs. 2, 3, and 4 same as in preceding act.)

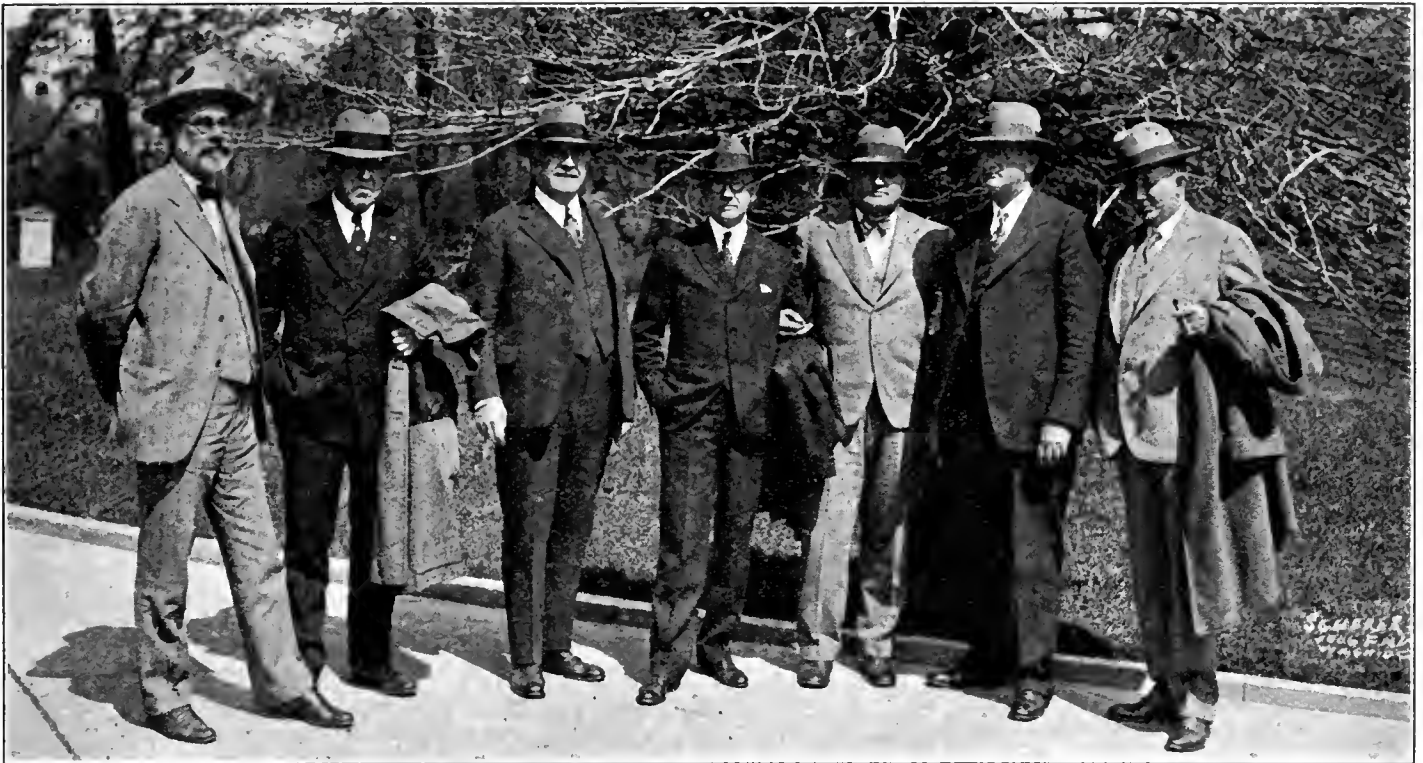
Approved, March 2, 1929.

Construction Credits, Yuma Project

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act entitled "An act to authorize credit upon the construction charges of certain water-right applicants and purchasers on the Yuma and Yuma Mesa auxiliary projects, and for other purposes," approved June 28, 1926, be amended so as to read as follows:

"That the Secretary of the Interior be, and he is hereby, authorized and directed to credit the individual water-right applicants on the Yuma reclamation project and the purchasers of water rights on the Yuma Mesa auxiliary project, on the construction charges due under their contracts with the United States under the Reclamation act and acts amendatory thereof and supplementary thereto, with their proportionate part of all payments heretofore made or hereinafter to be made by the Imperial irrigation district of California under contract entered into under date of October 23, 1918, between the said district and the Secretary of the Interior: *Provided*, That lands in the Yuma Indian Reservation for which water rights have been purchased shall share pro rata in the credits so to be applied: *Provided further*, That where construction charges are paid in full said payments shall be credited on operation and maintenance charges assessed against the lands to which said payments would otherwise apply."

Approved, February 26, 1929.



SOUTHERN DEVELOPMENT COMMITTEE

Left to right: David R. Coker, South Carolina; J. M. Patterson, Georgia; Rutledge Smith, Tennessee; Hugh MacRae, North Carolina; Burdette G. Lewis, Florida; R. E. Lambert, Alabama; L. O. Crosby, Mississippi

Southern Development Committee Confers

The accompanying illustration shows the members of the Southern Development Committee who conferred with President Hoover and Secretary of the Interior Wilbur during March and with Secretary of Agriculture Hyde early in April on plans for a continuation of work by the Bureau of Reclamation on planned group settlements in the South.

Dr. E. C. Branson, of the University of North Carolina, was also with the committee when calling on the President. H. H. Frasier, of Alabama; Mr. Gwinn, of the J. C. Penny-Gwinn Corporation; Mr. Patterson, Mr. MacRae, and Mr. Coker made up the committee of five who conferred with Secretary Hyde.

Reclamation Engineers Guests of A. S. C. E.

The engineers of the Bureau of Reclamation attending the Denver office conference were guests at the regular meeting of the Colorado Section of the American Society of Civil Engineers at the University Club in Denver on March 13, at which the commissioner spoke on the Colorado River development and construction of the Boulder Canyon Dam;

and papers were presented on the subject of Better Concrete and How to Obtain It, by various engineers of the bureau, including B. W. Steele, Denver office; W. R. Young, Kittitas division; F. A. Banks, Owyhee project; Ralph Lowry, Gibson Dam; H. J. Gault, Stony Gorge Dam; and F. F. Smith, Echo Dam.

Rio Grande Project Industrial Development

The El Paso Post stated in a recent issue that Tornillo, on the Rio Grande project, is an example of what energetic

and enterprising farmers can accomplish. It is a manufacturing village, made so by the farmers in that neighborhood. It is easily located by a large cotton gin and oil mill on one side of the railroad track and a big feed-grinding mill and cattle-feeding pens on the other. All these are exclusively farmer owned. They have been developed into a big, prosperous, and thriving business.

"The feeding pens not only turn out fattened stock but fertilizer is hauled from these back to the farms. Near the grinding mill once stood an immense stack of cotton stalks and another of milo maize from the Panhandle. The two were ground up with alfalfa and the mixture sweetened with molasses, thus making a choice cattle-fattening feed.

"The profits this year of the 100 per cent farmer-owned-and-operated mill are expected to amount to 50 per cent on the investment, notwithstanding the fact that the mill was two months late in starting. The profits will be expended in enlarging and improving the plant. It was a \$30,000 mill to start with. The plan is to make it a \$60,000 enterprise. The capacity is 50 tons per day. In the beginning, to show their faith in the proposition, three Tornillo farmers signed an obligation of \$75,000 to a bank to put the mill over. There were 29 stockholders in the mill originally. There were just that many farmers in the Tornillo section when the mill was launched."

New Map Available

A new map of the Boise project, Idaho, has been issued recently by the Bureau of Reclamation. In addition to canals, laterals, and drains, 12 irrigation districts, in distinctive patterns, are shown on the map. Views of the Arrowrock, Black Canyon, and Boise diversion dams are also included. The size of this map (No. 21900) is 26 by 37 inches, and the sale price has been fixed at 25 cents a copy.

Reclamation Organization Activities and Project Visitors

DR. Elwood Mead, commissioner, gave a talk on April 9 before the Board of Surveys and Maps, a coordinating agency of the Federal Government, on the relation of surveying and mapping to the Boulder Canyon development.

R. F. Walter, chief engineer, arrived at the Washington office on April 19 to confer with the commissioner on Boulder Canyon, the budget, and other matters.

J. B. Bonny, president, and J. M. Bruce, vice president of the Derbon Construction Co., were recent visitors on the Minidoka gravity extension unit.

Tom A. Clark, assistant engineer, and C. C. Ketchum, associate engineer, were detailed temporarily to the Denver office to assist in the preparation of specifications for advertising for bids for the construction of the next 16.3 miles of the Vale main canal.

Dr. J. J. Sarazin, president of the Owyhee Irrigation District, and W. F. Davidson, of the Oregon and Western Colonization Co., visited the Owyhee Dam site recently.

I. D. O'Donnell, of Billings, Mont., spent several days on the Milk River project assisting the Utah-Idaho Sugar Co. in obtaining crop contracts. Other visitors to the project included C. C.

Carey, of Winston Bros. Co., Minneapolis; Scott Hart, district engineer, State Highway Commission; and C. D. Greenfield, agricultural development agent of the Great Northern Railway.

Dana Templin, associate engineer, who has been connected with the American Falls office for several years, has been assigned to duty at the Burley office, Minidoka project.

Recent visitors on the Minidoka project included A. J. Wiley, consulting engineer, of Boise; F. A. Banks, construction engineer, Owyhee project; and B. E. Stoutemyer, district counsel.

L. N. McClellan, electrical engineer from the Denver office, spent two days on the Orland project in connection with the electrical installation at Stony Gorge Dam.

Governor Weaver has appointed a committee on irrigation to inquire into interstate water rights and appropriations in Nebraska. The committee comprises R. H. Willis, chief of irrigation, power, and drainage, Bridgeport, Nebr.; H. F. Parsons, of Scottsbluff, Nebr., manager of the Farmers' Irrigation District, to represent the water users in the upper territory; and J. C. McNamara, of North Platte, Nebr., to represent the users in the lower territory.

H. Kenneth Smith, assistant engineer, who for the past eight months has been engaged in making surveys and studies of storage possibilities on the lower Rio Grande for the State Department, has returned to the Klamath project.

Recent visitors on the Yuma project included George Joel Harris, Assistant Commissioner General of Immigration; C. S. Seofield, principal agriculturist in charge, Western Irrigation Agriculture; Prof. G. E. P. Smith, irrigation engineer, University of Arizona; L. M. Lawson, chairman, International Boundary Commission; G. H. Flebbe, president, Hollywood Corporation; and A. L. Sonderegger, consulting engineer, Los Angeles.

Watson W. Snyder, chief dragline operator, has been transferred from the Yuma project to the Sun River project.

Bennett B. Hill, instrument man, has been transferred from the Boise to the Minidoka project.

F. R. McMillan, director of research of the Portland Cement Association, Chicago, spent two days recently in the Washington office studying feature reports and project histories relating to Reclamation Bureau structures. Mr. McMillan, who had charge of important construction work on the Sunnyside division of the Yakima project during 1907-1909 is planning to visit a number of reclamation projects this summer in the course of a western trip undertaken in the interest of the association for the purpose of studying the factors affecting the permanence of concrete structures.

C. A. Bissell, Chief of the Engineering Division of the Washington office, represented the bureau at a meeting of Committee C-1 of the American Society for Testing Materials, on cement specifications, held at the Bureau of Standards April 18.

Albert Paddock, superintendent of construction on the Gibson Dam, Sun River project, was killed recently by being struck by another workman who lost his balance and fell from a height of about 100 feet, striking Mr. Paddock, who was working about 60 feet below him. Mr. Paddock was a former employee of the Bureau of Reclamation.



Threshing alfalfa seed, Valley Division, Yuma project, Arizona

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

Jos. M. Dixon, First Assistant Secretary; **John H. Edwards**, Assistant Secretary; **E. C. Finney**, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary and Budget Officer;
Northcutt Ely and **Ernest W. Sawyer**, Executive Assistants

Washington, D. C.

Etwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner P. W. Dent, Assistant Commissioner George C. Krutzer, Director of Reclamation Economics
W. F. Kurbach, Chief Accountant C. A. Bissell, Chief of Engineering Division Hugh A. Brown, Assistant Director of Reclamation Economics
C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent;
C. A. Lyman, Fiscal Inspector.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....	J. P. Siebeneicher.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	W. L. Vernon.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	W. J. Chiesman.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....	.....	.....	.....	.....
King Hill ³	King Hill, Idaho.....	F. L. Kinkade.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	D. S. Stuver.....	.....	.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.....	Joe C. Iddings.....	.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Owyhee, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	Henry H. Berryhill.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁸	Phoenix, Ariz.....	C. C. Cragin.....	.....	.....	.....	.....
Shoshone ⁹	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah.....	Lee R. Taylor.....	.....	.....	.....	.....
Sun River ¹¹	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹²	Irrigon, Oreg.....	A. C. Houghton.....	.....	.....	.....	.....
Uncompahgre.....	Hermiston, Oreg.....	Enos D. Martin.....	.....	.....	.....	.....
Uncompahgre.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Vale.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyen.....	C. M. Voyen.....	B. E. Stoutemyer.....	Portland, Oreg.
Yakima.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
Yuma.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹³	C. F. Williams.....	.....	J. R. Alexander.....	Montrose, Colo.
Kititas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gibson Dam.....	Augusta, Mont.....	Ralph Lowry ¹³	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Sun River, Main Canal Construction.....	Fairfield, Mont.....	A. W. Walker ¹³.....	.....	.....	do.....	Do.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.
² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.
⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928.
⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Paradise-Verde district investigations.....	Phoenix, Ariz.....	J. R. Iakisch.....	Salt River Valley Water Users' Association.
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	.....
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	.....
Yakima project extensions.....	Yakima, Wash.....	P. J. Preston.....	.....



58 ACRES IN SUGAR BEETS ON THE MILK RIVER PROJECT. MONTANA

NEW RECLAMATION ERA

VOL. 20

JUNE, 1929

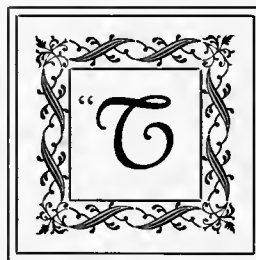
NO. 6



CONSTRUCTION PROGRESS ON 405-FOOT OWYHEE DAM

LEFT TO RIGHT; DIVERSION AND SPILLWAY TUNNEL READY TO LINE; OUTER COFFERDAM FLOODED; TRESTLE FOR LOWER COFFERDAM FINISHED AND JETTY PILES BEING DRIVEN

A Prophecy Fulfilled



THE reclamation and settlement of the arid lands will enrich every portion of our country, just as the settlement of the Ohio and Mississippi Valleys brought prosperity to the Atlantic States.

The increased demand for manufactured articles will stimulate production, while wider home markets and the trade of Asia will consume the larger food supplies and effectually prevent Western competition with Eastern agriculture. Indeed the products of our irrigation will be consumed chiefly in upbuilding local centers of mining and other industries, which would not otherwise come into existence at all. Our people as a whole will profit, for successful homemaking is but another name for the upbuilding of the nation.''

THEODORE ROOSEVELT

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

Price, 75 cents a year

RAY LYMAN WILBUR
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

June, 1929

No. 6

Interesting High Lights on the Federal Reclamation Projects

THE area contracted to be planted to sugar beets on the Minidoka project amounts to about 5,600 acres, of which 2,400 acres are on the north side and 3,200 acres on the south side. Last year the total area in this crop was only 1,733 acres.

THE large hatchery at Loving on the Carlsbad project sold 15,000 baby chicks during the month to water users on the project and to the outside trade.

THE monthly report of the Mini-Cassia Cow Testing Association, now known as the Mini-Cassia Dairy Herd Improvement Association, shows that first place was won by Robert Girardell, of Rupert, Idaho, on the Minidoka project, whose registered Holstein cow produced 2,427 pounds of milk and 82.5 pounds of butterfat in April.

THE 30-piece band of the Irrigation School, West Extension Irrigation District, Umatilla project, entered a state-wide contest in Portland, Oreg., on May 11. A remarkable feature of this band is that out of a total enrollment of 42 in the high school and the last four grades of the grade school, 32 are members of the band, and 3 more will be members by the time school closes this summer.

THE Oregon Packing Co. has announced plans for the erection of a cannery on the Yakima project costing \$50,000, to use 6,000 tons of pears and employ 900 people for five months.

S. M. COLBY, a water user in the reservation division of the Yuma project, has shipped more than 3,000 crates of strawberries from the first picking of this season's crop from a 12-acre patch. It is expected that the second crop will produce over 2,500 crates.

NINE Holstein bulls have been purchased by the Burley-Deleo Bull Association, Minidoka project, nearly all of them coming from farms in Washington and Oregon. They are all descendants of or related to a cow that for two years is reported to have been champion milk and butterfat producer of the United States, with a record of 1,432 pounds of butterfat in one year.

THE advertising committee of the Vale-Owyhee Government Projects Settlement Association is preparing data for a booklet descriptive of the Vale and Owyhee projects, for distribution to prospective settlers.

THE Montrose Junior Band, made up of boys and girls from the high school and grade school of Montrose, Uncompahgre project, and numbering about 70 pieces, won the first prize in Class A competition at Grand Junction on April 28, over 16 bands located on the western slope of Colorado. The band will compete in the national contest at Denver, May 23 to 25.

THE Central Pacific Railway has started laying track from Klamath Falls, and at the end of the month had laid track to a point about two miles west of Merrill, Oreg.

THE Belle Fourche Commercial Club and the Izaak Walton League are working on a program to beautify the shores of Orman Reservoir, Belle Fourche project. Contributions from the various towns are being solicited with a view to constructing laterals to take out of the supply canal and lead water around the shore line for several miles. The planting of trees and shrubs will be extended over several years.

A REPRESENTATIVE of the Holly Sugar Co. spent several days on the Klamath project and arranged for the growing of 40 acres of sugar beets for demonstration purposes. These demonstrations are being made in or adjacent to the Tule Lake division.

WITH the grading of 4 acres completed for the recreation park at Lahontan reservoir, Newlands project, and with trees being planted, the improvements are beginning to show promise of the bathing resort planned by the State Fish and Game Commission.

THREE prizes offered by the El Paso Chamber of Commerce for the greatest cotton production per acre in 1928 were won by farmers in the vicinity of Fabens, Rio Grande project. The first prize of \$300 went to B. C. Breeding, who raised 3.6 bales per acre. A. E. Ross was second, with 3.2 bales, and Charles Miller, third, with 2.4 bales.

WHAT is stated to be the largest export deal in boxed apples from the Pacific Northwest was consummated recently by a telephone conversation between a cold storage company on the Yakima project and a London firm. The Yakima concern will furnish 400 to 500 carloads of apples and pears a season under a 3 year contract involving \$650,000 annually.

TWO cooperative marketing organizations were formed recently on the Orland project. A permanent organization was effected of the Gless County Turkey Growers Association, as one of seven county cooperative units in the Sacramento Valley. Articles of incorporation have been filed by the Glenn County Prune and Apriect Growers.

Economic Survey of Certain Reclamation Projects

PLANS have been made for an economic survey of reclamation this summer, beginning shortly after the middle of June. The following letter, recommending the survey and outlining its scope, was sent by Commissioner Mead to Secretary Wilbur on April 8 and approved by him on April 10:

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D. C., April 8, 1929.

The SECRETARY OF THE INTERIOR.

DEAR MR. SECRETARY: It is planned, with your approval, to make an economic survey of reclamation during the coming summer, using for this purpose certain Federal projects where works are completed, others where works are being constructed, and certain private projects in financial distress where Government aid is asked. The proposed survey would commence in June of this year. The field work would continue for about a month, and be followed by an analysis of the data collected and the preparation of a report, to be submitted to you about the 1st of September. The following are the reasons for the proposed survey:

There is general agreement that the engineering operations of the Bureau of Reclamation are well conceived and capable carried out, but we are still drifting with regard to the economic principles and policies which should govern our conclusions as to feasibility or shape development of projects. Reclamation requires more than canals and reservoirs. The qualifications of settlers, the kind of agriculture which should be followed, and in general, those factors which determine earning power and well-being and contentment of the people of the communities created are as important as the engineering factors.

The results on a majority of the Federal reclamation projects fully justify the national policy. A great wealth in land has been created, farmers are prosperous, and the payments required under the contracts are being made, but there are other projects where development has been slow, where settlers are struggling in all stages of discouragement and hardship, and where delinquency in payments has been an inevitable result.

The making of this investigation at an early date is regarded as desirable because on backward projects a large percentage of the farms are either not irrigated or are poorly cultivated, with such low returns as to create grave doubt as to whether the contract obligations to the Government can be met. The data which it is pro-

posed to gather will be most helpful in determining what can and should be done to improve conditions and in aiding Congress in enacting desirable legislation.

The field of these studies would include the Stanfield and Westland districts in Oregon; the Bitter Root district in Montana; the Gem and Emmett districts and the King Hill project in Idaho; the Orchard Mesa division of the Grand Valley project in Colorado; the Shasta View district of the Klamath project, Oregon-California; the Owyhee project, Oregon-Idaho; the Northport division of the North Platte project, in Nebraska and Wyoming; the Sun River, Milk River, and Lower Yellowstone projects in Montana; the Willwood division of the Shoshone project in Wyoming. The economic data on the Stanfield and Westland districts have already been gathered. Much information has been submitted on the King Hill project in Idaho.

A large part of the field work would be done by members of the staff of the Reclamation Bureau. It would be under the direction of George C. Kreutzer, director of Reclamation Economics, assisted by H. A. Brown, assistant director; B. E. Hayden, reclamation economist; and W. W. Johnston, associate reclamation economist. There would be detailed to this work L. H. Mitchell, superintendent of the Shoshone project; H. H. Johnson, superintendent of the Milk River project; G. O. Sanford, superintendent of the Sun River project; and B. E. Stoutemyer, district counsel, Portland, Oreg. These employees would receive their regular salaries, with an allowance for travel and living expenses while detailed to this work.

In addition, it is desired to employ three economic experts having no connection with the Bureau of Reclamation, and who would therefore bring to the study of these questions an outside and detached viewpoint. For these positions I recommend Dr. Alvin Johnson, assistant editor, Encyclopaedia of Social Science, New York; Prof. Frank Adams, of the University of California; and one other, to be selected later. These three would be paid at the rate of \$25 a day, together with traveling expenses and \$6 per diem in lieu of subsistence.

It is planned to hold a preliminary conference at Billings, Mont., of those who are to take part in the gathering of data in the field, at which I plan to be present and outline more definitely the scope and purpose of the survey. About August 1, the investigators and those

who are to assist in the preparation of the report will meet in Denver.

At this final conference, we can, if we desire, have the assistance of Dean Marston, of the School of Engineering, Iowa State College; Charles L. Lory, president of the Colorado Agricultural College; and J. W. Haw, director of agricultural development of the Northern Pacific Railway. President Lory and Mr. Haw are recognized authorities on reclamation economics in their States. Dean Marston is this year president of the Associated Agricultural Colleges and of the American Society of Civil Engineers. It is not believed that these men would expect any salaries, but provision should be made to pay their living and traveling expenses.

An outline of the facts to be gathered is attached. The sum of \$75,000 is available for economic investigations in 1929 and 1930. It is believed that the cost of the survey proposed would not exceed \$30,000.

If approved, arrangements for this survey will begin in the near future.

Respectfully,

ELWOOD MEAD,
Commissioner.

Approved April 10, 1929.

RAY LYMAN WILBUR,
Secretary.

OUTLINE OF ECONOMIC SURVEY OF PROJECTS, 1929

1. History:

(a) When was the project first investigated by the Government, under what impetus was such examination made, and what assurances were given of settlement and early development of the district?

(b) Were any agreements entered into before construction began providing for repayment of the cost of the work? If not, when?

(c) How were the lands held—Government, State, or private ownership?

(d) When did settlement of the lands begin and what prices and terms were asked for private lands?

(e) When did irrigation begin and what were the charges—for construction, for operation and maintenance?

(f) What has been the record of payments?

(g) Have amendments to contract been sought? If so, on what grounds?

(h) What amendments, if any, have been made, and what relief granted?

2. Present economic and agricultural conditions of project:

(a) How is land held now, and who constitutes the nonresident owners?

(b) What is irrigable area of project?

(c) What kind of crops are grown and value of each per acre?

(d) What is ability of land to produce such crops under proper methods of culture?

(e) What is character of cultivation and reasons therefor?

3. Determine facts relating to resident farmers as follows:

(a) Capability and experience.

(b) First cost of farm, remaining indebtedness, rate of interest, and terms of payment of balance.

(c) Amount of other indebtedness and rate of interest charged?

(d) Character and value of buildings, farm equipment, and other improvements.

(e) Credit required to properly equip the farm.

(f) Kind of farming now practiced and changes that should be made.

4. What is most suitable size of holding for average farmer adequately financed?

5. What prices are asked for raw land, payment down, terms, and interest rate?

6. Is there a present demand for land? If so, what cooperation may be expected from present owners and local capital in the preparation of farms for occupancy?

7. What capital is required to develop new land?

(a) Cost of land.

(b) Cost of leveling and ditching.

(c) Cost of buildings, fences, and domestic water supply.

(d) Cost of farm equipment.

8. What sources of credit are available or could be made available for development of the district—at what rate of interest?

9. What is location and extent of markets available to the district?

10. What transportation facilities exist? Are they favorable for rapid development of the project?

11. What are the financial obligations of the district with reference to—

(a) Bonded indebtedness and other outstanding obligations of the district—total and per acre?

(b) Contracted obligations with the Government and annual payments required?

(c) Per acre and total cost of operation and maintenance?

(d) Per acre assessment for State and county taxes?

12. Concessions that must be made by creditors of district before conditions can become stabilized.

The investigators of the projects to be studied have been assigned as follows:

Northport division, North Platte project, Nebraska-Wyoming, and Riverton project, Wyoming, Dr. Alvin Johnson, of New York.

Willwood division, Shoshone project, Wyoming, B. E. Hayden, reclamation economist.

Lower Yellowstone project, Montana-North Dakota, L. H. Mitchell, superintendent of the Shoshone project.

Sun River project, Montana, H. H. Johnson, superintendent of the Milk River project.

Milk River project, Montana, and Bitter Root project, Montana, G. O. Sanford, superintendent of the Sun River project.

Gem Irrigation District, Emmett Irrigation District, and King Hill project, Idaho, W. W. Johnston, associate reclamation economist and B. E. Stoutemyer, district counsel.

Orchard Mesa Irrigation District, Grand Valley project, Colorado, and Shasta View Irrigation District, Klamath project,

Oregon-California, Prof. Frank Adams, of the University of California.

Owyhee project, Oregon-Idaho, A. C. Cooley, in charge of demonstration on reclamation projects, and B. E. Stoutemyer.

The investigators will also have the advice and assistance of representatives of the Federal land banks and of the agricultural colleges in the States in which the projects are located.

George C. Kreutzer, director of reclamation economics, will be in general charge of the investigation, and will visit all the projects in the course of the survey.

All the investigators will have a preliminary meeting at Billings, Mont., on June 18 for a general discussion and to insure uniformity in the collection and compilation of data, leaving immediately after the meeting to take up their respective assignments.

Reclamation and the Surplus

Extract from a radio address on May 6, 1929, by R. J. Newell, Superintendent, Boise project, Idaho

MANY of our friends in the East and the Mississippi Valley and, perhaps, ever closer at hand, believe that it might be better if Government reclamation should stop. They claim that bringing more land into cultivation can only increase surpluses of farm produce and add to agricultural depression.

I don't believe it. A reclamation project as a unit is a consumer rather than a producer. For instance, the Boise project represents half the Boise Valley. Our good friend Joel Priest will bear me out that more freight is shipped into the Boise Valley than is shipped out. The more farms in Idaho, the more towns and industries. The more Idaho grows, the more men are needed in Detroit to keep us supplied with Fords and the more corn and pork and vegetables Iowa will have to raise to feed these men in Detroit and Pittsburgh and all the other centers where goods are manufactured and shipped to our arid States.

The bulk of our produce doesn't go East to compete with Mississippi Valley. It goes West. And the very fact that the intermountain country is alive and growing and furnishing business to the railroads between their terminals makes it possible for these railroads to grant better through rates from the Mississippi Valley to the coast. It is to Iowa's advantage to see the Mountain States grow:

And it is to our local advantage to expand and irrigate more land.

Nearly 50 years ago when irrigation in Boise Valley covered only a strip along the river bottom, the building of the first canal to the top of the first bench south of the river brought consternation to the older settlers around Star. "There won't be water enough and if there is, there will be so much hay we won't be able to sell it." There is 20 times as much land irrigated now and we are better off than we were then. The water doesn't get any shorter and hay is easier to sell. The towns grow faster than the farms. And marketing facilities keep pace with the need. I firmly believe that funds wisely spent under the reclamation law benefit both the reclamation States and the Nation.

Proceedings of Denver Conference Available

The proceedings of the conference of reclamation officials, held in Denver, Colo., on March 13-15, 1929, have been mimeographed and distributed to the projects. A few copies are still available and may be obtained on request of the Commissioner, Bureau of Reclamation, Washington, D. C.

ACARLOAD of eggs was shipped recently from Sidney, Lower Yellowstone project, by the Mandan Creamery Co. This is notable as it is the first time a full carload of eggs has ever been shipped from the project.

The Relation of Maps and Surveys to the Boulder Dam Project

By Dr. Elwood Mead, Commissioner, Bureau of Reclamation

Presented before the Board of Surveys and Maps on April 9, 1929

THE importance of maps in planning works to utilize the Colorado River has been enhanced by the fact that for the first time we are not building for today but laying the foundations of a civilization under which unnumbered generations will dwell. That is a new conception. It owes its development to the fact that all States interested in the Colorado realize that Boulder Dam Reservoir will regulate and enable the entire flow of the river to be used for power, domestic uses, and irrigation. Doing that would establish a perpetual right to continue those uses. If, therefore, there is no law limiting the rights created by these works, the upper States would either cease development or use water at the pleasure of the holders of the prior right below. That was not satisfactory to the upper States. Their mountains collect the snows that make the river. They have fertile valleys that can be irrigated. They need more farms and towns and to create them they must have an unquestioned right to use a part of the river's flow.

To protect the upper States, representatives of the seven States met at Santa Fe, N. Mex., to frame a compact which would allocate the waters of the river. These representatives reached an agreement. They considered the future water needs of each State and sought to allocate to each State the water to meet those needs. This was done by dividing the drainage area into two sections, the dividing line

in the river to be at Glenn's Ferry. Four States, Wyoming, Utah, Colorado, and New Mexico, are in the upper section. Three, Nevada, Arizona, and California, are in the lower. The four upper States were given a right to 7,500,000 acre-feet, the three lower States were given 7,500,000 acre-feet, and 1,000,000 acre-feet was left unallocated.

To become a law it was agreed that this compact should be ratified by each of the seven States and by Congress. Six States have ratified. Arizona has not, but Congress in passing the Boulder Dam act declared that it would go into effect if six States ratified and that rights to water of the seven States should be as fixed in the compact. The act also makes a division of the water allocated to the three lower States.

I have made this explanation to show why maps have an extraordinary importance in carrying out this legislation. California has been allocated 4,400,000 acre-feet. Every locality where the water can be used wants a survey to show where and how it can be made available.

Nevada is asking for surveys and plans. In Arizona a large area of public land has been withdrawn from settlement. Some of it has never been surveyed. Now it will be. The four upper States are talking and thinking of how much of the 7,500,000 acre-feet allocated to them collectively each will need and where it ought to be used. Only surveys will tell this,

and surveys are being asked for. The legislature of Utah and, I believe, Colorado, have passed the following resolutions:

TO THE SECRETARY OF THE DEPARTMENT OF THE INTERIOR:

Your memorialists, the Governor and Legislature of the State of Utah respectfully represent that—

Whereas by the terms of the Colorado River compact 7,500,000 acre-feet of water annually are allocated to the State of Wyoming, Colorado, Utah, and New Mexico in perpetuity for their beneficial consumptive use; and

Whereas there will eventually be required a subsidiary compact between the States of Wyoming, Colorado, Utah, and New Mexico to divide the 7,500,000 acre-feet among the said States; and

Whereas such division can not be intelligently or equitably made until a survey is had to determine the number of acres in each of said States susceptible of reclamation by means of water from the Colorado River system, and classifying such lands as to their probable relative productivity, and making a soil survey if necessary; and

Whereas the Boulder Canyon project act, approved December 21, 1928, contemplates an eventual, comprehensive development of the entire Colorado River Basin; and

Whereas no comprehensive plan of development can be adopted until by means of a survey and classification of the reclaimable lands in each of the States of the Colorado River Basin, their potentialities have been accurately determined; and

Whereas the unreclaimed land in the Colorado River Basin is nearly all the property of the United States, over which the States have no control;

Therefore your memorialists, the Governor and the Legislature of the State of Utah, respectfully request and urge that the Department of the Interior forthwith begin and as rapidly as possible prosecute to completion a complete survey and classification, making a soil survey if deemed necessary, of the agricultural lands situated in the Colorado River Basin in the States of Wyoming, Colorado, Utah, and New Mexico.

The governor is hereby directed to transmit a copy of this joint memorial to the Secretary of the Interior, to each Senator and Representative in Congress from this State, and to the Governors of the States of Wyoming, Colorado, and New Mexico, with a request that they and their legislature join in this petition.

Meantime an active demand for maps has sprung up. Two thousand copies of a large colored map showing the reservoir sites and the irrigated and possible irrigable areas were printed by the Reclamation Bureau. They are all distributed and another 2,000 are being printed.



Irrigated sugar beets, Minidoka project, Idaho

Smaller maps in larger numbers have been distributed.

A new aid to understanding the country is the aerial map. We have had one made of Boulder Canyon and find it helpful in scheming how to get in and out of the canyon where the dam is to be built.

Among the requests coming in for definite and permanent allocations of water for uses not now in existence, that of the city of Denver best illustrates the need for long-time planning. The representatives of the water supply department of this city state that Denver has all the water it needs for its present population, and probably all it will need for the next 25 years, if it has only a gradual growth, but ultimately it is destined to be one of the largest cities of the Rocky

Mountain region, and that means a city of half a million or more people. When that time comes it will be necessary to go over on the other side of the main range and tap the Colorado. Provision for doing this should be made now, so that when the time does come when the needs of Denver justify the long tunnel required, the city will not be subjected to the additional expense of buying the rights acquired in the meantime.

Throughout the whole basin of the Colorado there is an awakening to the fact that as population increases and civilization advances, the value of this water supply will grow and the struggle over its control will increase in like measure. Since the movement began to build a reservoir to protect the Imperial

Valley from inundation, the growth of Southern California has brought to the people not alone of the cities but of the country a realizing sense that the time is not far distant when a further increase in farms, homes, and factories will depend on an increased water supply. That can come from but one source and that is the Colorado River. The enormous outlay which must be made to build an aqueduct nearly 300 miles long renders it imperative that it have the right dimensions and that this section of the country acquire an interest in the stored water adequate to meet future development. That means maps for the aqueduct line, maps to show the areas of land, the further extension of cities, topography, and differences in soils.

The Colorado River: Explorations, Investigations, and Reports

A Brief Chronology

By W. I. Swanton, Engineer, Washington Office

IN view of the widespread interest in the construction of Boulder Dam and the development of the Colorado River Basin, the following brief chronology of explorations and investigations of and reports on the Colorado River has been prepared for the information of readers of the NEW RECLAMATION ERA:

- 1539. Francisco de Ulloa discovered mouth of Colorado.
- 1540. Hernando de Alarcon sailed up the Colorado above the Gila.
Melchior Diaz explored the Colorado.
- 1540-1542. Coronado expeditions marched along rim of Grand Canyon.
- 1542. Don Lopez de Cardenas discovered the Grand Canyon.
- 1605. Juan de Onate went down the Colorado from Williams River to Gulf.
- 1618. Zalvidor and Padre Jeminez visited Marble Canyon.
- 1680-1711. Eusibio Francisco Kino made expeditions to Colorado.
- 1721. Ugarte visited mouth of Colorado.
- 1744. Jacobo Sedelmair visited the Gila and the Colorado at Williams River.
- 1771. Francisco Garces went down Gila to mouth of Colorado.
- 1774. Francisco Garces with Captain Anza crossed Colorado to California.
- 1775-76. Garces visited mouth of Colorado, the Mohave, and Little Colorado.
- 1776. Escalante visited San Juan, Dolores, Green, Virgin, Marble Canyon, and Lees Ferry.
- 1777. Father Font crossed Colorado at Camp Mohave.
- 1779-1781. Garces began to establish a settlement at Yuma.

- 1782. Don Pedro Foges made first trip from Colorado River to San Diego, Calif.
- 1808. Andrew Henry visited Valley of Green River.
- 1824. William H. Ashley established trappers on Green River.
- 1825. Ashley made trip through Flaming Gorge to Browns Park.
J. O. Pattie went down Gila and up Colorado.
- 1826. Lieutenant Hardy went down Gila and up Colorado.

- Jedediah Smith went down Colorado from Virgin to Needles.
- Kit Carson visited Colorado River Basin.
- 1827. Ewing Young trapped; visited Colorado River Basin.
- James P. Pattie visited Colorado River Basin.
- 1828. Salton Sink flooded by Colorado River.
- 1830. William Wolfskill visited Colorado River Basin.



Beet sugar factory at South Torrington, Wyo., on the North Platte project, Nebraska-Wyoming

1831. J. T. Warner, Waldo and Young crossed Colorado at Yuma to San Diego, Calif.
1832. Captain Bonneville visited Colorado River Basin.
1839. Thomas J. Farnham visited Colorado River Basin.
1840. Flood water from Colorado in Salton Sink.
1841. John Bidwell passed through Colorado River Basin, in first wagon train to San Francisco, Calif.
1842. Gen. John C. Fremont explored headwaters of Colorado River Basin.
1846. General Kearney reached the Colorado as commander of Army of West.
1847. Mormons crossed the Colorado River Basin and settled in Salt Lake City.
1849. Dr. O. M. Wozencraft journeyed across Salton Sink and planned irrigation Imperial Valley.
Flood water from Colorado in Salton Sink.
1850. First steamboat to Yuma, Ariz.
Lieut. George H. Derby made reconnaissance of Gulf of California and Colorado River to Yuma.
- 1850-1853. J. R. Bartlett, of boundary survey, made exploration of Colorado Desert.
1851. Fort Yuma established and steamboat line.
George A. Johnson visited mouth of Colorado in schooner.
1852. Lorenzo Sitgreaves explored Zuni and Little Colorado.
Flood water from Colorado in Salton Sink.
1854. Lieutenant Whipple surveyed railroad on thirty-fifth parallel.
- 1855-1860. Railroad surveys made.
1857. E. F. Beale made wagon road survey on thirty-fifth parallel, using camels.
Capt. George Johnson went above Vegas, Wash., in steamer.
- 1857-58. Lieut. J. C. Ives navigated in steamer to Vegas, Wash.
1858. Stage line through Yuma established.
1859. Flood waters, Colorado in Salton Sink.
Capt. J. N. Macomb and Dr. J. S. Newberry explored Grand and Green Rivers.
1861. Berthoud and Bridger explored road, Denver to Salt Lake.
1862. Flood waters, Colorado in Salton Sink.
1864. Capt. Samuel Adams explored El Dorado Canyon.
1866. Captain Rogers steamed up Colorado to Callville.
1867. James White reported to have gone through Grand Canyon on raft.
Flood waters, Colorado in Salton Sink.
- 1868-69. Maj. John Wesley Powell explored Grand Canyon.
1869. Lieut. George M. Wheeler made reconnaissance of Grand Canyon.
Gold spike on first transcontinental road driven.
Maj. J. W. Powell made first trip to Virgin River.
- 1871-72. Major Powell made second trip through Grand Canyon.
1876. Lieut. Eric Bergland surveyed Grand Canyon to Needles.
1877. Railroad completed through Yuma to Maricopa Wells.
1879. Lieut. Col. C. S. Stewart and Lieutenant Payson explored river.
1883. Railroad crossed Colorado at Needles.
Railroad crossed Green in Gunnison Valley.
- 1889-90. R. B. Stanton and F. M. Brown made railroad surveys, Grand Canyon.
- 1891-1893. C. R. Rockwood surveyed Imperial Valley.
- 1891-1896. Mexican Boundary Commission made map of Colorado River.
1894. Lieut. C. L. Potter navigated river, Diamond Creek to Virgin.
- 1895-96. Messrs. Gallaway, Stone, and Richmond went through Grand Canyon.
1896. George F. Flavell descended Green River to Yuma.
Charles E. L. B. Davis made preliminary survey of river.
California Development Co. organized.
1900. George Chaffey made contract for Imperial Valley Canal.
1901. Water flowing into Imperial Valley by canal.
- 1901-2. J. B. Lippincott made reconnaissance, Needles to Yuma.
1902. Imperial Valley irrigation begun.
- 1902-3. J. B. Lippincott, E. T. Perkins, E. C. Barnard, and R. B. Marshall continued investigation.
1904. Yuma project construction approved.
W. W. Schlecht made survey of Green River Basin to Ouray, Utah.
- 1905-6. Break in levees to Imperial Valley, February, 1905-November, 1906.
- 1906-7. Break to Imperial Valley, December, 1906-February, 1907.
- 1907-8. Messrs. Charles Russell, E. R. Monett, and Albert Loper descended river in boats from Green River to below Grand Canyon.
1909. Flood to Volcano Lake and Ockerson Levee built.
1909. J. F. Stone and N. Galloway descended river from Green, Wyo., through the canyons.
1911. Flood broke through Ockerson Levee.
- 1911-12. Kolb brothers descended river, Green River, Wyo., to Needles.
1916. Flood at Yuma, Ariz.
Wyoming cooperative report on Green River.
Imperial Valley irrigation system sold at auction to railroad company.
1919. All-American Canal report issued.
1920. Congress authorized investigation Colorado River.
1921. Wiley, Munn, Savage and Young reported on Boulder Dam.
Southern Colorado Edson Co. survey canyons down to Lees Ferry.
Preliminary report on "Problems of Imperial Valley" issued.
1922. Utah P. & L. Co. and United States Geological Survey surveyed canyons to Marble Canyon.
Report on problems of Imperial Valley issued as S. Doc. 142. November 24, Colorado River compact executed at Santa Fe, N. Mex.
1923. C. H. Birdseye and United States Geological Survey party survey canyons.
1924. Weymouth report in eight manuscript volumes issued.
Cosby report in Colorado River issued.
E. C. La Rue and party, surveys.
1927. Special advisers made report to Secretary of the Interior.
Conference of governors on Colorado River.
Colorado River Board made report to Secretary of Interior.
1928. December 21, Boulder Canyon act approved by President.



Main canal, Boise project, Idaho

Land Clearing in the Upper Kittitas District, Yakima Project

Agricultural development agent of Northern Pacific Railway proves High Line district can be cleared at price much below prevailing estimates

(From the Cle Elum Miner-Echo)

AS A result of promises made to the Bureau of Reclamation on behalf of the High Line district and demonstrations conducted by the county agent, E. F. Benson has started clearing on his holdings at Peoh Point. Being unable to contract the slashing, Mr. Benson hired eight men by the day, and is finding his costs much lower than estimates based on past experience in this section. As a result of his success, Mr. Benson now plans to slash 100 to 125 acres instead of 20 or 30 acres as originally planned. The following letter which he has written to Mr. W. O. Passmore, county agent, Ellensburg, Wash., will be of interest to all concerned in the High Line development:

"I have had eight good woodsmen slashing on my land at Benson Spur during the past 10 days at \$3.50 per day. The results are so surprising to me, I am sure you will be interested. Many men could be secured for \$3 a day, but these skilled woodsmen get \$6.50 to \$8 a day as timbermen during the logging season. Being out of work now they were anxious to work for \$3.50, and I am glad to pay the 50 cents extra a day (eight hours of actual work).

"I had only expected to slash 20 or 30 acres, but am going to slash 80 or 100 acres more and burn it next fall.

"Forty acres are now slashed at a cost to me of less than \$5 an acre. Two months ago I contracted 3 or 4 acres on a point projecting into the cleared field at \$25 an acre. I thought \$20 was enough, but had to give \$25. As the man hadn't started in two months, I canceled his contract, and four men did the job in half a day, thus costing me by the day \$14 total, instead of \$75 or more. Another tract of about 15 acres was so thick I told my foreman we would contract that at \$25 an acre. It was not quite as thick as Curtis photo 54503, but was fairly comparable to the brush in his photos 54510, 54511, 54515, and 54516. The crew made such good progress that this brush was slashed by the day and is included in the 40 acres above, about half of which had a more scattered growth.

"In a rich little flat subirrigated from a spring branch, was about 1 acre of very dense willows, quackensasp, briars, etc., too dense for anything to go through. For the past 15 years I have tried to hire at least a dozen different persons to slash this for \$30 or \$40. Two different crews

New Map Available

A map of the Vale irrigation project, Oregon, has just been issued by the Washington office, on which four plates have been used to show irrigation districts, canals, drains, power transmission lines, railroads, highways, dams, reservoirs, tunnels, siphons, etc. This map appears in two sizes, No. 23330 10½ by 15½ inches, sold at 10 cents per copy, and No. 23330-A, 22 by 33 inches, sold at 25 cents per copy.

For copies, address Commissioner, Bureau of Reclamation, Washington, D. C., inclosing check or money order.

of these 8 men were offered \$50 for this job, but refused to tackle it, so we went at it by the day and it cost me just \$15. You can imagine the regrets of these men who lost that \$35 of easy money.

"If these men have time before the regular work begins in the timber, I am going to slash 60 or 80 acres more. We have only cut the pine and fir and willows, and not piled it yet. I expect to get enough cord wood to pay for slashing the

sarvis and black thorn and piling all the brush for burning next September.

"I may blast out some stumps where scattering and plow the sarvis brush, thus putting 20 or 30 acres of new land in crop this spring, but the remaining 80 or 100 acres I will seed to pasture grass this fall if the canal brings us water by August, for which we are earnestly hoping.

"From your demonstration I am sure that those small pines will be so rotted in 3 or 4 years that their removal will be very little expense. Meantime, the pasture grasses and grazing of stock will have added greatly to the soil fertility and texture.

"I understand the cost of clearing the canal right of way for the plow ranged from \$150 to \$200 an acre. This method should not cost in money more than one-third or one-fourth those amounts, provided the pasture pays carrying charges while the stumps decay.

"Knowing your interest in all such experiences and hoping this may stimulate other landowners to do likewise, while No. 1 men are available and anxious to do such work during their off season at a wage that makes clearing not only feasible, but very attractive, I will be glad to keep you advised of our future progress."



Construction progress at Easton diversion dam, Kittitas division, Yakima project, Wash., looking toward north abutment, showing concrete placed in spillway section



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor New Reclamation Era



Community Club Houses and Club Activities

UNCOMPAHGRE PROJECT, COLORADO

THREE towns are on the project, Montrose with a population of 3,850, Delta with 2,800, and Olathe with 750. It has 6 banks, 27 schools, and 27 churches.

Six photographs of structures on the project, and information relative thereto, have been sent in as evidence of civic pride and combined effort for the establishment of an attractive social life.

No. 1 shows the Hall of Friendship, which is located on the Montrose County Fair Grounds, which grounds are adjacent to the town of Montrose and are used for fair purposes during September of each year in connection with the Western Slope County Fair. This fair has been an annual institution of this county for nearly 40 years. The hall was built in 1926 by the Federated Women's Clubs of the county and is used for vegetable, fruit, school, and fancy work exhibits at the annual Western Slope Fair.

No. 2 shows the Pea Green Community House, which was completed in April, 1927, and is located on the western edge of California Mesa, approximately 8 miles from the towns of Olathe and Delta. Practically all of the labor involved in the building of the community house and all of the material was donated by residents of the Pea Green community. This community obtained its name from the color of the paint used on the Pea Green schoolhouse.

All of the public activities of the community are handled in the new community house under the general supervision of the community club and this building is used on an average of three times a week. It has served a very useful purpose and local residents do not know how they formerly got along without such a building.

No. 3 shows the Fairview Community House and playground for children. This house was built in 1924 by 14 residents of the community who clubbed together and donated \$100 each for its construction. This house is used for social and community purposes in an Italian settlement and is considered to be a well worth-while investment. It is located between 3 and 4 miles from the town of Montrose.

No. 4 shows the development had in the Oak Grove settlement about 4 miles west of the town of Montrose. The old schoolhouse is shown at the left and the new building which was built about 1912

is shown at the right. The old building is now used for social and other purposes in the community and also for church use.

No. 5 shows the Menoken school building, which is typical of the type of schools now built in settled sections of the project. Sections of the project that do not have separate club buildings for community purposes generally use the schoolhouses of the district for those purposes and the Menoken School building is typical in size and appearance of the buildings of other school districts on the project. In such districts many of the activities operate under the leadership of parent-teacher associations but in the Pea Green and Stone school districts the community has organized clubs for social and district purposes.

The Menoken school building is located about 5 miles northwest of the town of Montrose.

No. 6 shows the Riverside school building, located about 5 miles south of the town of Montrose. The upper story of this building is used for all community activities under the general supervision of the parent-teachers association.

GRAND VALLEY PROJECT, COLORADO

This project has six towns—Grand Junction, the largest, with a population of 12,724; Fruita and Palisade, with 1,000 each; Clifton, 200; Mack, 75; and Loma, 40. It has 34 churches.

Mrs. W. A. Miller of Clifton, Colo., describes with pride, love of home, and faith in the future, the building up of an effective club spirit on the East Orchard Mesa of this project.

Building A Community House

Dr. Elwood Mead, in his report of the Reclamation Survey, 1924, showed us what was wrong with East Orchard Mesa, and also suggested a remedy. He said: "Where there is an active social life, happy homes are found, and settlers seldom move away."

Heretofore many of our landowners had been with us only during the brief period of seedtime to harvest.

Some of our public-spirited women, determined to test Doctor Mead's suggestion, and as a first step organized a women's club, November 25, 1925, its

object to be not only to encourage all-year residence of homesteaders, but also to develop and advertise a community wherein might be formed an attractive environment which would appeal to prospective purchasers.

Our main inducements thus far are 5,000 acres of excellent land and an abundance of water for irrigation and domestic purposes. Our club proved highly successful, enthusiasm spread, and led logically to the organization of a community club, whose officers are all men, a strange but helpful coincidence.

Within two years these clubs, working together, had brought to our formerly isolated community a telephone line, rural mail service, and inclosed school busses. Our roads had been wonderfully improved, and much attention had been given to beautifying home surroundings.

The community club held its first meetings in a packing house. At the beginning of our second year we had 90 members, including some landowners in adjoining sections, and others living in the town of Palisade.

Our club had outgrown the packing house and no other public building within 12 miles could accommodate our growing membership.

We resolved to build a community house, not one just sufficient for present needs, but one looking to the future and increasing population, of which we now felt assured. We bought our building lot and an acre of land, centrally located, for which we paid \$125 out of the proceeds of fruit and vegetable sales in near-by towns.

The plans for our house, 30 by 60 feet, called for a \$5,000 building of which \$2,500 was required for materials, and a like amount for labor and furniture. Our women's club guaranteed the full cement basement. Then the fun and work began in earnest. Men and teams by the score did the excavating, and hauled gravel, sand, and lumber. Women, old and young, raised money by frequent fruit, vegetable, and cooked food sales and chicken dinners in neighboring towns, which gave encouraging patronage. On days when the men worked our women always served hot dinners. These days proved fine opportunities in promoting acquaintance and sociability.

Labor to the value of \$2,000 was done by our landowners. One man only



COLORADO
PROJECT



COMMUNITY
HOUSES



Uncompahgre project: 1. Hall of Friendship. 2. Pea Green Community House. 3. Fairview Community House. 4. Oak Grove Community Center. 5. Menoken School. 6. Riverside School. 7. Grand Valley project's only community house

received wages, a carpenter, hired to supervise construction.

The building was begun in the spring of 1927. It was dedicated on October 10. Seats and tables had all been made by the men. The women's club, in addition to a donation of \$800 in cash, had equipped the building with an acetylene lighting plant, a fine piano, a kitchen range, and dishes to serve 150 people.

During the past two years more than 1,000 people have enjoyed our hospitality as guests or as patrons at banquets and other entertainments. These include the Lions Club and the Business and Professional Woman's Club, of Grand Junction. The Mesa County Woman's Extension Club held an all-day meeting, at which Helen Field Fisher was the guest of honor. In her radio talk, broadcast

over KFNE, Shenandoah, Iowa, Mrs. Fisher complimented our work very highly, describing our unique 4-in-1 baby bed, and mentioning particularly the beautiful flowers which she saw blooming in our yards in mid-November.

Our community house is open to the public on all occasions except dances. Such entertainments are strictly by invitation, assuring reputable guests. Programs at Christmas time and on other holidays provide a training school in self-expression for our children. Formerly they were taken to entertainments as spectators, now they are participants. The fact that our community has taken first prize for two years in the county-improvement contest is evidence that a spirit of cooperation and neighborliness has been created by our activities. Our

programs for several years will include the better-homes movement, as sponsored by the national board in Washington.

We are answering many inquiries from near and distant communities as to the secret of our success, and we are glad to aid wherever possible. We have many visitors, some traveling long distances to investigate our methods.

Our natural resources of soil, water, and climate, of course, furnish the necessary foundation, but it is largely our social community spirit which is drawing and holding settlers: Twenty-eight new houses were built last year.

Doctor Mead is right. We recommend his suggestion to other communities, "Where there is an active social life, happy homes are found," and settlers seldom move away.

Power Development on Government Reclamation Projects

Present practice and proposed new policies

By L. N. McClellan, electrical engineer, Denver office

THIS is an age of power-operated construction equipment, and the cost of power is no small item in the total cost of construction of present-day irrigation projects, especially where the construction of large dams, canals, tunnels, etc., is involved. It frequently happens, where conditions permit, that a substantial saving can be effected in the initial cost of a project by building a power plant for the purpose of furnishing a reliable supply of cheap power for construction purposes. The Boise River, Lahontan, Lingle, Pilot Butte, Roosevelt, Shoshone, and Spanish Fork hydroelectric power plants were all built primarily to furnish power for use in connection with the construction of the projects on which they are located.

Under certain conditions water can be delivered to lands more economically by means of pumps than by gravity, or pumping may be necessary for drainage purposes and the cost of power is an important factor in connection with any pumping development. Several of the larger power developments undertaken by this bureau have been built primarily for the purpose of providing cheap power for the operation of pumps. The Minidoka power plant, which supplies power for the South Side pumping division of the Minidoka project, the Black Canyon power plant on the Boise project, which supplies power to the Gem Irrigation District, and the Siphon Drop power plant on the Yuma project were all built to furnish cheap power for pumping purposes. Before the Black Canyon power plant was built, the

Gem irrigation district had been purchasing power from the local power company, but the cost of power together with the other costs of operation and maintenance, were more than the district could meet, and if cheaper power had not been obtained much of the land in the district would, no doubt, have reverted to a desert condition. Power from the Black Canyon power plant has reduced the district's cost of operation approximately \$40,000 per year, with the result that the district is now promptly paying the Government for power, and at the same time is carrying on an extensive program of drainage construction.

SIPHON DROP REDUCES COST

The Siphon Drop power plant on the Yuma project demonstrates what can be accomplished by a small power development operating under favorable conditions. This plant was completed in July, 1926, and develops about 1,000 kilowatts under the head of 10 feet which is now available. Previous to its construction, the Yuma and Yuma auxiliary projects had been purchasing power for pumping purposes at an average cost of about 2.8 cents per kilowatt hour, whereas power for project purposes is now obtained from the Siphon Drop plant at an average cost of less than 0.8 cent per kilowatt hour. During the calendar year 1928 this plant saved the Yuma and Yuma auxiliary projects some \$37,000 in cost of power and in addition produced a gross revenue of \$47,000

from sale of surplus power. The cost of operation, maintenance, and depreciation amounted to \$30,000 and the net benefit resulting from the operation of this plant amounted to about \$54,000. These results are due, in large measure, to a favorable contract with the Southern Sierras Power Co., under which all energy not required by the project is sold to the company and the power plant therefore operates at an exceptionally high-load factor.

A combination power and irrigation development may be economically feasible, where neither the power nor the irrigation development alone would be justified. The Guernsey Reservoir and power development on the North Platte project is typical of such a combination. The Guernsey Reservoir cost approximately \$23 per acre-foot of storage capacity, which was higher than could be justified on the basis of storage for irrigation alone, but by charging a part of the cost of the dam to power development, the cost of the storage was reduced to a point where the combination power and storage development became feasible. In a small way the Guernsey development is similar to the proposed storage and power development at Boulder Canyon, on the Colorado River in that power revenues are to repay the cost of construction.

SALT RIVER PROJECT POWER DEVELOPMENT

The Salt River project affords an outstanding example of a well coordinated

combination of irrigation and power development. The Bureau of Reclamation originally built four hydroelectric plants on this project with a total capacity of 18,000 kilowatts. The project was turned over to the Salt River Valley Water Users' Association to operate in November, 1917, and since then the association has built three additional plants, and a fourth is now under construction. When this latter plant is completed the total capacity of the power system will exceed 80,000 kv.-a. The principal plants are located on the Salt River below the Roosevelt Dam and above two smaller storage reservoirs at Mormon Flat and Stewart Mountain which serve to regulate the water to suit the irrigation requirements after it has passed the power plants. This combination of storage and power development permits power to be generated continuously throughout the year without waste of irrigation water. In a year of low water supply, the Salt River project power system will produce a gross revenue of about \$1,500,000 and in years of normal water supply, the gross revenue will exceed \$2,500,000.

SALE OF SURPLUS POWER

Frequently the project requirements for power for construction and pumping purposes utilize only a part of the capacity of a power plant and considerable surplus power is available for sale. For instance, on the Minidoka project, the power plant has a capacity of 10,000 kilowatts, of which 8,000 kilowatts is required during the irrigation season for operation of pumps, leaving 2,000 kilowatts of firm all-year-round power which is sold to the project towns and various mutual companies serving the rural districts for commercial lighting and power purposes. During the nonirrigation season, when power is not being used for pumping, some 3,500 kilowatts is sold for heating purposes.

Operation of the Lingle power plant on the North Platte project was started in the spring of 1919 to furnish power for construction of canals and drainage ditches on the Fort Laramie division, and shortly thereafter surplus power was sold to some of the project towns. As the construction work proceeded, the transmission lines were extended down the valley, and additional towns contracted for power and in this way the commercial load developed to such an extent that it became necessary to increase the capacity of the Lingle power plant from the original 750 kv.-a. to 1,750 kv.-a. in 1924. The first unit of the Guernsey power plant was placed in service in July, 1927, and the second unit was placed in service in January, 1928, and by the end of that year the load had increased to over 6,000 kilowatts. In

less than a year after the completion of the Guernsey power plant, the load had developed to such an extent that both the Lingle and Guernsey power plants were loaded to capacity, due largely to the disposal of power, at wholesale, to two public utility companies operating in that territory which transferred part of their load from steam plants to the Government hydro plants. The gross revenue from sale of power on the North Platte project in 1928 amounted to \$230,000, and the cost of operation, maintenance, and depreciation was \$100,000, leaving a net profit of \$130,000.

During the past year there has been a large increase in the commercial load on the Shoshone project due to drilling and pumping operations in the Oregon Basin and Frannie oil fields and to the extension of the Mountain States Power Co.'s transmission lines up the Big Horn Valley as far as the town of Worland, Wyo. It appears that the present installation in the Shoshone power plant will soon be loaded to capacity and negotiations are in progress for the installation of a third unit in this plant which it is proposed to finance with funds advanced by the power company which will be rebated out of monthly power bills. Revenues from commercial power on the Shoshone project in 1928 amounted to about \$45,000.

Construction work on the Riverton project will require considerable power for several years; and in order to provide an adequate supply for this purpose and to take care of the increasing commercial load, a second 1,000 kv.-a. generating unit is now being installed in the Pilot Butte power plant. A gross revenue of \$12,500 resulted from the sale of surplus power on the Riverton project during 1928.

DEVELOPMENT OF SEASONAL POWER

Opportunities for the development of considerable seasonal power exist on many of the projects at the large dams built to store water and at drops in the canals; but as this power is available only during the irrigation season with little or no power during the rest of the year, such power developments are unattractive except under very special conditions. This is the situation at the Arrowrock, Pathfinder, and Elephant Butte dams. Where seasonal power is utilized by a power system serving the usual commercial load, other sources of power, such as steam stand-by plants, must be provided of sufficient capacity to supply the demand for power during the period when the seasonal power is not available. The result is that the use of seasonal power when available simply saves fuel in the stand-by plant. The fuel cost of producing energy in present-day steam generating stations, designed for stand-by service,

may range anywhere from 0.4 to 0.75 cent per kilowatt-hour and conditions must be very favorable for hydroelectric power development if seasonal power can be delivered at such figures. Seasonal power is sometimes developed to supply power for irrigation pumping in which case the power requirement of the pumping plant occurs at the same time that the seasonal power is available. It is proposed to develop some 30,000 kilowatts of seasonal power at the American Falls Dam which will be used to operate pumping plants in connection with the North Side extension of the Minidoka project when this division is constructed.

FACTORS OF FEASIBILITY

The feasibility of a hydroelectric power development depends upon a large number of factors, some of the more important of which are:

(a) The quantity of water and head available, as these factors determine the amount of primary and secondary power that can be produced. The former must be supplied continuously whereas secondary power is only available during certain periods of each year and the price obtained for it is necessarily considerably less than for the primary power.

(b) Cost of construction: Other factors remaining the same, the cost of a power plant will vary inversely, although not in the same ratio, as the head and as a general rule other things being equal, the larger the power development the smaller the cost per unit of capacity. The cost of construction is especially important because it determines the fixed charges which invariably are a large part of the total cost of producing hydroelectric power.

(c) Cost of operation and maintenance.

(d) Market for power.

(e) Distance that power must be transmitted to reach a market: A large block of power of the order of 100,000 kilowatts or more may be transmitted economically at 220,000 volts a distance of 300 or more miles but the distance that smaller blocks of power can be transmitted at lower voltages will be much less.

(f) Load factor: This is the ratio of average power to maximum power. The annual cost of an hydroelectric power development is practically independent of the amount of energy produced and therefore the unit cost of energy varies inversely as the load factor. For instance, a given water power plant operating at 100 per cent load factor may be able to produce energy at a cost of say 2 mills per kilowatt-hour but the same plant operating at a load factor of only 50 per cent would produce only half as much energy and the unit cost would be twice as much or 4 mills per kilowatt-hour and at 25

per cent load factor the unit cost would be 8 mills per kilowatt-hour.

(g) Competitive power: The delivered cost of hydroelectric energy must be less than the cost of production by any other means such as steam or Diesel engine plants located at the load center.

RURAL USE OF POWER

Rural electrification is making rapid progress on several projects. For instance, on the Newlands project a number of local improvement districts have been organized for the purpose of financing the construction of rural distribution lines, which, when completed, will serve practically the entire settled portion of the project; 300 rural customers were served in 1928 and the service will be extended in 1929 to include some 560 farms. A rural distribution system is being constructed on the Salt River project which will serve about 4,500 farm homes; 600 miles of line are involved and recently a single order was placed for 8,000 steel poles to be used in this construction. These rural lines on the Salt River project are being financed by the Salt River Valley Water Users' Association by means of a bond issue. On the Minidoka project a number of mutual companies have been serving the rural communities for several years. These companies purchase power at wholesale from the Government and build and operate their own distribution lines. This general plan is also being used on the Shoshone and North Platte projects.

The law authorizing the Secretary of the Interior to dispose of power developed in connection with Federal irrigation projects requires that preference be given to municipalities. It also limits the period of power contracts to 10 years on all except the Salt River and Rio Grande

projects, where the period of such contracts is limited to 50 years. The policy of the department is to dispose of surplus power in large blocks, preferably at the generating station. Retailing and distribution of power to individual customers is avoided as far as possible. Rates in general must produce sufficient revenue to provide for a fair return on the investment in addition to the cost of operation, maintenance, and depreciation. The rate schedule must be so designed as to distribute the total cost of service fairly and equitably among the various classes of customers and rates for the larger power customers must be low enough to compete successfully with the cost of power from other sources. Discriminatory rates must be avoided. Quite naturally the rates for sale of power are different on the various projects depending upon the cost of the power system, the operation and maintenance cost, the amount of power utilized, and the load factor.

APPLICATION OF PROFITS

Profits from power operations have in the past been applied as provided in subsection I of section 4 of the act of December 5, 1924, which provides as follows:

That whenever the water users take over the care, operation, and maintenance of a project or a division of a project, the total accumulated net profits * * * derived from the operation of project power plants * * * shall be credited to the construction charge of the project, or a division thereof, and thereafter the net profits from such sources may be used by the water users to be credited annually, first, on account of project construction charge; second, on account of project operation and maintenance charge; and third, as the water users may direct.

Such application of the net power profits results in giving the water users on projects having power developments an

annual profit. This procedure was modified in the case of the North Platte project by the act of March 3, 1925, which provides:

That all net revenues from any power plant connected with this project shall be applied to the repayment of the construction costs incurred by the Government on this project until such obligations are fully repaid.

The appropriation bill for fiscal year 1930 makes special provisions as to application of net power revenues from the Black Canyon and Shoshone power plants. In the case of the Black Canyon plant:

The net power revenues are to be applied to the repayment of construction costs, first, of the Deadwood Reservoir; second, of the Black Canyon power plant and power system; and third, of one-half the cost of the Black Canyon Dam, until the United States shall have been reimbursed for all expenditures made incident thereto. Thereafter all net revenues shall be covered into the reclamation fund unless and until otherwise directed by Congress.

In the case of the Shoshone project, the 1930 appropriation bill provides that:

The net power revenues are to be applied—first, to the repayment of the construction cost of the power system; second, to the repayment of the construction cost of the Shoshone Dam; and third, thereafter such net revenues shall be covered into the reclamation fund.

The result of this new policy will be, that, instead of giving the net profits from power on any project, having a power development, to the water users, on that particular project to help them pay their annual construction and operation and maintenance charges, the net profits will be used to hasten the return to the reclamation fund of the money spent by the Government for construction, and will afford a means of liquidating losses which are now charged to the reclamation fund.



Holstein dairy herd in pasture, Salt River project, Ariz.

Evaporation on Federal Reclamation Projects

By Ivan E. Houk, Research Engineer, Denver Office



Floating pan evaporation station at East Park Reservoir, Orland project, Calif.

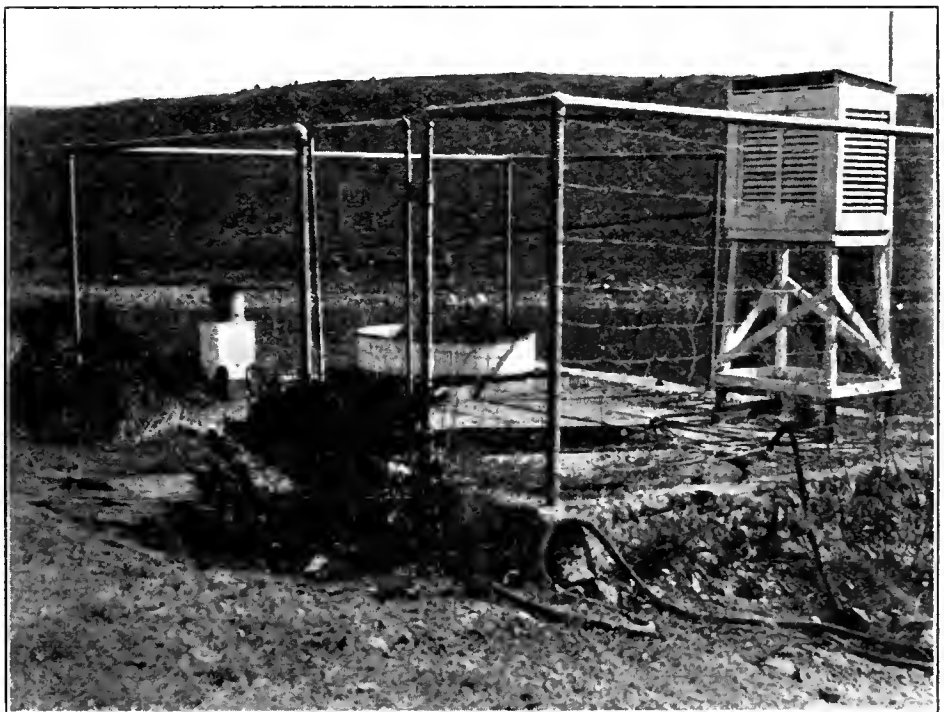
EVAPORATION from reservoir surfaces on Federal irrigation projects causes the loss of approximately 1,000,000 acre-feet of water each year, a quantity sufficient to irrigate an area of 250,000 acres. Such losses are unavoidable inasmuch as there is no practicable way of controlling the evaporation process on lake or reservoir surfaces of appreciable size. However, the amount of the losses must be determined so that accurate allowances can be made in determining the quantities of water available for irrigation use.

The rate at which water evaporates from lake and reservoir surfaces varies with local meteorological conditions. Consequently the depth of water evaporated annually from inland bodies of water varies widely in different sections of the country. Several formulas have been proposed for computing depths of evaporation, factors being introduced to allow for changes in temperature, wind velocity, relative humidity, and barometric pressure. The theory proposed by Dalton more than a hundred years ago, namely, that the evaporation rate varies with the difference between the vapor pressure corresponding to the temperature of the water surface and the actual vapor pressure in the air above, has been found most applicable of all. However, no formula thus far proposed has been found universally dependable. Therefore, estimates of evaporation losses for use in designing irrigation systems must still be based on measurements of water evaporated from small pans, preferably pans floated on existing lakes in the immediate vicinity of the proposed improvements.

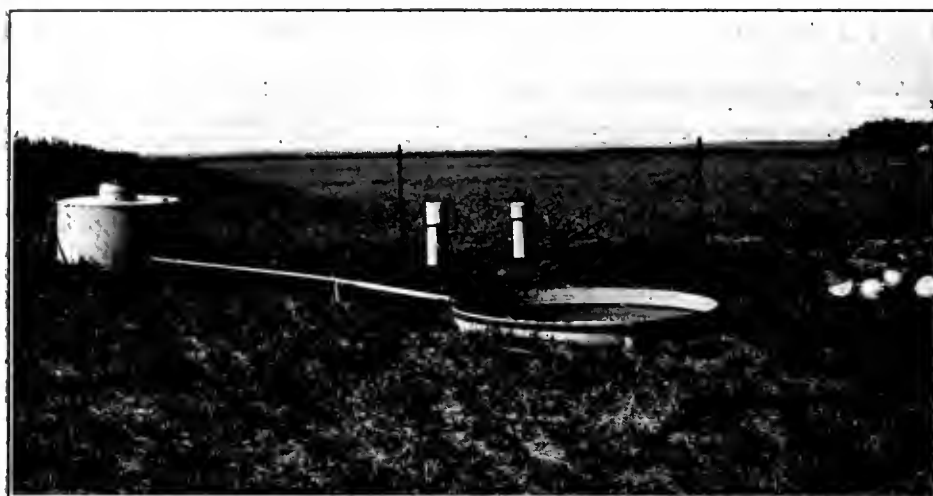
The Bureau of Reclamation has been collecting and studying evaporation data for many years. Floating or land pans, sometimes both, have been maintained on projects where large storage reservoirs are necessary parts of the works, the primary object, of course, being to determine as accurately as possible the actual evaporation losses from the reservoir surfaces. One of the accompanying illustrations shows the floating pan at the East Park Reservoir on the Orland project,

California. Although variations in type of installation and equipment sometimes have been necessary in order to meet local conditions, the general design for land pan installations during recent years has followed the specifications adopted by the United States Weather Bureau for its Class A stations. Briefly stated, the Class A station is equipped with a circular evaporation pan, 4 feet in diameter and 10 inches deep, mounted on a timber platform; and is provided with auxiliary meteorological equipment consisting of a rain gage, an anemometer, and maximum and minimum thermometers housed in a standard Weather Bureau thermometer shelter. The accompanying illustration of the evaporation station at the Elephant Butte Dam on the Rio Grande project, New Mexico-Texas, shows a typical Class A installation.

The United States Weather Bureau has cooperated with the Bureau of Reclamation, in many instances, in furnishing evaporation equipment as well as in publishing evaporation data. Many of the daily and monthly records of evaporation at stations on Bureau of Reclamation projects are published in the "Climatological Data for the United States," a monthly publication issued by the Weather Bureau. The greater number of the evaporation records published therein are for land pan stations, particularly



Class A evaporation station at Elephant Butte Reservoir, Rio Grande project, New Mexico-Texas



Land evaporation pan at Newell Experiment Farm, Belle Fourche project, S. Dak.

Class A installations, but a few floating pan records are included.

The Bureau of Public Roads of the United States Department of Agriculture has also cooperated with the Bureau of Reclamation in establishing and maintaining evaporation stations as well as in conducting special investigations of evaporation phenomena. In several instances evaporation stations have been maintained by the Department of Agriculture at their experiment farms on Federal irrigation projects. As a general rule these stations are equipped with circular pans, 6 feet in diameter and 24 inches deep, set in the ground to a depth of about 21 inches; and are provided with rain

gages, anemometers, and maximum and minimum thermometers. A typical installation of this type is shown in the accompanying illustration of the Newell Experiment Farm Station on the Belle Fourche project in South Dakota, except that the thermometer shelter is not within the field of view. The extra rain gage at this station, with the funnel cover removed, was installed for the purpose of measuring hail precipitation.

A tabular digest of evaporation records at all stations on Bureau of Reclamation projects, whether maintained by the Bureau of Reclamation or by other agencies, was published in the Transac-

tions of the American Society of Civil Engineers for June, 1927, pages 266 to 286, in an article by the writer entitled "Evaporation on United States Reclamation Projects." The tables included therein give the mean values of monthly evaporation calculated from the records available at the time of compilation, all data being corrected for precipitation. They also give the available data on mean monthly temperature, wind velocity, and relative humidity for the corresponding periods of time; data on maximum and minimum values of monthly and annual evaporation for selected stations; some data on evaporation from snow and ice surfaces at Saco, Mont.; and miscellaneous additional information of pertinent interest in evaporation studies. Values of mean monthly evaporation at selected stations where records were obtained during the entire year, together with pertinent descriptive information, have been abstracted from the article mentioned and are given in the accompanying tabulation.

The records of evaporation given in the accompanying table, as well as those included in the original tabulations, are actual depths evaporated from water surfaces in small pans. Such depths are usually greater than the depths evaporated from comparatively large lake and reservoir surfaces, especially in the case of the land pans. Data available at the present time indicate that the evaporation from the surface of a large body of water

Average water surface evaporation at selected stations on Bureau of Reclamation projects as measured in small pans¹

Project	Station	Type	Pan	Years of record	Elevation (feet)	Mean annual temperature, ° F.	Mean annual wind velocity in miles per hour	Mean evaporation, in inches, during months of—												Mean annual evaporation in feet
								January	February	March	April	May	June	July	August	September	October	November	December	
Carlsbad.....	Avalon Reservation.	Floating..	19 inches by 3 feet, square.	1914 to 1923..	3,188.62.1	2.09	3.10	5.33	7.15	7.99	8.41	9.97	9.14	8.31	6.25	3.16	2.47	6.11		
Rio Grande.....	Agricultural College.	Land.....	3 feet cubical ²	1908 to 1913..	3,800.63.3	4.68	3.89	6.56	6.90	10.79	10.46	10.62	10.09	7.51	6.41	4.82	3.83	7.21		
Do.....	Mesilla Park.....	do. ⁴	10 inches by 4 feet, circular.	1918 to 1923..	3,863.60.0	4.15	3.06	4.26	7.82	10.03	12.19	12.49	12.23	10.08	7.61	6.13	3.56	2.61	7.67	
Do.....	Elephant Butte.....	do. ⁴	do.	1917 to 1923..	4,475.61.1	4.52	2.82	3.98	8.05	11.03	14.15	14.29	12.55	10.88	9.08	7.90	4.05	3.02	8.44	
Salt River.....	Roosevelt.....	do. ⁴	do.	1916 to 1923..	2,175.67.3	1.73	2.31	3.03	5.46	7.88	11.08	13.36	12.52	10.45	8.73	6.04	4.05	2.30	7.26	
Yuma.....	Yuma Citrus.....	do. ⁴	do.	1921 to 1923..	181.70.7	3.03	4.23	6.08	8.71	11.02	14.32	15.90	17.53	14.93	11.85	8.76	5.50	3.98	10.23	
Do.....	Yuma Evaporation.	do. ⁴	do.	1917 to 1923..	127.67.4	1.38	3.08	3.95	5.82	7.60	8.25	9.00	10.42	9.46	7.30	5.29	3.16	2.48	6.32	
Newlands.....	Fallon.....	do.	2 feet by 6 feet, circular. ¹	1908 to 1923..	3,060.50.6	3.24	1.12	1.78	4.03	6.22	8.28	9.76	10.65	9.56	6.40	3.83	1.91	0.76	5.36	
Do.....	Lake Tahoe.....	Floating..	10 inches by 4 feet, circular.	1916 to 1923..	6,230.41.8	2.65	1.58	2.50	3.37	3.08	3.75	4.44	5.69	5.91	4.61	3.43	2.62	2.02	3.58	
Orland.....	East Park.....	do.	do.	1911 to 1923..	3,130.58.2	1.13	1.13	1.64	2.79	4.75	7.22	8.87	10.54	9.85	7.21	4.47	2.38	1.54	5.20	
Klamath.....	Klamath Falls.....	do.	22 inches by 42 inches, circular.	1921 to 1924..	4,100.47.7	3.07	3.07	2.52	1.82	2.82	4.73	6.51	8.55	7.49	6.10	4.33	2.96	1.50	4.36	
Umatilla.....	Cold Springs.....	do.	do.	1909 to 1913..	600.51.6	7.88	1.01	1.12	2.72	5.86	7.01	8.90	12.44	9.40	6.87	3.80	1.75	1.08	5.16	
Do.....	do.	Land.....	10 inches by 4 feet, circular.	1914 to 1923..	623.51.9	7.07	1.13	0.94	3.20	4.21	6.47	7.90	9.13	8.29	5.44	3.23	1.37	0.71	4.33	
Do.....	Hermiston.....	do.	2 feet by 6 feet, circular. ¹	1912 to 1923..	450.51.6	2.95	1.28	0.90	2.20	3.96	5.41	7.22	8.36	6.63	4.42	2.49	0.84	0.27	3.67	
Shoshone.....	Shoshone Dam.....	do.	10 inches by 4 feet, circular.	1915 to 1924..	5,390.46.5	0.87	0.87	1.25	1.62	3.44	4.85	7.46	8.22	7.88	5.43	2.97	0.50	0.30	3.73	
North Platte...	Sunflower Camp.....	do.	do.	1910 to 1917..	4,070.46.2	7.90	0.92	0.84	2.06	4.48	6.35	7.94	8.21	6.78	5.39	3.11	1.71	0.50	4.02	

¹ Abstracted from article entitled "Evaporation on United States Reclamation Projects," by Ivan E. Houk, published in Trans. Am. Soc., C. E., June, 1927, pp. 253 to 286.

² Set in the ground.

³ Estimated.

⁴ Class A, U. S. Weather Bureau installation.

is from 90 to 95 per cent of the evaporation from a floating pan, the exact factor depending on the size of the pan; about 94 per cent of the evaporation from a circular pan 6 feet in diameter by 2 feet deep, set in the ground; about the same as the evaporation from a circular pan 12 feet in diameter by 3 feet deep, set in the ground; and about two-thirds as great as the evaporation from a Class A pan, the relatively greater pan evaporation in the case of the Class A station being due to higher water temperatures caused by absorption of heat from the exposed sides of the pan.

Evaporation losses from lake and reservoir surfaces in western United States usually vary from about 2½ feet per an-

num in the northern mountainous regions to about 5 feet per annum in parts of the Southwestern States. Shoshone Reservoir in Wyoming, located at an elevation of approximately 5,400 feet above mean sea level, has an average annual evaporation of about 2½ feet; Lake Tahoe, Calif., at an elevation of 6,230 feet, has an average annual evaporation of about 3¼ feet; Elephant Butte Reservoir, located in southern New Mexico, at an elevation of about 4,500 feet, has an average annual evaporation of about 5½ feet. Records at the Yuma citrus land pan station, located on a desert mesa near Yuma, Ariz., where the meteorological conditions are unusually favorable for high rates of evaporation, show that a reservoir in that

vicinity might have an average annual evaporation as high as 6¾ feet.

Of course the total evaporation in any one year may be much greater or much less than the average. The actual pan evaporation at the Yuma citrus station has been as much as 11.3 feet in a year and as little as 9.5 feet, the average for the 3-year period of record being 10.2 feet. Depths of water as great as 17 inches have evaporated in a month at the Elephant Butte Class A station in southern New Mexico. Depths as great as 11 inches have evaporated in a month at the East Park floating pan station in northern California. Depths as great as three-fourths inch have evaporated in a day at land pan stations in Arizona.

Alaska Railroad Stages All-expense Tour

To stimulate interest in the vast northern empire of Alaska, and to enable Government employees to visit the Territory for less than it would cost them if making the trip alone, the Alaska Railroad, operated by the Department of the Interior, is sponsoring and organizing a 1929 personally conducted all-expense tour, leaving Washington, D. C., August 25 and Seattle August 31, cruising through the famous Inside Passage, the Gulf of Alaska, and Prince William Sound, thence to interior Alaska and return to Seward via the Alaska Railroad. The party will return to Washington, D. C., on September 25, the trip requiring 32 days, but only 26 days of annual leave. The minimum cost, including transportation, Pullman, dining car, hotel room, meals, baggage transfer, side trips and entertainment, is \$519 and the maximum \$549. Rates for Government employees residing outside the District of Columbia may be obtained from C. E. Harris, Traffic Manager, Department of the Interior, Washington, D. C., to whom all inquiries should be addressed. Reservations should be made as soon as possible. An initial deposit of 25 per cent will be required not later than July 16, the balance to be paid August 10.

Reclamation and Crops

From the Wall Street Journal, April 17, 1929

"People east of the Mississippi River, I believe, have a wrong impression of reclamation projects," said F. E. Williamson, president of the Chicago, Burlington & Quincy Railroad. "Although the Government advances funds to build these projects, it is reimbursed by the land-owners.

"It has been charged that increased acreage would mean surplus crops and further force down the price of farm products. The three major crops which suffer from overproduction are wheat, corn, and cotton. On the other hand there are many farm products which we now import.

"These importations run as high as \$800,000,000 a year for products that could come from the soil of the United States through reclamation projects. Sugar is one example. Bee and dairy products, wool, alfalfa, and clover seed, and many other products in which farmers in the arid sections can specialize are other imports.

"It is to the interest of the country as a whole that the West be allowed to develop, not only to enable it to supply food products now produced in no other part of the country, but also to encourage growth of a flourishing population that can help absorb the staple farm products of the East, Middle West, and South."

Boulder Dam Chart Available

The Bureau of Reclamation has on hand a supply of the chart of the Boulder Canyon project act, printed on the inside front cover page of the May issue of the NEW RECLAMATION ERA. Copies of the chart may be obtained at 5 cents each. Quantity prices will be furnished on request. Address the Commissioner, Bureau of Reclamation, Washington, D. C.

Estimated vs. Actual Cost

The following tabulation shows the estimated and actual cost of drainage construction in the Warm Springs Irrigation

District, Vale project, Oregon, under the direction of D. J. Paul, associate engineer:

Feature	Estimated	Actual
Length of drains (miles).....	47.96	65.85
Excavation (cubic yards).....	1,926,400	2,293,860
Cost.....	\$369,292	\$268,122
Field cost per cubic yard.....	\$0.11	\$0.0688

This is believed to be a record of field costs per cubic yard which is at least as low as if not lower than has been obtained on similar work in the bureau in the past, either by contract or by Government forces. On all of this work some extra cost was incurred in leveling off the spoil banks in order to present a more pleasing appearance.

New Selling Service for Arizona Wool Growers

A new wool-selling service is offered to farmers of the Salt River Valley, Ariz., who own only a few sheep. The Maricopa County Farm Bureau has become a member of the Arizona Wool Growers' Association, of Phoenix, and will assemble the small lots of wool and market it on a brokerage charge of one-eighth of a cent per pound. Ranchers wishing to sell wool under this plan will list it at farm bureau headquarters, giving the approximate quantity. When a sufficient quantity is listed to attract a buyer, a day and place for delivery will be appointed and a buyer will be present as well as a representative of the county farm bureau and wool growers' association. Each farmer's wool will be graded and weighed separately and he will receive a check from the farm bureau less only the brokerage charge. The quantity of wool produced in the valley is estimated at approximately two carloads of 30,000 pounds each.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

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Denver, Colorado, Wildo Building

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Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche	Newell, S. Dak.	F. C. Younghlutt	J. P. Siebenreicher	J. P. Siebenreicher	Wm. J. Burke	Mitchell, Nebr.
Boise ¹	Boise, Idaho	R. J. Newell	W. L. Vernon		B. E. Stoutemyer	Portland, Oreg.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	W. C. Berger	W. C. Berger	H. J. S. Devries	El Paso, Tex.
Grand Valley	Grand Junction, Colo.	J. C. Page	W. J. Chiesman	W. J. Chiesman	J. R. Alexander	Montrose, Colo.
Huntley ²	Ballantine, Mont.					
King Hill ³	King Hill, Idaho					
Klamath	Klamath Falls, Oreg.	H. D. Newell	N. G. Wheeler	Joseph C. Avery	R. J. Coffey	Berkeley, Calif.
Lower Yellowstone	Savage, Mont.	H. A. Parker	E. R. Scheppelmann	E. R. Scheppelmann	E. E. Roddis	Billings, Mont.
Milk River	Malta, Mont.	H. H. Johnson	E. E. Chabot	E. E. Chabot	do	Do.
Minidoka ⁴	Burley, Idaho	E. R. Darlington	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Newlands ⁵	Fallon, Nev.				R. J. Coffey	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.	H. C. Stetson	Virgil E. Hubbell	Virgil E. Hubbell	Wm. J. Burke	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.				B. E. Stoutemyer	Portland, Oreg.
Orland	Orland, Calif.	R. C. E. Weber	C. H. Lillingston	C. H. Lillingston	R. J. Coffey	Berkeley, Calif.
Owyhee	Owyhee, Oreg.	F. A. Banks	H. N. Bickel	Frank P. Greene	B. E. Stoutemyer	Portland, Oreg.
Rio Grande	El Paso, Tex.	L. R. Fiock	Henry H. Berryhill	L. S. Kennicott	H. J. S. Devries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	R. B. Smith	R. B. Smith	Wm. J. Burke	Mitchell, Nebr.
Salt River ⁸	Phoenix, Ariz.					
Shoshone ⁹	Powell, Wyo.	L. H. Mitchell	W. F. Sha		E. E. Roddis	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah					
Sun River ¹¹	Fairfield, Mont.	G. O. Sanford	H. W. Johnson	H. W. Johnson	E. E. Roddis	Do.
Umatilla ¹²	Herrison, Oreg.					
Uncompahgre	Hermiston, Oreg.					
Vale	Montrose, Colo.	L. J. Foster	G. H. Bolt	F. D. Helm	J. R. Alexander	Montrose, Colo.
Yakima	Vale, Oreg.	H. W. Bashore	C. M. Voyen	C. M. Voyen	B. E. Stoutemyer	Portland, Oreg.
Yuma	Yakima, Wash.	P. J. Preston	R. K. Cunningham	J. C. Gawler	do	Do.
	Yuma, Ariz.	R. M. Priest	H. R. Pasewalk	E. M. Philebaum	R. J. Coffey	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam	Coalville, Utah	F. F. Smith ¹³	C. F. Williams		J. R. Alexander	Montrose, Colo.
Kittitas	Ellensburg, Wash.	Walker R. Young ¹³	E. R. Mills		B. E. Stoutemyer	Portland, Oreg.
Sun River, Gibson Dam	Augusta, Mont.	Ralph Lowry ¹³	F. C. Lewis	F. C. Lewis	E. E. Roddis	Billings, Mont.
Sun River, Main Canal Construction	Fairfield, Mont.	A. W. Walker ¹³			do	Do.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1923.
² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927. E. E. Lewis, manager.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926. F. L. Kinkade, manager.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926. D. S. Stuver, manager.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928. Joe C. Iddings, manager.

⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917. C. C. Cragin, general superintendent and chief engineer.

⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926. Lee R. Taylor, manager.

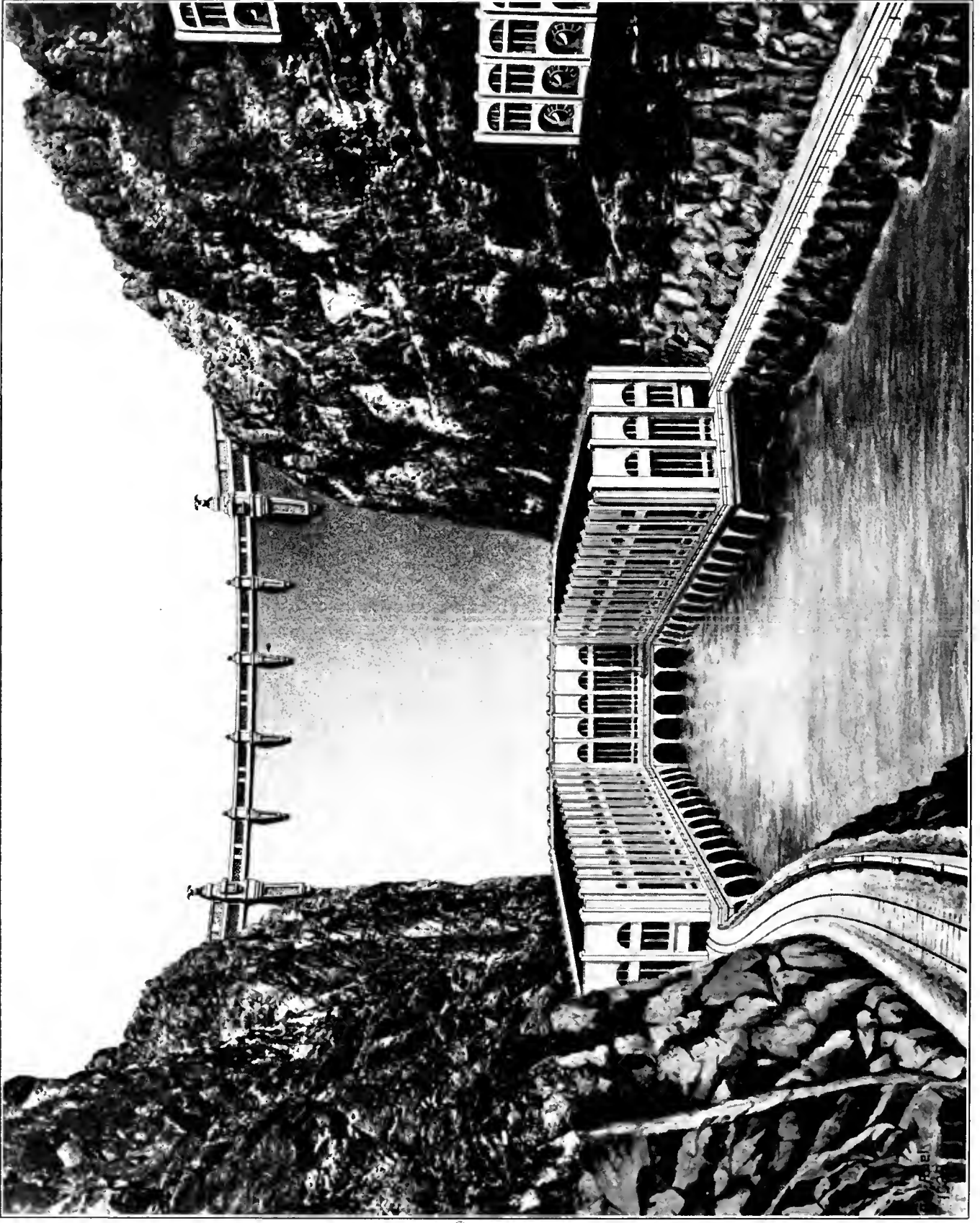
¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926. A. C. Houghton, manager; and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926. Enos D. Martin, manager.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Paradise-Verde district investigations	Phoenix, Ariz.	J. R. Iakisch	Salt River Valley Water Users' Association.
Heart Mountain investigations	Powell, Wyo.	I. B. Hosis	
Utah investigations	Salt Lake City, Utah	E. O. Larson	State of Utah.
Truckee River investigations	Fallon, Nev.	A. W. Walker	
Yakima project extensions	Yakima, Wash.	P. J. Preston	



WHAT THE BOULDER DAM AND POWER PLANT WILL LOOK LIKE
THE PICTURE IS REPRODUCED APPROXIMATELY TO SCALE AND IS BASED ON THE GENERAL PLAN OF THE COLORADO RIVER BOARD

NEW RECLAMATION ERA

VOL. 20

JULY, 1929

NO. 7



SOUTH BRANCH CANAL HEADWORKS, KITTITAS DIVISION, YAKIMA PROJECT, WASH.

A FARM PROGRAM

THERE are things so important that the Government must do them, if it is only through such exercise of collective power that they can be done.

Our object must be (1) to make the tenant farmer a landowner; (2) to eliminate as far as possible the conditions which produce the shifting, seasonal, tramp type of labor, and to give the farm laborer a permanent status, a career as a farmer, for which his school education shall fit him, and which shall open to him the chance of in the end earning the ownership in fee of his own farm; (3) to secure cooperation among the small landowners, so that their energies shall produce the best possible results; (4) by progressive taxation or in other fashion to break up and prevent the formation of great landed estates, especially in so far as they consist of unused agricultural land; (5) to make capital available for the farmers, and thereby put them more on an equality with other men engaged in business; (6) to care for the woman on the farm as much as for the man, and to eliminate the conditions which now so often tend to make her life one of gray and sterile drudgery; (7) to do this primarily through the farmer himself, but also, when necessary, by the use of the entire collective power of the people of the country; for the welfare of the farmer is the concern of all of us.

—THEODORE ROOSEVELT

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

RAY LYMAN WILBUR
Secretary of the Interior

Price, 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

July, 1929

No. 7

Interesting High Lights on the Federal Irrigation Projects

THE Vale-Owyhee Government Projects Settlement Association is continuing its campaign to secure settlers for the project lands and has for distribution to prospective settlers an illustrated booklet descriptive of the Vale and Owyhee projects. Letters have been sent to all owners of land on the Harper unit asking whether they desire to sell or develop their lands.

DAIRYING and poultry raising are showing a gratifying increase on the east division of the Umatilla project, the indications being that within the next few years 75 per cent of the division will be in the hands of poultry raisers and the remainder operated by dairymen.

AT Owyhee Dam, Owyhee project, work continued on lining the diversion tunnel and excavation of the abutments. At the end of the month the dam was 12 per cent completed.

AT Gibson Dam, Sun River project, 8,600 cubic yards of concrete were placed during the month, bringing the total to 153,000 cubic yards, with only 7,000 remaining before completion.

A FRUIT and vegetable packing plant is being constructed at Marsing, Idaho, to handle the output of the Gem district and the Snake River slope of the Boise project. The plant is expected to prove of great advantage to settlers in that section in disposing of perishable products.

THE settlers in the Tule Lake division of the Klamath project have appointed a committee to draft articles of incorporation and by-laws for a hay growers' association. A dairy association has also been formed on the project and is planning to construct a farmers' creamery at Klamath Falls.

THERE is a movement among the alfalfa hay growers on the Yuma project for the establishment of a Government hay grading station on the project similar to the one operating on the Salt River project. The growers wish to have their hay graded locally, and thereby assure themselves of a fair price for their product, the building up of the quality, and the assurance of a ready market which Government-graded hay brings.

THE Yuma Mesa Grapefruit Co. has leased a site near the Southern Pacific tracks at the outskirts of Yuma where they will erect a \$25,000 packing plant to handle their crop of citrus fruit. This year's bearing area of the company's lands will approximate 200 acres.

A NEW airport has been established on the Belle Fourche project on a 160-acre tract of land a few miles north of Belle Fourche. An up-to-date hangar, passenger station, and other improvements will be features of the airport.

THE cheese factory at Rupert, Minidoka project, has been forced to install a new 6,000-pound vat on account of the increase in business. The other two vats in the factory have a capacity of 8,000 pounds each. Daily receipts of milk are about 16,000 pounds, an increase of 6,000 pounds during the year. The Mini-Cassia Cooperative Creamery at Burley now receives about 30,000 pounds of milk per day.

A DEHYDRATION plant will be constructed on the Yuma mesa for the manufacture of a water softener in general use on railroads and in other industrial concerns where large quantities of water are used. The plant, with a capacity of 2,000,000 pounds of the product annually, will be composed of a laboratory, warehouse, and concrete drying beds, covering approximately 5 acres.

A NEW warehouse track a mile long has been built by the Oregon Short Line Railroad at Burley, Minidoka project, to care for increasing traffic, and it is reported that the company plans to erect a large, modern freight depot during the coming summer.

GOOD progress has been made at Echo Dam, Salt Lake Basin project, on raising the earth fill at the upstream toe of the dam and over the cut-off wall area. At the end of the month the dam was 35.2 per cent completed.

THE Montrose Junior Band, Uncompahgre project, made up of boys and girls from the high school and grade schools of Montrose, and numbering about 70 pieces, entered the national contest at Denver the latter part of May.

THE fruit crop on the Grand Valley project is in excellent condition, having escaped all spring frosts, and it is anticipated that a heavy crop of peaches, pears, and apples will be produced in practically all sections.

THROUGH the cooperation of the county commissioners of Cascade and Teton Counties, Mont., the State Extension Service, and the Great Falls Chamber of Commerce, arrangements have been made to place an associate county agent on the Sun River project.

THE dairy herd of O. W. Moore, in Gering, North Platte project, was sold recently, eastern stockmen and dairymen being the principal buyers. The stock in this herd comprised one of the finest in the State of Nebraska and brought a gross return of \$12,300. All of the animals sold were registered Holsteins. The highest price paid for a single cow was \$402.50 and for a bull, \$900. The average price paid was \$208.50.

Community Small Farms

An address before the Twenty-second Annual Convention of the National Association of Real Estate Boards, Boston, Mass., June 28, 1929

By Dr. Elwood Mead, United States Commissioner of Reclamation

(NOTE.—In the absence of Doctor Mead in the west, the address was delivered by Miss Mae A. Schnurr, secretary to the commissioner)

THE invitation to participate in this conference and in the discussion of its important problems is appreciated. The Reclamation Bureau claims fellowship with realtors because it has placed settlers on 135,000 farms and has ahead of it the task of finding suitable settlers for 5,000 additional farms. The bureau has been greatly helped in the past by the real-estate subdivider, and we hope and expect similar aid in the future, but we have to make our appeal to realtors on the ground of public advantage rather than private gain, because the settlement of land under reclamation projects is not directly remunerative. There is no law under which the bureau can pay commissions for securing settlers on public land, but on private land it is a matter of arrangement between the owner and the selling agent, and with the movement of people away from farms rather than toward them, with the profits of agriculture not visible to any cultivators except those specially qualified, the peopling of unoccupied farm lands is to-day a problem of peculiar difficulties.

We base our hope for cooperation, therefore, on the fact that the reclamation policy is immensely worth while because it is striving to build up in waste places new organic communities of healthy, happy Americans, enjoying an American standard of living and creating and adding to the political and economic strength of our country.

The attention now being given to what is required to create prosperous, stable farm communities is relatively new, and views thereon are still undergoing an evolution. It touched the city of this convention in 1918 when members of the Reclamation Bureau staff came to New England to see what opportunities New England had to provide homes for returning soldiers. There was misgiving that when more than a million men in our European army were returned to peace pursuits they could not be absorbed. Other countries had the same thought. Australia voted more than \$200,000,000 to aid returning soldiers to buy and improve farms. Canada arranged to lend each qualified ex-service man \$2,500 to help improve his homestead.

The farms available on western reclamation projects were so few in number that Secretary of the Interior Lane arranged for

a study of what could be done in the neglected and abandoned farming sections of the East. It was known that in 50 years lands farmed in New England had decreased 42 per cent; that in the South more than half the farms were cultivated by tenants, and many millions of acres had gone out of cultivation and were being given over to weeds and brush.

THE CITYWARD DRIFT

Nothing came of the scheme, however. It was dropped because soldiers found employment in industry. The movement from rural communities to cities in the South is still going on. Between 1920 and 1925 Alabama lost 19,000 farmers, Georgia 60,000, South Carolina 20,000. Speaking of it recently, Mr. George Soule said, "It looks more like an evacuation than a drift. A hostile army could hardly produce a greater effect." Few city dwellers realize how far this decadence has gone. They have not weighed the significance of the millions of acres between Virginia and the Mississippi River which were once farmed but which are now given over to weeds and brush. These great areas of neglected land are close to the markets of our largest cities and are connected with them by direct railroad lines. They have conditions of soil and climate that make possible long growing seasons for a wide range of crops. They are far superior in their natural advantages to the country which supports the flourishing agriculture of Denmark and Germany.

For several years, the thoughtful people of the Southern States have been giving these conditions serious attention, and after nearly 10 years of inquiry and effort a policy of planned community development has been evolved and a bill to carry this into effect has been introduced in the Senate of the special session of the Seventy-first Congress by Senator Simmons of North Carolina. The scheme includes an authorization of \$12,000,000, to be appropriated by Congress, to enable land to be acquired and one colony established in each of 10 Southern States. The best minds of rural life are to be employed to determine the kind of agriculture, the size of farms, the cooperative and other arrangements for marketing to enable these communities to function as the units of great industries now function.

The idea would be to have the farms owned by their cultivators and to be of the size that would give employment to the farm family. The farms would be sold on terms which would enable the man who brought his little capital to the venture to borrow enough to make his home a going concern and enable him to obtain the best results out of his labor and investment. The purchase price would be repaid in not to exceed 40 years, with 4 per cent interest.

FROM FAILURE TO SUCCESS

The Fairway Farms in Montana are an illustration of what is proposed in this measure. Dry-farming agriculture carried out by settlers who had no special training on 160-acre farms proved a disastrous failure. The Rockefeller Foundation was appealed to to determine what kind of agriculture could be made to succeed in Montana dry-farming conditions.

Land was bought on which to create farms of different sized areas and for different types of agriculture. Good men as far as industry and thrift are concerned, but who had failed under unplanned settlements, were put on them and adequately financed for the kind of farms they were to develop and ultimately own. The scheme had been thought out by some of the best economic brains of the country. They knew what they wanted to do. What they had to find out was how large their farms should be, what rotation they should follow, how many head of livestock they should carry, what machinery to buy and how to handle it. Now the result is that these men who had failed before are succeeding.

Such a scheme would recreate in this country a rural life and society closely resembling that established by the early settlers in New England. Their "towns" did not end with the stores, post office and the church, but included the farms of the surrounding country, and these "towns" were established for two things: The cultivation of the soils and the maintenance of an ordered and religious society. To do this they selected their members and then they restricted the right to transfer land. No one was allowed through such transfers to bring in people whose character and habits would not maintain the standards of the community.

In this country we have laid the foundation for making a demonstration or experiment of this policy. Machinery has lessened the hardest toil of the farm and made human labor more efficient. We have better breeds of livestock. We know more about how to maintain soil fertility and better appreciate the need for doing this. We are giving up the idea that each farmer can be a law to himself and ignore his neighbors. We are beginning to cooperate and act and think as communities. These things require our farmers to be informed about many things the pioneer did not have to consider. He must plan to operate his farm as factories are operated and that means he must study efficiency in farm operations and where and when to market his products.

He must do this because the rewards of farming no longer come through increases in the value of land. Income and profits must come from growing more and better crops and combining with his neighbors to create markets and ship in car lots.

RURAL RECONSTRUCTION IN THE SOUTH

The introduction of these improvements through individual action, is almost impossible in many sections of the country. This is especially true in the South. In the first place it is based on different practices from those which have prevailed there for more than a century. The negro, the mule and the single-crop farm must give way to mixed farming, to the introduction of improved breeds of livestock, to the use of costlier and more complicated farm implements. It is impossible to bring about these changes through any existing agency. We can talk to the farmer until we are black in the face and he will go on as he has in the past. The credit and the financial strength needed in better farming are lacking. What we have is now largely based on cotton and tobacco. It must be entirely changed. To do this needs the encouragement and strengthening of purpose which comes from a group of people, acting together, from the opportunities which this gives them to employ expert advice and direction, and thus have the benefit of superior training and intelligence, without too great expense. Rural reconstruction is a problem which transcends the power of the individual farm family.

The South has been encouraged to revive this movement by the notable success of Mr. Hugh MacRae of Wilmington, N. C., in creating organized communities, and by the arguments of Doctor Long of Clemson College, South Carolina, and Doctor Branson of the University of

North Carolina. They have shown that what the South needs is a complete change in farm practices.

Changing the farmers' practices, and bringing him to do his work better than it has been done in the past can be brought about only by showing that good farming pays and by having men of knack and skill show the beginner how to carry on. Single communities in each State will be beacon lights. They will lead to the establishment of other communities.

The most interesting feature of the hearing before the Senate Committee on the southern bill was testimony given by Hugh MacRae of Wilmington, N. C. Mr. MacRae was one of the first, if not the first, man in this country to realize the fact that the regeneration of rural life in the South could not come through individual action, but must come through group action. He knew what had been done in Denmark. As an able business man, he saw the great opportunities in the South and for years he worked as a pioneer, using his own money and giving freely of his time in the creation of one community after another, solving by trial the problems which were involved. His achievements and the patience and persistence with which he has labored entitle him to a Nobel prize or a distinguished-service medal. Some day his State will rear monuments to him, as northern Italy has done to Count Cavour for what he did for agriculture and rural life in that country.

THE MACRAE COLONIES

Speaking in support of the Simmons bill before the Senate committee, Mr. MacRae said:

"Twenty-five years ago there was no guide to follow. It was just a matter of trying different methods and I believe I made almost every mistake that could be made. I believe that what is unhappily

designated as the farm problem is a multitude of problems. I am an advocate of the provisions of this bill as furnishing a solution for many of them." Speaking of his latest colony, which is widely known as Castle Haynes, he said: "As the home of this colony I bought a worn-out cotton plantation of 600 acres, paying therefor \$12 an acre. I first divided the land into farms of 10 acres because I believed that 10 acres would give employment to all of the members of a farm family. I have since decided that 20 acres is a better sized unit and through amalgamation and purchase most of the farms now have 20 acres. I sought to include among the settlers a few expert cultivators who knew how to grow crops of high acre value. I thought that would supplement the work of the advisers who were employed to show people how to farm. I advanced money to help them build houses and other necessary improvements, giving easy terms of payment for money advanced. I placed the well-being of the family above any financial return, but I realized that before it would have any educational value it must be a business enterprise, and this it has been.

"When this area was acquired it had practically no value to the State of North Carolina. It would soon have become part of those millions of acres of neglected land, but through cooperation and credit needed to provide the equipment, the use of all that science and invention has brought to us, the 600 acres at Castle Haynes has produced crops worth \$500,000 a year and paid to the railroads \$50,000 a year for freight. Instead of the miserable cabins of the crop-share tenants, its homes are a source of civic pride to the State and of comfort and enjoyment to the people who live in them. Farmers who came there with nothing are now worth \$75,000, but the people who now live there would have never



General view of 4-year old grapefruit grove on Yuma Mesa

found themselves nor would the possibility of this region have ever been developed if this had been left to the needed action of individuals."

In the reclamation of western arid land as much attention is now being given to the agricultural and economic aspects as to the engineering. The growing of more crops and creating new wealth in land is being displaced in some measure by the new objective of creating organized communities of healthy and happy Americans. The older and more prosperous projects show what can be done by multiplying these splendid examples of wholesome and prosperous rural life. Times have changed and reclamation as a public policy must move forward as these changes require. If it does this, its social and political benefits will be immeasurably greater than can come from merely putting water on a few thousand more acres of land.

The idea of planned and supervised settlements is not new. In 30 of the foremost countries of the world it was and is a national policy and has worked a marvelous improvement in rural life.

A promising beginning has been made in this country, but future action will depend on an informed public and resulting legislation by Congress in support of the movement.

Among the causes of low-grade alfalfa are thin stands containing weeds and grasses, foreign material such as decayed rakings from previous cuttings, weather damage, overripeness at time of cutting, overdrying, baling, and stacking under-cured hay, baling during weather conditions which cause loss of leaves and stemmy appearing bales.

The Don Martin Project, Mexico

By Andrew Weiss, Resident Engineer

THE Don Martin project is one of the largest projects undertaken by the Mexican Irrigation Commission shortly after the passage of the Mexican Reclamation Law, approved February 6, 1926. It is located on the Salado River in the States of Coahuila and Nuevo Leon. The station of Rodriguez on the Mexican National Railways connecting Laredo with Mexico City, some 45 miles southwest of Laredo, is located near the center of its irrigable area, which embraces a total of about 160,000 acres.

IRRIGATION PLAN AND WATER SUPPLY

This project depends almost wholly upon the storage of flood waters of the Salado River in a reservoir located some 60 miles due west of Laredo, Tex. The capacity of this reservoir is 1,123,600 acre feet, and its area at the flowage line is 48,000 acres. These waters are to be retained by a dam now in course of construction in the bed of the Salado River, 42 miles upstream from Rodriguez and an equal distance west-northwest from the station of Camaron, the latter being located 36 miles southwest of Laredo. The latter station is connected with the dam site by a gravel-surfaced highway which was constructed at the beginning of the project for the purpose of facilitating traffic and the transportation of the construction materials from the railroad to the dam and auxiliary works connected therewith. This dam will also serve to divert these waters into the main canal

heading at Don Martin and extending thence in a general easterly direction some 26 miles, at which point one of the principal laterals continues in the same direction, a further distance of 48 miles to cover the first irrigation unit in the vicinity of Rodriguez and Camaron, comprising about 40,000 acres.

From the point of diversion of the Camaron Lateral the main canal will continue in a general southerly direction some 8 miles to the crossing of the Salado River, from which point it will continue in a general southeasterly direction, approximately paralleling the course of the river, to cover some 87,000 acres of land along the south side of the river, the lower limit of which reaches to within about 3 miles of the crossing of the Laredo-Monterrey highway with the Salado River.

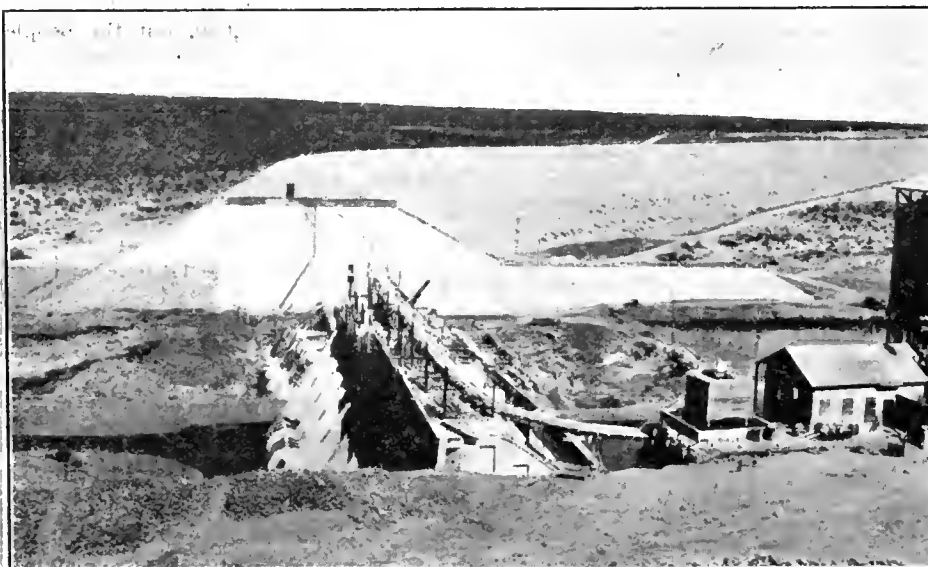
The catchment basin for the reservoir covers some 12,000 square miles drained by the Sabinas and Nadadores Rivers, which unite to form the Salado about 5 miles above the Don Martin Dam. This is a typical arid region, and the major part of the precipitation comes in the form of torrential rains generally distributed during the period May to September, and sometimes extending into October. From the available run-off record, which covers a series of 17 years, 1901 to 1912, inclusive, and 1923 to date, an annual yield of about 683,000 acre-feet has been estimated. With an assumed carriage loss of 40 per cent the project works are planned to provide annually a delivery of 2½ acre-feet per acre of irrigable land over the irrigable area served.

LAND OWNERSHIP

The project area is wholly located upon private lands, a large part being owned by the Milmo estate, and the balance distributed among not to exceed 30 to 40 persons. With the exception of the Milmo estate, the lands privately owned are distributed in lots generally laid out in strips of relatively narrow dimensions in widths of 4 or 5 kilometers and extending in length generally to the divides between the principal water courses as for example, on the north side of the river to the divide between the Rio Salado and Rio Grande.

SURVEYS AND SUBDIVISIONS

Only an approximate topographic survey of the portion of the project north of the river and the reservoir basin was



Don Martin Dam, Mexico, looking northwest along the axis of the overflow section. Earth portion of dam in background

available when construction was authorized in October, 1926. Owing to the difficulty of taking field topography by means of orienting the instruments by triangulation signals, the country being but slightly rolling and for the most part covered with mesquite brush of varying heights, it was decided to establish a system of rectangular surveys in all respects similar to that used in the western part of the United States. For this purpose an initial point was established near the center of the project from which were projected a base line and principal meridian, and these were supplemented with parallels and meridional township lines at a distance of 10 kilometers apart. The interior subdivisional lines were made parallel to the eastern boundary of these townships so established, and divided each township into 25 sections, each resulting in an area of 400 hectares, or approximately 1,000 acres. This system, together with its level control, was then used as the basis of the topographic surveys which followed.

The sections so established will serve in the subdivision of the lands into farm units, very similar to the system adopted in the United States. The exact mode of subdivision is as yet undetermined.

The Main Canal passes through an auxiliary reservoir of 1,600 hectare-meter capacity (12,970 acre-feet) which will materially aid in the regulation of the system below and the conservation of water during periods of changeable weather and the resulting fluctuating demands.

As indicated above, the main canal is being constructed to its junction with one of the principal laterals of the system which will supply the first irrigation unit of 40,000 acres by means of a suitably designed system of distributaries.

LATERAL SYSTEM

The lateral system is being planned and built to reach each individual farm unit. It embodies all features and safeguards which experience has shown to be needful, keeping in mind the systems of irrigation which may here prevail. All structures are being planned as nearly permanent as may be devised.

DRAINAGE SYSTEM

The principal arteries of the drainage system are being planned and built in connection with the irrigation systems. These are being built of sufficient size and depth to carry safely all storm and waste waters and also to effect the collection of soil drainage. As these soils are generally of a fairly compact structure, the collection and removal of seepage waters is believed to be necessary and important. To this end these ditches are generally

excavated to depths of from 7 to 10 feet, all of the open type for reasons above stated.

SETTLEMENT PLANS

Plans for the settlement of the various project units are in course of study and development. Following the experiences of the Bureau of Reclamation in the United States it is planned to develop the project and open it for settlement in divisions of suitable size, each division being subdivided into farm units of such dimensions as may best meet the local circumstances and necessities.

CONSTRUCTION OF WORKS

The construction of this project, together with projects located in Rio Mante, in the State of Tamaulipas, and on the Santiago River in Aguascalientes, is being carried forward under the supervision of the National Commission of Irrigation, under the immediate direction of the J. G. White Engineering Corporation, S. en C., with its principal offices in Mexico City, the management being supervised by G. W. Caldwell, general manager, and the engineering operations by C. H. Howell, chief engineer, the latter having recently succeeded F. E. Weymouth, former chief engineer of the Bureau of Reclamation.

On the Don Martin project R. M. Conner is superintendent of construction, with Sr. Alfredo Becerril Colín as assistant. The engineering is locally in charge of the writer supported by Messrs. W. C. Christopher, I. B. Jones, and Charles P. Seger, all formerly of the Bureau of Reclamation, and by a very able staff of Mexican engineers. The commission is represented locally by Srs. Manuel Bancalari and Francisco Ballesteros, technical and administrative supervisors, respectively.

Rio Grande Project Making Plans for Fair

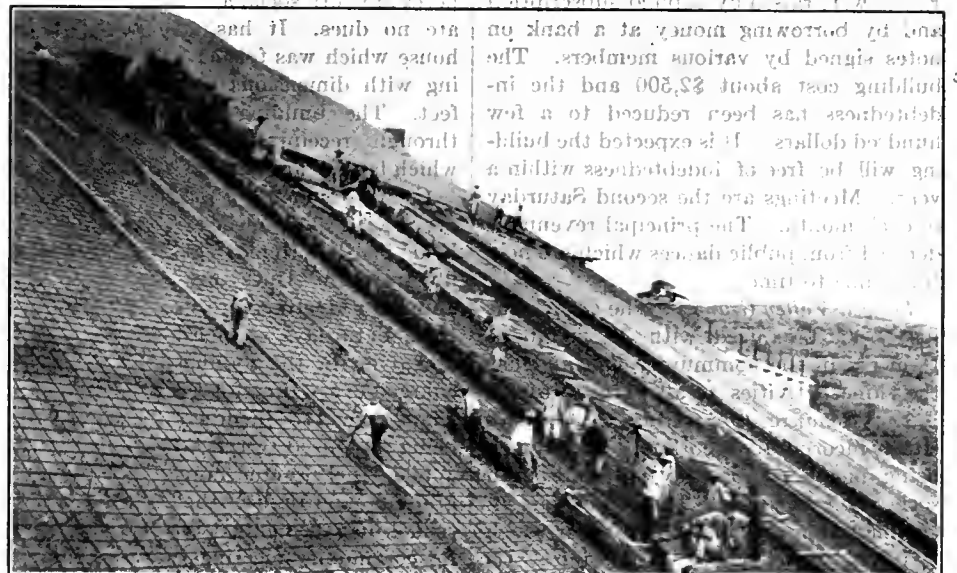
The Rio Grande project, New Mexico-Texas, is to have a fair this coming October, according to plans being drawn up by the directors of the Dona Ana County Farm Bureau. All farmers living in the Rio Grande project have been invited to join the farm bureau in presenting the biggest fair in the history of the project. It will be held at the fairgrounds at Las Cruces, these grounds, together with buildings to the value of \$15,000, being the property of the county farm bureau.

In addition to the agricultural features of the fair there will be sports of all kinds, the farm bureau fairground possessing race tracks, football field, and baseball diamond. A big feature will be the military exhibition put on by the Cavalry at Fort Bliss.

As Dona Ana County, according to Government figures, holds first place as a cotton-producing county in the United States, there will be some remarkably fine cotton exhibits on display. All the farmers of the project are expected to participate in agricultural displays showing that their project well merits its fine reputation.

The deflation in farm values of some crops has already gone so far that instead of overproduction existing at the present time there is actually a shortage in certain staple food products.

A CONTRACT has been let for the construction at Naches, Yakima project, for the use of the Horticultural Union, of a \$60,000 cold-storage plant with a capacity of 175 carloads.



Placing concrete facing on earth section of Don Martin Dam



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor *New Reclamation Era*



Club Activities of Our Projects

OKANOGAN PROJECT, WASHINGTON

IN 1912 the Women's Country Club of Omak, Wash., was organized. One year later it became affiliated with the National Federation of Women's Clubs. It is the only women's club on the project and has been a very active organization throughout the 16 years of its existence.

The club holds regular meetings and these are, alternately, a business meeting and a social meeting. The club is behind all movements that are for the benefit of the community. Its social gatherings are looked forward to as gala events offering a good time for all, and molding a spirit of neighborliness and friendship among project people it would be hard to bring about in any other way.

KLAMATH PROJECT, OREGON-CALIFORNIA

This project makes a good showing on organized club work and information on each group is presented:

Langell Valley Women's Club.—This club was organized May 27, 1915. It has about 30 members. Dues are \$1 per year. It meets at homes of different members. Its purposes are sociable and charitable. Any woman over 18 years of age is eligible to become a member. The regular meetings are the fourth Tuesday of each month, with one annual party for members and their husbands.

Langell Valley Community Club.—This club was incorporated in 1927. It built a building 32 by 60 with a kitchen, stage, and dressing room. (See illustration.) Funds were raised by popular subscription and by borrowing money at a bank on notes signed by various members. The building cost about \$2,500 and the indebtedness has been reduced to a few hundred dollars. It is expected the building will be free of indebtedness within a year. Meetings are the second Saturday of each month. The principal revenue is derived from public dances which are held from time to time.

Langell Valley Grange.—The grange has just been organized with 38 members. It meets in the community hall and has the same activities as all grange groups.

The Bonanza Community Club.—This club is incorporated, both men and women being members. Its purposes are both social and business. This club was instrumental in starting the activities which resulted in a school gymnasium. Its

main event is an annual Thanksgiving dinner. Two hundred people attended the one held last year.

Bonanza Women's Club.—For information about the Bonanza Women's Club I submit a memorandum prepared by one of its members:

"Became a member of the Oregon Federation of Women's Clubs four years ago. Has about 30 members. Holds four meetings per month, one social, one business and health, two literary. This year we are sponsoring a series of silver teas for the benefit of Federation scholarship fund, Doernbecher Hospital, Children's Farm Home and our own library fund. Last year through the efforts of the club, a branch of the county library was established in Bonanza. At present the library is housed in the Odd Fellows Hall and club members take turns in acting as librarian. The library is open three times a week. In time we expect to have our own building. We have \$50 in our building fund, donated to us by Bonanza Community Club from their prize money received from the county fair. Last year we also sponsored a community clean-up day and plan to make it an annual event. A community loan closet has been established through the club's efforts, and a fairly full line of sick room supplies is kept on hand and loaned to anyone asking for them. The club stands for everything which tends toward better civic, moral and social betterment for the community."

Poe Valley Community Club.—Its purposes are both social and business. There are no dues. It has purchased a club house which was formerly a school building with dimensions of about 20 by 40 feet. The building has been paid for through receipts from entertainments, which largely are dances and card parties.

Central Community Club.—Its purposes are social and business. Meetings are held in the Henley gymnasium. (See illustration.) Dues are 50 cents per annum. Meetings are held the first and third Saturdays of each month. Dances are given in the gymnasium, \$20 being charged every time for the use of the hall. There are 175 members. A grange is being organized to serve this community. While the gymnasium is on school grounds and under the control of the school management, it is used very much for community meetings whether they be

of a social or political character. It is also available for school plays and in the winter months is regularly used for basket ball.

Merrill Community Hall.—The Merrill Community Hall was built by a number of citizens who incorporated and issued shares having a par value of \$10. There are 60 stockholders. The hall is 56 by 100 feet with 16-foot ceilings. (See illustrations.) The stock has not yet been paid for although the probabilities are that those who bought stock will get their money back with reasonable interest. Moving pictures are held in this hall twice a week, and dances every Saturday night.

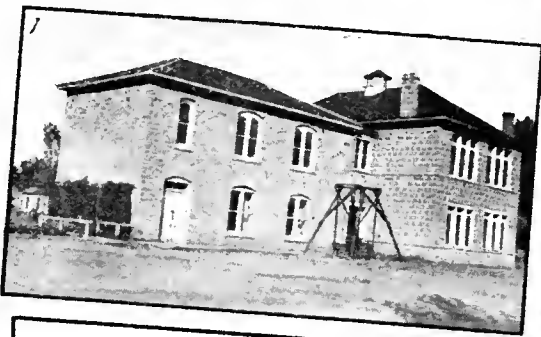
Merrill Library Club.—The activities of this club are given by the Secretary of the Club:

"The purpose of the Merrill Library Club is to maintain and support a public library. Members' dues are \$2 a year. Anyone, not a member of the club, may read by paying 50 cents a month or 10 cents a book. All of the current magazines are in the library also, for patrons to read. The officers of the club consist of president, vice president, secretary, and treasurer. The library is kept open on all week days, except holidays, or by special permission of the president, from 2 p. m. until 4.30 p. m. The librarian is chosen by the president and paid a salary of \$12.50 a month for her services. She has the privileges of a club member during her service. At each meeting, a penny collection is taken up, such funds to be used for a flower fund for the sick.

"Once each year, near Halloween time, the Library Club sponsors a dance for the purpose of making the greater part of money for the coming year. This year about \$385 was cleared after all expenses were paid. Card parties are also given during the winter months, from time to time, with a small charge for each player. These money-making pastimes, together with the club members' dues, readers' dues and fines, finance the library. A fine of 2 cents per day on a book kept overtime is charged, two weeks for an old book and one week for a new one being the allowed time.

"New books are purchased once a month, the number depending upon the amount of money the members decide to spend. The regular meetings are the

PROJECT CLUB ACTIVITIES



1. COMMUNITY HALL
VALE PROJECT, OREGON.

2. WOMEN'S IMPROVEMENT CLUB.
ORLAND PROJECT, CALIFORNIA.
ORLAND LIBRARY BUILDING

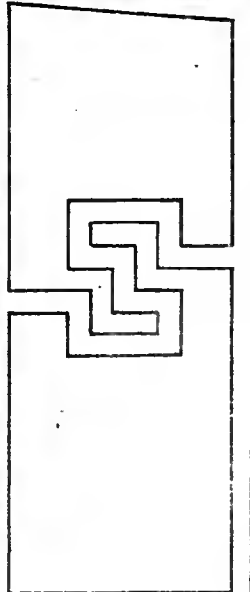
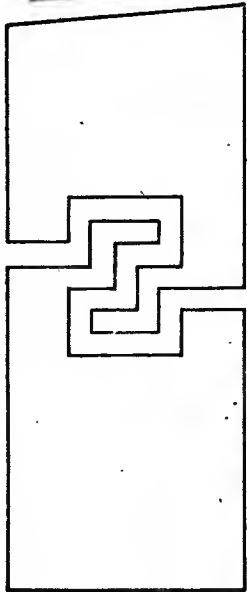
3. MERRILL COMMUNITY HALL
KLAMATH PROJECT,
OREGON-CALIFORNIA.



4. HENLEY GYMNASIUM,
KLAMATH PROJECT,
OREGON-CALIFORNIA.

5. LANGELL VALLEY COMMUNITY HALL
KLAMATH PROJECT,
OREGON-CALIFORNIA

6. WOMEN'S COUNTRY CLUB, OMAK
OKANOGAN PROJECT, WASHINGTON.



first Thursday in each month, either at some member's home or the library. There are at present 75 paid-up members. There are 1,730 books now in stock. An insurance of \$1,000 is carried by the club members on the books and furniture. The aim of the club is to furnish good reading material for the residents of the community at a small cost. The wants of the school children are also considered and a number of books ordered occasionally for school reading purposes.

"I believe this club affiliates with the county library, which in turn ties in to the State library at Salem, Oreg. Anyone, through the county library or its branches, may secure books from the State library at Salem."

Malin Helping Hand Society.—Meetings of this organization are held in different homes. Dues are 25 cents per year. Its purposes are social and charitable. Its main purpose is to raise a fund with which to build a hall. A bazaar is given each year, the profits of which go toward the building fund.

Bohemian Farmers Association.—The settlers in the vicinity of Malin are almost all Bohemian. An association has been formed which has 45 members. Dues are \$1.20 a year. Its purposes are cooperative, the idea being to aid any member in any way possible. Machinery is owned in common. At present they own a ditcher, threshing machine, and fanning mill. Machinery is loaned from farm to farm. This association communicates with Bohemians in other localities who desire to come to some Bohemian community.

Tule Lake Community Club.—The dues of this club are \$1 a year and there are 50 members. Meetings are held the first Saturday of each month. Its purposes are both social and business; to aid Tule Lake settlers in every way possible and to have some organization which can speak for the settlers. Thus far it has met in the loft of a barn which, however, has been given a good floor, is heated, and has electric lights. Dances are held there. A clubhouse will be built as soon as the location of the railroad is definitely known. It is the idea that a town site may be established, in which case the clubhouse will likely be located there. This club won first prize for the best float displaying farm products at the railroad celebration at Klamath Falls. It also won second prize for farm products exhibited at the Klamath County Fair.

Kill Kare Club of Tule Lake.—This club is for women only. It has 30 members. Activities are social, literary, and of a public character. No dues are charged. A fund of \$250 has been accumulated which will aid in the construction and furnishing of a clubhouse which

the Tule Lake Community Club has planned to build. The Kill Kare Club is also affiliated with the Siskiyou County Library Association.

ORLAND PROJECT, CALIFORNIA

One of the leading organizations in club activities on the Orland project is the Women's Improvement Club, the meetings of which are held in the Orland Library. (See illustration.) This club is quite active in civic improvements in addition to its social activities. Several years ago it fostered a movement which resulted in the planting of considerable shrubbery and trees on the Orland Library grounds.

There is also an Exchange Club meeting at present in the hotel. It is one of the many service clubs now in existence and during the past spring interested itself in the planting of rose bushes on the civic center at Orland.

It is planned to eventually have clubhouses in both Orland and Willows in the form of war memorial buildings. The California State law empowers the supervisors to levy a tax for this purpose and the American Legion Posts of Willows and Orland have cooperated in a program for construction of such a building for both places. One of the uses for these buildings will be that of providing meeting places for the various clubs of the community.

VALE PROJECT, OREGON

The Vale project is planned to irrigate about 25,000 acres of bench land north and west of the city of Vale. As water will not be available for land of the Vale project prior to 1930 and as the precipitation, which does not exceed 10 inches per annum, is too small to permit any kind of farming, there are at present no settlers on the lands of the Vale project. However, there are about 20,000 acres of land irrigated within the boundaries of the Warm Springs irrigation district immediately surrounding the city of Vale, and it is from the settlers of the Warm Springs irrigation district and from the population of the city of Vale that the Women's Civic Club of Vale, Oreg., draws its membership. This club has been in existence about 15 years, has a membership of 60, and holds meetings at the Vale City Hall in the evenings of the second and fourth Thursday of each month.

The two outstanding results of community effort in which the Women's Civic Club of Vale played a very prominent part are the remodeling of the old school building and the construction of the city park.

The old building had been left standing idle after the construction of the new school building, and it was reconstructed and converted into a Community Hall (see illustration), which is used for public meetings but has its principal use at this time as a gymnasium for the Vale schools and for volley-ball games during the fall and winter seasons by the citizens of the town.

The city park was built entirely by community effort. It has a grand stand which has seating capacity for 2,500 people, a race track a quarter of a mile long, a dancing pavilion, and a free tourist park with drinking fountains, with plenty of bluegrass and shade trees.

The park is also equipped with a large oven for preparing barbecued beef which is served annually on the Fourth of July. From four to six thousand people visit Vale for the celebration.

Minidoka Project Cow Makes Fine Record

Tests conducted by the Mini-Cassia Dairy Herd Improvement Association showed that a Holstein cow owned by Robert Girardell, of Rupert, Minidoka project, Idaho, produced, during the year ended May 1, a total of 774 pounds of butterfat and 22,092 pounds of milk. The net profit from these two products was \$261, and in addition she produced a heifer calf valued at \$100. The average profit from each of seven cows owned by Mr. Girardell for the year was \$140. The association again led the State in butterfat production for the month.

Rio Grande Cotton Ginning Costs Reduced

An anticipated saving of \$60,000 for 1929 has been secured for the farmers of Dona Ana County, in the Rio Grande project, New Mexico-Texas, by a reduction in cotton-ginning charges through the instrumentality of the Dona Ana County Farm Bureau.

These charges, according to Miss Margaret Page Hood, of the Las Cruces Chamber of Commerce, are fixed by the State Corporation Commission and were formerly 45 cents a hundredweight. The ginners had asked for an increase to 50 cents. Through the efforts of the farmers' organization the rates were reduced to a maximum of 40 cents, thus making a substantial saving in the total ginning costs of the county.

Making Profitable Use of Abandoned Land

C. C. Wright, Officer of Western Irrigation Agriculture, Prosser, Wash.

PERHAPS the greatest factor in the solvency of existing Government irrigation projects at the present time is the proper dispensation of the unimproved, abandoned, or nonproductive lands which are held as security for the repayment of construction costs. On all of the projects there is a considerable area of poor land usually occurring as small parts or islands within the good land, which according to some authorities should never have been included in the scheme for irrigation development. Such land is generally of such poor character that when used for ordinary crop purposes it will not even justify the Government water charges against it to say nothing of paying local, county, and State taxes and recovering the expense of putting it under irrigation. In one small district comprising about 2,200 acres situated in the lower Yakima Valley there are at the present time about 300 acres which have been confiscated by the county and the irrigation district for delinquent taxes and water assessments. Besides this, there are 370 acres foreclosed by the Federal farm loan bank and a number of farms in the hands of private mortgage companies, most of which is abandoned. As soon as this land becomes confiscated by the county it ceases to pay water assessments, and much of it in private ownership is several years delinquent in payments. Hence in this district a large percentage of the land does not pay either construction costs or operation charges at the present time, but the remainder of the land in the district is required to carry the construction load and pay all of the operation and maintenance charges which should be shared by this nonproductive part. Many other districts in the lower valley have floated L. I. D. bonds and incurred other obligations until they are in much worse condition than this one. Obviously these lands are a liability rather than an asset, and solvency depends upon their just disposal or use.

The uses to which these lands may be put are often very limited, but one way in which at least a small part of them can be utilized to very good advantage is illustrated by the following actual case:

In April, 1927, a 40-acre tract of this abandoned land was purchased for \$3,200 from the Federal farm loan bank, which had foreclosed a mortgage on it. This tract had never been known to produce more than a few tons of hay and a few bushels of corn each year. It was one of



This is Pedigree Avenue on "Henacres" irrigated poultry farm

the farms which had been abandoned for several years. A fourth of it had never been irrigated and the neighbors all said it could not be irrigated. "It was too high, and even if it were leveled down it was so gravelly water would run through it too fast to do any good."

The purchaser of this tract was E. R. Wells, owner and operator of one of the largest poultry plants in the Northwest. He hatches and sells approximately 200,000 baby chicks a year. His entire organization has been built up on land irrigated by the Government and he started with a box of store eggs in 1908, together with a lot of fortitude and hard work. A unique feature of "Henacres"—the trade name of this plant—is its cooperative plan with neighboring farms.

A considerable number of farmers in the immediate vicinity of Prosser, Wash., the home of this plant, keep only "Henacres" Leghorns, and handle these flocks strictly as breeders the year around. They sell their eggs to Mr. Wells at a nice premium over market prices during hatching season. But in order to make this "Henacres" organization a little more independent, the abandoned 40-acre farm as mentioned above was purchased for \$3,200 in the spring of 1927.

About the first thing Mr. Wells did upon acquiring this "no good" land was to get

in touch with the local agricultural experiment station. He consulted the crops specialist, the soil specialist, and the irrigation specialist, and asked them to go over the land with him. After a thorough examination and survey, a certain cropping plan was laid out. The entire farm irrigation system was replanned and relaid; and 20 acres out of the 40 produced a good crop the first year. That part of the 40 which "could not be irrigated" was irrigated and is now producing alfalfa abundantly for 2,000 healthy, vigorous Leghorns each year, which help to produce the 300,000 eggs which hatch out the 200,000 baby chicks which are sold all over the Northwest.

This 40 acres, which up until the time of Mr. Wells's purchase was an idle, abandoned waste, is now a thriving poultry laying farm. It is occupied by four large modern houses, a well-equipped barn, and is surrounded by a 6-foot woven-wire chicken-tight fence. Every acre of it is producing something, and Mr. Wells says in five years it will have paid for itself with a substantial profit besides.

If more of the abandoned farms on our Government projects could be handled by men with the necessary capital, experience, and ability, a large part of the burden which is now breaking the camel's back would be lifted.

Survey for All-American Canal, Boulder Canyon Project

THERE is set out below in full a copy of the contract dated March 26, 1929, recently entered into between the United States, on the one hand, and the Imperial Irrigation District and the Coachella Valley County Water District, on the other, for the expenditure of not to exceed \$100,000, one-half by the United States and one-half by the districts for surveys, etc., connected with the proposed all-American canal, Boulder Canyon project.

THE CONTRACT

This agreement made the 26th day of March, 1929, between the United States of America, acting for this purpose through Elwood Mead, Commissioner, Bureau of Reclamation, under the provisions of the act of June 17, 1902 (32 Stat. 388), and acts amendatory thereof or supplementary thereto, herein styled the United States, and the Imperial Irrigation District, an irrigation district organized and existing under and by virtue of the laws of the State of California, with its principal office at El Centro, Calif., and the Coachella Valley County Water District, a county water district organized and existing under and by virtue of the laws of the State of California, with its principal office at Coachella, Calif., herein styled the districts, witnesseth:

2. Whereas it is desired to make investigations and surveys of a main canal and appurtenant structures located entirely within the United States, connecting the Laguna Dam, or other suitable diversion dam, with the Imperial and Coachella Valleys, in California; and

3. Whereas it will be of mutual advantage, conducive to economy and efficiency, and will avoid a duplication of effort and expense to have said investigations and surveys made by the United States,

4. Now, therefore, in consideration of the premises and the mutual covenants and agreements herein contained, it is stipulated and agreed as follows:

5. The United States will make investigations, surveys, and cost estimates of a main canal and appurtenant structures, located entirely within the United States, connecting the Laguna Dam, or other suitable diversion dam, with the Imperial and Coachella Valleys, in California, which said surveys shall be made in sufficient detail so that the character and cost of development will be shown.

6. The execution of the work hereunder shall be under the supervision and direction of the chief engineer of the Bureau of Reclamation. All employees of the United States shall be subject to established rules and regulations of the United States Civil Service Commission.

7. Upon the execution of this contract the districts shall deposit the sum of \$10,000 with the fiscal agent of the Bureau of Reclamation at Denver, Colo., and on or before January 1, 1930, the districts shall deposit with said fiscal agent within 10 days after receipt of

notice or notices from the chief engineer of the Bureau of Reclamation, the additional sum of not to exceed \$15,000, and shall thereafter deposit the remaining sum of \$25,000 within 10 days from receipt of notice or notices from the said chief engineer, or so much thereof as may be required to complete the work as herein contemplated to be disbursed by the United States in the payment of the cost of the investigations, surveys, compilations, estimates, plans, and reports, including overhead and other expenses to be incurred in making said investigations and surveys, it being expressly understood and agreed that the obligation of each respective district in each instance where the districts are required to advance funds under this contract, shall be in the proportion of four parts from the Imperial Irrigation District and one part from the Coachella Valley County Water District, and bills

New Map Available

A new map of the Uncompahgre project, Colo., has been issued recently by the Washington office of the Bureau of Reclamation. The map, which is in colors, shows canals, laterals, waste ditches, tunnels, siphons, and topography, and includes a description of the project. The scale is 3 miles to an inch, and the size is 10½ by 12½ inches. Copies may be purchased at 10 cents each from the superintendent, Uncompahgre project, Bureau of Reclamation, Montrose, Colo., or from the commissioner, Bureau of Reclamation, Washington, D. C.

or demands for advancement of funds shall, in each instance, be in that proportion of the respective sums demanded.

8. The gross expenditures contemplated by the said investigations and surveys is limited to the sum of \$100,000, payable equally by the United States and the districts: *Provided*, That upon completion of the work any unexpended balance of the funds deposited by the respective districts shall be refunded.

9. All work hereunder shall cease when the funds herein provided for shall have been expended, without reference to whether the investigations and surveys shall have been completed or not.

10. Upon completion of the work or sooner termination thereof as herein provided, the field notes, original plans, calculations, or other data acquired or prepared by the United States in pursuance of this agreement shall be filed with the Bureau of Reclamation, and copies thereof will be furnished the districts upon request, in event sufficient funds are available for the purpose. If funds are not thus available, then such copies will be furnished upon the estimated cost thereof being advanced by the respective districts.

11. On completion of the investigations and surveys herein contemplated, or the sooner termination thereof as herein provided, a report shall be made by the chief engineer of the Bureau of Reclamation outlining the scope of the work done, with explanatory maps, plans, and other documents as exhibits, together with preliminary estimates of cost for the proposed development, so far as practicable, and there shall be filed with said report a statement showing the amount of funds made available by the United States and the districts and the cost of making such investigations, surveys, estimates, and report.

12. Any and all moneys advanced to the United States by the districts under the terms of this agreement and not refunded under the terms of article 8 hereof shall be refunded to said districts from funds made available pursuant to the provisions of the Boulder Canyon project act, approved December 21, 1928, if and when funds for such purpose are made available by Congress.

13. Where the operations of this contract extend beyond the current fiscal year it is understood that the contract is made contingent upon Congress making the necessary appropriation for expenditures hereunder after such current year has expired. In case such appropriation as may be necessary to carry out this contract is not made, the districts hereby release the United States from all liability due to the failure of Congress to make such appropriation, and in that case the United States hereby likewise releases the districts.

14. No member of or delegate to Congress, or resident commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom. Nothing, however, herein contained shall be construed to extend to this contract if made with a corporation for its general benefit.

In witness whereof, the parties have hereto signed their names the day and year first above written.

THE UNITED STATES OF AMERICA,
By ELWOOD MEAD,
Commissioner, Bureau of Reclamation.

IMPERIAL IRRIGATION DISTRICT,
By EARL C. POUND, President.
By F. H. McIVER, Secretary.
COACHELLA VALLEY COUNTY

WATER DISTRICT,
By R. W. BLACKBURN, President.

Attest:
MARGARET D. TURTON,
Secretary.

THE Boys' Sugar Beet Club on the Shoshone project has six members, each boy having one acre of beets, except one with an acre and a half. The Great Western Sugar Co. and the Castberg Creamery will present a high-grade dairy calf from Oregon to the champion beet-club member.

Classification and Appraisal of Land on New Projects

By W. W. Johnston, Associate Reclamation Economist

THE classification of lands on new projects as now conducted includes first the separation of areas considered economically susceptible of reclamation from those which for any reason are believed too poor to be farmed; and second the division of the irrigable area into classes to show the relative productive value.

The results of classification in addition to forming a basis for the determination of storage requirements and for laying out the lateral system and farm units, are useful as a factor in determining feasibility, as a basis for appraisal, and in some cases it is possible to give soil information that will be helpful to the drainage engineer in estimating future drainage requirements.

CLASSIFICATION METHODS

A number of different classification methods are used, depending on the particular requirements of the different projects and with variation in the information to be reflected. The basic system now approved includes the division of the project lands into three classes, one nonirrigable (class 6) and two irrigable (classes 1 and 2). In some cases additional classes are required. The particular conditions which will decide in what class an area of land should be placed will not be the same on all projects, but the following definitions serve as a general guide:

Irrigable land

Class 1.—Soils of the project best suited to the type of agriculture to which the region is adapted. Topography smooth with slopes less than 6 per cent and with reasonably large-sized areas sloping in the same plane. Drainage conditions favorable, both present and prospective.

Class 2.—Lands of relatively less value for irrigation farming due to poorer soil, topography, or drainage or a combination of these conditions. This includes slopes up to 12 per cent.

Nonirrigable land

Class 6.—This class includes lands considered nonirrigable on account of poor soil, rough or steep topography, or unfavorable drainage conditions.

Factors to be considered in classifying land may be grouped under three headings, i. e., soil, topography, and drainage. The method of giving consideration to these three factors was first used by A. T. Strahorn, of the United States Bureau of

Soils, who has classified much of the land on Government projects. The reason for placing land in a lower class than "1" is indicated on classification maps by placing the letter s, t, or d after the classification number or in cases where more than one of these factors has contributed, a combination of these letters is used; "s" indicates soil, "t" topography, and "d" drainage.

SOILS

Soil considerations may be divided into chemical and physical. Chemical characteristics include fertility, alkalinity, and the relation of bases in the soil make-up. Complete chemical analyses are generally of little value in classifying land. With the exception of very sandy soils the content of mineral plant foods is almost always high enough so that this is not a limiting factor. Nitrogen and humus are almost always low, but this deficiency must be taken care of by subsequent cropping. Field tests and occasionally more detailed laboratory tests are useful in deciding on present and possible future alkalinity. It is important to know if the soil is high in lime and that the ratio of the so-called earthy bases, such as calcium and magnesium, is high in proportion to the alkali bases, such as sodium and potassium, for otherwise there is danger of a hard impervious black alkali condition developing, which is not remedied by drainage. Physical considerations include such factors as texture, depth, compactness, and the study of the soil profile. Since most of our new projects include high bench lands, depth is often a limiting factor and it is important to know what underlies the soil, depth to gravel or creviced basalt meaning quite a different thing from depth to alkali shales.

TOPOGRAPHY

Topographic limitations vary somewhat with the locality, the soil, and the purpose for which the land is to be used. Costs for preparing land and in irrigating it, which would be excessive for general farming, may form only an item in the expense of producing high-class fruit which would be much more than counterbalanced by the benefit of better air drainage which may be available on the steeper land.

DRAINAGE

In the third item considered, i. e., drainage, no eliminations are made except of areas that are obviously undesirable,

such as the bottoms of narrow draws and drainage courses. The general problems of drainage must be decided by the drainage engineer and not the land classifier. It is possible, however, by classifying certain areas down on account of drainage, to call attention to the existence of soil conditions which will hinder the percolation of water and which would warrant special consideration in advance of irrigation development. Areas where hard alkaline conditions exist which it is believed would not be remedied by keeping the water table down, are classed out on account of soil.

PROBLEMS OF LAND CLASSIFICATION

In the progress of making land classifications in different parts of the West, problems are constantly arising and some of these are general in nature. Anyone who has examined land classification maps made by different individuals can not help but be impressed by the extreme variation in opinion to as just what constitutes desirable irrigable land. This may be explained in a few cases by the fact that the classification was made by State employees or others who were not influenced by the policies of the bureau, but generally variation is due to a difference in judgment or in the methods used. It is rare to find two equally well qualified men who will agree in detail as to the proper rules for the classification of a particular unit and still more variation will occur in their interpretation of these rules in the field.

Exactly what can be done in the way of standardization is problematical. The simpler a classification is, the more apt we are to have uniform results. A classification system such as has been described, including only two irrigable classes, can be more accurately followed than one including four or five classes, but there is still a great deal of chance for variation in deciding just what soils are best and just what topography is desirable.

Practically all new projects are near developed irrigated lands, generally on similar soil types. Where such conditions prevail the classification standards to be followed for the new area can be based quite largely on a study of the soils of the developed lands and the results being secured from irrigating them. There is too much variation in the chemical and physical made-up of soils of different origin and which have developed under varying climatic conditions to

warrant the use of any fixed classification standards. These need to be fixed for each project to be studied.

USE OF A SUSPENDED CLASS ON NEW PROJECTS

Another problem is the use of a suspended class on new projects. There are generally certain lands which are marginal between class 6 (nonirrigable) and the lowest class if irrigable land. In a number of classifications such lands have been placed in class 5. The use of this class, while sometimes making it possible to give a better picture of soil and topographic conditions, has a tendency to cause confusion and for this reason many believe that it should never be used on new projects. The question always arises as to what consideration is to be given to such lands in figuring canal capacities. It has generally been recommended that such areas be considered as a part of the nonirrigable area as far as consideration for construction is concerned. In a few cases it has been recommended that areas of class 5 occurring in farm units largely of better soil be included in lateral capacities, and that areas occurring in larger bodies, particularly when these require additional lateral construction be considered as totally nonirrigable. Another trouble with the use of class 5 on new lands is that there is a tendency for the classifier to include in it areas which it is hard to classify rather than to make the necessary study to decide about such questionable areas. It would appear that there should be a very compelling reason before class 5 should be used and that it should only be made to apply to a single particular soil or topographic condition.

LAND APPRAISAL

The appraisal of lands on new projects may include both the evaluation of undeveloped lands and of developed properties. This phase of the work can probably best be discussed by telling of a typical example of the appraisal of the lands of a new project, for example, the gravity extension of the Minidoka project.

APPRAISAL OF EXCESS LANDS

Contracts between this district and the Government called for the appraisal of lands in excess of 160 irrigable acres, including mainly old properties which are to receive a supplemental water supply from the American Falls Reservoir, and also of new lands which are to receive a full water supply and are mainly in the raw state.

The contracts called for the appraisal of lands, including water right, separate

from the improvements. Leveling of land and other improvement in preparation for irrigation were to be included with the "improvements" so that the value as fixed for the land on these improved properties should be comparable to the value of raw land plus the value of the water right appurtenant to it, together with some increased value by reason of the land having been cropped to legumes.

The appraisal board included one man representing the district, one the Secretary of the Interior, and the third selected by the other two. They had at their disposal land-classification maps of all the new lands, very good irrigable-area survey records of the old lands, and information of the relative value of the appurtenant water rights.

The board decided that an acre of the best land with a share in the Big Wood Canal Co., on which there was evidence that the fertility had been maintained, was worth \$50, and that the poorest land, chiefly of value because of the water right attached to it, was worth about \$25. Values were then fixed with these limits as standards.

For convenience in arriving at the value of improvements these were considered under three heads, the first being condition, including leveling, removal of rock, and farm-irrigation structures, together with some little increase by reason of certain areas being in a well-established permanent crop, such as tame pasture or a good new stand of alfalfa; second, the value of buildings and domestic water; and third, the value of fences and corrals.

In the case of improvements as well as land certain standards of value were agreed upon and these were kept in mind as general guides. For instance, a good well in that country is worth about \$1,000, being relatively costly because of the considerable depth which must be drilled through basalt. Therefore when a 40-acre tract was found to have a good well with casing and pump in good repair this item was listed in the notes as having the value of \$1,000. If there was also a high-class storage tank with the water piped to house and barn an additional value was included to care for these features. If on the other hand the equipment and casing were found to be in poor condition or inquiry revealed that the water supply was deficient, a lower value was assumed. Condition varied from nothing to \$45 per acre. Conditioning costs have been relatively high on this district because of the more or less general occurrence of loose rock in patches. The figure is less than half of the cost of many farms when the farmer's time has been taken into consideration as having value.

It was felt by the board that this system of considering these various items in arriving at the value of a 40-acre tract and of keeping certain values in mind as standards helped to keep the appraisal uniform and to make the values as fixed for the different tracts fair and comparable. There are a great many ideas of value, depending largely on whether a person has something to sell or desires to buy, but a landowner will not object so much if he feels that he has been given as good a value as his neighbor. Also, he will be more tractable if he has had the opportunity to express his views before the board. Whenever the landowner was on hand when the appraisal was being made he was consulted and after all the values had been tentatively fixed, a meeting was held by the board at which time any interested landowners were invited to meet them and express their views. Prior to the meeting the secretary of the district had mailed each a list of his land, together with a statement of the appraisal that had been tentatively made. A number appeared before the board and voiced objections. In a few cases evidence was presented which convinced the board that something had been overlooked and a few changes were made. It is believed that this meeting was a valuable contributing factor in enabling the district officials to secure 100 per cent signatures on excess land contracts. That this exception was not due to excessively liberal appraisals is attested by the fact that the representative of one of the largest excess landowners, a loan company which had acquired their holdings through foreclosure, showed that the board's appraisal, which they accepted, totaled for their properties, approximately \$20,000 less than the loans and the cost of foreclosure.

APPRAISAL OF NEW LANDS

New lands on the project were appraised on the basis of classification, values being fixed by the board as follows:

Class 1: \$15, \$12, or \$10 per acre depending on the extent to which the subdivision was cut up by class 2 or class 6 areas and the location with respect to large bodies of irrigable land, the value being less in isolated areas.

Class 2: \$8, \$6, or \$4 per acre depending on the extent to which the subdivision was cut up by class 6 areas.

Class 6: \$1 per acre.

PROBLEMS OF NEW LAND APPRAISAL

The above values are high when considered strictly on the basis of present utility but some such values must be used in order to give a reasonable spread between lands of different classes. In fact with irrigation assessment on a flat-rate basis it is questionable if there is enough

difference. A purchaser of class 1 land at \$15 will have a better deal than the settler who buys the poorest irrigable land at \$4. The values may seem low to landowners with speculative motives who disregard the cost of making a farm out of a piece of raw land. An analysis will show, however, that this is not the case.

The economic report on this project shows that it will cost the average new settler \$6,000 or more to develop a farm with 70 irrigable acres to the point of a going concern and to purchase necessary livestock and equipment. Of this amount some \$3,800 or \$55 per acre represents cost of necessary buildings, leveling, and other real-estate improvements. It is understood that construction costs will be in the neighborhood of \$90 per acre, making the cost for water and land \$145. The average sale price of 25 developed farms sold in 1926 on the adjoining north side Twin Falls tract, was \$130 per acre. These lands had a bonded debt of only \$7 per acre.

It is evident from this comparison that the only chance the new settler has to come out even and to obtain a small amount as wages for the labor he has expended in developing the farm, is in the advantage of interest-free money for construction repayment. Perhaps the most optimistic way of looking at this cost is to consider the yearly assessments for construction repayment as interest on a capital investment; \$90 per acre to be paid in 40 annual installments equals an assessment of \$2.25 per year. This is 6 per cent interest on \$37.50 and would make the cost of the producing farms a little over \$90 per acre. When compared with the value of developed properties this leaves only a margin of \$30 per acre as payment for four years of hard work and as value for the land, since only a filing fee of \$1.50 was considered in the calculations. These figures while theoretical, are based on a rather careful study of the situation. They represent

what may be accomplished by the average selected settler. Some would do better, but since no allowance is made for sickness or more than ordinary contingencies, the figures given more nearly represent minimum than maximum costs. No matter what method of calculation is used it is evident that the cost of improving a raw piece of land, together with the cost of water, precludes the valuation of raw land at more than a few dollars per acre. These conditions are equally true on the other new projects, for while in some localities the value of the developed farm would exceed \$130 per acre, the construction costs on such projects are correspondingly higher than in the example used.

A number of additional problems come up to the man in the field in appraising undeveloped lands. The appraisals so far made have been on the basis of classification. Land classification, however, does not take into consideration two factors which under some conditions have a real effect on the value of the land for farming. These are location and air drainage.

The location of a farm some miles distant from a shipping point may, for instance, mean that the farmer will have to forego the production of some crop such as sugar beets which might be the most profitable crop in the country. Air drainage is only of significant importance in a fruit producing area. In a portion of the Roza division of the Yakima project, for instance, some of the best prospective fruit land is in class 3 on account of topography. This land is valued locally at a considerably higher figure than the flatter class 1 land, because of having good air drainage and being especially well adapted to soft fruits. It is true that the cost of bringing a young orchard to bearing stage, together with the high cost of a water right, is too high to allow much value for the raw land, but if a man is going to develop an orchard it will pay him to

secure higher priced land well adapted to orchard production rather than to pay a much lower price for land less favorably situated for this purpose.

Contracts allow the sale of new lands at figures in excess of the appraisal, provided one-half of such excess be applied on irrigation charges, and this provision will probably take care of the location problem. It is likely, however, in a fruit producing area, that there would be a pressing demand for higher appraisal on land especially good air drainage, which is especially adapted to fruit production, and the basis on which such appraisals should be made presents a problem which would seem to warrant some thought and consideration.

Small Grain Useful in Irrigation Farming

In well-established irrigated sections small grain is grown as a secondary crop in rotation or to utilize land where the water supply is insufficient to mature more valuable crops, according to W. W. McLaughlin, irrigation specialist, in *Farmers' Bulletin 1556-F*. The common practice on new land is to grow one or two crops of small grain, during which time the farmer may determine where the surface needs further leveling. On new land flooding generally gives better results than other methods, and when the grain is harvested the water marks are valuable guides in leveling the field in preparation for more valuable and permanent crops, such as alfalfa.

Flooding from field ditches is the usual method employed, but wild flooding, the border method, and the corrugation method are adapted to such crops. The bulletin also discusses the preparation of the land for irrigation, the proper time to apply water for spring and fall grains, and the quantity required.



Gibson Dam Sun River project, Montana, nearing completion

Adequate Capital Essential If Settlers are to Succeed

THE following interesting discussion of the capital requirements of settlers is from the report of the Department of Lands of the Union of South Africa for the year April 1, 1927, to March 31, 1928:

A factor contributing to the heavy arrears and equally to the losses recorded year by year in respect of advances made to settlers who have failed and of rent and interest due by the latter and written off is the insufficiency of the capital with which many settlers start operations. It is necessary to mention this matter. The records of the department certainly contain ample evidence of men having proved strikingly successful who began operations with a very small initial capital of their own, or even entirely with borrowed money. Capital is admittedly not the only requisite of the prospective settler. But the successful men in these circumstances are the exceptions and it can not be gainsaid that, without a reasonable initial private capital, the chances are on the side of failure. What is a reasonable capital depends of course on the class of farming to be pursued, but even a small holding absorbs more capital than is generally assumed. Wherever the department examines the position, the fact emerges that one of the root causes for the failure of many settlers in the past and for the difficulties under which many of the existing settlers labor has been a lack of initial private capital.

There are, of course, notable exceptions to this general statement, such as, for instance, where settlements were established on unsuitable land or on uneco-

nomie unit holdings or where, as in northern Zululand, other factors beat settlers of an excellent type with substantial capital. On some of the closer settlements where the greater portion of the working capital was provided by the department, the small holders have, in many cases, never been able to free themselves from the handicap of debt. Such small initial capital as they had was expended on the first crop. If it was a poor one, as is often the case on virgin soil during the first year, store and other credit had to be obtained. If only average seasons followed, the holdings began to suffer as the settlers were without the necessary funds to purchase fertilizers and go on with development; the diminishing return circle set in. In those dry settlement areas suitable mainly for stock raising, a settler with, say, 50 head of indifferent quality stock makes but a poor living on a farm that could readily carry four times that number, from which a reasonable living could be obtained. Starting with a few head of breeding stock, the necessity for providing for his family compels him to sell every year the equivalent to the increase. He struggles on in this fashion year after year. Any improvement in type of stock is not to be expected. To improve a herd costs money, and this he has not got. The time comes when unless assisted financially by the department he transfers his farm to some one else who pays him a small consideration to get out. The business of farming can not be embarked on successfully without capital any more than any other business can.

The department has made many advances in the past to supplement the initial capital of settlers and, quite clearly, it will have to continue to do so. But extensive departmental advances, except for breeding stock, can prove to be too great a handicap to success, and this has been particularly the case on closer settlements. The losses on advances on the settlements have been high, much higher in proportion to those incurred in stock areas. The less the small holder in particular is loaded with debt the better, even if the debt be to the department.

Whether the probationary settlers on small holdings established under the scheme inaugurated in 1925 will succeed with the whole of their working capital provided by the department can not yet be determined. They certainly start on fully improved holdings as going concerns under much more favorable conditions than their small holder predecessors under other schemes, who, in most cases, had to tackle virgin land. It will be some years, however, before the results are known. It is in any case a matter for consideration whether immediate steps should not be taken to grant further advances to the present settlers in stock areas whose initial capital was small, even after augmentation in many cases by a departmental advance, or whose capital was dissipated in unsuccessful agricultural operations. If the farms could be stocked up to something approaching their carrying capacity or at any rate to a stage when the settlers can see a greater prospect of success than many of them see to-day, it would give a stimulus to the permanency of the settlement undertaken and, in the long run, the payments to the department would be more certain. The losses should not be excessive as the departmental experience over many years has been that the losses on breeding stock loans in recognized stock areas have been consistently low.

Construction Program for Yakima Valley

It is estimated that the construction program for the Yakima Valley, Wash., for 1929 will total \$10,000,000. In addition to the expenditures of the Bureau of Reclamation for the Kittitas division and Cle Elum Dam, the Indian Service will complete the Wapato pumping unit at an estimated cost of \$410,700; more than \$1,500,000 will be spent on new work and maintenance of the State highway units in the Yakima Valley and the Naches Pass route; and the county will spend \$500,000 on roads. Paving in the city of Yakima will total \$40,000, and commercial and general building will amount to \$4,000,000.



Seventy-four bales of Yuma cotton loaded on truck and trailer for Los Angeles Harbor

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, left for the West on June 12. After stopping at Denver and Salt Lake City, he and Chief Engineer Walter expect to meet Secretary Wilbur at Las Vegas, Nev., on June 22 for a trip to the Boulder Dam site. Doctor Mead will visit a number of projects and plans to return to the Washington office about August 1. P. W. Dent is acting commissioner during his absence.

George C. Kreutzer, director of reclamation economics, and H. A. Brown, assistant director of reclamation economics, left Washington, D. C., on June 15 for Billings, Mont., where they will attend the economic conference on reclamation June 18 and 19. Mr. Kreutzer will visit all the projects under investigation and expects to return to the Washington office about August 1. Mr. Brown will visit the Shoshone, Riverton, and North Platte projects, returning to Washington about the end of June.

W. F. Kubach, chief accountant, left for the West on June 14. He will stop at the Denver office in connection with the preparation of material for the Budget and will also visit one or two projects before returning to Washington.

In the absence of Doctor Mead in the West, Miss Mae A. Schnurr, secretary to the commissioner, will read his address on Community Small Farms before the twenty-second annual convention of the National Association of Real Estate Boards, at Boston, Mass., June 28.

P. W. Dent, assistant commissioner of Reclamation, spent several days in Syracuse and Chicago in connection with hearings before the General Land Office on the adjustment of mining claims in Deadwood Reservoir.

J. E. Stimson, still picture photographer of Cheyenne, Wyo., and George A. Beyer, motion picture photographer of the Washington office will visit the Boulder Dam site and a number of projects this summer with a view of obtaining a photographic history of construction work and economic development.

Dr. Taijiro Ikeda, chief engineer, Reclamation Affairs Bureau, Government-General of Chosen, Japan, was a recent visitor at the Washington office. Dr. Ikeda plans to visit a number of the projects during the summer.

Fairfax D. Kirn, junior engineer on the North Platte project, has been transferred to the designing section of the Denver office.

Two Monuments Unveiled on North Platte Project

On May 26 exercises were held by the Daughters of the American Revolution on the North Platte project, Nebraska-Wyoming, for the unveiling of two monuments, one at the grave of Rebecca Winters, a pioneer mother who died while en route to Utah over the old Oregon Trail, and the other to commemorate the signing of the treaty with the Indians at Horse Creek. The principal speaker was Dr. Heber Grant, of Salt Lake City. Mrs. Grant is a granddaughter of Rebecca Winters. The program also included addresses by officials of the Burlington and Union Pacific Railroads and by officials of the Daughters of the American Revolution of the States of Wyoming and Nebraska.

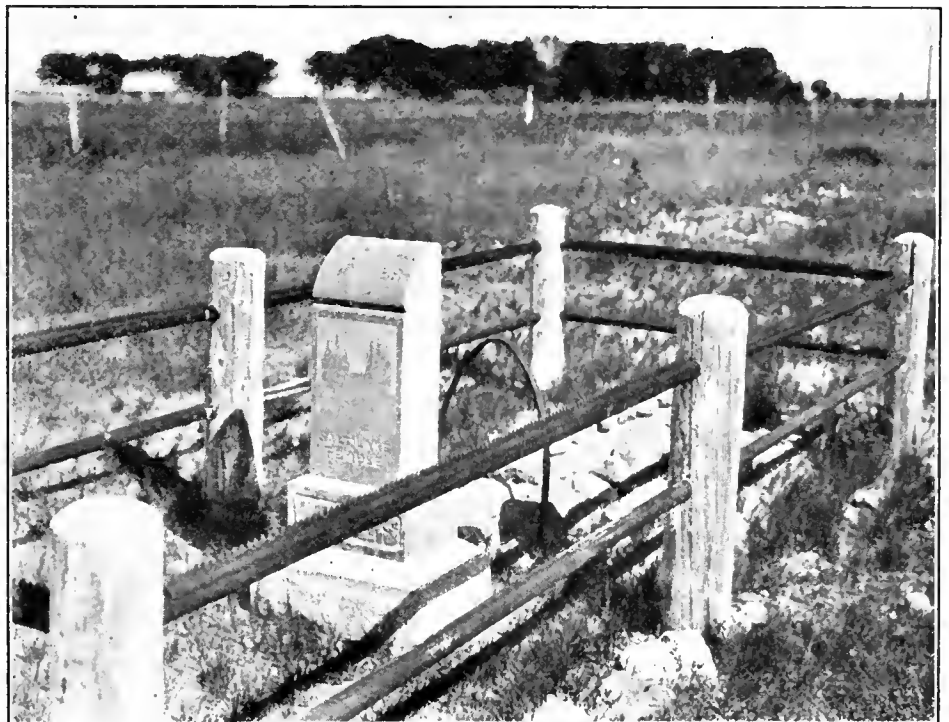
D. C. McConaughty, engineer, has been reinstated in the designing section of the Denver office.

An engineering board consisting of consulting engineers A. J. Wilcy and D. C. Henny, met recently with P. J. Preston, superintendent of the Yakima project, and J. L. Savage and B. W. Steels of the Denver office, at Cle Elum, Wash., to consider plans for a large dam on the Cle Elum River, which has been authorized by Congress.

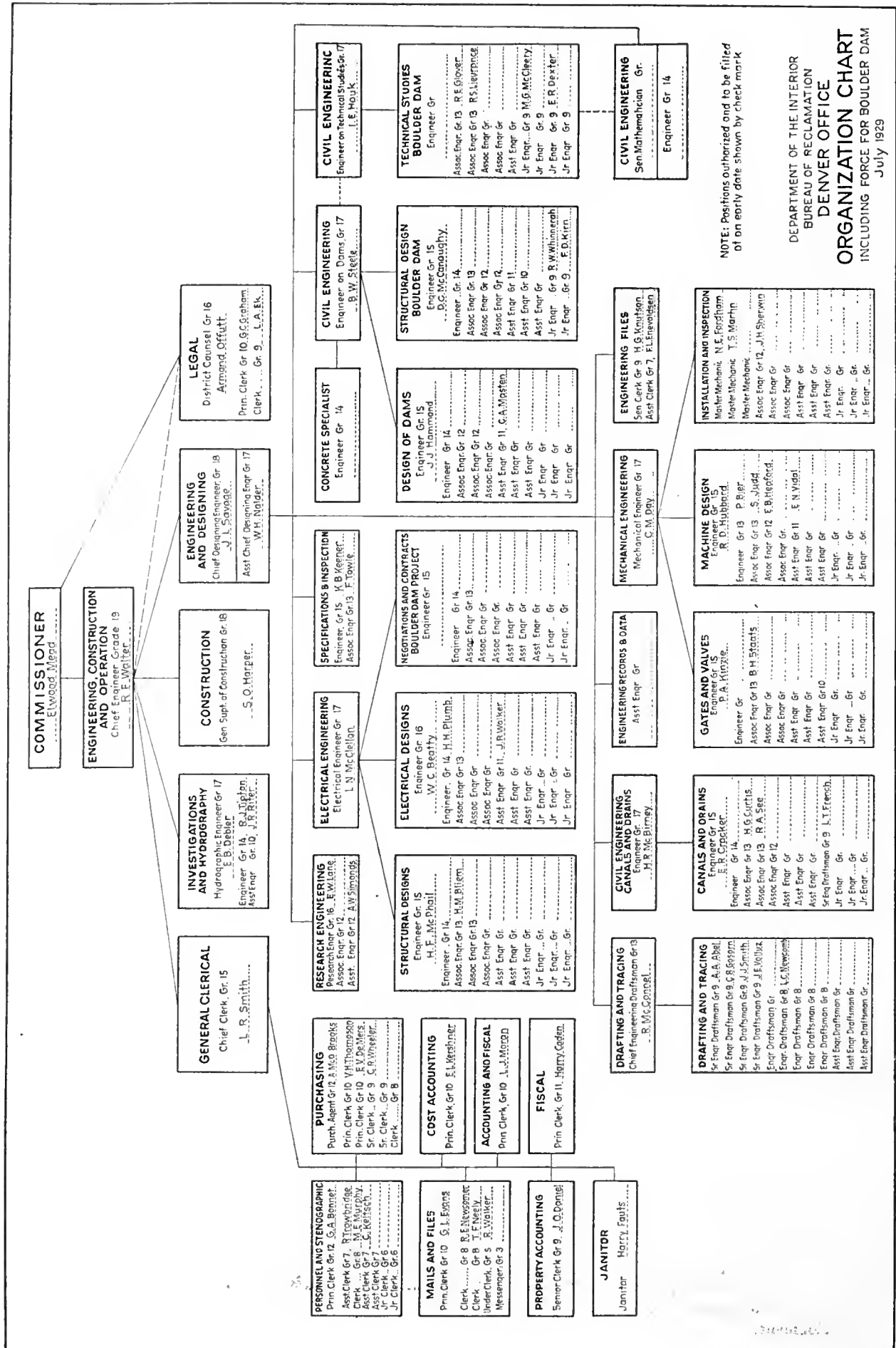
C. B. Smith, county agent of Morrow County, Oreg., was a recent visitor at the office of the West Extension Irrigation District, Umatilla project.

I. M. Zaki, Assistant Director of Public Works for Egypt, who is spending considerable time in this country studying irrigation and related problems, spent four days on the Vale project inspecting irrigation works under construction.

C. W. Burningham, assistant engineer, arrived on the Belle Fourche project recently to take up his duties in connection with drainage construction and investigations.



Grave of Rebecca Winters, a pioneer mother who died on the Old Oregon Trail. Photo taken in 1921 on the North Platte project



ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

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E. K. Burlew, Administrative Assistant to the Secretary and Budget Officer;
Northcutt Ely and **Ernest W. Sawyer**, Executive Assistants

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

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W. F. Kubach, Chief Accountant C. A. Bissell, Chief of Engineering Division Hugh A. Brown, Assistant Director of Reclamation Economics
C. N. McCulloch, Chief Clerk

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R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....	J. P. Siebeneicher.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	.....	B. E. Stontemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	W. J. Chiesman.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	.....	.....	.....	.....	.....
King Hill ³	King Hill, Idaho.....	.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stontemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	.....	.....	.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.....	.....	.....	.....	B. E. Stontemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Owyhee, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stontemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	Henry H. Berryhill.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁸	Phoenix, Ariz.....	.....	.....	.....	.....	.....
Shoshone ⁹	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah.....	.....	.....	.....	.....	.....
Sun River ¹¹	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹²	Irrigon, Oreg.....	.....	.....	.....	.....	.....
Uncompahgre.....	Hermiston, Oreg.....	.....	.....	.....	.....	.....
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voven.....	C. M. Voven.....	B. E. Stontemyer.....	Portland, Oreg.
Yakima.....	Yakima, Wash.....	P. J. Preston.....	R. K. Nunningham.....	J. C. Gawler.....	do.....	Do.
Yuma.....	Ynupa, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

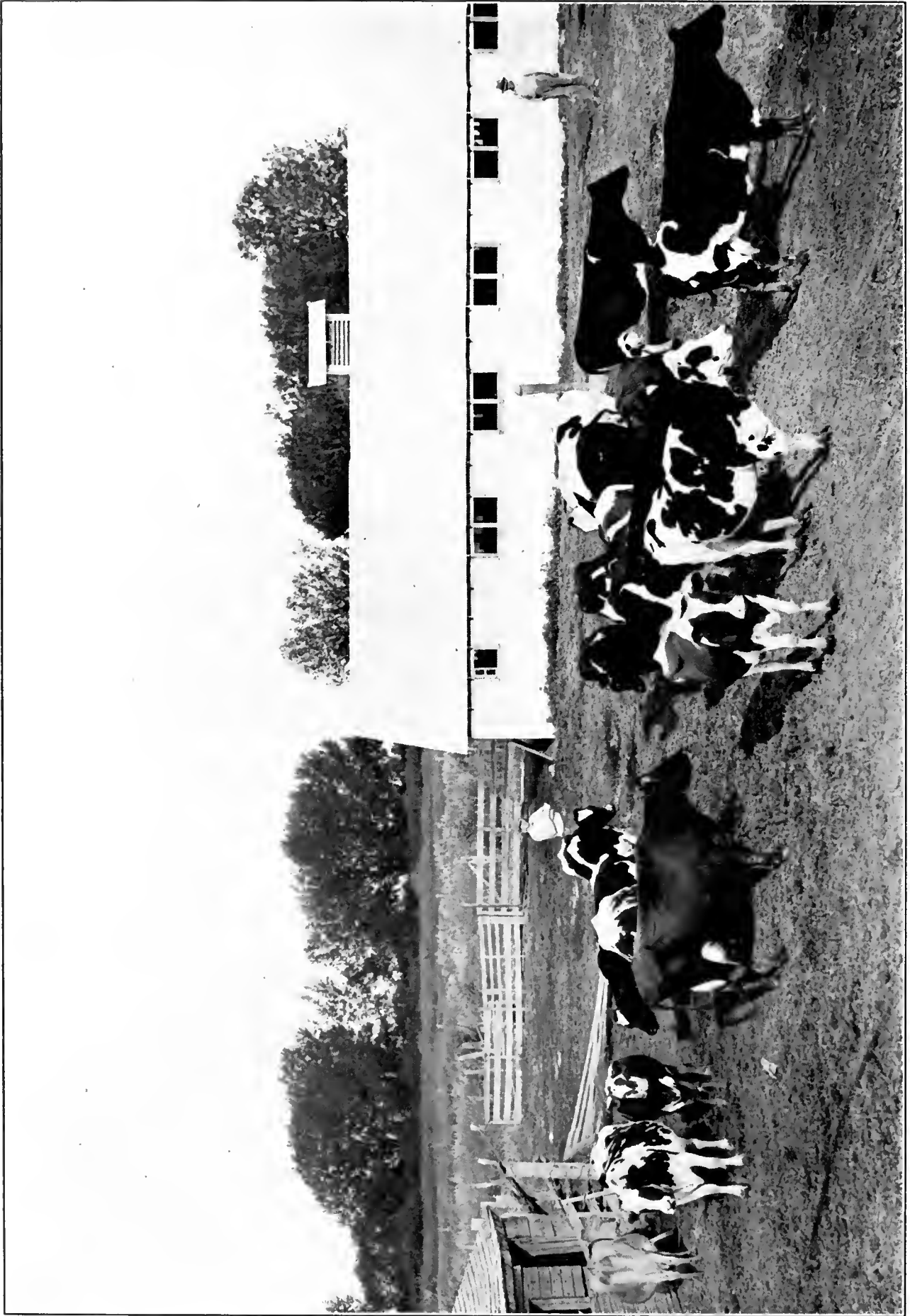
Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....	.....	B. E. Stontemyer.....	Portland, Oreg.
Sun River, Gibson Dam.....	Angusta, Mont.....	Ralph Lowry ¹³	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Snn River, Main Canal Construction.....	Fairfield, Mont.....	A. W. Walker ¹³.....	.....	.....	do.....	Do.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.
² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927. E. E. Lewis, manager.
³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926. F. L. Kinkade, manager.
⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1925, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.
⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926. D. S. Stuver, manager.
⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1923. Joe C. Iddings, manager.
⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917. C. C. Cragin, general superintendent and chief engineer.
⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.
¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926. Lee R. Taylor, manager.
¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.
¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926. A. C. Houghton, manager; and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926. Enos D. Martin, manager.
¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
All-American Canal investigations.....	Yuma, Ariz.....	H. J. Ganlt.....	.....
Paradise-Verde district investigations.....	Phoenix, Ariz.....	J. R. Iakisch.....	Salt River Valley Water Users' Association.
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hoisig.....	.....
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	.....
Yakima project extensions.....	Yakima, Wash.....	P. J. Preston.....	.....
Aleocva-Casper and Saratoga projects.....	Casper, Wyo.....	J. R. Iakisch.....	.....



A DAIRY HERD ON THE MILK RIVER PROJECT, MONT.

NEW RECLAMATION ERA

VOL. 20

AUGUST, 1929

NO. 8



THE DESERT RECLAIMED

Benefits from Crop Rotation

By DR. GEO. STEWART

THE feeding range of plants is changed.

Minor changes are made in the plant nutrients.

Residues of preceding crop may benefit succeeding ones.

Available soil nitrogen may be considerably increased.

The supply of organic material may be increased.

The physical condition of the soil may be improved.

Opportunities for utilizing farm manure and commercial fertilizers.

The soil is kept occupied with crops a major part of the time.

It may reduce injury from insects, weeds, and diseases.

The farmer can farm more acres under crop rotation.

Farm machinery and other equipment can be used more efficiently.

Irrigation water can be made to care for more crop acres.

The income is more dependable on account of its arising from several sources.

—Western Irrigation.

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

RAY LYMAN WILBUR
Secretary of the Interior

Price, 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

August, 1929

No. 8

Interesting High Lights on the Federal Irrigation Projects

FARMERS in the Langell Valley district, Klamath project, have organized the Langell Valley Dairy Association and have begun the erection of a cheese factory near Lorella, Oreg.

CONSTRUCTION now under way on the Yakima project will increase the cold storage capacity of the valley from 9,410 cars to 10,550 cars, and common storage from 5,784 cars to 5,884 cars, at a cost of approximately \$500,000.

THE poison campaign is still being waged against grasshoppers in the Tule Lake division of the Klamath project, and the outlook for the control of the pest is the best it has been during the past eight years. Very little damage to crops has been reported.

COUNTY officials are taking steps to proceed with the taking of tax titles to about 25 Belle Fourche project farms that are more or less abandoned, and it is expected that these places will pass into the hands of real farmers when title is cleared. Similar action will be continued until the entire lot of about 100 farms that are delinquent in both taxes and water charges gradually comes into possession of the county and in this way made available for better production.

A CARLOAD of Guernsey cattle was purchased recently in Wisconsin and has arrived in Belle Fourche for distribution to project farmers and others interested in this breed of dairy cow.

ENCOURAGING reports are being received from the colonization agent employed by the Northern Pacific and Great Northern Railway Cos. to locate settlers for the Lower Yellowstone project. Two farms were sold recently to settlers from Colorado and a large number of men have expressed their intention to look over the project at an early date.

IT is estimated by the Denver & Rio Grande Western Railway that 1,600 cars of peaches will be shipped from the Grand Valley project this season. This is the heaviest crop of peaches produced in several years.

Secretary Wilbur Visits Our Projects

Hon. Ray Lyman Wilbur, Secretary of the Interior, has returned to Washington after a month's trip through the West, during which he inspected the site of Boulder dam in Black Canyon near Las Vegas, Nevada, in company with Dr. Elwood Mead, Commissioner of Reclamation, and R. F. Walter, Chief Engineer.

Plans were outlined for the development of a railway line to the dam, the building of a community for the engineers and workmen near the damsite, and conferences were held with representatives of the various States and municipalities and power companies interested in the contract for the sale of power which must be let before actual work upon the structure is begun. The Secretary announced the policy of preferring to sell falling water as the basis of such contract.

With Dr. Mead and Mr. Walter, the Secretary also visited the Owyhee project, in eastern Oregon and western Idaho; the Boise project, the Gooding project, and the Minidoka project, in Idaho. At Boise he addressed a meeting of Governors and the representatives of Governors of Western States on the subject of public lands, proposing a new policy for the turning over of the surface rights of the public domain to the various States, provided they were willing to accept responsibility and to enact necessary legislation concerning parks, grazing, and conservation of water.

AT THE Owyhee Dam, Owyhee project, work proceeded on the lining of the remainder of the diversion and spillway tunnel, on the excavation of the abutments for the dam, and on the removal of muck from the river channel. At the end of the month the dam was 14 per cent completed.

THE Holly Sugar Corporation has announced that the Grand Junction factory, Grand Valley project, will not be operated in 1929, requiring shipment of all beets to Delta. The small tonnage expected is given as the reason for the suspension of the factory.

FOUR cars of lambs were sold recently by the Minidoka Lamb Pool, Minidoka project, for \$12.85 per 100 pounds, or an average price of \$10.85 per head. One shipment of 21 lambs was the product of 12 ewes. Their total weight was 1,950 pounds, or an average of 93 pounds, so that at the price named each ewe's product was worth more than \$20.

AT Echo Dam, Salt Lake Basin project, the dam fill placed during the month amounted to 95,410 cubic yards, and work was continued on stripping borrow pit areas and the dam foundation. At the end of the month the dam was 39.8 per cent completed.

A FORMAL opening was held recently of the Gering cheese factory and centralizing plant of the North Platte Valley Cooperative Cheese Co., North Platte project. About 1,200 people attended the opening.

IT is anticipated that 800 tons of green beans, 100 tons of wax beans, 300 tons of table beets, and 100 tons of sour cherries will be canned at the Delta Canning Factory, Uncompahgre project, this season. The producers in this district will receive about \$60,000 for these products.

President Hoover Issues Proclamation Making Effective the Boulder Canyon Project Act of December 21, 1928

ON June 25, 1929, President Hoover issued the following public proclamation:

"Pursuant to the provisions of section 4 (a) of the Boulder Canyon project act approved December 21, 1928 (45 Stat. 1057), it is hereby declared by public proclamation:

"(a) That the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming have not ratified the Colorado River compact mentioned in section 13 (a) of said act of December 21, 1928, within six months from the date of the passage and approval of said act.

"(b) That the States of California, Colorado, Nevada, New Mexico, Utah, and Wyoming have ratified said compact and have consented to waive the provisions of the first paragraph of Article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven States signatory thereto, and that each of the States last named has approved said compact without condition, except that of six-State approval as prescribed in section 13 (a) of said act of December 21, 1928.

"(c) That the State of California has in all things met the requirements set out in the first paragraph of section 4 (a) of said act of December 21, 1928, necessary to

render said act effective on six-State approval of said compact.

"(d) All prescribed conditions having been fulfilled, the said Boulder Canyon project act approved December 21, 1928, is hereby declared to be effective this date.

"In testimony whereof I have hereunto set my hand and caused the seal of the United States of America to be affixed.

"Done at the city of Washington this 25th day of June, in the year of our Lord one thousand nine hundred and twenty-nine, and of the Independence of the United States of America the one hundred and fifty-third.

[SEAL.] "HERBERT HOOVER.

"By the President:

"HENRY L. STIMSON,
"Secretary of State."

PRESIDENT HOOVER'S STATEMENT

"I signed this morning the Colorado River proclamation, making effective the compact between six of the seven States in the Colorado River Basin. I have a particular interest in its consummation, not only because of its great intrinsic importance, but because I was the chairman of the Colorado River Commission that formulated the compact.

"The compact itself relates entirely to the distribution of water rights between the seven States in the basin. It has

nothing per se to do with the Boulder Canyon development except that it removes the barriers to such development.

"It has some points of very considerable interest.

"SETTLEMENT OF DISPUTES

"It is the final settlement of disputes that have extended over 25 years and which have estopped the development of the river. The difficulties over the respective water rights of the different States have served to prevent development in a large way for nearly a quarter of a century.

"And it has an interest also in that it is the most extensive action ever taken by a group of States under the provisions of the Constitution permitting compacts between States. The only instances hitherto were mostly minor compacts between two States on boundary questions except the one case of the New York Port Authority, which was of first importance, but is a compact between two States.

"This compact is, however, an agreement between seven States, and represents the most important action ever taken in that fashion under the Constitution. It opens the avenue for some hope of the settlement of other regional questions as between the States rather than the imposition of these problems on the Federal Government.

"The compact was originally signed five years ago by the seven States subject to ratification by their legislatures. It has a similarity to matters in international negotiation in the difficulties that it has to pursue in the path of ultimate consummation, but for the first time in history a compact involving so many interests has been made effective.

"There is only one point still left open, and that is the relation of Arizona to the compact. I am in hopes that Arizona and California may compose their mutual problems which have hitherto prevented Arizona from joining in the compact.

"With Arizona in, the whole basin will have settled the major question of water rights for all time."

THE contract has been let for a \$10,000 alfalfa seed warehouse and laboratory to be erected near the Southern Pacific tracks on the outskirts of Yuma, Yuma project. Work will be rushed so that the structure may be completed before the peak of the local alfalfa seed threshing season.



Concrete canal lining (concrete placed by hand), South Branch Canal, Kittitas division, Yakima project, Washington

Economic Survey of Reclamation, 1929

THE conference of participants and others interested in the economic survey of certain reclamation projects this summer was held at Billings, Mont., June 18 and 19, for an open discussion of the scope and method of the survey. The investigators were informed that their examination should be directed with a view to obtaining information which would enable them to submit conclusions and recommendations regarding the following classes of projects:

1. Projects which are largely undeveloped and unirrigated after several years of operation.

2. Projects now being constructed where the acre cost of water is so high as to raise a question of the ability of settlers to meet payments required by the district contract. Consideration should be given to the steps needed to promote early and complete settlement and the largest return from irrigation.

3. Private projects which desire financial aid from the Government should be studied to determine whether the money required for reconstruction and improvement can be repaid under the terms of the reclamation act.

The 2-day session of the conference was devoted to a discussion of the following specific questions:

1. Have the economic and social benefits of this project justified its construction?

2. What are its opportunities and what ought to be done to enable these opportunities to be fully utilized? What are its profitable crops and what kind of agriculture ought to be promoted?

3. How much of the unsettled, undeveloped land is sufficiently productive to justify settlement under present agricultural conditions? What should be done with the unproductive land?

4. How far has delayed settlement been affected by—

- (a) Defects in soil?
- (b) Climatic conditions?
- (c) Remoteness from developed communities and lack of markets?
- (d) Lack of capital on part of settlers?
- (e) Amount of water charges?
- (f) Local taxation?
- (g) Lack of credit?
- (h) Health conditions, insect pests, and plant and animal diseases?

5. Can the irrigation payments required under present conditions be made by the people now on the project? What is being done and what should be done to insure the settlement and cultivation of land delinquent in State and county

taxes and irrigation charges? Should the Bureau of Reclamation be given authority to acquire title to land through purchase of tax certificates and thus become an active settlement agency?

6. If more construction work is asked for by the project water users, what will it cost? Is it needed and will it be paid for in accordance with the reclamation act?

7. How much capital is required to purchase a farm of unimproved land and bring it to full production? How much of this capital should a new settler possess at time of settlement? How much credit is required and upon what terms?

8. If the settler's capital needs to be supplemented to improve and equip farms, where can credit for this be now obtained and what additional credit should be provided? What agency should furnish this credit?

9. Beet-sugar companies assign from 6 to 12 experienced field men to the territory served by each factory to assist farmers in selecting fields to grow beets, give advice in preparing seed bed, and other farm operations. This assures good farm practice and has increased the average yields of beets. This is regarded as a profitable expenditure on the part of the sugar-factory management. The Bureau of Reclamation has a great deal more at stake. Should it render a similar service to assist settlers in working out farm programs and in the organization of cooperative marketing agencies? The bureau has been unable to do this, because the expense would have to be met by increased charges to settlers. The Agricultural Department can render such a service because it is provided with funds which do not have to

be repaid. Should not the Bureau of Reclamation be given funds on the same terms or, if not, should not the operation of projects and responsibility of collecting the money due the Government be turned over to others?

10. Would there be any gain to the settlers and to the income from projects if the works when constructed were turned over to the State for settlement and development and for the repayment to the Government of the construction debt?

11. Recommendations should be made regarding any changes in laws or practices of the bureau or of the settlers which the investigator believes should be carried out.

George C. Kreutzer, director of reclamation economics, presided as chairman of the conference, with H. A. Brown, assistant director of reclamation economics, serving as secretary. The following were in attendance:

George C. Kreutzer, director of reclamation economics, Bureau of Reclamation, Washington, D. C.

Hugh A. Brown, assistant director of reclamation economics, Bureau of Reclamation, Washington, D. C.

B. E. Hayden, reclamation economist, Bureau of Reclamation, Denver, Colo.

W. W. Johnston, associate reclamation economist, Bureau of Reclamation, Denver, Colo.

H. D. Comstock, superintendent, Riverton, project, Riverton, Wyo.

L. H. Mitchell, superintendent, Shoshone project, Powell, Wyo.

H. H. Johnson, superintendent, Milk River project, Malta, Mont.

George O. Sanford, superintendent, Sun River project, Fairfield, Mont.



Earl, Wilmer, Frances, and Ruth Thornberry, just arrived from Missouri to live on a new homestead on the Willwood division of the Shoshone project, Wyoming



The adobe home of a new settler on the Willwood division, Shoshone project, Wyoming

Alvin Johnson, economic expert, New York City.

Prof. Frank Adams, economic expert, University of California Berkeley, Calif.

Dorothy Lampen, special economic investigator, Great Falls, Mont.

A. C. Cooley, senior agriculturist in charge of demonstration on reclamation projects, Salt Lake City.

Alfred Atkinson, president Montana State College, Bozeman, Mont.

F. B. Linfield, director Montana Experiment Station, Bozeman, Mont.

Sherman E. Johnson, associate professor of agricultural economics, Montana State College, Bozeman, Mont.

James McKittrick, engineer-appraiser, Federal Land Bank, Spokane, Wash.

John A. Whiting, state engineer of Wyoming, Cheyenne, Wyo.

D. P. Fabrick, manager, Western Agricultural Co., Billings, Mont.

W. P. Hogarty, manager Amalgamated Sugar Co., Missoula, Mont.

E. C. Leedy, general agricultural development agent, Great Northern Railway Co., St. Paul, Minn.

Charles D. Greenfield, agricultural development agent, Great Northern Railway Co., Helena, Mont.

E. B. Duncan, Agricultural development agent, Great Northern Railway Co., Havre, Mont.

John W. Haw, director, department of agricultural development, Northern Pacific Railway Co., St. Paul, Minn.

L. A. Campbell, agricultural development agent, Northern Pacific Railway Co., Missoula, Mont.

Irving J. Courtice, agricultural development agent, Northern Pacific Railway, Billings, Mont.

W. J. Hunt, assistant to director, agricultural development department, Northern Pacific Railway, St. Paul, Minn.

Val Kuska, colonization agent, Chicago, Burlington & Quincy Railroad Co., Omaha, Nebr.

H. L. Ford, agricultural development agent, Chicago, Burlington & Quincy Railroad Co., Chicago, Ill.

Evan W. Hall, agricultural supervisor, Miles City, Mont., Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

Arthur C. Smith, assistant to the supervisor of agriculture, Union Pacific system, 114 Union Pacific Building, Omaha, Nebr.

I. D. O'Donnell, farmer, Billings, Mont.

Blaine Ferguson, agriculturist, Valier, Mont.

W. L. Murphy, Missoula Chamber of Commerce, Missoula, Mont.

Damon Boynton, Mystic, Conn.

C. B. Trowbridge, field representative of the Department of the Interior, Denver, Colo.

Following the Billings conference the investigators went immediately to their assigned projects, as follows:

Dr. Alvin Johnson: Riverton and Northport division of the North Platte project.

Prof. Frank Adams: Shasta View and Malin districts of Klamath and Orchard Mesa division of Grand Valley project.

A. C. Cooley: Owyhee project.

G. O. Sanford: Lower Yellowstone and Bitter Root.

L. H. Mitchell: Milk River.

H. H. Johnson: Sun River.

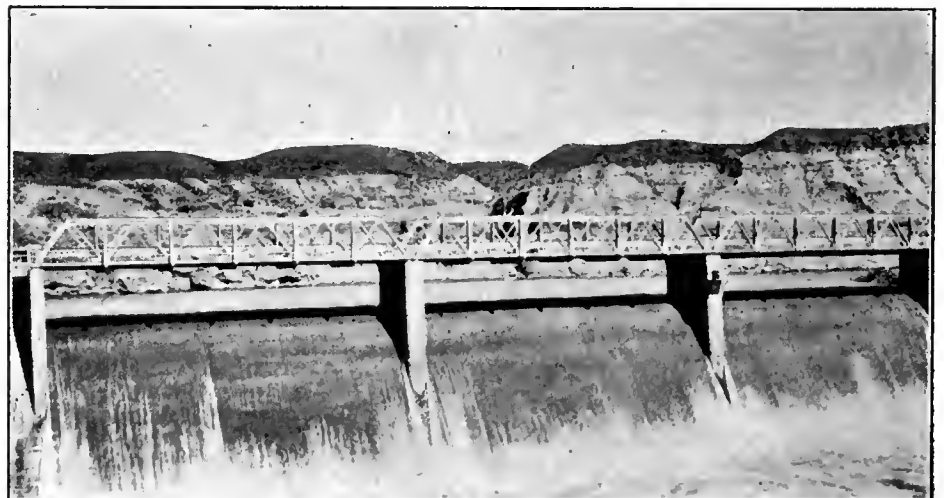
W. W. Johnston and B. E. Stoutemyer: Gem, Emmett, and King Hill.

B. E. Hayden: Willwood division of Shoshone project.

These investigators were assisted in their work by representatives of the State agricultural colleges, other State officials, the Federal land banks, bankers, sugar company officials, and railroads. Each investigator was instructed that at the conclusion of his investigation, and before returning to his home, he should tabulate the data gathered by him, formulate his conclusions, and forward them to H. A. Brown, secretary of the survey, at Washington, D. C., all reports to be in the Washington office not later than August 1.

A committee to review and correlate these individual reports will meet probably in Washington, D. C., not later than September, composed of the following: George C. Kreutzer, director of reclamation economics, chairman; Dr. Alvin Johnson; Prof. Frank Adams; A. C. Cooley; J. W. Haw; and H. A. Brown.

This committee will draw up a report and their conclusions based on the individual reports submitted by the investigators. This report will then be mimeographed and sent to each investigator for comment. Upon the return of these comments the final report will be drafted for submission to the Secretary of the Interior.



Willwood diversion dam, Willwood division, Shoshone project, Wyoming

Regulations Concerning Sheep Grazing Permits on the Riverton Project, Wyoming

THE following letter to the Secretary of the Interior from the Commissioner of the Indian Service relating to sheep-grazing permits on the Riverton project, Wyoming, was concurred in by the Acting Commissioner of Reclamation and approved on July 3, by the First Assistant Secretary:

JULY 3, 1929.

The honorable the SECRETARY OF THE INTERIOR.

MY DEAR MR. SECRETARY: As a result of several informal conferences between representatives of the Indian Service and representatives of the Reclamation Service, it has been agreed that in order to make the lands under the Riverton irrigation project on the Shoshone Indian reservation attractive to settlers, the Indian Service will arrange, so far as practicable, for bona fide settlers to obtain grazing privileges on the adjoining Indian lands, provided such privileges can be granted without prejudice to the interests of the Indians and that such privileges be paid for at the prevailing rate.

Pursuant to this understanding and based on the assurance of the Riverton project officials that such territory would be satisfactory and sufficient for the needs of bona fide settlers for the next several years or until October 1, 1933, the grazing range known as No. 19 was advertised last fall for a diminishing permit. This range is occupied by the Yellowstone Sheep Co. It practically surrounds that part of the Riverton project to which water can now be delivered, hence grazing within its boundaries would be accessible to the settlers under proper permit.

The Yellowstone Sheep Co. submitted the only bid received and was awarded the permit. The permit provides for a reduction in number of sheep grazed by that company to such extent as may be necessary in order to accommodate the sheep or other stock of bona fide settlers, provided that notice be given the company not less than two months prior to October 1 of any given year.

In order that grazing privileges may be properly granted under the arrangement outlined above, it is recommended that the following requirements or regulations be approved and promulgated:

1. The applicant must be a bona fide settler on irrigated lands within the Riverton project, either as the owner of such lands or as a bona fide lessee of such lands.

2. He must live upon and cultivate such lands.

3. An owner of irrigated land who lives elsewhere and employs another person to

live on and cultivate the lands will not be considered as a bona fide settler.

4. A tenant actually living upon and cultivating leased irrigated lands may be granted grazing privileges, provided his lease or contract with the owner of such land does not provide for a share of the stock; and such tenant or lessee will be required to file with the superintendent of the reservation a copy of the lease or agreement under which the tenancy is held.

5. Any actual settler who homesteaded lands on the ceded portion of the Shoshone Reservation prior to the construction of the Riverton project and whose homesteaded lands lie within that portion of the project to which water is being delivered may be granted grazing privileges to such extent as his acreage with water right may warrant.

6. The number and kind of stock which may be grazed by a settler will be determined by the superintendent of the reservation after conference with the superintendent of the Riverton irrigation project, and in arriving at conclusions as to the number and kind of stock in any given instance the determining factor shall be the livestock needs of the applicant for the consumption of such products of the unit or farm as can be more profitably fed to stock than marketed in any other way, the purpose being to provide sufficient grazing to supplement the feed raised by the applicant up to such limit as the proportion of the acreage of farmed irrigated lands to the acreage of Indian lands available for grazing will allow.

7. The superintendent of the Shoshone Reservation shall notify the regular permittee, on range 19, on or before August 1 of each year, of the proposed reduction in number of stock to be run by him under his permit.

8. Permits issued under these regulations will be at the same rate for sheep as now paid by the Yellowstone Sheep Co., viz, 40 cents per head per year. For domestic or farm cattle, including farm horses, the rate shall be \$2 per year.

9. Permits must be completed and filed with the superintendent of the Shoshone Reservation not later than September 1 of the year the permit becomes effective.

10. Payments shall be made semiannually in advance and any permit in which the grazing fees amount to more than \$100 a year must be accompanied by a satisfactory bond.

11. All permits issued under these regulations must be written to expire not later than September 30, 1933, to conform to the expiration date of existing permits on the ceded portion of the reservation, and be submitted for departmental approval in the usual way.

Respectfully,

C. J. RHOADS,
Commissioner.
JULY 3, 1929.

The Reclamation Service concurs.

P. W. DENT,
Acting Commissioner.

Approved July 3, 1929.

JOS. M. DIXON,
First Assistant Secretary.



Gibson dam, Sun River project, Montana, nearing completion

Progress of the West Requires Federal Reclamation

By E. E. Roddis, District Counsel, Billings, Mont.

WE are in the midst of an irrigation project built with funds derived from the sale of public lands in 16 Western States and with the royalties received from oil, gas, coal, and phosphates produced on lands owned by the United States. The building of irrigation works by the Federal Government involves the question of internal improvements supervised or entirely controlled as a Federal institution. All Government moneys expended for internal improvements, except that for irrigation, are lost to the Federal Treasury. The reclamation fund is obtained from the sale of Government property in the States where irrigation expenditures are made and from repayments by the farmers on the projects. No money comes from the general fund of the Treasury. In 25 years the expenditures made from the reclamation fund by the Federal Government have made arable a large area of waste desert land, and have made possible the building of 50,000 homes.

It is being oft repeated that there is a surplus of farm products, and that any attempt to increase production by increasing the arable area is inadvisable. Whether the United States has a surplus of farm products is an important question from a governmental standpoint, because it is lending its aid to the extent of about \$10,000,000 a year to increase the area that can be cultivated in the arid regions of the 17 Western States. This is a small sum, and results are not accomplished for many years.

During and immediately following the Civil War, agricultural and other developments west of the Mississippi River were rapid. The vast area of rich farm lands in States like Iowa, Nebraska, Minnesota, Kansas, and Oklahoma were settled and came into cultivation. The advance guard of this settlement reached the arid plains in the early eighties, and was driven back by years of drouth. Some of the pioneers passing on into the mountain region began the development of irrigation. When the small private irrigation systems had been developed to the fullest extent practicable, corporations supplied money for building; then the Carey Act was passed, which permitted the use of the Government land as security for bond issues, and the failure of this development led to passing the reclamation act on June 17, 1902, thus admitting that Federal aid and development were necessary for the continuation of the increase in areas that could be used for the successful cultivation of crops in the Western States.

As early as 1877 Congress had recognized the necessity of making it easy for individuals to secure land and place it under irrigation and cultivation; when it passed the desert land act. This permitted a man to obtain 320 acres of Government land, and by bringing water upon the land secure title. The act was an adjunct to the homestead law of 1862, under which the settlement of the Mississippi Valley took place.

The reclamation fund is revolving; that is, landowners whose lands are irrigated must repay the cost of the construction of the irrigation system benefiting their lands. Thus money invested in a project is repaid and the returned money is invested in other projects. About \$200,000,000 has been expended on 28 projects, and considerable has been written about the sum that has been lost or written off. The present estimate of losses from projects that were not successful and from those projects that are not repaying as anticipated is about \$10,000,000. Five per cent of the invested capital may be lost, which is a very small proportion when you consider the newness and uncertainties of the venture.

Recent legislation has developed plans for returning to the fund the net earnings of power plants made possible by storage of water, which will in a few years go a long way towards repaying the losses now estimated.

In the development of irrigation works on a large scale, storage of water is necessary, because the natural flow of many of the streams in the Western States is already over appropriated. The government is required, therefore, to seek out feasible reservoir sites and store water for its irrigation needs. Storage water develops a possibility of the generation of electrical energy. It is in most instances a by-product of irrigation construction. On all projects where electrical development was possible, the power plants have been constructed primarily for power to be used in building the irrigation works. Electrically operated machinery has proven to be economical and successful. It has tended to reduce the cost of the works which must be repaid by the farmers on the projects. After the construction work is completed, the electric power is a by-product, which usually can be disposed of to commercial enterprises in the vicinity or to the farmers for use on their farms. The Minidoka project is an outstanding example of the use of cheap electricity by farmers. It betters the liv-

ing conditions of the settlers and increases the commercial activities in general.

If this part of the country is to advance someone must continue to build. Irrigation systems and cultivated farms can not be created in a day. The building of irrigation works is so extensive and return of funds so slow that only an institution representing all the people can finance the work. In the train of this financing and building goes the construction of roads, commercial enterprises, school houses, churches, and other enterprises which you see in the vicinity.

The statement has been made recently that there is an excess of production of farm products, but to demonstrate that this is true only of a very few products your attention is called to the fact that outside of wheat and potatoes most of the other products which are consumed are relatively high priced. Fat cattle are selling for \$15.50 per hundredweight in Chicago; hogs, \$11 per hundredweight; sheep, \$17 per hundredweight; bacon retails at 50 cents per pound; beef, 40 cents per pound; and similar prices can be quoted throughout the entire category of farm products. But we must have a surplus of materials and food supplies. We need a surplus of good things and by this token we are guaranteed against suffering and want. In China famine destroys a million or two, and thus balances consumption with production.

The irrigation projects are consumers more than producers. The settlement is being built up at the cost of production from the irrigated area, and much of the supplies must come from outside sources. Building material, for instance, is obtained from the west coast; wire, hardware, furniture, automobiles come from the East; and the commerce of the Nation is increased from every standpoint. Very few of the products of the irrigated section come in competition with farm products of other areas in the United States. Beet sugar, wool, butter, eggs, cream, seed beans, peas, alfalfa seed, and similar products are imported, because there is not a sufficient supply in the United States, or because other areas can not produce enough to supply the demand. The area cultivated and planted to wheat is negligible, because it is not a profitable crop under irrigation. Corn is not raised to any material extent. Alfalfa is fed to stock which goes to a market that must be supplied to some extent by importations from foreign lands.

Good statesmanship demands a looking into the future to build up our food supplies for a much larger population. If we must curtail production, reduce or eliminate the appropriations for the Interior and Agriculture Departments, and stop the increase in area of tillable land, let the corn borer eat the excess corn; the black rust and smut reduce the wheat yield; the boll weevil the surplus cotton; the blackleg the cattle; the hog cholera, the hogs; and in a few short years we would have want and famine stalking in our byways.

From a national standpoint, the human side of irrigation work is more interesting and important than the commercial business created by it. The farm home, and it might be added the home in the small town, is the foundation of the most conservative population of the country, and the numbers should be increased. On the irrigation projects and in their vicinity lack of employment and want are unknown.

When war was declared in 1917 the Shoshone project, on which there was no habitation before the construction began in 1904, furnished for the United States 199 soldiers for the Army and 8 for the Navy. It might be of interest in connection with this statement to mention the fact that the first woman to enter the Army service during the World War from Wyoming was from the Shoshone project. Three hundred and twelve thousand dollars' worth of Liberty Bonds was subscribed by the residents of this vicinity, and the Red Cross subscriptions and subscriptions of other war activities exceeded \$25,000. Of the men enlisted, two were killed in action and one man was wounded.

Whether irrigation in the West shall decrease or increase is a matter for consideration of statesmen. Statesmanship is an attribute which compels looking into the future—not the future of the individual but the future of the Nation. Consideration should not be given to the present-day needs, for we know they are ample now in nearly every branch of human endeavor in the United States, but the future of a fast-growing Republic requires that some one shall look ahead to view the affairs of the Nation in 10, 50, or a hundred years hence. This is not a function of the politician or the man engaged in the scramble for dollars; it is the work of statesmen.

THE Amalgamated Sugar Co. is preparing the Burley factory, Minidoka project, for a 100-day run next fall. In 1928 the run lasted less than 30 days.

Cement Association Conducts Lecture Course at Denver Office

REPRESENTATIVES of the Chicago office of the Portland Cement Association conducted a series of lectures on concrete at the Denver office of the Bureau of Reclamation during the afternoons and evenings of June 3 and 4, 1929. Several of the lectures were illustrated by lantern slides, and some were accompanied by actual demonstrations of the principles involved in mixing concrete of proper consistency and workability. The program was as follows:

TUESDAY AFTERNOON, JUNE 4, 2 P. M. TO 5 P. M.

Effects of factors other than proportioning on quality of concrete, by R. S. Phillips.
Round table discussion.

TUESDAY EVENING, JUNE 4, 7.30 P. M. TO 10 P. M.

Durability of concrete structures, by F. R. McMillan

The lectures and discussions covered many of the important factors involved in the production of strong, durable, water-tight concrete. Some of the factors discussed were the physical properties of cement, water-cement ratio, gradation of aggregates, methods of curing, use of admixtures, use of patented curing systems, and effect of variations in time of mixing. The quality of the cement paste was emphasized as the most important single factor in securing first-class concrete, and the curing of the concrete of next importance, assuming aggregates of satisfactory strength to be available. It was shown that variations in the water-cement ratio might cause variations of 50 to 100 per cent in the strength of the concrete; whereas variations in the proportions of the aggregates, using the same cement paste, would not cause variations of more than 10 to 15 per cent in the strength. A detailed report on the lectures and discussions is being prepared and copies will be forwarded to the various offices of the bureau as soon as available.

The lectures were attended by approximately 60 engineers, including the staff of the Denver office of the Portland Cement Association, the staff of the Denver office of the Bureau of Standards, several members of the engineering faculty of the University of Colorado, Construction Engineer F. A. Banks of the Owyhee project, and practically the entire engineering staff of the Denver office of the Bureau of Reclamation. District Engineer P. F. Meade, of the Denver office of the Portland Cement Association, was instrumental in arranging for the lectures.

Warning Notice For Boulder Canyon Land

The General Land Office is cooperating with the Bureau of Reclamation in posting the following notice at numerous points in the vicinity of Boulder Dam site and on the public land that will eventually be irrigated from the constructed works:

UNITED STATES DEPARTMENT OF THE INTERIOR

NOTICE

Notice is hereby given that the public lands withdrawn in connection with the Boulder or Black Canyon Dam and reclamation project are not subject to settlement, application, or any form of appropriation.

Therefore, any person performing any act of appropriation or settlement on any of the land so withdrawn will gain no rights by such unlawful act, but will be considered a trespasser and dealt with accordingly.

C. C. MOORE,
Commissioner
General Land Office.

ELWOOD MEAD,
Commissioner
Bureau of Reclamation.

MONDAY AFTERNOON, JUNE 3, 2 P. M. TO 5 P. M.

The fundamentals of concrete mixtures, by F. R. McMillan.

Trial method of designing concrete mixtures, calculation of yield by absolute volumes, and demonstration of bulking of sand, by R. S. Phillips.

MONDAY EVENING, JUNE 3, 7.30 P. M. TO 10.30 P. M.

Volume changes of concrete and mortar, by M. B. Lagaard.

Field control methods, by R. S. Phillips.

AT Gibson Dam, Sun River project, all concrete, except 1,300 cubic yards to be poured in the diversion openings, had been placed at the end of the month, at which time approximately 10,000 acre-feet of water was stored in the reservoir.

Growing Olives on the Orland Project, California

By R. C. E. Weber, Superintendent

OLIVES were first introduced into the United States by the Franciscan Fathers, who nearly 150 years ago brought some to this country and planted them at the San Diego Mission, near the site of what is now the city of San Diego, Calif. From this early mission the trees were distributed to others located in the southern and central parts of the State. Some of the original plantings are still thrifty and productive after nearly a century and a half, indicating the abnormally long life of the tree. At one time in the early history of California horticulture, olives were for many years the most important fruits produced in the State.

The early planting of olives in the Orland community consisted mostly of rows of trees on the exterior boundaries of other orchards, primarily for wind-break purposes. Because of the hardy nature of the tree, together with its rather dense evergreen foliage, the olive was well adapted for this purpose. It was not until after about 10 years of the Orland project's operation that the acreage of olives was sufficiently extensive to be itemized in the annual crop census report. In 1921 there were 3 acres of bearing trees reported. This has been gradually expanded until 173 acres were in a bearing state during 1928.

On account of its sturdy qualities the olive is adaptable to most all the soils of the project. Thus far the industry has not been extensive enough to establish definitely the relative merits of the various project soil classifications for most successfully raising olives. Like-

wise, it is not yet certain as to the best practice regarding fertilization, although the consensus of most growers is to the effect that some method of fertilization, either growing a cover crop or the use of barnyard manure, is desirable. The tree is remarkably free from pests; this is especially true where pruning is practiced, which largely eliminates the possibility of infestation by certain varieties of scale. Light and regular annual pruning is recommended.

The irrigation requirements of the olive are relatively light, the normal being about four or five irrigations during the summer, beginning usually about May 15, provided that the spring plowing has been done sufficiently early to secure the benefit of the winter moisture for this purpose. Cultivation after irrigation is necessary for the proper conservation of moisture. During the ripening period—in October and November—it is essential that there be sufficient moisture in the ground to prevent the olives from shriveling. In normal years, the usual fall rains provide ample moisture for this purpose.

LEADING VARIETIES

The leading varieties of olives raised at Orland are the Mission (deriving its name from the original plantings in California at the Mission San Diego), the Manzanillo, and the Sevillano; the latter is more commonly known as the Queen and is a comparatively new variety on the project. The olive may be propagated by seeds or cuttings as well as by budding and grafting. Cuttings, however, are used mostly. Grafting is re-

sorted to where for some reason it is found desirable to change the variety of olive after the tree has had several years' growth. Quite recently a number of mature trees on the project have been grafted to the Sevillano variety.

Too close a distance between trees in planting is not desirable, as the tops become high, making the picking of the fruit difficult and expensive. From 50 to 60 trees per acre are recommended as general practice best suited for local conditions.

On account of its late blossoming period—the latter part of April and early in May—olives on the project are practically immune from frost damage. They mature about the 1st of October and picking continues well into November. The later and overripe olives are used for oil; the early product is used for pickled olives. Picking is by hand and is necessarily an expensive operation. The average cost of picking, which is usually performed on a piecework basis, is \$25 per ton.

THE OLIVE MARKET

Considerable difficulty was encountered for a number of years by the lack of an established market for Orland olives. This has been corrected by the formation of a local organization of growers, known as the Orland Olive Growers' Association, which is a subsidiary of the California Olive Growers' Exchange, a state-wide marketing organization of olive producers. The local association has a membership of 22 and represents approximately 185 acres of groves, most of which are located in the project area. In 1927, a 10-year contract was entered into by the Orland association and the Sylmar Packing Co., a large established commercial packing firm, whereby the growers are guaranteed a fixed price for their olives, varying from \$40 to \$225 per ton, depending upon the grade, together with a participation in the net profits to the extent of 50 per cent. This contract, which has been in effect during 1927 and 1928, has stabilized prices and has done much toward establishing the local industry on a going basis. Prices received by the growers have been remunerative, and quite universal satisfaction has resulted from the two years' operation under the contract.

In the two years of its existence the local association has acquired plant and equipment representing an investment of \$3,600; this will be increased to \$5,000 during the fall of 1929 in extensions and



An irrigated olive grove on the Orland project, California



Shipping olives, Orland project, California

improvements. A grader was purchased last year and was used in handling the 1928 crop. Other equipment consists of brine tanks for preliminary processing of olives, preparatory to their shipment by rail to the Sylmar plant near Los Angeles, where they are prepared for the market. At present the equipment of the growers is housed in the packing plant

of the Orland Orange Growers' Association under a temporary rental arrangement. Property with railroad frontage, however, is owned by the olive growers on which the erection of an independent plant is ultimately contemplated.

As now graded for shipment, the local product consists of five commercial varieties or sizes, together with a low grade,

consisting of small olives, which is used in the manufacture of oil. After grading the olives are subjected to treatment in a brine solution, after which they are shipped by rail in tank cars to the processing plant near Los Angeles.

PRODUCTION

The value of an olive grove in prime bearing state is estimated at \$750 per acre. Some of the best trees produce 6,000 pounds of olives; a fair average production is from 2,500 to 3,000 pounds per acre. At an average price of 5 cents per pound the mean gross return will vary from \$125 to \$150 per acre per year, which will leave the grower a substantial net return after deducting labor and other operating expenses.

There are a number of features in connection with the olive industry at Orland which speak well for a highly successful future. Climatic and soil conditions combined with the natural hardiness of the trees are most conducive to raising olives here, and the long term contract, which has already demonstrated its effectiveness, will afford a market for the product at prices that will yield the grower profitable returns.

Petrified Forest on Lower Yellowstone

H. A. Parker, superintendent of the Lower Yellowstone project, Montana-North Dakota, and E. E. Roddis, district counsel, at Billings, Mont., have discovered a petrified forest on Indian Coulee about 3 miles southwest of Savage, Mont. With Federal aid the State of Montana is reconstructing 8 miles of the main highway from Glendive, Mont., to Williston, N. Dak. This is the principal road through the Lower Yellowstone project. The reconstructed highway crosses Indian Coulee in some picturesque bad-land territory. Adjacent to the roadway on the west side are several acres of fallen petrified trees. Some of them are 10 feet in diameter and over 100 feet long. The tops of the petrified trees taper off abruptly, indicating they belonged to the coal-tree forests of that geological age; furthermore, this conclusion is supported by the location of a vein of coal in an adjoining hill, which appears to be on the same earth strata.

The trees have fallen in the same direction, leading to the belief that they were uprooted by a violent southeast wind. Over an area 30 miles wide and 100 miles long in eastern Montana pieces of petrified wood can be found, but this is the

first forest of petrified trees lying in place as they had fallen. The silicate deposit which turned the trees to stone has not crystallized, and none of the wood rings of the trees is visible.

The new road is on a scenic location as it crosses Indian Coulee, and the plains bordering the project can be viewed for more than 50 miles. Visit the scenic Lower Yellowstone.—E. E. Roddis.



[Petrified trees on Lower Yellowstone project, Montana-North Dakota



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Assistant to the Commissioner and Associate Editor *New Reclamation Era*



Project Club Activities

INFORMATION as to club activities and illustrations of club buildings have been carried in the May, June, and July issues of this magazine. Each project group is proud of the showing it can make in this connection and I feel sure the information on one project is of interest to all others, not only to show the extent of the activities but the methods of organization.

SHOSHONE PROJECT, WYOMING

The Shoshone project is located in the northwestern portion of the State of Wyoming and about 80 miles east of Yellowstone National Park. Two towns are located on the project, Deaver and Frannie, each with a population of a little less than 100. It has one bank, two churches, and two schools, and the population of the irrigated farms is approximately 600.

The Farm Bureau has an active organization, also the American Legion, with its auxiliary. The Lions Club and the Chamber of Commerce cover civic activities. There are three study clubs, the Delphians, Epasc Club, and Library Club, the latter maintaining a very good circulating library.

With the exception of the Library Club, which has its own building, and the Epasc Club, which meets at the homes of members, all of the foregoing meet at the schoolhouse or the various church basements, which are equipped with kitchen and dining-room facilities. The Garland Men's Club meets at the schoolhouse there and the Badger Club, a purely social men's club of Powell, has permanent quarters in the Lyric Theater Building. Of the seven social community clubs two have buildings—the North End Club and the Riverside Club—while the East End, the O'Donnell, Philophronean, Deaver, and Willwood Women's Clubs meet at the farm homes.

To summarize, there are 7 fraternal, 2 civic, 4 study or educational, 2 men's, 7 community, and 1 farm club on the project. It will be seen that there is no lack of social life and organized endeavor on the project. There is spasmodic talk of building a central community house large enough to house most of these organizations and containing a large dining hall, well equipped kitchen, large dancing floor, etc., with possibly a swimming pool also, but since the high-

school building has a large auditorium, which is freely offered to the public by the school board, and three of the churches have large basement dining rooms and kitchens, the need is not very urgent, and it is not likely any such movement will find favor until the school bonds are retired and the farmers are more prosperous than at present.

Of the three club buildings owned, the North End Club Building is the most attractive. Fifteen years ago, when this building was erected, each family interested donated \$5 and two days' work on the building. The Reclamation Service gave a lease on the ground, two mail-order houses donated the dishes and silver, a departing member donated a piano and stove, and the chairs were bought with the proceeds of entertainments. Thus, with no great burden on anyone, the project was able to have a neat and attractive community gathering place which, though not large or pretentious, was sufficient for its modest demands at that time and is still in constant use.

The Library Club Building is an old school building which was purchased from the school board, moved to its present location near the High School Building, and all except a small room at the front is now rented to the school board for a primary room. The Riverside Club Building was once a store building and although, when it was moved, the plan was to remodel it, this has not yet been done.

YUMA PROJECT, ARIZONA

The Yuma project straddles the boundary line of Arizona and California, with its greatest acreage in Arizona. The project has 3 banks, 14 schools, and 25 churches. It has five towns, the largest of which is Yuma, with a population of approximately 8,000. The population on irrigated farms is a little less than 4,000.

There are three federated women's clubs on the Yuma project—the Somerton Women's Club, located at Somerton, Ariz.; the Gadsden Women's Club, located at Gadsden, Ariz.; and the Delta Club at Yuma. The first two mentioned own their own clubhouses. (See illustration.) The Delta Club at Yuma, however, owns a lot in the residential section of the city, but as yet has not built on it. They conduct their meetings at the homes of the various members. These clubs do not hold meetings during June, July, August, and September, due to the

heat of these summer months and the absence of many of the members at that time.

The Gadsden Women's Club, with a membership of 20, has one active department called home economics, and two study departments. This club meets every two weeks.

The Somerton Women's Club, with a membership of 36, meets every other Thursday, and is made up of four departments—namely, Americanization, philanthropy, parliamentary, and cooperation with World War veterans.

The Delta Club, of Yuma, with a membership of 80, holds meetings every other Thursday and is comprised of four departments—literary, travel, local history, and Americanization; in addition to which there are three study departments. All of these clubs engage in charity and civic work as well.

In addition to the above women's clubs there is also a business and professional women's club at Yuma, which is affiliated with the State and National Federation of Business and Professional Women's Clubs. The local club, with a limit of two-thirds of its membership to business and professional women and the other third to housewives, has a total membership of 80. This club owns its own clubhouse. (See illustration.) The building is very attractively furnished and a revenue is derived from renting it for various local social functions. The activities of the club are mainly of a social nature; however, they do a considerable amount of charity and civic work as well.

There is also a Wednesday Afternoon Club with a membership of 20, comprised of the wives of the ranchers in the valley division of the project. Their meetings are held twice monthly at the homes of the various members. The activities of the club are equally divided between social and home economics work.

Other clubs of a civic nature on the project are the Yuma Chamber of Commerce, with a membership of 225, and the Kiwanis Club, with a membership of 54. Neither of these organizations, however, owns a clubhouse.

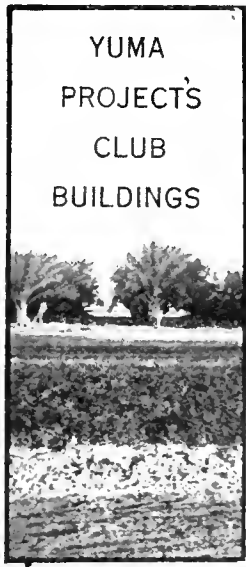
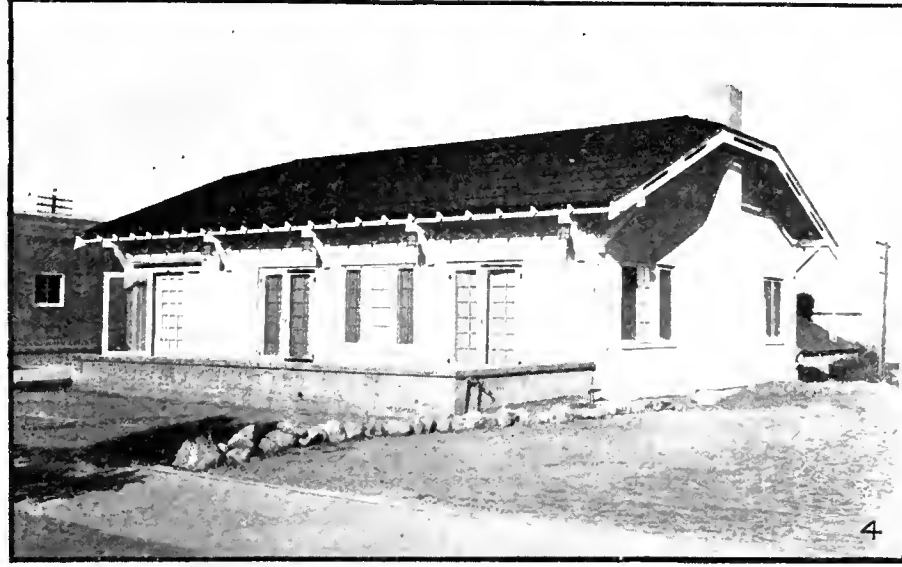
The Yuma Valley Country Club, with a membership of 131, owns its clubhouse (see illustration), and a 9-hole golf course, swimming pool, and shotgun range. This club is located on the Yuma Mesa $\frac{3}{4}$ miles east of the town of Yuma. The club grounds of 80 acres are about 1 mile west of Fly Field, the local airport,

1
GADSDEN WOMENS CLUBHOUSE.
 GADSDEN, ARIZONA.

2
YUMA VALLEY COUNTRY CLUB,
 NEAR YUMA, ARIZONA.

3
SOMERTON WOMENS CLUBHOUSE,
 SOMERTON, ARIZONA.

4
**BUSINESS AND PROFESSIONAL
 WOMENS CLUBHOUSE.**
 YUMA, ARIZONA.



**YUMA
 PROJECTS
 CLUB
 BUILDINGS**

and were acquired five years ago, for the amount of the mortgage. Grapefruit, orange, and lemon trees afford a source of revenue to the club, which is placed

a general fund. The officers, a president, four directors, and a secretary, serve without compensation. Initiation fee is \$100 and yearly dues \$36.

This issue completes the series of articles on clubs for adults, and junior activities will be treated commencing with the September issue.

Drainage Work—Cooperative Results by Contract and by Government Forces

By J. R. Iakisch, Engineer, Denver Office

ANY discussion of results obtained on construction work by whatever method employed should give consideration to the various differences and difficulties encountered on the work. In the determination of comparative results on drainage work by contract and by Government forces, a tabulation only of unit costs without a description and comparison of the conditions under which the work was accomplished might easily be more misleading than instructive. In the following discussion an attempt has been made to select from the large number of drainage jobs completed during the last 15 or 16 years, only such work as had sufficient similarity in construction conditions to warrant a comparison and to go somewhat beyond the figures of a cost report or a bid price to determine if there were advantages in any method of construction which might not be shown in a mere tabulation of costs and prices.

Waterlogging of lands is caused by the accumulation of underground waters derived from canal losses, irrigation losses, and rainfall wherever the natural under drainage is insufficient to remove such waters as rapidly as supplied. These underground losses in their passage down the slope may be forced to the surface by impervious strata but eventually the greater portion goes to fill up the underground reservoir. This process continues until the losses from any given area through natural underground or artificial drainage, surface run-off, and evaporation from waterlogged land equal the losses into the subsoil.

Drainage is usually undertaken before this balance between inflow and outflow is reached and the investigator in formulating the plans for the relief and protection of an area usually has only unstabilized and changing conditions upon which to base a plan of drainage. When the water table approaches the critical stage, changes in the extent of the water-logged area can and often do occur very rapidly. It is not uncommon for lands to become water-logged between seeding and harvesting time and such changing conditions often make changes in the original plans advisable and necessary.

EFFECTIVENESS OF DRAINS

When relief from existing water-logged conditions has been effected, farming is resumed and a new set of conditions is imposed on the area. Lands once idle because of seepage and alkali deposits are again irrigated, the total water applied to

the land and carried in the canals is increased and the aggregate of the losses into the subsoil are greater. The constructed drainage channels may not be adequate for the removal of these surplus losses and additional branch drains are often found to be necessary. This supplemental drainage work, because the drains are usually short, moving costs large, and canal and drain crossings numerous, costs more than the original work. Costs for this class of work on the Newlands project show an increase of 15 per cent and on the Shoshone project of 10 per cent. The investigations and development of plans for such secondary drains requires greater detail study as the acreage to be protected is usually small and the acreage cost of drainage should not exceed the value of the land when reclaimed.

The development of water-logged conditions is usually a slow process, the final effectiveness of constructed drains can be determined often only after some years of operation and the changing conditions of inflow into the subsoils of an area preclude the possibility of formulating a plan of drainage based upon existing conditions that will be adequate for all possible future needs. The requirement for changes in plans and the fact that drainage can be planned and should be undertaken only as conditions warrant and demand do not make drain construction readily adaptable to contract work. It is a type of work more similar to the maintenance of a project and the betterments necessary after an irrigation system has been in operation for some time and it has usually been found to be advantageous to do this class of work by Government forces.

Drainage work is usually undertaken on a project after it has been operated and maintained for some time by Government forces and the nucleus of an increased organization is usually present. There are also drag lines and other construction equipment used only at intervals on maintenance and available at other times for drainage work. With the combined work under one management, maintenance crews and equipment can be used to better advantage. This probably results in more benefit to maintenance than to drainage and its exact value is difficult to determine, but it is a real benefit and has a tangible value in the economic operation of a project.

EARLY DRAINAGE CONSTRUCTION

Most of the drainage work on Federal reclamation projects has been done by

Government forces. Some of the tile drain work on the Huntley project during the earlier period of construction was done by contract, but later was discontinued because of failure to obtain bids that compared favorably with the cost of similar work being done by Government forces on the project. The first drainage work done on the Shoshone project was by contract and the price bid for excavation was 18 cents per cubic yard. The contractor failed and the work was finished by Government forces. During the period of drain construction on the Rio Grande project certain open drains, totaling about 10 miles in length, were let by contract. As the cost of this work was in excess of that being done by Government forces, this practice was discontinued upon the request of the water users' organization.

Such unsatisfactory results during the early period of drainage construction were due largely to the scarcity of contractors suitably equipped to handle such work. In the interests of economical construction, if for no other reason, it became necessary for the bureau to do the work by Government forces. This required the purchase of costly equipment and the development of a skilled personnel to handle the work successfully. Conditions in the contracting field, however, have changed considerably in recent years. A large amount of drainage work has been done on private irrigation projects and the demands in other lines of work have compelled contractors to equip themselves with excavating machinery suitable to handle drainage work efficiently. One result of such changed conditions is that there is now a sufficient number of contractors suitably equipped and experienced in this line of work to furnish keen competition in the bidding on all drainage work which is being advertised for contract.

CONTRACT WORK

Within the last four or five years it has become necessary to do at least some of the drainage work in progress by contract. This was in line with the policy of the department that all construction work would be done in the future by contract if satisfactory bids could be obtained. To suspend all drainage work being done by Government forces seemed to be very doubtful economy. Under such an arrangement, the large amount of construction equipment in use and not yet fully depreciated would be rendered idle or would have to be disposed of at a figure

probably below its value on the books of the project. The bureau was, therefore, permitted to continue drainage work by Government forces on those projects where this method was in use and where construction equipment was readily available and to confine drainage work by contract to those projects where drainage had not been previously undertaken or where suitable construction equipment was not available for the work.

Before proceeding to advertise drainage work it was necessary to prepare specifications covering all items of construction. It was the intention in the preparation of such specifications to provide for the contractor to handle all the items of construction connected with the work, assume all responsibility of interference with traffic and communications and the delivery of water, and, in general, to relieve the projects of the necessity of maintaining even a small organization for construction purposes in connection with the work. In this respect they have fulfilled their purpose, as the amount of additional work that it has been necessary to do by Government forces has been so small that it has been handled by project maintenance crews along with their other work.

COMPARISON OF METHODS

Mention has been made of some of the advantages and disadvantages under the different methods of construction, but these have been more general than specific in nature. The most important feature in any comparison of results is after all contained in a direct comparison of unit costs obtained on work having the same general characteristics. On drainage work such a comparison on a mileage basis is not permissible. Drainage conditions on the projects require drains of different depth and carrying capacity. Total structure costs may also vary with the type installed, the size of farm holdings, and the number of canal, lateral, and farm crossings necessary. The comparison must be made on the basis of the different items of work, and as excavation on open drains usually comprises more than 80 per cent of the total contract cost of drain construction the study of comparative costs under the different methods has been confined to this item of work.

Drainage work by contract is at present confined to the Lower Yellowstone project, the Belle Fourche project, and the Minidoka project. For purposes of comparison it was considered best to select the Newlands project, the Vale project, and the Shoshone project, where drainage work by Government forces has been done in recent years or is still in progress. By doing this all of the earlier drainage work done on the projects has been eliminated from consideration, although it contains

some of the lowest unit costs that have been obtained by Government forces. The selections made, however, lend themselves more readily to a direct comparison, as labor conditions and costs, excavation, construction, and climatic conditions, excavating machinery used, and fuel and supply prices are more nearly the same.

It is considered advisable before proceeding with a direct comparison to describe briefly the differences and similarities in construction conditions that exist on the various projects. Climatic conditions on the Lower Yellowstone and the Belle Fourche projects are very similar to those on the Shoshone project and those on the Newlands and Vale projects more nearly resemble those on the Minidoka project. Excavation conditions on the Belle Fourche and Lower Yellowstone projects are considered to be very good. No hard material has been encountered and the excavation consists largely of sandy clays and gravels with some sticky clays. Some sloughing of banks has occurred and a small amount of recut has been necessary. Mats for drag lines have been necessary on all of the work under consideration. Excavation difficulties have probably been the greatest on the Newlands project where considerable difficulty has been experienced from eaving banks, unstable footing for drag lines and the necessity for recut. A considerable amount of hardpan that required blasting was encountered on the Vale project work. The recent work on the Shoshone project is somewhat complicated by frequent ledges of sandrock and shale, short drains, and heavy moving costs.

Excavation on the Vale project has been done almost entirely by electric drag lines and on the Shoshone project by electric and gasoline drag lines. On the other projects such work has been done by gas-

oline drag lines although electric power was available on the Lower Yellowstone project at a reasonable cost if it had been desired.

FIELD COSTS

The accompanying tables show the field costs on drainage work done by Government forces and bid prices on drain excavation under the various contracts in recent years. None of the work dates back farther than 1921. The field cost of excavation on work done by Government forces and the bid price for drain excavation under contract work are directly comparable in so far as the elements which go to make up the cost are concerned.

On the basis of the figures presented in the tabulation, the average bid price received for open drain excavation on contract is approximately 28 per cent above the field cost of the work done by Government forces and the lowest bid price is \$0.004 higher than the highest unit field cost. It should be noted, however, that such bid prices have been lower on the more recent advertisement, due probably to greater competition and more familiarity with this class of work. It is not improbable that still lower bids may be obtained on future advertisements.

Most of the contract work done so far has been under circumstances that are considered to be very favorable and it still remains to be demonstrated whether the specifications cover all possible contingencies and whether the contractor can successfully accomplish such work under all possible difficulties that may arise. In closing, it might be well to add that contractor's costs on excavation as kept by the bureau have shown that none of the contract work accomplished in recent years has been done at a loss to the contractor.

Open drain excavation costs on recent work done by Government forces

Project	Period	Length, in miles	Average depth, in feet	Excavation, cubic yards	Cost per cubic yard	Power
Newlands.....	1921-1925	150	9.0	5,309,900	\$0.081	Gas.
Shoshone.....	1926-1928	24	7.7	611,700	.073	Gas and electric.
Vale.....	1927-1928	57	9.5	2,243,800	.069	Electric.
Total.....		231	9.0	8,215,400	.077	

Bid prices on open drain excavation—Recent work by contract, 1927 to 1929, inclusive

Project	Specifications	Length, in miles	Average depth, in feet	Excavation, cubic yards	Bid price per cubic yard	Power
Lower Yellowstone.....	458	8.0	8.0	220,000	\$0.1175	Gas.
	465	13.3	8.0	330,000	.113	Do.
	465	3.5	9.0	95,000	.12	Do.
	465	9.7	7.0	220,000	.115	Do.
	478	10.0	8.0	230,000	.106	Do.
Belle Fourche.....	478	7.2	8.0	160,000	.10	Do.
	466	30.0	9.1	860,000	.10	Do.
	482	23.2	9.2	565,000	.0894	Do.
Minidoka.....	487	33.6	9.2	800,000	.085	Do.
	469	6.0	8.0	143,000	.10	Do.
Total.....		144.5	8.7	3,623,000	.099	

List of Congressional Reports on the Colorado River

In reference files, Washington Office, Bureau of Reclamation, June 30, 1929

Compiled by W. I. Swanton, Engineer, Washington Office

Date	Report	Pages	No.	Congress and session	Date	Report	Pages	No.	Congress and session
1903 Dec. 18	Colorado River, Ariz. and Calif., Chief of Engineers, War Department. Freight on river.	6	H. Doc. 204.....	58th, 2d.	1920 Mar. 5	Examination of Imperial Valley and other lands in California. Report on H. R. 12537.	4	H. Rept. 717.....	66th, 2d.
Do.....	Colorado River, Nev., Chief of Engineers, War Department. Eldorado-Rioville.	5	H. Doc. 237.....	Do.	Apr. 1	Imperial Valley, Calif. Report on H. R. 12537 by secretary.	2	S. Rept. 497.....	Do.
1904 Mar. 21	Irrigation by means of the Colorado River; Heber and Smythe. House Irrigation Committee.	86	House hearings....	Do.	May 18	Imperial Valley investigations Kinkaid act (41 Stat. 600).	2	Pub. No. 208.....	Do.
Apr. 2	Water from Colorado River for irrigation; Heber and Smythe. Tables of discharge of Colorado River.	65	Senate hearings...	Do.	May 19	Irrigation of Imperial Valley; appropriation for investigations, \$20,000.	2	S. Doc. 276.....	Do.
Apr. 21	Diversion of Colorado for Yuma and the Colorado Indian reservations (33 Stat. 189).	1	Indian appropriation.	Do.	1921 Jan. 1	Problems of Imperial Valley and vicinity; preliminary report; maps.	91	Committee print..	66th, 3d.
Apr. 28	Investigation use of waters of Colorado for irrigation by the Secretary of the Interior (33 Stat. 591).	1	Pub. Res. 32.....	Do.	June 4	Compacts between States, Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. House Judiciary Committee.	32	Hearings.....	67th, 1st.
1905 Jan. 9	Use of waters of lower Colorado for irrigation; C. D. Walcott.	8	H. Doc. 204.....	58th, 3d.	June 17	Division and apportionment waters of Colorado. Report on H. R. 6877.	2	H. Rept. 191.....	Do.
1907 Jan. 12	Imperial Valley or Salton sink region, illustrations. Message of President on flood.	40	S. Doc. 212.....	59th, 2d.	June 27	Disposition waters of Colorado. Report on S. 1853.	1	S. Rept. 180.....	Do.
Jan. 18	Salton Sea, Imperial Valley, and lower Colorado River. House Committee on Public Lands.	50	Hearings.....	59th, 2d.	Aug. 19	Colorado River compact permitted by act (42 Stat. 171).	2	Pub. No. 56.....	Do.
1908 Feb. 11	Irrigation in Imperial Valley; map and drawings; C. E. Taft, irrigation engineer.	56	S. Doc. 246.....	60th, 1st.	1922 Feb. 8	Parker, Fort Mohave, and Cihola irrigation projects, Arizona; maps, appendix A to hearings, H. R. 11449.	149	Hearings.....	67th, 2d.
Feb. 26	Memorial to John Wesley Powell. Report S. 4469.	2	S. Rept. 293.....	Do.	Feb. 23	Problems of Imperial Valley and vicinity. Fall-Davis report, illustrations, and maps.	326	S. Doc. 142.....	Do.
Feb.-Apr.	Southern Pacific Railroad Imperial Valley claim; House Committee on Claims; Cory, Grusky, etc.	70	Hearings.....	Do.	Feb. 28	Development of the Imperial Valley, illustrations. House committee print of nearly all S. Doc. 142.	233	Committee print..	Do.
1910 June 8	Grand and Green Rivers; surveys by engineers, War Department.	29	H. Doc. 953.....	61st, 2d.	June 15- Feb. 21	Protection and development lower Colorado River Basin. House Committee on Irrigation; 5 parts.	273	Hearings.....	67th, 2d.
1911 Feb. 23	Dam across Colorado River, Yuma County, Ariz. (near Head Gate Rock).	2	S. Rept. 1233.....	61st, 3d.	1923 Jan. 23	Southern Pacific Co. Report of S. Committee on Claims; break in Colorado.	21	S. Rept. 1066.....	67th, 4th.
Dec. 22	Ockerson report on Imperial Valley levee construction; maps; pp. 129-191.	63	H. Doc. 504.....	62d, 2d.	Feb. 28	Promotion industry, Colorado River Basin. Report from President and Bureau of the Budget.	3	S. Doc. 331.....	Do.
1914 Dec. 18-19	Imperial Valley, flood protection. Hearings urgent deficiency bill 1915, pp. 118-137, Kettner et al.	141	Hearings.....	63d, 3d.	Mar. 2	Colorado River compact. Report of Colorado River Commission, Herbert Hoover, chairman.	12	H. Doc. 605.....	Do.
1915 Jan. 7	Protection lands and property in Imperial Valley; map of delta; Marshall.	16	H. Doc. 1476.....	Do.	Apr.- Aug.	Protection and development of lower Colorado River Basin; information House Committee on Irrigation; Diamond Creek. H. R. 2903, including Federal Power.	212	Hearings.....	68th, 1st.
1916 Jan. 5	Flood control; H. M. Chittenden, U. S. Army. I. The Colorado Problem, pp. 59-65.	67	H. Doc. 2.....	64th, 1st.	1924 Feb. 9- May 17	Protection and development of lower Colorado River Basin, Swing bill, H. R. 2903; 8 parts, with index.	1980	Hearings.....	68th, 1st.
Jan. 13	Imperial Valley, construction protection works (report of General Marshall in manuscript).	2	S. Doc. 232.....	Do.	Apr.- June.	Protection and development of lower Colorado River Basin; information by citizens of Arizona and others. H. R. 2903.	152	Information.....	Do.
July 29	Plan for protection of Imperial Valley; Marshall's report, illustrations and maps.	21	H. Doc. 586.....	Do.	May 14	La Plata River compact. Report on S. 1656.	1	S. Rept. 554.....	Do.
1917 June 1	Colorado River Indian irrigation project., Report on H. R. 6901 by Secretary.	2	H. Rept. 1062.....	Do.	May 26	Southern Pacific Railroad claims; account of Colorado River flood (43 Stat. 171).	1	Pub. 141.....	Do.
Feb. 3	Colorado River and relation to Imperial Valley; C. E. Grusky, June 30, 1907.	39	S. Doc. 103.....	65th, 1st.	Dec. 17- Jan. 23.	Colorado River Basin; Senate Committee on Irrigation on S. 727; 2 parts.	320	Hearings.....	68th, 2d.
Feb. 27	Colorado River in Arizona. House Flood Control Committee; Marshall, Cory, etc.	28	Hearings.....	65th, 3d.	1925 Jan. 6	La Plata River compact. Report on S. 1656.	7	H. Rept. 1076.....	Do.
July 9- Mar.	Flood control, Colorado River, Calif. and Ariz. Data complete.	1	H. Rept. 1149.....	Do.	Oct. 26- Dec. 22.	Water Supply Paper No. 556, E. C. La Rue, Colorado River. Numerous maps and drawings. Colorado River Basin, Senate hearings, S. Res. 320; 6 parts.	176	H. Doc. 540.....	Do.
July 16	All-American canal for Imperial and Coachella Valleys, 3 parts. Colorado River survey, Imperial Valley. Hearings House Flood Control Committee.	619	Hearings.....	66th, 1st.	1926 Feb. 5- May 17	Colorado River Basin. House Irrigation Committee hearings on H. R. 6251 and H. R. 9826; 2 parts.	931	Hearings.....	69th, 1st
July 22	All-American canal report, maps; by Messrs. Mead, Schlicht, Grusky, and Preston.	24	do.....	Do.			312	Hearings.....	Do.
		98	Report.....						

Date	Report	Pages	No.	Congress and session	Date	Report	Pages	No.	Congress and session
1926 Apr. 19	Boulder Canyon reclamation project, 2 parts. Report on S. 3331.	116	S. Rept. 654.....	69th, 1st.	1928 Apr. 24- May 2 May 3	House Rules Committee, Boulder Dam; 2 parts. Investigation of waters of Gila River, N. Mex. and Ariz. H. R. 10786.	83	Hearings.....	70th, 1st.
May 17	Glen Canyon, Bridge Canyon, and Arizona High Line Canal. Fred T. Colter (illustrations).	19	S. Doc. 113.....	Do.	May 15	Rules report on Colorado River bill on H. R. 5773.	2	S. Rept. 1179.....	Do.
Dec. 22- Jan. 23	Boulder Canyon reclamation project. Report on H. R. 9826; 5 parts.	125	H. Rept. 1657.....	69th, 2d.	May 18	Compact, New Mexico and Colorado, San Juan, Las Animas, Rivers, etc. H. R. 6498.	1	H. Rept. 1666.....	Do.
1927 Jan. 17	Estimates for irrigating lands under Colorado River compact. Report on S. J. Res. 131.	2	S. Rept. 1258.....	Do.	May 18	Compact, New Mexico and Arizona, Gila and San Francisco Rivers. H. R. 6499.	2	H. Rept. 1740.....	Do.
Jan. 20- 22	Rules Committee (House). Hearings on Boulder Dam, H. R. 9826, in 3 parts.	121	Hearings.....	Do.	May 18	Interstate compact, Colorado, New Mexico, San Juan, Las Animas, etc.	2	H. Rept. 1747.....	Do.
Feb. 2	Lower Rio Grande and lower Colorado Rivers. Report of Secretary of State.	2	H. Doc. 676.....	Do.	May 18	Interstate compacts, Colorado-Utah.	1	H. Rept. 1751.....	Do.
Feb. 3	do.....	2	H. Rept. 1951.....	Do.	May 28	Equitable use waters, lower Colorado and Rio Grande, Dept. State.	9	S. Doc. 163.....	Do.
Feb. 9	do.....	2	S. Rept. 1455.....	Do.	May 29	Board of Engineer's to report on Boulder Dam. S. J. Res. 164 (45 Stat. 1011).	1	Pub. Res. 65.....	Do.
Feb. 23	Protection and development lower Colorado River.	1	H. Rept. 2212.....	Do.	Dec. 3	Sibert report on Boulder Dam project, Colorado River.	15	H. Doc. 446.....	70th, 2d.
Mar. 1	Federal Power Commission licenses affecting Colorado River. Report on S. J. Res. 4.	2	H. Rept. 2285.....	Do.	Dec. 10	Colorado River development, Geo. W. Malone.	225	S. Doc. 186.....	Do.
Mar. 3	Investigation Rio Grande and lower Colorado River. H. J. Res. 345 (44 Stat. 403).	1	Pub. Res. 62.....	Do.	Dec. 21	Boulder Canyon project act. H. R. 5773 (45 Stat. 1057).	11	Pub. No. 642.....	Do.
Mar. 4	Federal Power Commission licenses affecting Colorado River. (44 Stat. 1456.)	1	Pub. Res. 71.....	Do.	1929 Jan. 17	Apportionment waters Gila and San Francisco Rivers. Reapportionment Rio Grande, San Juan, and Las Animas Rivers.	2	S. Rept. 1496.....	Do.
1928 Jan. 7	Regulating the Colorado River; Mr. Davenport. House Irrigation Committee on H. R. 5770.	52	Hearings.....	70th, 1st.	Feb. 11	Compacts, Colorado, Wyoming, New Mexico, and Utah, respecting division of water.	2	S. Rept. 1724.....	Do.
Jan. 6- 14	Protection and development of lower Colorado River basin. House Irrigation Committee on H. R. 5773; 4 parts, index, and appendix.	664	do.....	Do.	Feb. 19	Restricting Federal Power Commission licenses affecting the Colorado River.	3	H. Rept. 2621.....	Do.
Jan. 17- 21	Colorado River Basin; Senate Irrigation Committee on S. 728 and S. 1274, including special advisers' report.	517	do.....	Do.	Feb. 25	Apportionment of waters of Gila and San Francisco Rivers. H. R. 6499.	2	H. Rept. 2784.....	Do.
Jan.	Development, lower Colorado River; Special Advisers Emerson, Durand, Schrugham, and Garfield. (Reprint Senate hearings.)	71	Report.....	Do.	Mar. 1	Restricting Federal Power Commission granting licenses on Colorado River.	1	Pub. Res. 98.....	Do.
Mar. 15- 24	Boulder Canyon project. Report on H. R. 5773; 3 parts.	134	H. Rept. 918.....	Do.	Mar. 2	Compacts, Colorado and New Mexico, regarding Rio Grande and San Juan Rivers, etc.	1	Pub. No. 946.....	Do.
Mar. 20- Apr. 9	Boulder Canyon project. Report on S. 728; 2 parts.	76	S. Rept. 592.....	Do.	June 25	Compact, New Mexico and Arizona, respecting Gila and San Francisco Rivers. Presidential proclamation. Boulder Canyon Dam project act effective.	1	Pub. No. 963.....	Do.
Apr. 2	Investigation of waters of Gila River, N. Mex. and Ariz., H. R. 10786.	2	H. Rept. 1101.....	Do.				No. 1882.....	

Advertising the Kittitas Project

E. E. Mundy, secretary of the Chamber of Commerce of Ellensburg, Wash., writes that this organization is actively interested in securing a satisfactory type of settler for the Kittitas division of the Yakima project, including a program of advertising and publicity articles in newspapers and magazines.

The accompanying illustration shows one of the large bulletin boards erected by the chamber of commerce at strategic points on the highway system at three points in the State. The copy on the bulletin boards is changed twice a year. The new copy, now on display, emphasizes "opportunities for superior settlers."



A NEW farmers' cotton compress company has been organized, incorporated at \$100,000, and construction of a compress is under way at Las Cruces, Rio Grande project.

GRAPEFRUIT and oranges are sizing up very well on the trees on the Yuma Mesa, Yuma project, with indications of a very good yield during the coming season.

THE potato growers on the Boise project are joining a state-wide association to control the grading and marketing of their product.

Reclamation Organization Activities and Project Visitors

DR. Elwood Mead, Commissioner of Reclamation, returned to the Washington office on July 17. While in the vicinity of Boulder Canyon Doctor and Mrs. Mead enjoyed an airplane trip, looking down on the canyon and on Imperial Valley from a height of 12,000 feet. A message to the Washington office written in the plane at this height, signed by both, is a memento very highly prized.

The following new employments or reemployments were made effective during the month, for assignment to the Denver office: Foster Towle, reemployed as associate engineer; Merrill J. Martz, temporarily employed as junior engineering draftsman; W. C. Beatty, reemployed as engineer; and Richard W. Whinnerah, E. R. Dexter, and Merle G. McCleery, junior engineers.

Sr. Luciano Jacques de Moraes, who has been sent to the United States by the "Servico Geologico e Mineralogico" of the Brazilian Department of Agriculture, for the purpose of studying the methods used by the Bureau of Reclamation, arrived in the Denver office recently en route to the West to visit several of our irrigation projects.

Miss Mae A. Schnurr, assistant to the commissioner, and Miss Mary E. Gallagher, stenographer to the commissioner, made the trip to Boston and return by boat recently. Miss Schnurr delivered Doctor Mead's address on Community Small Farms before the National Association of Real Estate Boards.

Dr. L. E. Soskin, of Palestine, who is interested in settlement problems, in connection with his work with the Zionist organization, visited a number of our projects recently.

Prof. David Weeks, of the University of California, Rev. C. W. Alheit and Rev. A. D. Luckhoff of the Dutch Reformed Church of South Africa were recent visitors on the Orland project.

Oliver P. Morton, Special Assistant to the Attorney General, and District Counsel Coffey spent several days on the Orland project in connection with the Stony Creek water right adjudication suit.

Recent visitors on the Vale project included W. J. Martin, assistant supervisor of agriculture of the Union Pacific system; Mr. Foster, of the Oregon State Chamber of Commerce; and N. A. Bowers, Pacific coast editor of the Engineering News-Record.

Prof. Frank Adams, of the University of California, spent several days on the Klamath project, investigating economic conditions in the Shasta View and Malin districts.

Recent visitors on the Yuma project included R. E. Blair, assistant chief of field crops, State department of agriculture, Sacramento, Calif.; Earl C. Pound, president, Michael Dowd, chief engineer, and C. L. Childers, attorney, Imperial irrigation district; Charles B. Ward, chairman, and C. C. Cragin, engineer advisor, Arizona-Colorado River Commission.

Echo Dam, Salt Lake Basin project, was visited during the month by Mark Tuttle, secretary, Associated General Contractors; Paul Wattis, E. O. Wattis, and Lester Corey, of the Utah Construction Co.; F. T. Crowe and Harry Morrison, of Morrison-Knudsen Co.; R. F. Hoffmark, of A. Guthrie & Co. (Inc.); and Lieut. Charles F. Fletter, constructing quartermaster, Fort Douglas, Utah.

Paul W. Banks, junior engineer, Lower Yellowstone project, was in the veterans' hospital at Sheridan, Wyo., during the month.

Nate Bowers, western editor of the Engineering News-Record; Jay Jelliek, western coast manager; and Homer Hadley, district manager of the Portland Cement Association were recent visitors on the Kititas division of the Yakima project.

George B. Archibald, civilian engineer of the United States Army Engineers, spent about two weeks on the Milk River project in an investigation of Beaver Creek and Milk River flood conditions. Other visitors to the project included D. C. Salyerds, right of way agent, State highway commission; C. D. Greenfield, agricultural development agent, Great Northern Railway; and E. S. Sperry, State bureau of mines.

A. W. Bainbridge has assumed the duties of office engineer at El Paso, Rio Grande project.

J. N. Cook's Alfalfa Field, Orland Project

The accompanying illustration shows the second crop of alfalfa raised on the farm of J. N. Cook, of the Orland project, California. Mr. Cook is a director of the Orland Unit Water Users' Association.

This crop of alfalfa was matured in a period of 38 days. The first crop was cut April 15, and the second crop on May 22. The estimated yield of the second cutting was 1¼ tons per acre. Mr. Cook is feeding his hay to a herd of Holstein dairy cows.



J. N. Cook's alfalfa field, Orland project, California

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

Jos. M. Dixon, First Assistant Secretary; **John H. Edwards**, Assistant Secretary; **E. C. Flinney**, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary and Budget Officer;
Northcutt Ely and **Ernest W. Sawyer**, Executive Assistants

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Assistant to the Commissioner P. W. Dent, Assistant Commissioner George C. Kreutzer, Director of Reclamation Economics
W. F. Kubaeh, Chief Accountant C. A. Bissell, Chief of Engineering Division Hugh A. Brown, Assistant Director of Reclamation Economics
C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche	Newell, S. Dak.	F. C. Youngblutt	J. P. Siebeneieher	J. P. Siebeneieher	Wm. J. Burke	Mitchell, Nebr.
Boise ¹	Boise, Idaho	R. J. Newell	W. L. Vernon	W. L. Vernon	B. E. Stoutemyer	Portland, Oreg.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	W. C. Berger	W. C. Berger	H. J. S. Devries	El Paso, Tex.
Grand Valley	Grand Junction, Colo.	J. C. Page	W. J. Chiesman	W. J. Chiesman	J. R. Alexander	Montrose, Colo.
Huntley ²	Ballantine, Mont.					
King Hill ³	King Hill, Idaho					
Klamath	Klamath Falls, Oreg.	H. D. Newell	N. G. Wheeler	Joseph C. Avery	R. J. Coffey	Berkeley, Calif.
Lower Yellowstone	Savage, Mont.	H. A. Parker	E. R. Seppelmann	E. R. Seppelmann	E. E. Roddis	Billings, Mont.
Milk River	Malta, Mont.	H. H. Johnson	E. E. Chabot	E. E. Chabot	do.	Do.
Minidoka ⁴	Burley, Idaho	E. B. Darlington	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Newlands ⁵	Fallon, Nev.				R. J. Coffey	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.	H. C. Stetson	Virgil E. Hubbell	Virgil E. Hubbell	Wm. J. Burke	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.				B. E. Stoutemyer	Portland, Oreg.
Orland	Orland, Calif.	R. C. E. Weber	C. H. Lillingston	C. H. Lillingston	R. J. Coffey	Berkeley, Calif.
Owyhee	Owyhee, Oreg.	F. A. Banks	H. N. Biekel	Frank P. Greene	B. E. Stoutemyer	Portland, Oreg.
Rio Grande	El Paso, Tex.	L. R. Fiock	Henry H. Berrybill	L. S. Kennicott	H. J. S. Devries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	R. B. Smith	R. B. Smith	Wm. J. Burke	Mitchell, Nebr.
Salt River ⁸	Phoenix, Ariz.					
Shoshone ⁹	Powell, Wyo.	L. H. Mithell	W. F. Sha		E. E. Roddis	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah					
Sun River ¹¹	Fairfield, Mont.	G. O. Sanford	H. W. Johnson	H. W. Johnson	E. E. Roddis	Do.
Umatilla ¹²	Irrigon, Oreg.					
Uncompahgre	Hermiston, Oreg.					
Vale	Montrose, Colo.	L. J. Foster	G. H. Bolt	F. D. Helm	J. R. Alexander	Montrose, Colo.
Yakima	Vale, Oreg.	H. W. Bashore	C. M. Voyer	C. M. Voyer	B. E. Stoutemyer	Portland, Oreg.
Yuma	Yakima, Wash.	P. J. Preston	R. K. Cunningham	J. C. Gawler	do.	Do.
	Yuma, Ariz.	R. M. Priest	H. R. Pasewalk	E. M. Philebaum	R. J. Coffey	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam	Coalville, Utah	F. F. Smith ¹²	C. F. Williams		J. R. Alexander	Montrose, Colo.
Kittitas	Ellensburg, Wash.	Walker R. Young ¹²	E. R. Mills		B. E. Stoutemyer	Portland, Oreg.
Sun River, Gibson Dam	Augusta, Mont.	Ralph Lowry ¹²	F. C. Lewis	F. C. Lewis	E. E. Roddis	Billings, Mont.
Sun River, Main Canal Construction	Fairfield, Mont.	A. W. Walker ¹²			do.	Do.
Boise project, Deadwood dam	Cascade, Idaho		C. B. Funk		B. E. Stoutemyer	Portland, Oreg.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927. E. E. Lewis, manager.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926. F. L. Kinkade, manager.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926. D. S. Stuver, manager.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928. Joe C. Iddings, manager.

⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917. C. C. Cragin, general superintendent and chief engineer.

⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926. Lee R. Taylor, manager.

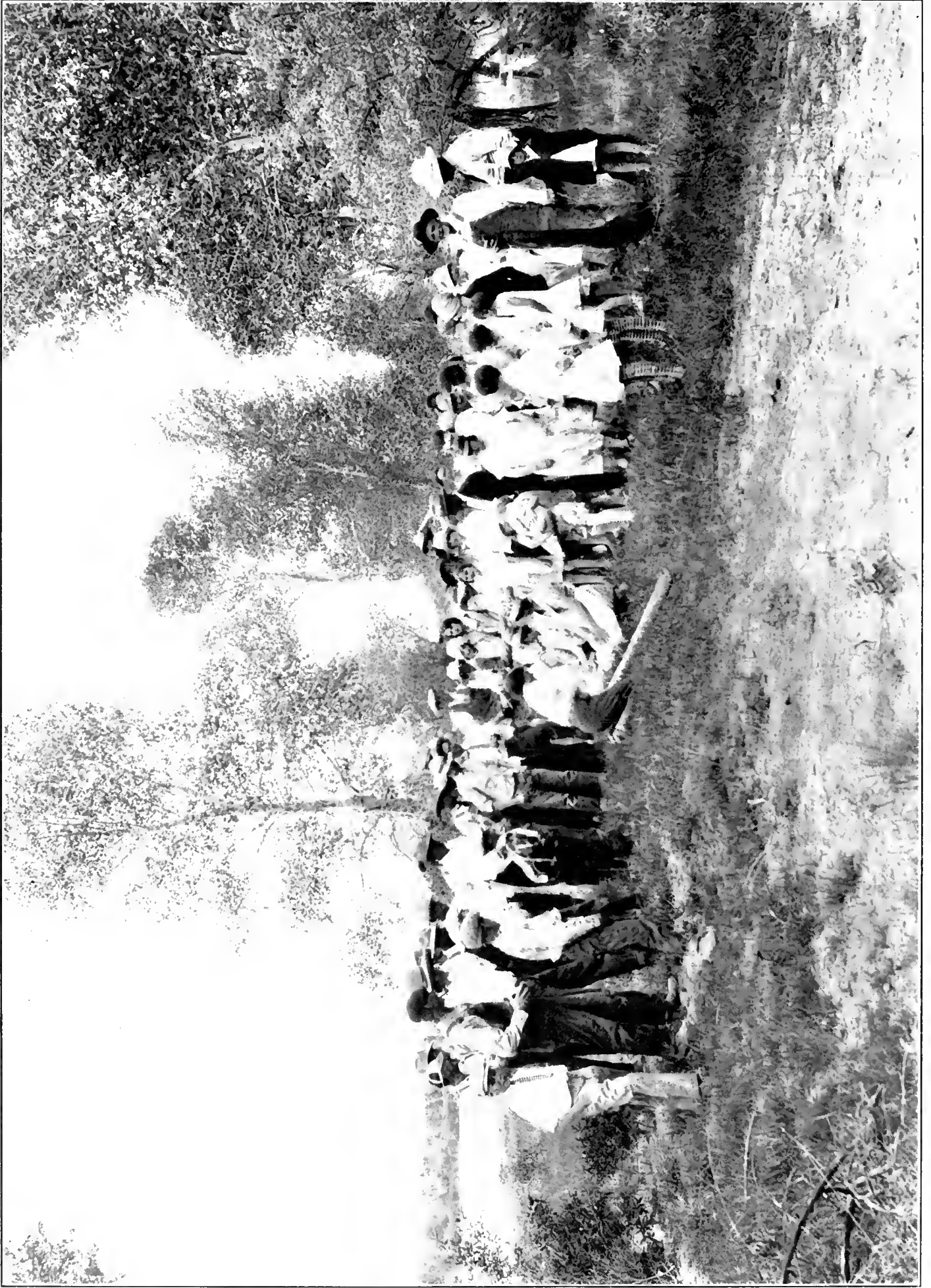
¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926. A. C. Houghton, manager; and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926. Enos D. Martin, manager.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
All-American Canal investigations	Yuma, Ariz.	H. J. Gault	Arizona and New Mexico.
Gila River cooperative investigations			
Truckee River investigations	Fallon, Nev.	A. W. Walker	
Utah investigations	Salt Lake City, Utah	E. O. Larson	State of Utah.
Yakima project extensions	Yakima, Wash.	P. J. Preston	
Alcova-Casper and Saratoga projects	Casper, Wyo.	J. R. Iakiseh	



PICNIC OF WILLWOOD SETTLERS ON THE SECOND ANNIVERSARY OF THE OPENING OF WILLWOOD DIVISION LANDS, SHOSHONE PROJECT WYOMING, JUNE 10, 1929

NEW RECLAMATION ERA

VOL. 20

SEPTEMBER, 1929

NO. 9



BACK TO SCHOOL
ABOUT 700 SCHOOLS CARE FOR THE EDUCATIONAL NEEDS OF THE CHILDREN
ON THE FEDERAL IRRIGATION PROJECTS



IRRIGATION

*I*RRIGATION should be looked upon as a blessing, not a hardship. Soils formed under arid conditions are always rich in the mineral elements which make up plant food. The skies in arid sections are clear, not cloudy, and the sunlight is intense. The climate is warmer than it would be were there more clouds. If now, with all this, it is possible for us to apply moisture to the roots of the growing crops, and apply it at the right time and in the right amount, we have all the conditions necessary for optimum growth and yield.

—PROFESSOR E. B. HOUSE,
Colorado Agricultural College.

NEW RECLAMATION ERA

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Secretary of the Interior

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ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

September, 1929

No. 9

Interesting High Lights on the Federal Reclamation Projects

AT a recent meeting of some 550 poultrymen of Payson, Utah, and vicinity, on the Strawberry Valley project, it was decided that south Utah County, which covers the project area, should have a feed plant and an egg candling plant. This will be a big boost to Utah's famous milk white egg. It is estimated that by October 1 about 250 cases a week will leave Payson for New York and other points.

HARVESTING of the third crop of alfalfa on the Orland project had been completed and the fourth crop was well matured at the end of the month.

THE new bridge on the Oregon State highway about 8 miles west of Vale is practically completed. This will form an important highway link from Harper through the Vale project lands of the Harper and Little Valley areas to the Vale-Harper division of the central Oregon highway.

LINING of the diversion and spillway tunnel, Owyhee Dam, Owyhee project, has been completed. As soon as the material and cofferdams around the portales have been removed, the river will be diverted through the tunnel and excavation of the river bed begun.

AFOREST fire burned over almost the entire western watershed of Salmon Creek below Conconully Reservoir, Okanogan project, recently, and the gate tender's cottage was saved only after strenuous effort on the part of the fire fighters.

THE Central Pacific Railway has completed the laying of track from Klamath Falls, Oreg., Klamath project, to Alturas, Calif., and it is expected that the line will be opened for traffic at an early date.

A CONFERENCE was held recently on the Belle Fourche project to discuss the need of buildings on idle farms. Representatives of the local commercial clubs, the sugar company, the railroad company, and others took part in the discussion, and a resolution was adopted recommending the organization of a credit corporation to carry on a building program as the first essential for settlement of the unoccupied lands.

SEVERAL prospective settlers were shown over the Riverton project recently and two applications were received for farm units.

SUGAR beets which had been well cultivated and irrigated on the Milk River project have made an exceptional growth, and a record crop is in prospect.

THE several town organizations on the Milk River project held a joint meeting recently at Saco with members of the Montana State Highway Commission to urge the rapid completion of a highway from Malta to Glasgow. This highway will traverse the project and will be an important factor in its development. Work has been started on a surfaced highway between Malta and Dodson.

THE Worden Creamery, Huntley project, which has been closed for the past two years, has been moved to a new location on the Northern Pacific right of way, near the depot, and will be opened under new management in the near future.

JUDGING from the number of day-old chicks purchased on the East division of the Umatilla project there will be an increase of approximately 25 per cent in the number of laying hens on the division this fall.

THE boys and girls of the 4-H clubs on the Grand Valley project are getting together an exhibit for the coming State fair.

THE Valley Evaporating Co., Yakima project, which already has evaporating plants at Prosser and Buena, has begun the construction of a third plant at Yakima to cost approximately \$20,000 and capable of handling about 4,500 tons of green fruit yearly. It is expected to handle only apples which find a ready market in Holland, Germany, and other European countries, and will employ about 70 people.

THE new Zeolite plant on the Yuma mesa, Yuma project, and the \$10,000 concrete alfalfa seed warehouse and laboratory on the outskirts of Yuma have been completed.

ONE of the progressive water users in the valley division of the Yuma project planted 40 acres to cantaloupes on May 1. On July 15 he had picked the last of the melons at a net profit of \$4,000, the result of intensive fertilization, cultivation, and proper irrigation methods. The same water user netted \$50 an acre from 80 acres of alfalfa planted during the fall of 1928.

PLANS are under way for the erection of a potato products mill at Burley, Minidoka project, by the Otato Corporation of New York. The cost of construction of the first unit will be about \$100,000. The plant will use only culls and No. 2 potatoes and thus, it is believed, become an important factor in the stabilization of potato prices.

GIBSON Dam, Sun River project, was completed in July, and construction equipment and camp buildings were being removed at the end of the month.

Federal Irrigation Projects: Their Economic and Social Value

An Address Before the National Editorial Association, Powell, Wyo., August 3, 1929

By George C. Kreutzer, Director of Reclamation Economics

IRRIGATION in the West began as an economic necessity. The Mormons under the leadership of Brigham Young diverted water from the creeks at Salt Lake and grew their first crop of potatoes and maize a stone's throw from the site of the Mormon Temple. In a few years irrigation was practiced in every State west of the one-hundredth meridian.

Irrigation is more of an economic necessity now than it was in 1847. At that time a handful of pioneers depended on the food that sun and water could produce from a desert. Now a western empire uses irrigation as crop and food insurance. It has converted Territories into States. It has made modern transportation possible and profitable across a trackless desert, linking a teeming eastern coast with a rising western empire to hold these regions under a united Government. Highways, telephone and telegraph lines connect its populous centers. Vegetables and fruits, dairy products and meats are supplied the workers in mines and forests from western projects. Irrigation is intimately interwoven with the economic and social fabric of the West.

Millions of western acres are suited only to stock grazing six or seven months in the year. Complete utilization of this vast area depends on the production of grain and forage for winter feeding. Alfalfa is the main crop grown under irrigation and supplies a cheap and near-by winter food supply for range stock. It is the foundation of the livestock industry west of the humid region.

One flockmaster in Idaho is said to be the largest individual sheep operator in the world. He grazes more than 100,000 ewes on the deserts in the spring and in the mountains during the summer, operating with 70 sheep camps. He crops 2,000 acres of alfalfa land and buys more on half a dozen irrigation projects in that State to winter his sheep. He also imports many cars of Nebraska and Iowa corn to supplement his forage crops and to carry on his operations. To make this business profitable requires the combined resources of the West in grazing land and alfalfa and the production of corn in Nebraska and Iowa. Without alfalfa this industry would not be possible and the output of these animals in food and fiber would have to be imported. In 1928 we produced in the United States 351,000,000 pounds of wool and imported 240,000,000 pounds from foreign countries.

In general, alfalfa is the most profitable crop grown under irrigation but it is profitable only when high yields are secured. This requires good stands and the maintenance of soil fertility. After a few years the stands thin out and the tonnage drops off. Every four to eight years the crop must be plowed under. A change of crop is necessary. This introduces crop rotation which involves alfalfa, grains, and such row crops as sugar beets, potatoes, and beans. The grains are generally fed on the farms and row crops are sold for cash. In the intermountain region, sugar beets are the main cash crop. In 1928, 71,250 acres of sugar

beets were grown on Federal projects alone, producing 778,000 tons of beets, worth about \$5,600,000. In the same year the United States imported three-fourths of its sugar.

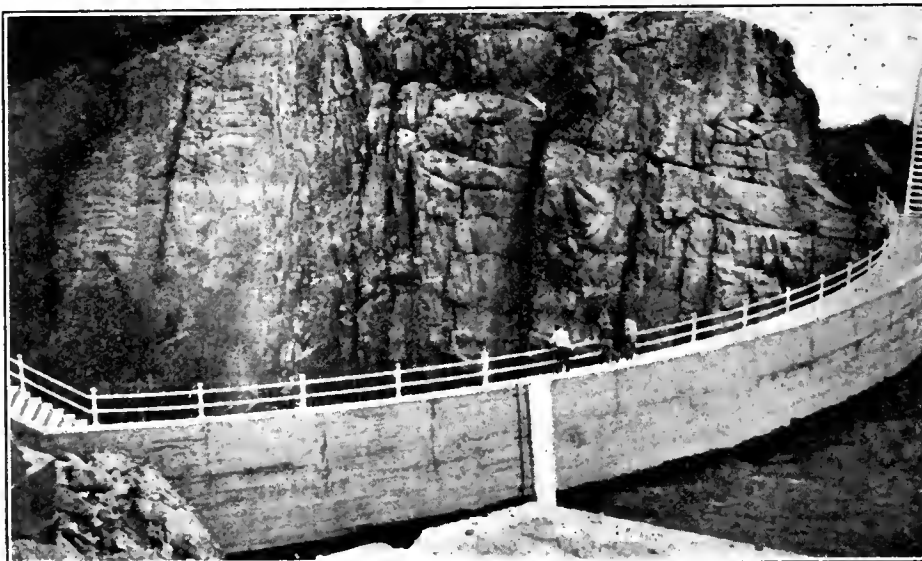
ECONOMIC VALUE OF A TYPICAL PROJECT

There are 24 operating Federal reclamation projects located in 15 of the Western States. They show a wide variation in crop adaptation and climate, but alfalfa is grown on all of them. An analysis of any one of them gives a fair measure of their economic importance. The Shoshone project is in many respects a typical reclamation project. Prior to 1904 it was a sun baked, uninhabited valley covered with desert plants. Its annual precipitation is only 5 inches. This is less than a third enough moisture to carry on successful dry farming. It was a spring pasture for wandering herds of sheep and cattle while they were being taken to the mountains. It was too hot and dry to produce summer feed without irrigation.

Construction of the project was authorized in 1904. Water was first available in 1908, and the Shoshone Dam was completed in January, 1910. This dam is a rubble concrete structure located 8 miles above Cody, Wyo., on the Shoshone River. It is 328 feet high, 65 feet long at the stream bed, and 200 feet at the top. It contains 78,576 cubic yards of concrete and impounds 456,600 acre-feet of water. The surface area of the reservoir is 6,600 acres. Flood waters of this turbulent river are stored in the spring and made available for irrigation in the summer. In addition to furnishing a reliable water supply for the Shoshone project, it has a beneficial effect on flood control on the Missouri and Mississippi Rivers.

The income from this area was trifling before it was irrigated. Now more than 40,000 acres are irrigated and cropped with annual crop values of \$1,200,000. It provides homes for 1,989 people on farms and 1,572 people in five project towns. It has 5 schools, 9 churches, and 3 banks. When the project is finally completed it will include over 100,000 irrigable acres with corresponding increases in production and population.

Statements are frequently made that these projects greatly aggravate the troublesome crop-surplus problem. An analysis of the situation on Shoshone,



UPSTREAM FACE OF SHOSHONE DAM, WITH THE RESERVOIR FULL, SHOSHONE PROJECT, WYOMING

which is a typical project, shows that these statements are misleading and incorrect. In 1928, 433 cars of commodities with a value of \$729,375 were shipped to this project. Thirty-one cars were automobiles and 86 consisted of gasoline and lubricating oils. Fifty-three cars were groceries, 15 were feedstuffs for animals, and 12 were flour. The laborers and artisans who helped manufacture these goods, practically all of which came from the East and Middle West, had to be fed and while thus employed they were eating the products grown in the localities in which they worked.

SHIPMENTS TO AND FROM THE PROJECT

In 1928, 1,885 cars with a value of \$1,055,680 were shipped out of the project. One thousand cars with practically half the value of all commodities sent out, were sugar beets. This is not a surplus crop. In the production of sugar beets and the conversion of the beets into sugar a large number of people are employed, all of whom are users of food and fiber. Furthermore, they are consumers of agricultural products which are now produced in surplus in other parts of the country. The other commodities shipped out consisted of beans, honey, peas, wheat, potatoes, cattle, hogs, poultry, sheep, wool, and dairy products. Only two of these, wheat and potatoes, are surplus commodities in so far as production of the entire country is concerned, and these are largely consumed in the mining and industrial centers of the mountain region. Twenty-five cars of wheat were shipped out and 12 carloads of flour shipped in. In addition, 15 cars of stock feeds were shipped in, the basis of which is largely wheat, corn, and oats. Potatoes are gradually giving way to sugar beets, a more reliable cash crop. A large amount of summer vegetables, poultry, and dairy products are trucked into the Yellowstone Park, which assist in furnishing the visitors with fresh and reasonably priced food-stuffs.

The project is developing into a cattle and sheep feeding area for fattening and wintering livestock. The success of Wyoming's livestock industry depends on alfalfa hay and other forage being near the ranges. The Shoshone project is conveniently located to large grazing areas and brings about their full and economic utilization.

The project is of substantial and permanent construction. The structures are of concrete. Its cost to June 30, 1928, amounts to approximately \$9,500,000. This includes features like the Shoshone Dam, which is partly chargeable to unconstructed divisions. The money expended in its construction did not come

out of the taxpayers' pockets. It came out of the reclamation fund. This fund is made up of a combination of revenue from a portion of the receipts of sales of public land within the 16 Western States and from bonuses, royalties, and rentals; from petroleum and other minerals; and from repayments from water users on constructed projects. It is a revolving fund, with two-thirds of the revenue now coming from settlers' repayments on older projects. Under the reclamation act of 1902, the Government furnishes the money and constructs the works and the farmers receiving the benefits repay the cost. It is neither charity nor a subsidy from Federal tax receipts. Reclamation aids in the Federal policy of river control through the construction of storage reservoirs on the headwaters of streams requiring levees to protect property on their lower reaches. It differs from river and harbor control works, however, first in that the money is supplied by western farmers and from the sale of western resources, and second, the money must be repaid.

THE NEED FOR RECLAMATION

Wyoming requires reclamation. It includes 62,500,000 acres; 17,500,000 acres are unappropriated public land suitable only for grazing and usable only with near-by irrigation. Approximately 10,000,000 acres are in forest reserves, providing summer pasture, and in Indian reservations. Over 2,000,000 acres are in the Yellowstone National Park. Federal withdrawals for oil reserves, phosphate lands, and for other public purposes account for another 2,250,000 acres. Tax burdens fall heavily on the privately owned part of this large, sparsely settled State. It maintains an excellent system of highways and gives to its people and

visitors police protection, education, health inspection, and everything demanded by a modern civilization.

Wyoming is rich in natural resources. It has large amounts of timber, coal, petroleum, and the precious metals. These are gradually being depleted. To prevent deterioration of the State and to meet increasing demands for public outlay there is a need for the establishment of new resources more permanent in character which can maintain its population and increase its taxable wealth. Reclamation of its desert land is one of the ways of accomplishing this. Wyoming has contributed \$34,293,000 to the reclamation fund. Of this, \$26,000,000 are proceeds of the oil-leasing act. Five great rivers derive all or a large part of their flow from this State. These are the Yellowstone, Bighorn, North Platte, Green, and Snake Rivers. Wyoming waters flow to the Gulf of Mexico, the Pacific Ocean, and the Gulf of California. The discharge of these and smaller streams approximates 10,000,000 acre-feet a year at the State line. No one should object to a conservative extension of reclamation in this State to aid its 225,000 people in maintaining a prosperous Commonwealth in the Union. What has been said of Wyoming is quite largely true in other Western States. Their growth and prosperity are dependent on water conservation and the extension of their irrigated areas.

ECONOMIC FEASIBILITY

In making these extensions as much attention must be given to the quality of the soil to be reclaimed, the character of crops that can be grown under irrigation, the selection of people who should occupy these farms and to their well-being as has been given to the adequacy of the water supply and the design and con-



DOWNSTREAM FACE OF SHOSHONE DAM, SHOSHONE PROJECT, WYOMING

struction of the works. Studies are now made in advance of construction and all poor soils, those heavily charged with alkali and lands of rough surface, are eliminated from the project. Canals are built only for lands suitable for farming under irrigation. Our economic investigations include an analysis of the crops that can be grown, crop rotations most likely to succeed, and estimates of the costs of developing farms and the incomes which can reasonably be expected. Under this plan a fair forecast can be made of the earning power of projects. To be sound and economically feasible, project analyses must indicate enough probably income to maintain a fair standard of living for the settlers and return project costs to the Government within the time limits provided by law. Adequate long-time and intermediate credit at low rates of interest to supplement settler's capital must yet be provided by some agency to make farms profitable soon after settlement.

RECLAMATION PROJECTS DO NOT AFFECT THE SURPLUS PROBLEM

We buy each year some \$800,000,000 worth of agricultural products that we do not produce. These consist of seeds, fruits, sugar, and many other items which are or can be produced in this country: Before the war most of our clover seed was imported from Belgium. Now, the best seed is produced in the arid West under irrigation. Sugar-beet seed is practically all imported from Germany. Experiments prove that it can be produced here. During the World War the Great Western Sugar Co. operated a number of beet-seed farms. Domestic seed would be better suited to our climate and aid in an increase in yields with increased



CORBETT DIVERSION DAM, SHOSHONE PROJECT, WYOMING

farm income. When we import seed, 75 to 90 cents out of every dollar paid therefor goes out of the country. We should not be dependent on any country for our seed supply. Favorable moisture conditions and dry weather during harvest on irrigation projects help to produce seeds of bright color and high germination test with greater freedom from plant diseases and insect pests than in humid regions. The most damaging plant diseases and insect pests are of foreign importation and largely come into the country with imported seeds or plants. The inroads of the Japanese beetle are well known.



J. C. COULEE FLUME, WILLWOOD DIVISION, SHOSHONE PROJECT, WYOMING

The recent outbreak of the Mediterranean fruit fly is threatening the fruit and vegetable industry not only of Florida but of the entire South, and to a certain extent of the whole United States. The battle being waged by the States and Federal Government against these enemies of agriculture is costing tens of millions of dollars annually. The losses to the farmers total infinitely more. Domestic production of seeds and of agricultural products adapted to our irrigation projects will reduce payments to foreign countries and minimize risks of infestations with improvement in economic conditions to the country as a whole.

Reclamation projects are gradually filling this gap. The Yuma project is producing avocados and alfalfa seed, the Idaho projects, clover seed, and the Montana projects certified seed potatoes for planting in the South. Bean and pea seeds are produced on a large number of projects. The field is almost unlimited as climatic variations range from the semi-tropical of the Salt River and Yuma projects in Arizona to the colder temperate climate of northern Montana.

RECLAMATION IS FARM RELIEF

Reclamation work in many localities is largely a measure of farm relief to alleviate distress resulting from inadequate water supply on areas covered by irrigation systems privately constructed. The Owyhee Dam in Idaho now under construction will bring gravity water to a half dozen pump districts along the Snake River having burdensome charges. The Echo Reservoir in Utah will furnish late water to irrigate the crops along the Weber River in that State. At Kittitas, in Washington, the Government works will furnish water to a large number of farmers whose supply from creeks fails in June and July every year. The Boulder Canyon project combines flood control, supplemental water to a large irrigated region, enlargement of water supplies for growing cities, and towns in the Southwest, and the generation of electric energy. It will bring relief to a large number of farmers and promote the growth of nearby cities and towns.

The Government has been committed to the national policy of reclamation for 27 years. In that time some mistakes have been made, but on the whole the results have been of incalculable benefit to the States and to the Nation. Large undertakings will be needed in the future. Most of these will combine flood control, irrigation, and power development in some form. They will involve the administration of interstate streams. The Government is the best agency to finance and construct these projects.

"How the Other Fellow Does It"

FOR a number of years the NEW RECLAMATION ERA has from time to time printed articles by successful water users describing their experiences in attaining success on the Federal reclamation projects. Frequently this success has been the result of what, on their face, appear to be only slight modifications of former farm practice, the application of which has materially increased the farm income and made it possible for the water user to pay his charges to the Government with a smile. Naturally we are interested in more smiles and more dollars for the water users, as they usually spell contentment and prosperity.

If stories of your own individual success will help others not so fortunate to get started on the road to success, we are anxious to print them in the NEW RECLAMATION ERA. What we are trying to say has been said so well in a recent letter that we are printing it in full below, in the hope that it will result in bringing a flood of manuscripts over the editor's desk, telling the struggling newcomer on a project how his more successful neighbor "does it."

Mr. GEORGE C. KREUTZER,
Bureau of Reclamation,
Washington, D. C.

DEAR MR. KREUTZER: I believe that a page in the NEW RECLAMATION ERA, devoted to how the other fellow does it, would prove of much benefit to men who are making a start on raw land. This might cover crop plans to give the maximum amount of feed per acre for the first two or three years; simple plans for chicken houses or sheds that will be within reach of the average homesteader; selection of seeds and seeding dates to provide feed for milch cows and chickens at a low cost; or other methods used by successful settlers on other western projects which might be applied here or in other localities with similar conditions.

If a new settler can produce feed for one or two milch cows and a few chickens the first year, he is practically assured of a living. But if he is obliged to put out the cash for food for his family and forage for his livestock, he is using money that should go into improvements and more livestock. And it will cripple him so seriously that it will take him years to reach a point where he will have some spare cash to use as working capital. I believe that every man who has taken land on this project within the last three years would be worthy of a loan for improvements, but since this is in the future, they can be aided by the practical application of the experience gained on older

projects. Any idea that will help them to conserve their cash for investment in livestock or poultry as fast as they can produce the feed would certainly help them over the hard spots.

Our soil will produce an abundant supply of alfalfa and sweet clover, but it takes two years before the land can be pastured at a profit. Then the settler will need a good fence, a well, some sheds for shelter, and hay tools before he can handle stock. And we must not overlook the comfort of his family. All of these things take capital, which he can not borrow for the reason that he does not have title to the land, so that every dollar that he can save during the first two years counts. Not all men will profit by the experience of others, but if only one or two would take hold and make their places pay from the start, others would fall in line. Peas and oats might prove to be an excellent first-year crop for hay, and if the combination has been tried out on other projects our people would be interested in knowing the rate of seeding and the best date to plant and the amount of hay that they might cut under ordinary conditions.

The small grains seem to do best here on ground that has been allowed to lie over one year or where they follow a cultivated crop like corn or potatoes. It would help our people if they knew what others had produced by following this plan. If some woman on one of the projects has a large income from chickens, turkeys, a garden plot, or if she made her home more comfortable by careful planning inside and a few native shrubs and trees on the outside, it would certainly

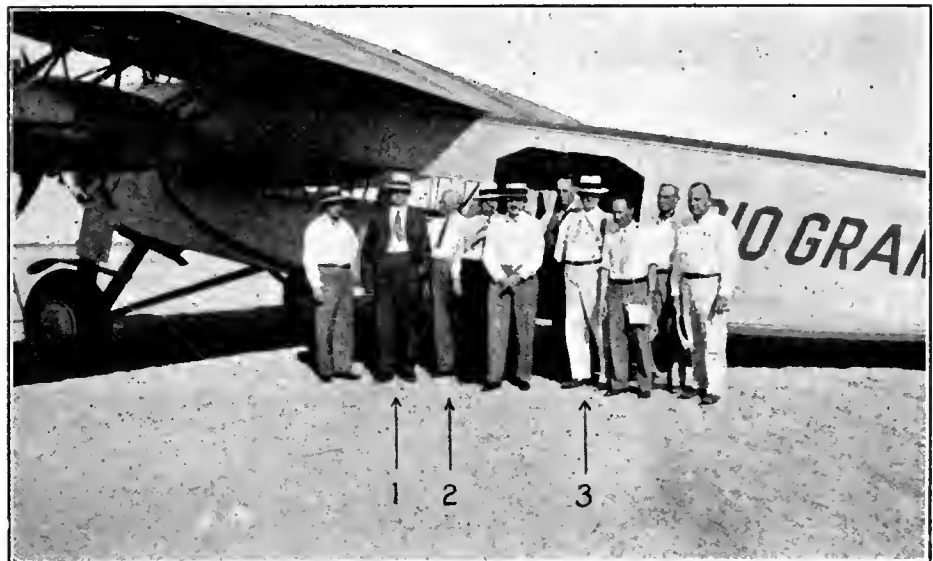
interest the women who were real home makers on other projects. This information makes good reading and it helps to keep away a desire to walk off the place when they have nothing but a shack stuck out in the sage brush, with sand drifting in through the windows and a bunch of hungry stock looking for feed and water. The individual settler is the man who makes things go and it is the crop that he can produce on 1 acre that spells success or failure for him, so why leave him to flounder around in a country that is probably new to him, when a little aid would point the way to progress with added returns for his labor and less hardship for his family.

Yours very truly,

Viewing Boulder Dam Site By Airplane

On June 26, 1929, Dr. Elwood Mead, Commissioner of Reclamation, R. F. Walter, chief engineer, and Louis C. Hill, consulting engineer, with others, went by airplane from Los Angeles to the site of the Boulder Dam in Black Canyon on the Colorado River. While flying at 12,000 feet above the dam site, the following statement was written and signed by the members of the party:

"As a record of our trip from Los Angeles to El Centro in the ship *Rio Grande*, leaving Los Angeles at four minutes to five Wednesday evening and arriving in El Centro at 6.45, this is written and signed by us 12,000 feet above sea level, and our wish is that at any time in the future when we may find ourselves 'in the air' it will develop into as gratifying an experience."



READY FOR THE FLIGHT TO BOULDER DAM SITE. 1. R. F. WALTER, CHIEF ENGINEER; 2. LOUIS C. HILL, CONSULTING ENGINEER; 3. DR. ELWOOD MEAD, COMMISSIONER OF RECLAMATION



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Assistant to the Commissioner and Associate Editor New Reclamation Era



Boys' and Girls' Club Work on Federal Reclamation Projects

CLUB work among grown-ups on Federal reclamation projects has been treated in preceding issues of the ERA and showed a lively interest and beneficial effect.

The young folks are just as proud of their club work and desire to know what other projects are doing along this line. It is my purpose, therefore, to present their activities in successive issues of the ERA, starting with this one.

This club work among growing boys and girls incites competition and develops leaders. It should be encouraged in every way.

UNCOMPAHGRE PROJECT, COLORADO

This project has an enrollment of 400 in 4-H Club work, 143 being boys and 257 being girls. Of the girls, 36 carried projects in crops or livestock, including poultry, during 1928.

The club makes a good showing on the financial value of the work during the past calendar year.

Kind of club	Number enrolled	Value	Profit
Corn (570 bushels).....	11	\$570.00	\$165.00
Sugar beets (176 tons)....	16	1,320.00	561.17
Dairy and beef.....	14	825.00	201.25
Sheep.....	50	2,535.50	1,138.00
Pigs.....	31	844.44	221.03
Poultry.....	51		
Turkeys ¹		1,117.00	789.52
Chickens ²		887.65	559.24
Clothing (articles made).....	124	484.84	
Foods ³	97	832.27	161.72

¹ 10 members; 273 birds raised.

² 41 members; 1,123 birds raised.

³ Canning club members 26; 2,860 jars.

Total value of club products, exclusive of food clubs, other than canning, \$9,416.70. Total profits on club products exclusive of clothing clubs and food clubs, other than canning, \$3,796.93.

Senator John J. Tobin offered a fine silver trophy last year for the member of the livestock or crops clubs doing the most outstanding piece of work for the year. This was awarded to Melvin Sumner.

He raised 290 turkeys, of which he sold 190 for \$993.37 on the Thanksgiving market. He estimates the 100 birds left on hand to be worth \$365. His total expense, including the value of the 15 birds he started with, amounts to \$402.64, making an estimated net profit of \$955.73. He hatched 360 birds and had very little loss except from dogs. Only half of these

should be credited to him as he was in partnership with his grandmother. His flock contracted a severe case of roup, and Melvin treated, individually, over 200 birds for this disease, and some of them several times, by draining off the pus and injecting the swellings with argyrol solution, without the loss of a bird.

Boys and Girls Clubs Uncompahgre Project

(Titles to illustrations)

1. Montrose County Sugar Beet Club with local leaders.
2. Poultry clubs and leaders visiting California Mesa turkey farm.
3. Livestock club studying Duroc Jersey hogs.
4. Montrose County delegation to State fair.
5. Fairview Livestock Club on stock-judging tour.
6. Lila Sumner and Alma Green, State champion poultry demonstration team, 1928. They represented Montrose County at the Western National Stock Show, Denver, 1929.
7. Pea Green First-Year Clothing Club starting for a club meeting.
8. Donald Clark, Helen Faast, and Gordon Carkhuff, stock-judging team at State fair, 1928.
9. Winning exhibit in western section, comprising 11 States, at national canning contest, 1928, packed by Hazel-Atlas Good Luck Canning Club, Montrose County.
10. Wilna Hall and Alice Elicker, baking demonstration team, winners of first place in baking contest, State fair, 1928.
11. Donald Clark, county pig club champion, 1928, with sow and litter from which he made a Profit of \$63.92 this year.
12. Pea Green Turkey Club at home of Melvin Sumner and part of flock of 290 turkeys raised by him.

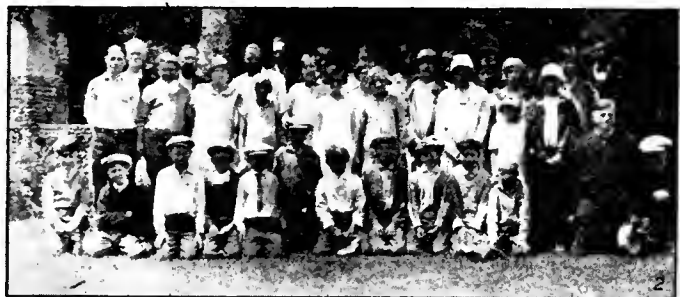
Each year certain of the club champions, depending upon the amount of competition in the various clubs, as well as demonstration teams, are sent to the State fair, either as rewards for work done, or to enter into competition in the State demonstration contests.

In 1928 the following club champions and demonstration teams were sent to the State fair: Champions, Elbert Baldrey, poultry; Roy Manuel, corn; Donald Clark, pig; Lois Kelley, meal preparation; Dale Marsh, sheep; Lloyd Monell, sugar beet; Verna Stryker, advanced canning, reserve champion; Beulah Mae LaBarr, third-year clothing; Edith Price, fourth-year clothing; Jean Price, second-year clothing; Gladys Walstrom, first-year clothing; Hazel Richards, reserve champion canning, third-year foods; Maude Smith, reserve champion, third-year clothing. Demonstration teams, stock judging, Donald Clark, Gordon Carkhuff and Helen Faast; poultry demonstration, Lila Sumner and Alma Green; baking demonstration, Alice Elicker and Wilna Hall; clothing demonstration, Beulah Mae LaBarr and Fern Button.

The following awards were received at the State fair in demonstration contests or on exhibits: First place among baking teams, first and championship by the poultry demonstration team, State canning championship, by Beulah Mae LaBarr, and second in canning by Hazel Richards. State poultry championship, by Clyde Scarlett, who showed the highest scoring pen of chickens in open class, and third in poultry, by Elbert Baldrey; a blue ribbon in health contest by Lois Kelley, and red ribbons by Wilna Hall and Gordon Carkhuff.

The State champion demonstration team in poultry was taken to Denver as guests of the Western National Stock Show Association in January of this year, where they gave several demonstrations on the control of internal parasites of poultry. Beulah Mae LaBarr also won a trip to the Western National Stock Show as State Canning Club champion.

For the past two years Montrose County has participated in the national canning contest held in Chicago by the Hazel-Atlas Glass Jar Co. of Wheeling, W. Va. Both years the Montrose County club, designated as the Hazel-Atlas Good Luck Canning Club, has won



BOYS AND GIRLS



CLUB WORK



UNCOMPAHGRE PROJECT, COLORADO



the first prize on club exhibit in the 11 Western States, besides winning a large number of individual premiums. There were 16 girls in this club in 1928.

One of the most outstanding features of the 4-H Club work in Montrose County has been the sheep club, practically all of the members of which own pure-bred Hampshire sheep. Montrose County has become noted as headquarters in Colorado for pure-bred Hampshire sheep, which is largely due to the work of the Sheep Club. The past two years the Hampshire exhibit at the Montrose Fair has been the principal feature of the livestock exhibit and has been the largest Hampshire sheep

show ever held in the State, including the Western National Show at Denver and the State fair.

One of the valuable features of 4-H Club work is the development of leadership among the club members. For the past two or three years former club members have been taking places of leadership in their communities, including the local leadership of 4-H Clubs, in which they have almost invariably made fine records. The case of Wilna Hall, of Olathe, is cited as an outstanding example of this work. Miss Hall, who is still of club age, carried two club projects in 1928, winning a county championship in one of them, as

well as being on the demonstration team which won first in its class at the State fair. She also led two first-year clubs, one in clothing and one in meal preparation, developing a county champion in each, in addition to training a demonstration team that stood second in the demonstration contest at the county fair. Miss Hall was also one of the State health champions selected at the State fair. Besides all this, she is an accomplished musician and taught a class in music during part of the past summer.

The photographs give a fine illustration of junior activities on the Uncompahgre project, of which they can justly be proud.

Boulder Dam Fostered by Yuma Conservation Club

A RECENT issue of the Yuma Morning Sun chronicles the organization of the Yuma Conservation Club, following the visit there of Dr. Elwood Mead, Commissioner of Reclamation. The idea of the club was germinated at that time, with a view to advocating a golden mean in arriving at an amicable settlement of the stand taken by Arizona concerning the construction of Boulder Dam and the development of the Colorado River Basin. The preamble to the constitution of the club is as follows:

PREAMBLE

In view of the fact that construction of a dam on the Colorado River at Black Canyon and the construction of the all-American canal are reasonably certain, and that conditions on the lower Colorado River will be materially affected thereby; and in view of the immensity of the results affecting our own locality, the Yuma country should evince the liveliest interest in everything pertaining to Colorado River development.

In view of the controversies which have arisen over river legislation, the Yuma country has been singularly quiescent. We are part of Arizona yet immediate neighbor to the great Imperial Valley. In large measure what affects Imperial affects Yuma and what affects Arizona affects Yuma.

The first object of a local conservation club is clearly the interests of its own locality; and the first object of this organization should be the furtherance of the interests of our own territory comprising in a general way the Bard or San Pascual Valley, in California, and Yuma Valley, Yuma Mesa, North and South Gila Valleys, and the city of Yuma, in Arizona,

which are roughly designated as Yuma project or the Yuma country.

The Colorado River development will materially affect our plans for the generation of electrical energy and we purpose to secure for our project the highest returns obtainable without infringing on the rights of other districts. We should have faithful and experienced servants keeping us in the closest touch with the events of river development and who will keep us posted on every detail thereof.

But in this day of the highest cooperative developments we should work in harmony with other organizations; and to that end this organization may be the most useful by working, so far as possible, in harmony with—

Yuma County Water Users' Association, Arizona Colorado River Commission, Yuma Bureau of Reclamation, United States Bureau of Reclamation, Laguna Irrigation District, Yuma Mesa Unit Holders Association, Yuma Chamber of Commerce, Imperial Irrigation District, and American Conservation Club.

And because they have not yet come to a harmonious understanding, one of our high aims should be to bring about an agreement between the Arizona and California river commissions. Our close relations with Imperial Valley and our position as the district in Arizona most vitally affected by Colorado River development legislation give us a peculiarly strong standing to ask for and work for harmony between the river commissions of these States.

OBJECTS

The objects of this club are:

(1) The upbuilding of our territory and the material success of the residents thereof.

(2) Acceptance of the fact that Boulder Canyon (or Black Canyon) Dam will be built and All-American canal constructed, to secure the highest benefits therefrom to our territory.

(4) To aid and assist in and work for a complete understanding and agreement between the Colorado Basin States and between the three lower Basin States, and the adoption by Arizona of the compact between the Basin States.

(5) To secure harmony in all development work between Imperial Irrigation District and Yuma project.

(6) The utilization of the work of every public organization in our territory toward a harmonious conclusion of pending endeavors to carry out river development plans.

(7) And generally, to assist in the bringing of the highest development to the entire Southwest.

A Correction For The Shoshone Project

In the August issue of the NEW RECLAMATION ERA, in the article on Project Club Activities, the statement was made that "two towns are located on the Shoshone project, Deaver and Frannie, each with a population of a little less than 100. It has one bank, two churches, and two schools, and the population of the irrigated farms is approximately 600."

This statement is in error. As a matter of fact the main towns on the Shoshone project are Powell, Deaver, and Frannie. The largest is Powell, with a population of about 1,500. There are about 3,800 people on the project, about 1,700 of whom live in the five towns on the project. There are eight churches on the Garland division and two church organizations on the Frannie division. Consolidated schools at Powell and Deaver serve nearly all the project and some small adjacent communities. Powell and Deaver also have complete 4-year high schools.

Weed Control in Irrigation Canals, New South Wales, Australia

By T. M. Wilson, Superintendent of Water Distribution and Engineer for Maintenance, Yanco Area, Murrumbidgee Irrigation Areas

DURING the latter part of the 1928 irrigation season a weed-cutting launch was purchased for use in the main and branch canals in order that the growth of water weeds could be held in check, as some trouble had been experienced and the flow retarded owing to an excessive growth of water weeds of the trailing variety.

Good results have been obtained in the main canal below Berembed Weir, also on the Mirrool area near Yenda, and the launch was recently returned to the weir, as it is thought that should the coming winter prove a mild one, with few frosts, the growth of weeds will necessitate the constant use of the launch from the early part of the season.

With the rapid extension of the rice industry and consequent increase in the demand for water, it was essential that both supply and drainage channels should be maintained so that they would function efficiently, and with the object in view of increasing the mileage dealt with, rather than decreasing the annual cost of maintenance, various devices were made and tried out which have proved of considerable benefit.

The accompanying illustration shows three implements which have been used during the past season with success, particularly No. 1. The best results have been obtained with this implement when working in water from 2 feet to 3 feet 6 inches deep, and after cutting it has been noted that although the weeds grow again they are very scattered; in fact, Cumbungie cut during the early part of the 1927-28 sea-

son is still not so dense as before the first cutting took place. It is hoped to experiment further with an implement of this type during the coming season to endeavor to reduce the weight without reducing the efficiency.

No. 2 is an implement of a somewhat heavier type and was designed to give temporary relief as speedily as possible in drainage channels where flooding was taking place, and consists of a 4 by 4 by $\frac{1}{2}$ inch angle-iron frame to which is fitted a double moldboard designed to throw the weeds, etc., to either side, leaving a clear passage down the center of channels. On the underside of the angle iron a cutting blade is fitted, made of 4 by $\frac{1}{8}$ inch spring steel drawn out to a fairly fine edge and ground. The implement is drawn by two horses on each side of the drain attached to a wide spreader, from which a single wire cable about 20 feet long is hooked to a drawbar on the nose of the cutter almost level with the bottom of the angle-iron frame. Although this implement has done good work it requires some alteration and will be again tested during the coming season and the necessary alteration made.

No. 3 is a somewhat lighter implement and has been used with success in cutting not only the trailing variety of weed but also the young growth of Cumbungie after it has first been cut with implement No. 1. It consists of a V frame of 5 by $\frac{3}{8}$ inch spring steel to the underside of which is fitted a serrated blade of 4 by $\frac{1}{8}$ inch spring steel, drawn out and ground. This implement is not more than about

120 pounds in weight and can be easily drawn by one horse on each side of the supply or drainage channel and is hitched up in the same manner as No. 2.

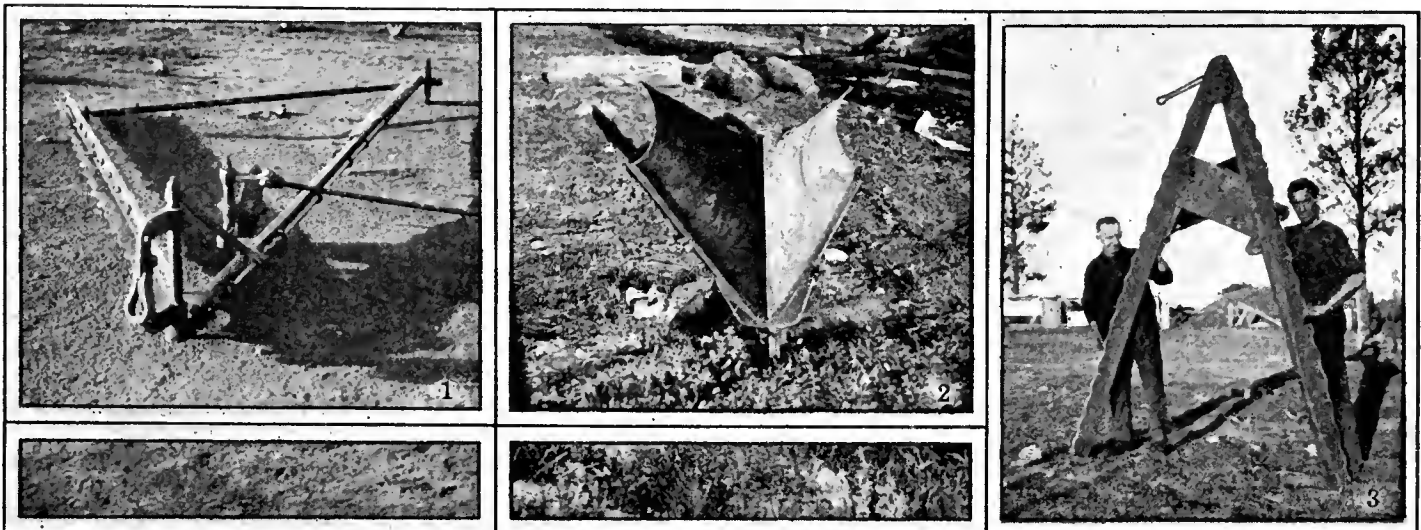
All three implements have been made adjustable and can be altered to suit any width of channel up to say 8 feet bed width, but it has been found that the most efficient width of setting is between 30 and 40 degrees.

The weeds when cut float to the surface immediately, and in order that their removal can be carried out more expeditiously two or three No. 8 wires are placed diagonally across the channel at about the surface of the water and drawn taut. This has the effect of holding up the weeds to a very great extent and, provided there is sufficient velocity, the weeds collect in large masses on the wires, along which they travel to the bank of the channel, from which point they can be easily removed with pitchforks or horse-drawn grappling hooks.

Many dairymen who do not now utilize much alfalfa hay would become buyers if supplies of high-grade hay were available at all times.

Characteristics of high-grade alfalfa hay are purity, a high percentage of leaves, clinging foliage, green color, and pliable stems.

The foundation of the business of producing alfalfa hay for market is a good, pure, stand.



TYPES OF IMPLEMENTS USED IN AUSTRALIA FOR WEED CONTROL IN IRRIGATION CANALS

Deadwood Dam, Boise Project, Idaho

Work Starts on Concrete Arch Dam on the Deadwood River, Idaho

A CONTRACT has recently been awarded to the Utah Construction Co., of Ogden, Utah, to build the Deadwood Dam on the Deadwood River, a branch of the South Fork of the Payette River in Idaho. This will give the Boise irrigation project a third high dam in addition to the Arrowrock, which is 349 feet in height, and the Black Canyon, 183 feet high. The dam site is about 60 miles northeast of Boise. Although only 25 miles by direct line, it is 67 miles by road from Cascade, Idaho, the nearest railroad station, on the Idaho Northern branch of the Oregon Short Line Railroad.

ADDITIONAL POWER MADE AVAILABLE

The reservoir will have a storage capacity of 160,000 acre-feet. Run-off records at the Lowman station 15 miles below the dam site show an average for the six years 1922-1927, inclusive, of 276,400 acre-feet. The storage will be utilized to afford a regulated flow for the power plant at Black Canyon on the Payette River. This plant supplies power for pumping to the Gem Irrigation District of 30,000 acres and five other districts smaller than the Gem, whose development is threatened because of the otherwise very heavy cost of pumping varying from \$7 to \$10 per acre. Under present conditions, there is a serious shortage of water for power purposes during the peak of the irrigation season in July and August, and the output of the power plant is greatly reduced during this period. Construction of the Deadwood Reservoir will relieve this condition, and make 8,000 kilowatts of firm power available throughout the irrigation season. Additional power is also needed in the construction of the Owyhee Dam and irrigation works now under way on the Owyhee project in eastern Oregon. The Gem Irrigation District has contracted for and will eventually receive gravity water under the Owyhee project.

Revenues from the sale of this power are expected to return the cost of the Deadwood Reservoir. The estimated construction cost of the reservoir is \$1,200,000, or \$7.50 per acre-foot, of which \$800,000 has already been appropriated. Approximately \$795,000 is now available, of which \$395,000 is from the second deficiency act for the fiscal year 1928 and \$400,000 from the fiscal year 1929.

The bid of the Utah Construction Co. was the lowest received, amounting to \$673,485 for construction of the dam, ap-

purtenant works, and construction road. This figure does not include cost of cement, steel, outlet gates, or other material which will be supplied by the Government. No satisfactory bid was received for clearing the reservoir site and therefore all bids on this item were rejected and the work is being readvertised. No improved lands will be submerged by the reservoir.

ROAD CONSTRUCTION

The site is in the Payette National Forest and because of its inaccessibility the transportation problem is important. It will be necessary to haul materials 67 miles by road from the railroad at Cascade. For 58½ miles of this distance, the Forest Service Highway from Cascade to Lowman will be used, and the contractor must build 8½ miles of construction road to connect this Forest Service Highway with the reservoir site. The construction of this 8½-mile road will be the first work required under the contract. This bureau is cooperating with the Forest Service in surfacing and otherwise improving the highway in from Cascade, between Bear Valley and Pen Basin, by paying a part of the cost, the work being done by the Forest Service.

Upon completion of the construction road, it will be turned over to the contractor for his use during the construction of the dam and the contractor shall maintain it without cost to the Government until the contract is completed. At the close of the contract, the road, together with structures, is to be returned to the Government. The road bed sections are 14 and 16 foot widths.

CONCRETE ARCH TYPE OF DAM

A board of engineers, comprising A. J. Wiley and D. C. Henny, consulting engineers, W. H. Nalder, engineer of the Denver office, and R. J. Newell, superintendent of the Boise project, made a report on the reservoir project in August, 1927. Three types of dams were considered by the board, which advised that studies be made of a concrete arch, rock fill with gravel face and rock fill with concrete face. Conditions at the site were found to be favorable for any one of these types, but after comparative studies the concrete arch type was adopted. Foundation conditions are excellent, the dam site being formed by a gorge in a massive hard granite ridge which closes the south side of the reservoir and is part of a general granite formation surrounding the entire basin. The granite extends at shallow

depth clear across the river and rises abruptly on either side.

Good gravel and sand for concrete are close at hand in the reservoir basin in unlimited quantities and tests made with this material in Denver showed 2,000 to 2,200 pounds per square inch compressive strength in 28 days for a 1-2-4 mix, and washing the sand did not increase the strength.

THE DAM

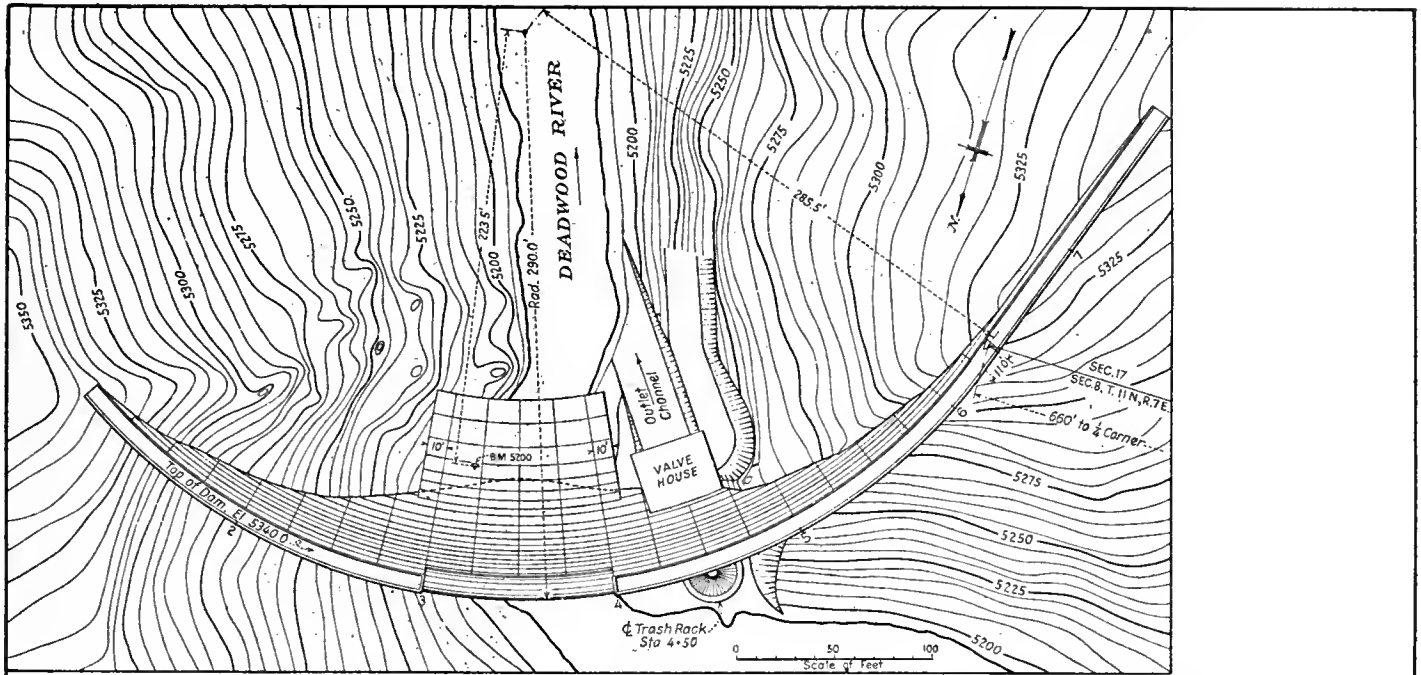
The dam will be of the concrete arch type with an upstream radius of 290 feet. It will be about 160 feet in height above the foundation bedrock, and about 700 feet long on the crest. The main structure will require 50,000 cubic yards of concrete. The spillway section will be of the open overflow type discharging over the central portion of the dam, this section being 6 feet below the top of the dam. An independent spillway is not necessary, as the spill which will usually not exceed 3,000 second-feet and may never exceed 10,000 second-feet, will not materially erode the rock of either the abutments or the bottom. No apron will be necessary.

Reservoir outlets will be provided through the lower portion of the dam and will comprise two 66-inch diameter conduits controlled by 4.5 by 4.5 foot high-pressure gates and 54-inch balanced needle valves.

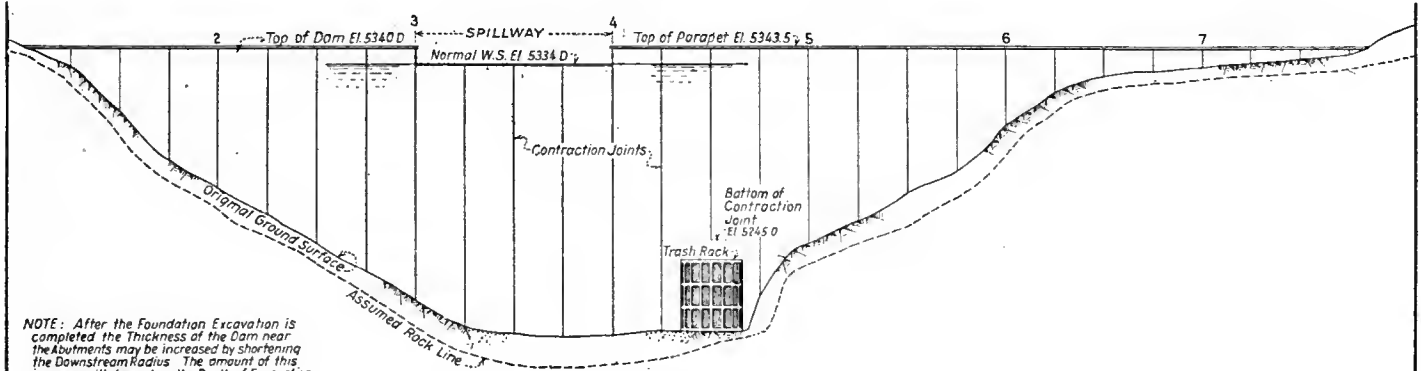
Diversion during construction will be through the outlet conduits. The specifications call for grouting and drainage systems, with the drilling of 6,000 linear feet of grout and drainage holes and placing 1,900 cubic feet of grout. It is intended to drill grout holes in the bottom of the upstream cut-off trench at about 5-foot intervals.

Among the principal items and estimated quantities involved in the contract are 22,000 cubic yards of all classes of excavation for the dam; 33,000 cubic yards of all classes of excavation for the construction road; mixing and placing 51,000 cubic yards of concrete; manufacturing and placing 10,500 linear feet of concrete drain tile; placing 75,000 pounds of reinforcement bars; installing 514,000 pounds of structural steel and other metal work; and erecting 32 M feet b. m. in bridges.

It was originally hoped to begin construction of the dam a year ago. However, the bureau had difficulty in acquiring right of way, as there were two groups of placer mineral claims in the reservoir site as to the value of which there was difficulty in coming to terms with the

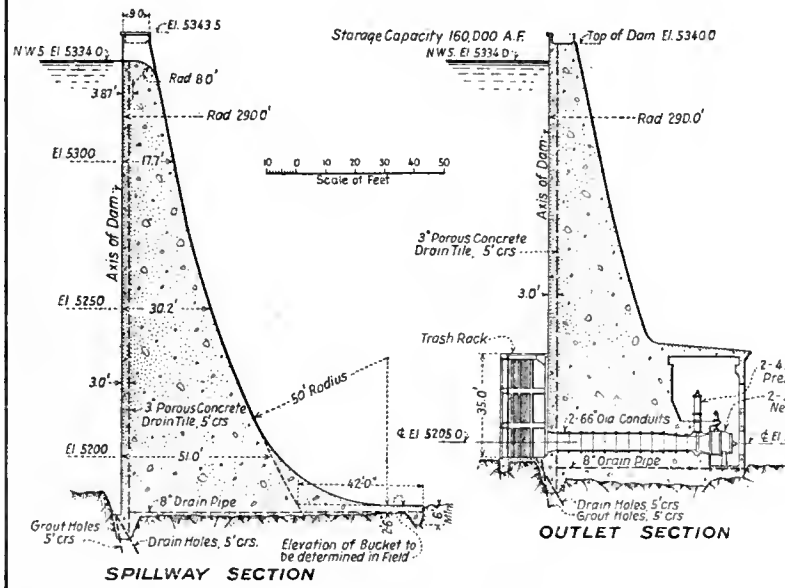


PLAN



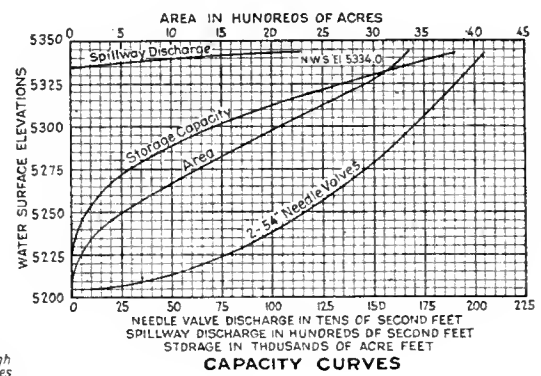
UPSTREAM ELEVATION (DEVELOPED)

NOTE: After the Foundation Excavation is completed the Thickness of the Dam near the Abutments may be increased by shortening the Downstream Radius. The amount of this increase will depend on the Depth of Excavation below the Original Ground Surface.



SPILLWAY SECTION

OUTLET SECTION



CAPACITY CURVES

DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION
 BOISE PROJECT-IDAHO-PAYETTE DIVISION

DEADWOOD DAM
PLAN, ELEVATION AND SECTIONS

DRAWN EBM SUBMITTED *B. J. Hill*
 TRACED P.M.C. RECOMMENDED *B. J. Hill*
 CHECKED P.P. APPROVED *C. S. Walter*

23394 DENVER COLO., MAY 1, 1928 3-D-361

owners. After a considerable delay, a settlement was reached for \$15,000 for each group.

On October 19, 1928, the President approved the recommendation of the Secretary of the Interior as to the feasi-

bility of the reservoir. The Utah Construction Co. is scheduled to complete the dam in the spring of 1931. This company has recently completed for this bureau the Gibson Dam on the North Fork of Sun River on the Sun River irri-

gation project, Montana, and had previously successfully carried out the construction of the American Falls dam on the Snake River in Idaho, and the Guernsey dam on the North Platte River in Wyoming.

Economic Problems of Reclamation in New South Wales, Australia

By Hon. H. H. Dare, Commissioner, Water Conservation and Irrigation Commission

UNION HOUSE, 247 GEORGE STREET,
Sydney, March 25, 1929.

DEAR DR. MEAD: YOUR letter of January 18 last, with the inclosed report on Economic Problems of Reclamation on the Federal irrigation projects in the United States, together with the "Foreword" by yourself, reached me recently, and have been read with great interest. Your action in making the pamphlet available is much appreciated. The conclusions arrived at seem to be very sound, and for the most part are borne out by our experience in Australia.

As you are good enough to invite comments on the contents of the report, it seems desirable to give these in the form of a brief outline of our experience under some of the headings dealt with.

FINANCING SETTLERS

Referring firstly to the financing of settlers, it has always been found that the settler with adequate capital to fully develop his farm is quite the exception. For the great majority therefore it has been compulsory to provide a portion of the necessary funds on the security of the farm and improvements. The Water Conservation and Irrigation Commission in this State, and the kindred body in Victoria—and also, I understand, in Queensland and South Australia—have power to make advances so that settlers having only a portion of the necessary capital may be allowed to proceed with the work of bringing their farms into production with as little delay as possible. Speaking for New South Wales, there would also be the Rural Bank, which is empowered to lend not only to ordinary settlers on dry farms, but also to irrigationists. As a matter of fact, for irrigation farms other than those occupied by soldiers, who are in a special category, the policy of this commission is to encourage settlers to come under the bank's auspices. The bank has wide powers. It raises its money by the same methods as an ordinary trading bank. This money has to be used for rural purposes, either in advances to individual settlers or to cooperative groups. I feel that it will be better to let you have the fullest particulars of the bank's operations, and will therefore invite that institution to give you these.

Although it is the policy to have the bank take over the financing of settlers, there still remain with the Irrigation Commission a large number of clients, particularly amongst the earlier settlers,

and in addition, there are the soldier settlers, who took up farms without any capital under the Government's policy of placing them in agriculture at the termination of the war. The practice which had to be followed of advancing 100 per cent of the necessary capital was not a business one. This, combined with a general fall in the value of agricultural produce, has caused heavy losses throughout Australia, which the governments are meeting.

In considering the question of advances to settlers, the necessity for good markets for irrigation produce must be remembered. In the United States, with your great population, the difficulties under this heading are for the most part probably not as great as they are here, and Dr. Alvin Johnson in stating his excellent case for financing settlers, naturally assumes that they will find satisfactory markets when farms are ready to produce. Unless this is so, there is no justification in going on with development. At the same time, the marketing problem, as far as this country is concerned, is a real one, and forms an additional difficulty which has to be overcome, and which has to be borne in mind when advancing capital.

Briefly, therefore, it may be stated that given adequate market prospects, the advancing of capital to settlers on reasonable security (say 66 $\frac{2}{3}$ per cent of the whole) is perfectly sound, and has the great advantage of bringing farms into production speedily.

PREPARATION OF FARMS

The suggested preparation of land in the way of clearing and grading prior to occupation has much to commend it, particularly when land can be treated in fairly large areas. While this proved costly when inexperienced soldier settlers were employed in groups soon after the war, it has since been carried out with very satisfactory results with experienced labor under proper supervision.

CONSTRUCTION COSTS—STATE'S CONTRIBUTION

Referring to the State's contribution to construction costs, you will remember the position in the Commonwealth. It is necessary for the State to make fairly heavy contributions toward irrigation schemes. This has in some instances taken the form of "free headworks," although loss of interest for other reasons has at times to be carried by the State.

Here the settlers do not become directly responsible for any construction charges; they are offered land at certain prices and water at certain charges. Beyond the payment of these they are not concerned whether the rents and water rates bear any definite relation to construction costs. They obtain their holdings at market rates.

The irrigation commission of this State is placed in a difficult position in relation to obtaining a return on construction costs for headwork. By act of Parliament settlers may have their rentals reappraised, or may apply for conversion to freehold, the values in both cases being fixed by the land and valuation court. Again the marketing problem arises, and is taken into consideration by the court. A conversion case came up for decision some time ago, and the value then fixed governs the commission, with the result that lands may have to be offered at considerably less than cost of land plus works. This represents a very definite contribution by the State, and when new farms are to be made available in the future it will be a question of Government policy to determine whether the States can continue to provide certain types of farms at below cost. There is something to be said for the State aiding irrigated agriculture in this way, seeing that the establishment of schemes opens up new settlements, increases population and production, and adds generally to the wealth of the State. This is no doubt a warrant for allowing free headworks. How much farther the system of State contribution can be allowed to go will have to be carefully considered.

BETTERMENT OF PRIVATE LANDS

The reference to the irrigation of private lands by Government works is of great interest to us. We are anxious to obtain the fullest information as to how the restriction of areas privately held, and the fixing of sale prices operate where these are applied. There appear to be great difficulties in fixing the price of land as against private holders, although it is done as against the State under our system referred to under the previous heading. It certainly does seem right that the State should be reasonably compensated when by its expenditures it increases the values of land, but seeing that in Australia we put down railways and other large public works without obtaining any part of the betterment, you will see that a big matter of policy is involved. This has been considered from time to time without finality

being reached. If you can advise us in due course as to your experience, it would be of the greatest advantage.

THE ECONOMICS OF OUR CROP FARMING

Doctor Branson's observations under this heading, particularly in respect of cotton and tobacco, are most interesting. Our experience does not allow of any valuable comments being offered. Since Mr. Brady, acting on your suggestion, brought back rice seed from the United States in 1921, there has been a considerable development in that industry on the Murrumbidgee irrigation areas, sufficient rice for Australia's requirements being produced there now. This crop is a machinery crop. It is sown by machinery and harvested by machinery. Furthermore, there is no encouragement for settlers to make it the only crop. As a matter of fact, the commission has limited the area that can be put under rice to 100 acres per farm. Apart from the fruit industry on the small farms, it can be said that the larger farms on the irrigation areas are almost wholly devoted to mixed farming—e. g., cropping, dairying, rice growing, etc.

PLANNING AHEAD

As you are aware, the suggested planning of settlements has been carried out by the States in Australia. Certainly there have been mistakes at times, particularly in respect of the suitability of land for certain varieties of fruits, but on the whole the effort at planned community buildings has been a success. Lands have been cleared in large areas and have been subdivided into farms, roads of access being provided. In many cases clearing and grading have been carried out prior to settlement, or financed immediately afterwards.

SOCIAL LIFE

On the irrigation areas in Australia there is very little tenant farming. For the most part each man works his own property. In New South Wales there is a residence clause which provides that a farm must be the main place of abode of the holder. This has been modified to allow of suspension of residence where the farm is being put to its best use. This privilege is taken advantage of only in a comparatively small number of cases. The result of this is that there is built up an excellent community spirit. Settlers are organized both for the purpose of buying and selling, and for watching their general interests. All the usual social amenities, churches, schools, banks, and amusements are available in the several

towns that have come into existence on the irrigation areas. The cooperative societies are perhaps the outstanding example of the successful organization of settlers for their own welfare. In passing, it might be mentioned that in the town of Griffith the price fixed by the land court recently for a central position was \$200 per foot.

WHAT TO GROW

You will have seen in our last annual report a reference to the formation of the Murray River advisory committee. This committee has been created with a view to recommending the best use of the Murray waters when stored. The idea is to avoid any haphazard planting of fruit, or the creation of any farming industry which may result in overproduction. As far as fruit is concerned, this commission some years ago formed a planting committee consisting of agricultural officers and settlers, whose duty it was to advise to the best of their knowledge the most suitable varieties to plant. The Murray River advisory committee will go further in that it will examine the economics of the various types of irrigated agriculture and make the result of this examination available prior to any new schemes being undertaken.

SCARCITY OF SETTLERS

It is gathered that there is a scarcity of settlers offering for irrigation farms in the United States. This is the case here. In Australia it can not be put down to the absence of methods of finance. As has been shown, adequate provision is made

and settlers with comparatively small capital—say \$2,500—would be encouraged. The chief reason seems to be the marketing difficulty referred to previously. When satisfactory markets become available, irrigation farming will no doubt prove more attractive to the new settler than it is at present. The Murray River advisory committee considers that mixed farming on the lines referred to by Doctor Branson has proved sufficiently successful in Victoria to warrant its further encouragement, and it is possible that a large quantity of the Murray water will be used in that direction.

In conclusion, I would say that the above are somewhat sketchy notes on the very thoughtful reports you have sent, and if there are any special queries arising out of my notes, I shall be very glad to do what I can to answer them.

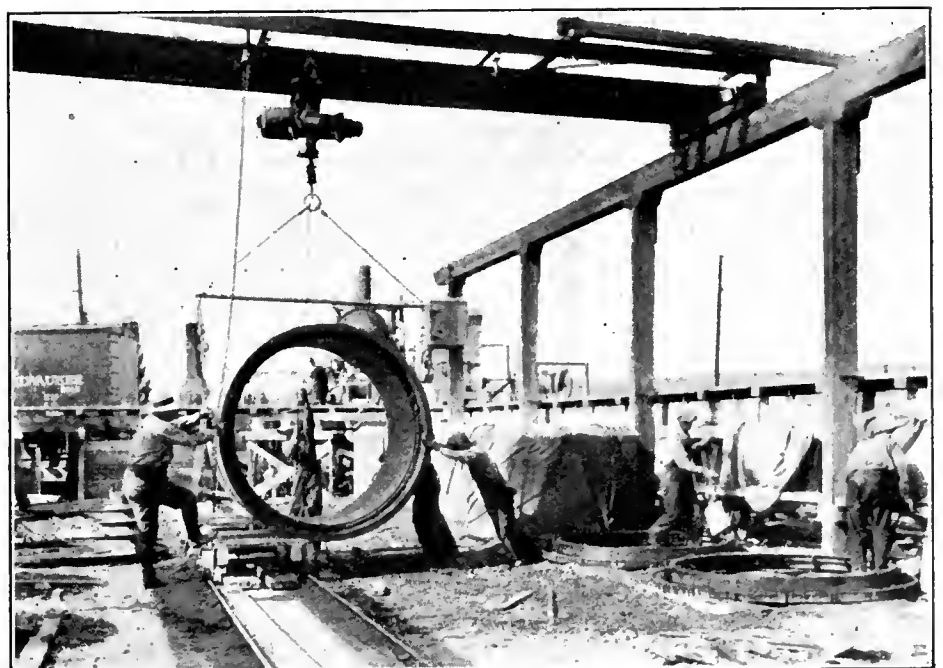
I trust that you and your people are keeping in the best of health.

With kindest regards, in which I am joined by Mr. Evatt, who has collaborated with me in the preparation of the above information.

Yours sincerely,

H. H. DARE,
Commissioner.

THE colonization agent employed by the Northern Pacific and Great Northern Railway Cos. has brought several prospective settlers to the Lower Yellowstone project from Colorado and four of five farms were sold during the month. Many more prospects intend to visit the project later in the season.



LOADING 72-INCH PIPE ON FLAT CAR AT ELLENSBURG PIPE PLANT, KITTITAS DIVISION, YAKIMA PROJECT, WASHINGTON

Gila River Suspension Bridge, 20 Miles East of Yuma, Ariz.

By C. B. Clegg, Acting Office Engineer, Yuma Project

THIS bridge was designed by the Arizona State Highway Department and is being constructed under their supervision. The State matched funds with Yuma County to make the bridge possible, the contract price being \$153,000.

The bridge will be the only structure for vehicular traffic across the Gila River between Antelope Hill and Yuma, a distance of some 50 miles. This will provide ready access to market for produce from the North Gila Valley at all seasons of the year, whereas in the past, with the use of small ferries and fords, flash rises in the river have seriously interfered with the marketing of commodities grown in this district and have prohibited the growing of perishables, such as lettuce and melons, to which this valley is equally as well adapted as the Yuma Valley and project.

The bridge is of the suspension type, having a clear span length of 800 feet between towers. The center span will be supported by two 5¼-inch cables containing 870 strands each of No. 8 hard wire. The approach spans are 57 feet and 119 feet long, respectively, and are hung on the piers supporting the towers. The bridge will be anchored in small rock hills on each side of the river, the first available bridge site of moderate length span above Yuma. It will be necessary to construct 6 miles of highway connecting the bridge to the North Gila Valley proper, and approximately ¼ of a mile of road to the present highway leading from Dome to Yuma.

Owing to the absence of surface flow in the Gila River during periods of several months each year, radical departures are possible from the usual construction methods employed on bridges of this type. Instead of adopting the usual method of

weaving or stringing the cable in place, a piece of overflow land near one anchorage of the bridge was leveled and wooden horses placed at 15-foot centers for a distance of 1,300 feet (the total length of the completed cables). At each end of these horses concrete anchors were constructed, in which were imbedded two large supports bearing sheaves, through which the strands were strung. Three cables of 290 strands each are used in making up each of the two main suspension cables.

Owing to a maximum range of 50 degrees in temperature experienced locally during a period of 24 hours, some difficulty was experienced as a result of contraction of the cable on the wooden horses during the cooler hours of the night. At first the weaving or stringing was carried on during the day with temperatures ranging as high as 108° F. The strands were placed at a tension of 150 pounds at 68° F., with a correction of 3.8 pounds for each degree change in temperature. When about through weaving the first cable of 290 strands a cool night was experienced with a minimum temperature of 58° with the result that the contraction of the unfinished cable on the horses pulled out the concrete anchorages. This was overcome by weaving at night only during the period of maximum contraction.

The small cables upon completion are removed from the horses and pulled into place by a drag line and a set of blocks. The temporary servings are then removed from the three small cables on each side of the bridge and these pressed into one 5¼-inch cable by means of a 5,000-pound hydraulic press which clamps the cable every 2 feet at which points it is temporarily served. The cable is then

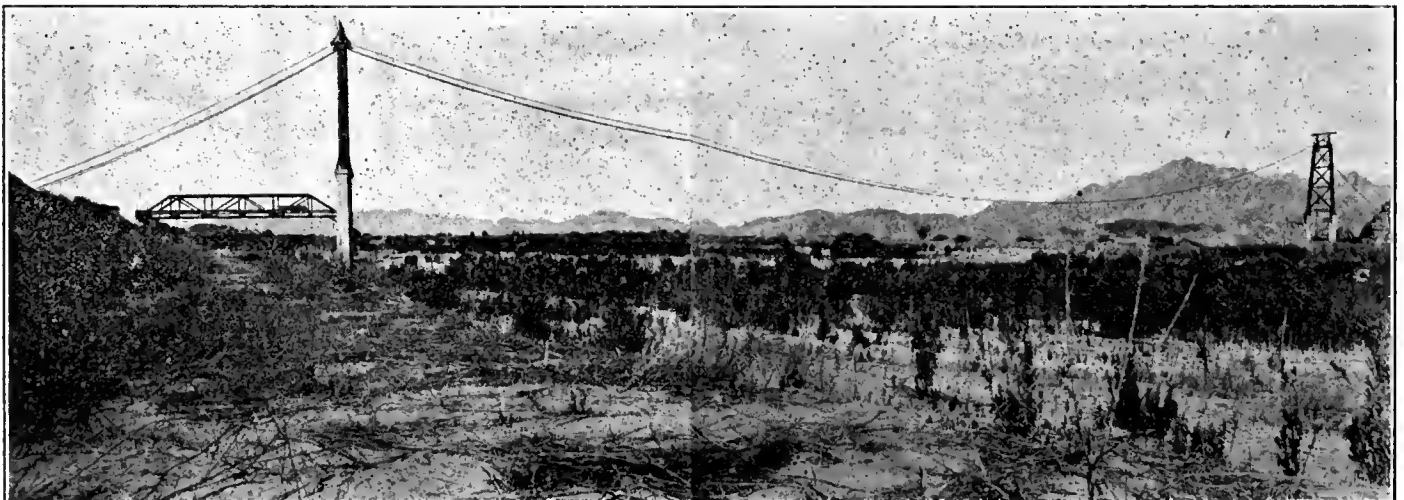
painted and a wrapping machine used to wrap the cable over its entire length between anchorages. The wrapping machine, using three wires, is capable of wrapping eight inches a minute, less the time required in making splices.

Another departure in construction methods made possible by the absence of flow in the river is that of starting the hanging of the steel at the middle of the span and working toward each tower rather than the usual practice of starting at each tower.

The steel towers at either end of the span are set on saddles on the concrete piers and have a deflection of 11 inches at the top toward the anchorages. Upon suspending the cables and hanging all the steel, the towers will be brought to a deflection of 3½ inches toward the anchorages and are so constructed that should the designed loading of the bridge of 60 pounds per square foot be ever imposed the towers will assume a vertical position.

This structure will be completed by the middle of October or the first of November and will supply a long-felt need in providing a permanent, safe crossing of the Gila River for the ranchers of the North Gila Valley and others with mining and cattle interests in the adjacent territory.

WORK at Echo Dam, Salt Lake Basin project, comprised continuation of the dam fill, excavation of the spillway channel, concrete work at the lower end of the spillway channel, and excavation of the cut-off trench. At the end of the month the dam was 45.8 per cent completed.



GILA RIVER SUSPENSION BRIDGE

Settlement Questionnaire Used on Don Martin Project, Mexico

IN the July issue of the *NEW RECLAMATION ERA* we printed an article describing the Don Martin project, Mexico, by Andrew Weiss, resident engineer. The National Irrigation Commission has prepared a questionnaire, as follows, which must be filled out by each applicant for a farm on the project:

1. Name.
2. When and where were you born?
3. What is your post-office address?
4. Are you married or single?
5. How many dependents do you support?
6. How many children have you?
7. How many sons?
8. How many sons are over 15 years of age?
9. Physical condition of your family.
10. Do you read and write?
11. What other education have you?
12. How much money in cash do you have?
13. Give a list of the tools and agricultural machinery you have.

14. Will you need credit?
15. How much (describe this precisely and in detail)?
16. How much are you earning actually?
17. What is your occupation?
18. What agricultural work have you been doing (give complete details)?
19. In what branch of agriculture have you specialized?
20. Where have you worked on farms?
21. Will you cultivate your farm if accepted as a colonist?
22. How much land would you like to have in the colony?
23. Would you like to obtain land free of trees, shrubbery, etc., or would you prefer to clear it yourself?
24. Do you expect to employ farm labor, or do you expect to do the work yourself?
25. When would you be ready to come to the colony if you were accepted as a colonist?

26. Would you favor a cooperative organization, and would you like to be a member of it in the colony?

27. If the commission should offer to lease the land to you or give it under a partnership contract, in order that you may have an opportunity to learn the particular conditions of the colony before establishing yourself definitely there, would you like to begin your work as a lessee, or as a partner, with the object in view of purchasing the land later if conditions seem satisfactory to you and if you demonstrate your ability to run a ranch?

28. Give some references with whom the commission may communicate with a view to obtaining information as to your ability to run a ranch.

29. Give in detail the places of your residence and how long you have remained in each place during the last 25 years, and the reasons in each case for having moved.

NOTE.—Do not get ready to move to the colony. It is useless for you to go there, as the project is not finished and it is impossible to cultivate the lands at present. If you will fill out this questionnaire and send it to the commission, you will hear from it in due time.

Experiment Station May Go To Yuma Mesa

There is considerable discussion of the possibility that a Government experiment station may be established on the mesa division of the Yuma project, Arizona-California. The benefits of such a station would be considerable, as there are 70,000 acres within the Yuma project limits and more than double this amount outside, which presumably will some day be developed.

It has already been demonstrated that this area is ideal for the growth of citrus fruits, and it is believed that an experiment station would demonstrate conclusively that the locality is equally well adapted to the growth of many other commercial crops of high value. It is believed, for example, that vegetables could be brought on the market from the mesa at such a time as to command a fancy price, although it is recognized that to do this would require proper fertilization in conjunction with experience and knowledge. The land on the mesa will be very much in demand if it can be demonstrated that other profitable crops besides citrus fruits can be grown there.

International Water Commission, United States and Mexico

THE State Department announces a joint meeting of the Mexican and American sections of the International Water Commission, United States and Mexico, to be held in Mexico City on August 20. Commissioner of Reclamation Dr. Elwood Mead, chairman of the commission, leaves Washington August 15, accompanied by Miss M. A. Schnurr, assistant to the Commissioner of Reclamation and secretary of the American section of the Water Commission, and Assistant Engineer Karl F. Keeler. They will be joined at Laredo, Tex., by Gen. Lansing H. Beach, U. S. A. (retired), Pasadena, Calif., and Mr. W. E. Anderson, consulting engineer, of San Benito, Tex., the remaining members of the American section.

This commission, set up by act of Congress dated May 13, 1924, was charged with a study regarding the equitable use of the waters of the Lower Rio Grande. At the request of Mexican authorities the study was extended to the Colorado and

Tia Juana Rivers. This was accomplished by joint resolution dated March 3, 1927. Mexico was unwilling to consider the Rio Grande alone, and it was only after all three rivers were authorized in this study that a joint meeting of the American and Mexican sections was held. These meetings were held at points along the border in February and March, 1928, and the entire personnel of the commission made an inspection trip of the lands involved.

During these meetings it was agreed to collect certain stipulated data on both sides of the border, principally with respect to stream-flow records and present beneficial use. Both sections have diligently gone about the gathering of this information and are ready for consideration of the data collected. A conference has, therefore, been called where all the material gathered on each side will be considered with a view to evolving some satisfactory working arrangements to be submitted to the two countries with a view to a treaty.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, left Washington, D. C., on August 9 for the Denver office, where he conferred with the chief engineer and others interested in the power contracts at Boulder Dam. From Denver he left for Mexico City to attend a joint meeting of the Mexican and American sections of the International Water Commission, United States and Mexico. Doctor Mead is chairman of the American section. He is expected to return to the Washington office about September 15.

P. W. Dent, assistant commissioner, is acting commissioner of the bureau during the absence of Doctor Mead.

Miss Mae A. Schnurr, assistant to the commissioner, left Washington, D. C., on August 8 for Mexico City for the meeting of the International Water Commission. Miss Schnurr is secretary of the American section.

L. M. Lawson, international boundary commissioner, will attend the sessions of the International Water Commission in Mexico City as a special advisor. Prof. Frank Adams, of the University of California, will attend as a consultant on Colorado River questions. Karl F. Keeler, assistant engineer of the American section, will also be present at the sessions of the commission.

George C. Kreutzer, director of reclamation economics, returned to the Washington office on August 6, after an extensive trip in the West in connection with the economic survey of reclamation of which he is in charge.

Hugh A. Brown, assistant director of reclamation economics, served recently as one of the members of a committee designated by the Director of the Census to draft the schedules of irrigation and drainage to be used at the Census of 1930.

Recent visitors at Stony Gorge Dam, Orland project, included G. F. Chapman, superintendent of construction, and J. H. Jerome, chief operator of the West Kortanay Power & Light Co. (Ltd.), of Birmingham, British Columbia, and Taijiro Ikeda, chief engineer, reclamation affairs bureau, Government General of Chosen, Japan.

The Owyhee project was visited recently by Gov. I. L. Patterson, of Oregon, Senator Steiwer and Congressman Butler, of Oregon, and Senator Thomas and Congressman Smith, of Idaho.

E. R. Kalnakaea, of the Department of Agriculture, spent several days on the Klamath project making a study of the duck disease which has prevailed in that country during the past few years.

E. W. Laue, engineer, has been transferred from the engineering department at large, War Department, to the designing section of the Denver office.

R. J. Tipton, engineer, has been appointed to the Denver office and assigned to the hydrographic section.

During the month, R. F. Walter, chief engineer, visited Echo Dam, and the proposed Cache Valley development, Salt Lake Basin project; the Kittitas division of the Yakima project; the Owyhee project; the North Side gravity extension division of the Minidoka project; the Grand Valley and the Uncompahgre projects.

Señor Luciano Jacques de Moraes, who has been sent to the United States by the "Servicio Geologico e Mineralogico," of the Brazilian Department of Agriculture, to study methods used by the Bureau of Reclamation, was a recent visitor at the Denver office. He planned also to visit the Grand Valley, Klamath, Yakima, Shoshone, and Salt River projects.

Lothrop Crosby, of Tacoma, formerly engineer for the Idaho Irrigation Co., was a recent visitor at the construction work in progress on the main canal of the gravity extension division of the Minidoka project.

John A. Whiting, State engineer of Wyoming, was a recent visitor on the Riverton project.

E. Carlton Jansen, hydroelectric engineer for the Public Service Co. of Colorado, visited the Grand Valley project recently to inspect the method employed at the diversion dam for the removal of silt.

Recent visitors on the Yakima project included Representatives Dickinson, of Iowa; Watson, of Pennsylvania; Summers, of Washington; Sandlin, of Louisiana; and Buchanan, of Texas. J. C. McDonald, of Victoria, British Columbia, comptroller of water rights for the Government of British Columbia, also spent a day on the project.

The Yuma project was visited recently by Rev. C. W. Alheit and Rev. A. D. Luckhoff, of the Dutch Reformed Church, South Africa; Edmund P. Sutter, of Switzerland, who is investigating grapefruit with a view to supplying the Switzerland market with this fruit; and Señor Luciano Jacques de Moraes, of the Department of Agriculture, Brazil.

B. W. Steele, engineer from the Denver office, spent two weeks on the Boise project testing concrete aggregates for the Deadwood Dam.

Barry Dibble, former project manager, Minidoka project, was a recent visitor at Burley and Rupert in connection with an investigation of power.

A large number of physicians, en route to Portland, Oreg., to attend the convention of the American Medical Association, stopped recently at American Falls, Minidoka project, and visited the dam.

The Montana State Extension Service of the Agricultural College has assigned Dan P. Thurber as associate county agent to work with the farmers in the development of the Sun River project.

The following employees have been transferred from Gibson Dam, Sun River project: O. C. Smith, associate engineer, to the Boise project; L. R. Dunkley, assistant engineer, to the Salt Lake Basin project; Claude H. Jackson, inspector, to the gravity extension division, Minidoka project; Walter Boettcher, junior engineer, to the Riverton project; and Ernest Fraser, inspector, to the Lower Yellowstone project.

O. W. Monson, of the Montana State College, spent several days on the Lower Yellowstone project making a study of the cost of preparing land, constructing ditches, and applying water.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

Jos. M. Dixon, First Assistant Secretary; **John H. Edwards**, Assistant Secretary; **E. C. Finney**, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary and Budget Officer;
Northcutt Ely and **Ernest W. Sawyer**, Executive Assistants

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Assistant to the Commissioner P. W. Dent, Assistant Commissioner George C. Kreutzer, Director of Reclamation Economics
W. F. Kubach, Chief Accountant C. A. Bissell, Chief of Engineering Division Hugh A. Brown, Assistant Director of Reclamation Economics
C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Dehler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Bella Fourche	Newell, S. Dak.	F. C. Youngblutt	J. P. Siebeneicher	J. P. Siebeneicher	Wm. J. Burke	Mitchell, Nebr.
Boise ¹	Boise, Idaho	R. J. Newell	W. L. Vernon		B. E. Stoutemyer	Portland, Ore.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	W. C. Berger	W. C. Berger	H. J. S. Devries	El Paso, Tex.
Grand Valley	Grand Junction, Colo.	J. C. Page	W. J. Chiesman	W. J. Chiesman	J. R. Alexander	Montrose, Colo.
Huntley ²	Ballantine, Mont.					
King Hill ³	King Hill, Idaho					
Klamath	Klamath Falls, Oreg.	H. D. Newell	N. G. Wheeler	Joseph C. Avery	R. J. Coffey	Berkeley, Calif.
Lower Yellowstone	Savage, Mont.	H. A. Parker	E. R. Scheppelmann	E. R. Scheppelmann	E. E. Roddis	Billings, Mont.
Milk River	Malta, Mont.	H. H. Johnson	E. E. Chabot	E. E. Chabot	do.	Do.
Minidoka ⁴	Burley, Idaho	E. B. Darlington	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Ore.
Newlands ⁵	Fallon, Nev.				R. J. Coffey	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.	H. C. Stetson	Virgil E. Hubbell	Virgil E. Hubbell	Wm. J. Burke	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.				B. E. Stoutemyer	Portland, Ore.
Orland	Orland, Calif.	R. C. E. Weber	C. H. Lillingston	C. H. Lillingston	R. J. Coffey	Berkeley, Calif.
Owyhee	Owyhee, Oreg.	F. A. Banks	H. N. Bickel	Frank P. Greene	B. E. Stoutemyer	Portland, Ore.
Rio Grande	El Paso, Tex.	L. R. Fiock	Henry H. Berryhill	L. S. Kennicott	H. J. S. Devries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	R. B. Smith	R. B. Smith	Wm. J. Burke	Mitchell, Nebr.
Salt Lake Basin	Salt Lake City, Utah					
Salt River ⁸	Phoenix, Ariz.					
Shoshone ⁹	Powell, Wyo.	L. H. Mitchell	W. F. Sba		E. E. Roddis	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah					
Sun River ¹¹	Fairfield, Mont.	G. O. Sanford	H. W. Johnson	H. W. Johnson	E. E. Roddis	Do.
Umatilla ¹²	Irriqon, Oreg.					
Uncompahgre	Hermiston, Oreg.					
Vale	Montrose, Colo.	L. J. Foster	G. H. Bolt	F. D. Helm	J. R. Alexander	Montrose, Colo.
Yakima	Vale, Oreg.	H. W. Bashore	C. M. Veyen	C. M. Veyen	B. E. Stoutemyer	Portland, Ore.
Yuma	Yakima, Wash.	P. J. Preston	R. K. Cunningham	J. C. Gawler	do.	Do.
	Yuma, Ariz.	R. M. Priest	H. R. Pasewalk	E. M. Philebaum	R. J. Coffey	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.	Coalville, Utah	F. F. Smith ¹²	C. F. Williams		J. R. Alexander	Montrose, Colo.
Kittitas	Ellensburg, Wash.	Walker R. Young ¹³	E. R. Mills		B. E. Stoutemyer	Portland, Ore.
Sun River, main canal construction.	Fairfield, Mont.	A. W. Walker ¹³			E. E. Roddis	Billings, Mont.
Boise project, Deadwood Dam.	Cascade, Idaho		C. B. Funk		B. E. Stoutemyer	Portland, Ore.

¹ Operation of Arrowrook Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927. E. E. Lewis, manager.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926. F. L. Kinkade, manager.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926. D. S. Stuver, manager.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928. Joe C. Iddings, manager.

⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917. C. C. Cragin, general superintendent and chief engineer.

⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926. Lee R. Taylor, manager.

¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926. A. C. Houghton, manager; and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926. Enos D. Martin, manager.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
All-American Canal investigations	Yuma, Ariz.	H. J. Gault	Arizona and New Mexico.
Gila River cooperative investigations			State of Utah.
Utah investigations	Salt Lake City, Utah	E. O. Larson	
Yakima project extensions	Yakima, Wash.	P. J. Preston	
Alcova-Casper and Saratoga projects	Casper, Wyo.	J. R. Iakisch	



ONE OF THE SEVENTEEN SUGAR FACTORIES ON THE FEDERAL IRRIGATION PROJECTS

NEW RECLAMATION ERA

VOL. 20

OCTOBER, 1929

NO. 10



THOMPSON SEEDLESS GRAPES, YUMA FEDERAL IRRIGATION PROJECT, ARIZONA-CALIFORNIA

Construction and Economic Results

Bureau of Reclamation

To June 30, 1929

Reservoir capacity (acre-feet)	12,881,963
Canals, ditches, and drains (miles)	16,557
Tunnels	122
Length (feet)	175,536
Canal structures	148,462
Bridges	11,631
Length (feet)	277,449
Culverts	14,043
Length (feet)	535,396
Pipe (linear feet)	4,091,096
Flumes	4,811
Length (feet)	853,022
Power plants	35
Power developed (horsepower)	166,128
Telephone lines (miles)	3,350
Transmission lines (miles)	2,056
Excavation (cubic yards)	276,822,500
Irrigated farms	40,788
Population	153,663
Towns	212
Population	451,811
Schools	687
Churches	689
Banks	136
Deposits	\$147,732,900

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

RAY LYMAN WILBUR
Secretary of the Interior

Price 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

October, 1929

No. 10

Interesting High Lights on the Federal Reclamation Projects

THE Orland project fig growers have contracted this season's crop, estimated at 100,000 tons, at \$95 per ton f. o. b. Sacramento. This price will net the growers better than \$85 per ton at Orland and is a remunerative price for the product.

THE five factories of the Western Slope Cheese Co., three of which are on the Uncompahgre project, have shipped 700,000 pounds of cheese since January 1, and an additional 175,000 pounds have been used for local consumption.

A TOUR of the Milk River Valley was conducted recently, in order that all farmers might become familiar with conditions generally over the project. The tour, which was under the direction of Associate County Agent Bingham, started at Glasgow where the least development has taken place, and progressed up the valley to Chinook, where many of the farms are in a comparatively high state of improvement. It is believed that the tour will have a decided influence in the general improvement of agricultural methods, especially in the use of irrigation water.

THE colonization agent employed by the Northern Pacific and Great Northern Railways has brought several more prospective settlers from Colorado to the Lower Yellowstone project and at least two farms have been sold. A party of prospective settlers was also brought in from Wyoming by the Holly Sugar Corporation and several farms were sold.

SEVERAL sales of land were reported from the Vale project and a great many inquiries are being received by the Vale-Owyhee Government Projects Land Settlement Association. Fourteen public land farm units were opened to entry on September 3, and announcement was also made of the availability of water next spring for 4,012 acres of land in the project.

ONE new renter took up a farm on the Belle Fourche project during the month and a number of prospective settlers have visited the project. These are men from the dry-farming areas where drought has stimulated inquiries for irrigated land. The North Western Railway Co. is planning an active settlement campaign beginning October 1 to bring in high-class farmers.

AT Echo Dam, Salt Lake Basin project, good progress was made on the dam fill section, and at the end of the month the dam was 50.8 per cent completed.

THE two canneries in Yakima, on the Yakima project, have been working to capacity on pears, employing approximately 2,000 persons. This will continue for several weeks, thousands of cans being processed daily. The pears from the upper valley are reported of excellent quality.

THE Worden Creamery and the Balmantine Cheese Factory, Huntley project, which have been closed for some time, have been opened under new management.

AT the instigation of the Grand Valley Water Users' Association, a movement has been started on the Grand Valley project to encourage the construction of cisterns and other means of water storage to encourage the handling of more livestock on project farms, the association to furnish forms and a concrete mixer for a nominal charge and assist in the construction of these facilities. As a result, about a dozen large stock cisterns will be built before the end of the irrigation season.

THERE is good prospect of a high price for alfalfa on the Sun River project. Reports have been received of offers running up to \$15 a ton in the stack, and farmers are holding out for \$17.

CONSIDERABLE agitation was caused recently on the North Platte project by the application of the railroad companies for an increase in the freight rate for earload shipments of cheese from the valley to Omaha. The final result of the agitation was a reduction in the freight rate to 60 cents on earload shipments, which is the same rate as was granted recently to Wisconsin shippers.

FLY aviation field, which is located on the Yuma Mesa, was used as an official fueling stop for the national women's air derby in August. With the successful sale of county bonds voted recently, \$25,000 is available for improving the field.

A NEW dehydrating plant for drying fruit and vegetables is being constructed at Nampa, Boise project, and will be ready for this season's crops.

THE Rio Grande project pear crop exceeded predictions with a total shipment of 225 cars averaging about \$1,000 per car.

THE branch line of the Southern Pacific from Klamath Falls, Oreg., on the Klamath project, to Alturas, Calif., was opened for traffic on September 15.

AT Owyhee Dam the Owyhee River was diverted through the completed diversion and spillway tunnel on August 7. At the end of the month the dam was 18 per cent completed.

THE Associated Seed Co. (Inc.), on the Shoshone project, has completed the addition to its seed house, and now has a building 30 by 150 feet in size, with an elevator and two cleaning mills for either peas or beans. The new building has a storage capacity of 50 earloads of seed. It also has a room where 20 pickers will be employed in cleaning seed for shipment.

President Hoover's Proposed Public Land and Reclamation Policy

An address before the Conference of Governors of the Public-Land States, Salt Lake City, Utah, August 26-27, 1929

By Hon. Joseph M. Dixon, First Assistant Secretary of the Interior

BASED upon the knowledge gained from nearly 40 years' residence in the West, and upon many years of service in both legislative and administrative duties in Montana and Washington, I have faith to believe that out of this conference will come much of good to the people of the public-land States and to the Nation as a whole.

We meet not as partisans but as citizens of a common country imbued with the sole idea of setting in motion a movement that will solve the perplexing problems now involved in the joint administration of State and Federal Government in the public-land States of the West.

For the success of the plan, it argues well that the present Chief Executive of the Federal Government was born and reared in the West and has a sympathetic interest in its people and its local problems.

It is also not without interest to know that all of the chief administrative officials of the Department of the Interior, which deals almost exclusively with the problems of the West, are men of the West, who have lived their lives among and with you.

In order that you may have at first hand, and for your immediate consideration at this conference, the present conclusions and tentative plans of President

Hoover in his desire to fully cooperate with you in this work, he has dictated the following letter to me for presentation to this conference of the western Governors and their delegated representatives:

PRESIDENT HOOVER'S LETTER

THE WHITE HOUSE,
Washington, August 21, 1929.

HON. JOSEPH M. DIXON,
Assistant Secretary of the Interior,
Washington, D. C.

MY DEAR SECRETARY DIXON: I have for some years given thought to the necessity and desirability for a further step in development of the relations between the Federal and State Governments in respect to the public lands and the Reclamation Service. The meeting of the governors of the public-land States at Salt Lake City which you are attending offers an opportunity for consideration of some phases of these questions, and I should appreciate it if you would present them to the governors.

It may be stated at once that our Western States have long since passed from their swaddling clothes and are today more competent to manage much of these affairs than is the Federal Government. Moreover, we must seek every opportunity to retard the expansion of Federal bureaucracy and to place our communities in control of their own destinies. The problems are in large degree administrative in character, both as they affect the Federal Government and the government of the States.

It seems to me that the time has come when we should determine the facts in the present situation, should consider the policies now being pursued and the changes which I might recommend to Congress.

That these matters may be gone into exhaustively and that I may be advised intelligently, I propose to appoint a commission of 9 or 10 members, at least 5 of whom should be chosen from leading citizens of the public-land States, and I should like to secure the cooperation of the governors by submission from them of names for such a commission. This commission would naturally cooperate with the Department of the Interior.

As an indication of the far-reaching character of the subjects which could come before such a commission, I may recount certain tentative suggestions for its consideration. No doubt other subjects and other proposals would arise.

PUBLIC LANDS

The most vital question in respect to the remaining free public lands for both the individual States and the Nation is the preservation of their most important value—that is, grazing. The remaining free lands of the public domain (that is, not including lands reserved for parks, forests, Indians, minerals, power sites, and other minor reserves) are valuable in the main only for that purpose.

The first of the tentative suggestions, therefore, is that the surface rights of the remaining unappropriated, unreserved public lands should, subject to certain details for protection of homesteaders and the smaller stockmen, be transferred to the State governments for public-school purposes and thus be placed under State administration.

At the present time these unappropriated lands aggregate in the neighborhood of 190,000,000 acres, and in addition some 10,000,000 acres have been withdrawn for purposes of stock-watering places and stock drives which might be transferred as a part of a program of range preservation. In addition, some 35,000,000 acres have been withdrawn for coal and shale reserves, the surface rights of which with proper reservations might be added to this program of range development in the hands of the States.

Reports which I have received indicate that, due to lack of constructive regulation, the grazing value of these lands is steadily decreasing due to overgrazing, and their deterioration, aside from their decreased value in the production of herds, is likely to have a marked effect upon the destruction of the soil and ultimately upon the water supply. They bring no revenue to the Federal Government. The Federal Government is incapable of the adequate administration of matters which require so large a matter of local understanding. Practically none of these lands can be commercially afforested, but in any event the forest reserves could be rounded out from them where this is



Dragline handling 54-inch lock-joint pipe, South Branch Canal, Kittitas division, Yakima project, Washington

desirable. Therefore, for the best interest of the people as a whole, and people of the Western States and the small farmers and stockmen by whom they are primarily used, they should be managed and the policies for their use determined by the State governments.

The capacity which the individual States have shown in handling school lands already ceded out of every township which are of the same character is in itself proof of this and most of the individual States already maintain administrative organizations for this purpose, so that but little added burden would thus be imposed. They could, to the advantage of the animal industry, be made to ultimately yield some proper return to the States for school purposes, and the fundamental values could be safeguarded in a fashion not possible by the Federal Government. They would also increase the tax base of the State governments.

A question might arise upon the allotment of the Federal road fund as a result of a shift of the public land ownership. It would only be just if this allotment could be undisturbed for at least 10 years while the States were organizing their range conservation measures.

It is not proposed to transfer forest, park, Indian, and other existing reservations which have a distinctly national as well as local importance. Inasmuch as the royalties from mineral rights revert to the Western States either direct or through the reclamation fund, their reservation to the Federal control is not of the nature of a deprivation.

RECLAMATION SERVICE

It seems to me that the vital questions here are to reorient the direction of the Reclamation Service primarily to the storage of water and to simplify its administration.

The reclamation fund and the Reclamation Service were created in 1902, and the situation has since changed materially. The present plan, as you are aware, is that receipts from sale of public lands, mineral royalties, and repayments by the beneficiaries for expenditure upon projects all accrue to this fund. The Reclamation Service undertakes special projects upon the authorization of Congress, which are financed from the fund on the basis of return by the land owners or purchasers of the cost of the project but without interest for a term of years. A total of approximately \$182,000,000 has been expended from the fund.

The present reclamation act is based fundamentally on the reclamation of Government-owned lands. Possible areas available for reclamation have now passed almost wholly into private ownership and the use of the reclamation fund for further projects may be legally criticized owing to the fact that the land is no longer part of the public domain and circumlocution by voluntary agreements may not always be possible.

Moreover, the application of the fund under the present organization results in very large Federal administrative activities within the States of a character which was never originally contemplated and which could be much better administered by the local State governments themselves. In many ways it duplicates the State water administrations.

There are several tentative suggestions for more effectual handling of the fund. For instance, the Reclamation Service for all new projects might well be confined to the construction of permanent works—that is, dams and such construction as results in water storage—and at the completion of such construction the entire works be handed over to the States with no obligation for repayment to the reclamation fund except such revenues as might arise from electrical power and possibly in some cases from the sale of water until the outlay has been repaid or in any event for not longer than, say, 50 years.

Again, there are certain instances of insufficiently capitalized community owned irrigation projects which are at the point of failure, for which the reclamation fund might be made a proper vehicle to rescue homes that are now in jeopardy.

A further activity which might be considered for incorporation in the Reclamation Service would be the authorization to join with the States and local communities or private individuals for the creation of water storage for irrigation purposes. The primary purpose of these suggestions is thus to devote the Federal Government activities to the creation of water storage and a reduction of other activities within the States.

Under such arrangements the States would have the entire management of all new reclamation projects and would themselves deal with the irrigation land questions and land settlements. It is only through the powers of the States that reclamation districts can legally be organized which would incorporate the liability of privately owned lands for irrigation expenditure and by such organization it ought to be possible to finance the subsidiary works.

By direction of the Reclamation Service in some such manner the large provision of water storage would ultimately secure a very large increase in the irrigable area

of the various States. It is evident to every engineer that water storage is not always directly connected with an irrigation project but vital to expansion of irrigation. This emphasis and this direction of Federal activities to water storage rather than land development has also an incidental importance to flood control and navigation.

It is not suggested that the States should take over the administration of the established projects but that the system should be set up for future undertakings. If it were instituted, it would, of course, be necessary to set up some safeguards to cover interstate projects. No doubt each new project as at present should be specifically authorized by Congress.

It must be understood that these suggestions are only tentative; that they have no application to dealing with power questions except that which is incidental to storage of water for irrigation or its further incidental use in navigation and flood control. Moreover, the question of the advisability or inadvisability of opening new areas of land for cultivation in the face of present obvious surplus of farm products does not arise because the activities outlined herein will only affect farm production ten or twenty years hence, by which time we shall probably need more agricultural land.

MINERAL RESOURCES

The policies to be pursued in development and conservation of mineral resources of the public domain present many problems. They are problems of a national as well as a local character. I know that the western as well as the eastern States agree that abuse of permits for mineral development or unnecessary production and waste in our national resources of minerals is a matter of deepest concern and must be vigorously prevented.



Gibson dam, Sun River project, Montana

Because of such abuse and waste I recently instituted measures to suspend further issue of oil prospecting permits on public lands and to clean up the misuse of outstanding permits, and thereby to clear the way for constructive conservation. It may interest the governors to know that when this decision was taken on the 12th of March there were prospecting permits in force covering over 40,000,000 acres of the public domain. We have now determined that over 40 per cent of these holders had not complied with the requirements of the law; that the larger portion of these licenses were being used for the purpose of preventing others from engaging in honest development and some even as a basis of "blue sky" promotions. After yielding to the claimants the widest latitude to show any genuine effort at development under the outstanding prospecting permits, the total will probably be reduced to about 10,000,000 acres, upon which genuine development is now in progress. The public domain is, therefore, being rapidly cleared of this abuse. The position is already restored to a point where measures can be discussed which will further effectually conserve the national resources and at the same time take account of any necessity for local supplies.

GENERAL

These suggestions are, of course, tentative pending investigation of the full facts, but generally I may state that it is my desire to work out more constructive policies for conservation in our grazing lands, our water storage, and our mineral resources, at the same time check the growth of Federal bureaucracy, reduce Federal interference in affairs of essentially local interest, and thereby increase the opportunity of the States to govern themselves, and in all obtain better government.

Yours faithfully,
HERBERT HOOVER.

DISPOSAL OF THE PUBLIC LANDS

I am not so optimistic as to believe that out of this conference will come the final solution of all the problems of the West,

but I do believe that you can here plant a real milestone in the history of its development.

Let us analyze the proposals of the President and see what may evolve from their enactment into statutory law.

First, his proposal as to the disposition of the surface title of the remaining public lands.

On June 30, 1929, there remained of the public domain, in the 11 major public-land States, exclusive of a much smaller acreage in North and South Dakota, Alabama, Arkansas, and Minnesota, and exclusive of national forests, Indian reservations, national parks, stock driveways, water holes, etc., as follows: Arizona, 16,911,367 acres; California, 20,209,421 acres; Colorado, 8,218,875 acres; Idaho, 10,734,420 acres; Montana, 6,900,144 acres; Nevada, 53,410,938 acres; New Mexico, 16,282,582 acres; Oregon, 13,227,141 acres; Utah, 25,147,867 acres; Washington, 951,903 acres; Wyoming, 17,035,537 acres.

These 11 States have heretofore (exclusive of their grants for their various educational and other State institutions) been granted by the Federal Government for their public-land funds—in some States two sections out of each township, and in Utah, New Mexico, and Arizona four sections in each township—the following total acreage of the public domain lying within their respective limits:

	Acres
Arizona.....	8, 093, 156
California.....	5, 534, 293
Colorado.....	3, 685, 618
Idaho.....	2, 963, 698
Montana.....	5, 198, 258
Nevada.....	2, 061, 967
New Mexico.....	4, 355, 662
Oregon.....	3, 399, 360
Utah.....	5, 844, 196
Washington.....	2, 376, 391
Wyoming.....	3, 470, 009

From these Federal land grants alone the States of the West have built up their present public-school funds, which year by year are steadily growing in magnitude and from which are annually distributed millions of income to the school children of our respective States.

Taking my own State as a yardstick, in order to visualize the actual result of the surrender value of the remaining public lands within her borders and we find the total area of school sections granted under her enabling act to have been, in round numbers, 5,000,000 acres. The present proposal gives Montana, in round numbers, 7,000,000 acres additional.

Naturally, the remaining 7,000,000 acres are not the equivalent, acre for acre, of the school lands embraced within the original grant, and still my judgment is that the granting of the remaining 7,000,000 acres will almost double the income of the permanent school fund of Montana, and to that extent lift the burden of local school taxation from the homes and farms and business interests of our State.

Take Idaho. Under her original public-school land grant she received approximately 3,000,000 acres; under the President's proposal she will receive in excess of 10,000,000 acres additional, more than three times the original grant.

Here again, you will find that acre for acre, it is not of the same intrinsic value. No doubt in Idaho the enterprising State land agents and early settlers and the large cattle and sheep outfits made their entries alongside the streams and water holes, so that in many places water for the remaining lands is now at a premium and not immediately available for the larger use of the millions of acres of grazing lands now held by the Federal Government.

But my judgment is that we have not as yet, half developed the future and potential water supply on these vast areas of grazing lands.

The sinking of wells a few hundred feet, at almost any place in the two States just named, will develop abundant water for stock raising and domestic use, if the proper rewards were offered through honestly administered, long-term leases by the States.

At the present time these millions of acres of the public domain bring to the Federal Government, from the surface rights, not one dollar of revenue.

Since the enactment of the free homestead law, in 1862, under the administration of Lincoln, the Federal Government has never attempted to coin revenue from the disposal of the public lands, except from the royalties imposed upon oil and coal, which are immediately turned back into the reclamation fund for the development of the arid lands in the West.



Dr. Alvin Johnson at the Lingle power plant, North Platte project, Nebraska-Wyoming

From time to time there have been proposals for the leasing of the remaining grazing lands by the Federal Government, but I have never yet seen one that was not most cumbersome in its proposed operation, and worst of all, inevitably lodges bureau control at Washington, in the administration of the lands here in the West.

That is what the President now proposes to abolish, by giving to the States themselves the ownership and right of control. The individual States have the machinery already set up for doing this very work, through their efficient State land boards already functioning in the administration of the present State-owned school lands.

There is another and even bigger matter involved in the President's proposal: Any man who is intimately acquainted with the present physical condition of our Federal-owned grazing lands well knows that they have been pastured down to the grass roots. We know that they are not now producing one-fifth of the natural forage that they would produce, if intelligent use were applied.

The old days of the luxuriant bunch grass has disappeared under the present ruinous practice of indiscriminate grazing, without any restriction whatever.

Intelligent use of our western grazing land would easily treble their carrying power in the matter of production of cattle, sheep, and wool.

There is another matter involved, that to the far-seeing man may even assume bigger proportions than the immediate one of the increased carrying capacity of our ranges, and that is the very serious impairment of our watersheds from overgrazing, which has already resulted in a much lower carrying capacity for the annual snow and rainfall, with the resultant quick run-off in the spring and disastrous floods that inevitably follow.

The people of the East can make no better future investment than that of granting to the people of the West the remaining public lands, if we can assure them, in turn, that our administration of the trust involved will result in better protection of the watersheds, through a better use and rehabilitation of the natural soil covering and through a continually expanding program of impounding at the head of our rivers, by dams and reservoirs, constructed primarily for irrigation, the flood waters that now pour down each spring in disastrous floods to the lower reaches of our great rivers.

THE RECLAMATION PROGRAM

In his letter the President calls to your attention his proposal to make the present reclamation act more flexible and of far greater consequential value to the West. We of the West counted its enactment as another milestone in the development

of the national heritage. To the man of limited vision it might seem to have been wrought out for the benefit of the semi-arid States alone.

That was the narrower viewpoint that had to be combated at Washington, when President Roosevelt led the fight for its enactment in 1902. The actual experience of 27 years has abundantly justified the wisdom of the plan, not only for western development but also the accruing economic benefits that have been widespread throughout the Nation, in the greater demand for eastern-made goods from every reclaimed farm in the West.

About \$182,000,000 has now been expended in the construction of Federal reclamation projects, of which amount approximately \$15,000,000 has been charged off, owing to unforeseen physical conditions, and approximately \$13,000,000 has also been placed in "suspense."

Repayments by settlers on the various projects now amount to approximately \$36,000,000. The commitments for projects now under construction or authorized will approximate about \$32,000,000.

Under the reclamation act all monies arising from the public lands go into the reclamation fund. Congress has made no direct appropriation for the construction of these vast works.

Last year approximately \$7,000,000 came into the reclamation fund, nearly all of it from oil and coal royalties and repayments from projects now completed.

We of the West know that the major problems affecting new irrigation projects arise from the difficulties involved in the settlement of the raw lands.

It has not been an easy matter for the settler on irrigated lands, whether Federal or privately developed, to forge his way to a fairly prosperous condition, involving, as it must do, a heavy investment in land levelling, construction of buildings, and in machinery and livestock.

As a whole, the Federal reclamation projects, providing for long-term repayments without interest, have been far more successful than those constructed with private capital, involving the heavy interest charges on the bonds.

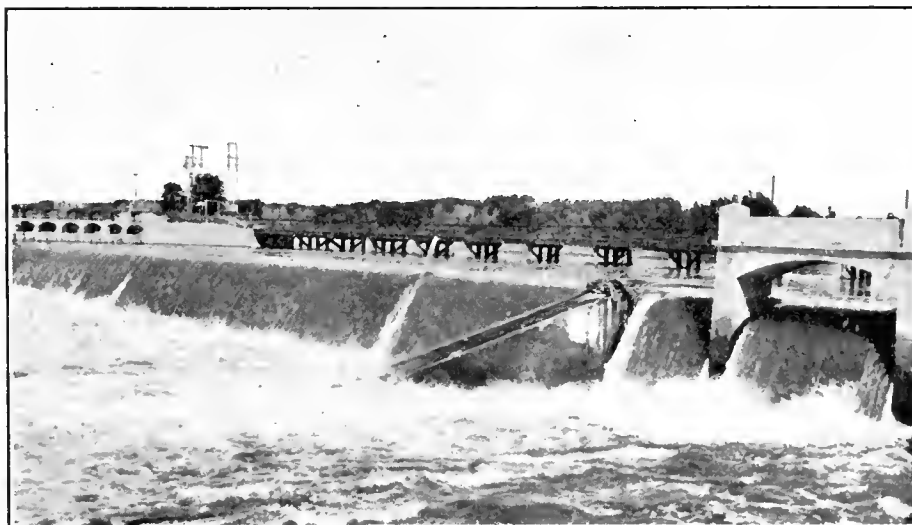
It is common knowledge to us from the irrigation States that many of these privately constructed projects are now in a bad way and that many meritorious projects of this type are threatened with disaster because of their inability to refinance themselves.

In the President's proposal he points out that in these meritorious cases the reclamation act might well be given more flexibility, so as to take care of this type of privately constructed project, where the settler is already upon the land, by long-time loans advanced from the reclamation fund, with a low interest rate. To me there is no more practical way of extending intelligent help to agriculture at this time.

He also proposes, if the individual States will take over the job of administering the work of reclamation, that the Federal Government, in its future commitments from the reclamation fund, advance the money necessary for the construction of the dams and reservoirs, without repayment from the States, the individual States in turn to have supervisory control of the digging of the main canals and laterals.

This plan would very materially reduce the acre cost of future reclamation to the point where successful land settlement would be assured.

I judge that the President, in recommending this joint plan, believes that the Nation itself is fully justified in making this contribution of the dams and reservoirs, both for irrigation and an offset against the lessened danger from floods and as a more comprehensive plan of national flood control.



Whalen diversion dam, North Platte project, Nebraska-Wyoming

MINERAL SUBSURFACE RIGHTS

As to the general plans above outlined, my guess would be that most of you are in agreement up to this point, but that in some of your minds the question has arisen, what about the mineral subsurface rights? Why should they not also be turned over, as a gift to the public-land States?

As a man of the West, whose past life has been lived in and whose personal interests and future hopes are wholly wrapped up in its development, I will give you the reason why that very thing is neither desirable nor to be hoped for at this time.

In the first place, there is no public-land State that has the equipment absolutely necessary for scientifically handling the vast mineral resources underlying the public lands. The Federal Government is spending, and for years has been spending, more than a million dollars per year in the maintenance of its Geological Survey. Here we have a force of about 500 highly trained men at work, in making most comprehensive surveys and studies of our coal, oil, phosphates, potash, metalliferous ores, topographical surveys, stream gaging, underground water supply, and their related subjects.

This work is particularly a National and not a State affair. The individual States at this time are not financially able, nor are they equipped in even the most meager way, to undertake or carry on this work.

From both the National and the State viewpoint it would be a disaster to attempt to reverse this procedure.

In the second place, the individual States would reap no actual benefit by a surrender of this Federal right to the States, as the individual public lands States are now receiving, through the reclamation act, every dollar of revenue that comes from mineral royalties, except a meager 10 per cent of the receipts which the Federal Government retains for its supervisory control and administration of the underground mineral wealth.

Surely the States could not hope to carry on this work of exploration and administration so cheaply or with such efficiency.

Only recently I heard the comment that turning over the surface title to the public lands, without the accompanying mineral title, was like presenting the egg shell without the meat.

Certainly no man from the West, who has a comprehensive knowledge of the facts involved, will give patient ear to such loose and foolish conversation.

There is also another side to that question that we might as well face first as

last. All this proposed plan for turning over the public lands and making more flexible the present reclamation act involves favorable congressional action.

I believe that under the kindly and intelligent leadership of the President these two things are possible, and that the Congress will follow his leadership in bringing it to a successful conclusion.

But a proposal to Congress to turn over the coal, oil, potash, phosphates, and metalliferous ores to the several States, with our minimum of representation in the House and Senate, would be hopelessly impossible from its inception.

THE NATIONAL FORESTS

The same is true of the national forests. In the administration of the national forests the Federal Government is spending each year far more than it receives from the sale of timber and the grazing receipts.

To begin with, 25 per cent of all forest receipts are immediately returned to the States in which the forests lie.

The next time any man proposes that the individual States take over the national forests, I wish you would keep in mind the following facts and figures:

For the fiscal year ended June 30, 1925, the Federal Government expended for the administration of the national forests, for the purchase of additional lands, and for the building of permanent roads and trails therein, the sum of \$23,759,375, of which total \$10,477,564 was expended for road construction work alone. The receipts from the national forests that year from timber sales and grazing fees totaled \$5,000,137.

For 1926 the Government expended on its national forests \$22,729,343, of which \$12,989,605 was expended for roads and trails and \$1,146,487 for additions to the forests. During the year 1926 the total receipts from the national forests was \$5,155,661.

For the year 1927 the total expenditure by the Federal Government for the national forests was \$23,512,220, of which \$10,532,407 was for the construction of permanent roads and trails and \$1,063,930 for the acquisition of additional forest lands. For the year 1927 the Federal Government's total receipts from grazing fees and timber sales was \$3,166,605.

For the year 1928 the total expenditure by the Federal Government for the national forests was \$22,657,454, of which \$9,626,805 was for the construction of permanent roads and trails and \$2,069,122 for the purchase of additional lands. The total receipts for the year 1928 were \$5,441,434.

For the 4-year period from 1925 to 1928 the Federal Government expended on its national forests a sum total of \$92,658,392, and for the same period received in return

\$20,763,837, 25 per cent of which, \$5,190,960, was returned to the States.

A study of the receipts and expenditures by the Federal Government in the conservation of the national forests surely will not leave any enthusiasm in the minds of those who have been clamoring for the Federal Government to surrender the national forests to the individual States.

I have a very distinct recollection of the agitation that spread through the West 25 years ago, when President Roosevelt led the crusade for the preservation of the remaining national forests of the West. I recall how bitterly he was assailed at the time by the cry of those who said that he was "robbing the West of its heritage." The experience of the past quarter of a century now shows that, as a matter of fact, he was literally saving us from ourselves, by putting a check on the indiscriminate, immediate destruction of the forest lands of the Mountain States.

Only a few weeks ago I saw the same clamor arise in some portions of the West when President Hoover declared his present policy of conserving in an orderly manner the oil reserves of the West that happen to lie within Government-owned lands.

All of us present here to-day will, in the coming years, pay grateful recognition to the act of President Hoover in trying to lessen the present wastefulness in the overproduction of our great natural resource of oil, so that it may be developed in an orderly, economical way.

From all the royalties paid the Federal Government on oil, coal, and timber sales from public lands, outside the national forests, there is immediately returned to the individual States 37½ per cent for our roads and schools, 10 per cent for administration, the remaining 52½ per cent being paid into the reclamation fund.

When we talk about taking over the mineral wealth for the public-land States we automatically close down all further aid for reclamation.

We can not eat our pie and keep it too.

In our enthusiastic support of a program that we ourselves favor, we are sometimes prone to overlook an inventory of the cold facts.

The public domain was acquired by gifts from some of the older States, by purchase from foreign governments, and as indemnity from Mexico, as a result of the war of 1845-1847. No public-land State has ever added one single acre to our flag.

The mineral wealth underlying our public lands does not belong to the public-land States and never did.

Neither should we forget that the Constitution reposes in the Congress the exclusive authority to dispose of the public

lands and to adopt the rules and regulations regarding their disposal.

The President can only recommend to Congress such action as he deems wise and beneficial to the Nation as a whole, of which we of the West are an integral part.

Our only hope for bringing about the desired change in present conditions, that we believe is fraught with such big possibilities for the development of the West, is through orderly procedure and the presentation of our case in a way that will appeal to the far-seeing Congressmen and Senators from the Eastern States.

A FACT-FINDING COMMISSION

In order to bring this about the President now proposes to name a commission of 9 or 10 men, 5 of whom shall be from the public-land States of the West, to study this matter and then to make report to him of the result of their findings. Backed up by a favorable recommendation of this kind, he is of the opinion that the Congress will favorably respond by the enactment of legislation that will bring to early fruition the program outlined in his letter to you.

As members of this commission, he earnestly desires that the five western members shall include some of our biggest and best men, who are thoroughly conversant with the problem involved.

In his letter he asks that each governor submit to him two or three names from his State to help guide him in making up the list from the West.

We can accomplish nothing without mutual cooperation and leadership. I have faith to believe that out of this conference will come great good and bigger things for the future development of the great Republic to which we all hold allegiance and especially to that portion which we affectionately call "the West," with its great mountain ranges, valleys and plains, irrigated lands, undeveloped water powers, and mineral wealth.

In his letter to you the President has outlined his plan for turning over to you a great heritage. He has also pointed the way whereby the irrigation States of the West can develop their now arid lands, under their own control, to full fruition.

He has proposed a method of now cutting the Gordian knot that will free you from bureaucratic control at Washington, of which we have complained in the past.

May not we of the West, under the leadership here assembled, now confront an opportunity that if taken at its flood tide will surely lead on to bigger and better things in the years just ahead of us?

May not the President's proposals, if now met in a reciprocal spirit, easily assume the magnitude of a Magna Charta in the future development of the West?

Rural Electrification Progress on the Salt River Project, Arizona

THE rural electrification program of the Salt River project, Arizona, is now nearing completion, only the odds and ends of completing the job remaining. The work was financed by a bond issue of \$1,200,000, voted by the shareholders of the Salt River Valley Water Users' Association, and consists of nine substations located throughout the valley where the power is taken from transmission lines and transformed to 4-kilovolt, 3-phase, 4-wire current for distribution over approximately 750 miles of distribution lines. About 2,000,000 pounds of copper wire were used in the construction of the lines.

Electricity is now available at every one of the 7,000 farms on the project and service is installed upon payment of \$25 for connection charge. To date 1,950 farms have been served, with 250 more applications for power service. Farms are being connected at the rate of about 50 per week, and it is expected that before the end of the year there will be 3,000 services installed.

The use of electricity on the farms is growing in amount rapidly. The rate for combined cooking, lighting, water heating, and refrigeration is \$4 per month minimum, for which the consumer re-

ceives 55 kilowatt-hours, the next kilowatt-hour at 3 cents per kilowatt-hour, and the balance at 2½ cents per kilowatt-hour. Several hundred ranges are in use, and the number installed is growing rapidly. Electric power is used for many other purposes, including water heating, ensilage cutting, milking machines, cream separators, refrigeration, feed grinding, incubators, brooders, etc. Heating of houses is done to some extent by electricity, but only in special cases where the cost is not a prime consideration.

The average use per rural customer last year was 135 kilowatt-hours per month, with only about 900 services. It is expected that this average will be higher under the enlarged program. The association has established a merchandising department to supply electrical appliances to the shareholders and to assist them in making full use of the possibilities of electricity on the farm.

There are approximately 7,000 farms in the project, although the separate water accounts amount to over 9,000. This is accounted for by the extensive subdivision of lands into small holdings of 1 acre and less which are utilized for country homes rather than for farming purposes.

Dressing Turkeys Pays Well in North Platte District

INCREASED profits from turkey growing as the result of cooperative marketing of the dressed fowls has proved an incentive to farmers in the North Platte irrigation district in western Nebraska. Marketing dressed turkeys in ear lots is one of the most practical of cooperative marketing projects.

The growers in a county or district determine approximately the number of turkeys available for sale. Representatives of the growers get in touch with prospective buyers and receive from them sealed bids which are opened at a stated time. The entire number is then sold to the highest bidder, who then fixes the dates on which he wishes the dressed birds to be delivered. The farmers dress the turkeys the day before delivery and cool them overnight on the farms. The birds are weighed, graded, and paid for as they are delivered. The purchaser bears all

expenses and assumes all responsibility after the birds are received.

Turkey growers realize from 50 cents to \$1 for the labor of dressing. This represents from 15 to 20 per cent of the value of the turkey, and is fully three-fifths as much as the entire feed cost of raising and fattening the birds in the North Platte district. In 1927 the growers sold nearly 25,000 birds, and netted about \$18,000 for the work of dressing. At turkey-dressing time neighbors often change work, and if one grower is inexperienced he can usually get a neighbor to show him the best method of dressing the birds. Farm dressing is usually better done than in commercial establishments and buyers consider this when bidding for the turkey crop. The fact that turkeys move to market so largely just in advance of Thanksgiving and Christmas is a point favoring the cooperating sellers.

The Settlement Problem of the Vale and Owyhee Projects

An Address Before the State Reclamation Congress of Oregon, September 17, 1929

By H. W. Bashore, Construction Engineer, Vale Project

THE construction of contemplated irrigation works will make possible the delivery of water to areas of new land on the Vale project, Oregon, varying from 21,000 to 30,000 acres and to approximately 70,000 acres of new land on the Owyhee project, Oregon-Idaho, or to a total of about 100,000 acres of new land on the two projects. Of the new land on the Vale project approximately 1,200 irrigable acres are public land and the balance private land. Of the 1,200 irrigable acres of public land, approximately two-thirds are now being opened to entry. The private land was acquired by individuals a number of years ago through the operations of the homestead and desert land laws and grants were also made by the Federal Government of large areas for constructing roads for military purposes. Only one or two settlers now reside on any of the private new land of the projects. The full development of the Vale project will require from 350 to 450 settlers and the Owyhee project from 1,200 to 1,500, or a total of from 1,550 to 1,900 settlers on the new lands of the two projects.

COST OF PROJECTS

The Secretary of the Interior has entered into a contract with the Vale, Oreg., irrigation district in which the Government, in the discretion of the Secretary and contingent upon annual congressional

appropriations, agrees to expend not to exceed \$4,500,000 in the construction of irrigation and drainage works for the Vale project.

In similar contracts with the Owyhee irrigation district and Gem irrigation district and others, the Government agrees to expend not to exceed \$18,000,000 in the construction of irrigation and drainage works for the Owyhee project.

APPROPRIATIONS

The total of the annual appropriations made by Congress to cover expenditure to be made to June 30, 1930, amounts to \$2,796,000 for the Vale project and \$6,315,000 for the Owyhee project, or a total of \$9,111,000 for the two projects. The appropriation for the fiscal year 1930 for the Vale project is \$796,000 and for the Owyhee project, \$2,000,000, or a total of \$2,796,000 for the two projects; and this total is about 30 per cent of all money appropriated by Congress for Federal reclamation work for the fiscal year 1930, and about 36 per cent of all money appropriated for construction work. These relatively large appropriations for Federal reclamation work in eastern Oregon might be considered as a measure of the confidence of the Bureau of Reclamation in the soundness of the two projects.

REPAYMENT

All sums expended by the United States in the construction of the two projects are

by the terms of the contracts with the irrigation districts to be repaid by the districts, without interest, within 40 years from the date that the Secretary announces that water is available and the amount of construction charges per irrigable acre on any division of the projects.

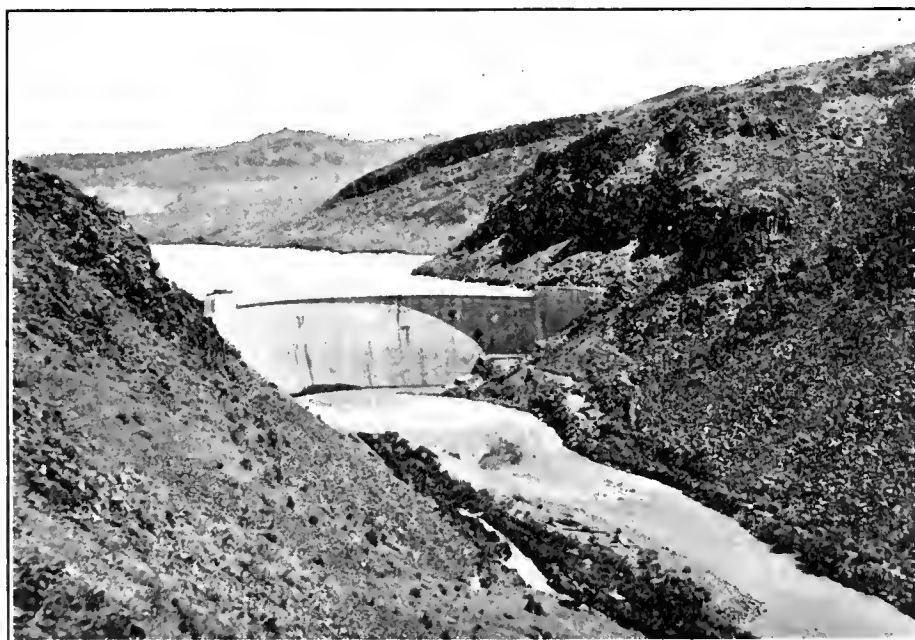
The payment of construction charges implies settlers on the land, clearing, cultivation, and the use of irrigation water in the growing of crops; and this brings us to the consideration of the problem of settlement of the projects and the probable influence of the success of settling the first units of the Vale project on the construction program of the Vale project as a whole and upon the construction program of the Owyhee project, and even on the national policy of reclamation.

CRITICISM OF FEDERAL RECLAMATION

This problem is serious on account of the erroneous impression which prevails in some quarters at this time that in the building of irrigation projects we are providing additional areas to produce crops which will come in competition with surplus crops already being produced with a tendency to further lower the price which the farmer receives on the world market. The claim is made by some that on account of the trend in population the change in exports and surplus agricultural production and the small per cent of settlement on some irrigation projects already constructed, there is no justification for further construction at present.

Statisticians have determined that the yearly number of births has decreased from 26 per 1,000 population in 1915 to 20 per 1,000 population to-day, and that the death rate has declined from 14 per 1,000 in 1915 to 11 per 1,000 to-day, or a natural increase of 12 per 1,000 in 1915 and 9 per 1,000 to-day. Economists point out that the death rate can not remain as low as 11 per 1,000, as this would give an average age of over 90 years, and they attribute the present low death rate largely to the fact that population increased mainly in the past due to immigration and that there is a much greater percentage of young people in the population now than there will be in the future.

They view with concern the probable effects on the agricultural situation of the decreasing rate of increase in population and also the decreasing number of children annually enrolled in the first grade of the public schools and some forecast a condition of stationary population in 20



Warm Springs dam and reservoir, Vale project, Oregon

or 30 years, and, if the birth rate falls much below the present level, claim that a decline in population may be expected, provided immigration does not increase.

With a decreased standard of living in the European countries and a lack of ability on their part to purchase, the exports to these countries have decreased, but this affects only directly the price of export crops. Statisticians have discovered that in the 5-year period from 1922 to 1926 combined on average prices for farm products for the 10 years preceding 1927, total farm production increased 14 per cent while population increased only 8 per cent. However, they also found that production in 1927 was less than in 1926, and in 1928 was equal to 1926, and it looks like peak agricultural production reached in 1926 is not likely to be exceeded very soon.

INFLUENCE OF IRRIGATION PRODUCTS ON WORLD MARKET

If it is true that the price which the farmer receives for his product is determined by the price of surplus crops on the world market, it may be of interest to ascertain again from statistics just what influence the production of the irrigation farmer will have on the exportable surplus. It is found that about one-fourth of the wheat grown in the United States by approximately one-third of the farmers in the United States is exported. About one-third of the tobacco crop is exported; one-third to one-half of the rice is exported; nearly 1 per cent of the corn grown is exported; but from one-third to one-half of all corn grown in the United States is fed to hogs and about one-third of the lard produced is exported. About one-half of the cotton grown in the United States by about one-third of the farmers in the United States is exported, and probably three-fourths of the farmers in the United States receive prices for their major crops determined by world markets.

With the exception of cotton, not any of the foregoing crops are the major crops of the irrigation farmer who produces alfalfa and barley to fatten cattle and sheep, dairy products, sugar beets for the production of sugar, potatoes, and fruits. Imports of beef, mutton, dairy products and wool exceed the exports. Only one-sixth of the sugar consumed in the United States is produced in the United States. It is therefore evident that the major crops of the irrigation farmer do not add to the exportable surplus or come in competition on the world market with the crops grown by at least three-fourths of the farmers in the United States. On the contrary, the irrigation farmer furnishes a market for the products of the farmers of the rain belt, and, on account of the wide distribution of these projects throughout

the West, a more uniform distribution of population is possible and a direct benefit accrues to all in the rates of corporations serving the public and in increasing the home market for the products of the industrial centers and in furnishing additional opportunities for employment and higher wages.

As long as the irrigation farmer produces crops which supply the home market his competition is beneficial and our national welfare depends on our ability to produce enough food in the United States to supply the home demand at least. Even if agricultural production increased 14 per cent from 1917 to 1926 while the population increased only 8 per cent, the opponents of reclamation will have to admit that if this 14 per cent increase could possibly have been occasioned by production on reclamation projects, it would not influence the exportable surplus except as to cotton and this not appreciably when total production is considered.

There are many other arguments to refute the unfriendly criticism against the development of irrigation projects, such as the depletion of soil fertility which has always followed the plow in the rain belt and the decreasing ability to restore fertility with the replacement of work animals with machinery, but they were very fully discussed by Mr. Stoutemyer in his paper¹ before this Congress about a year ago and do not need further comment. However, it might be added that if there is a tenant or landowner who has farmed land with depleted soil fertility in the rain belt and is producing exportable crops at a loss, a farm on an irrigation project may

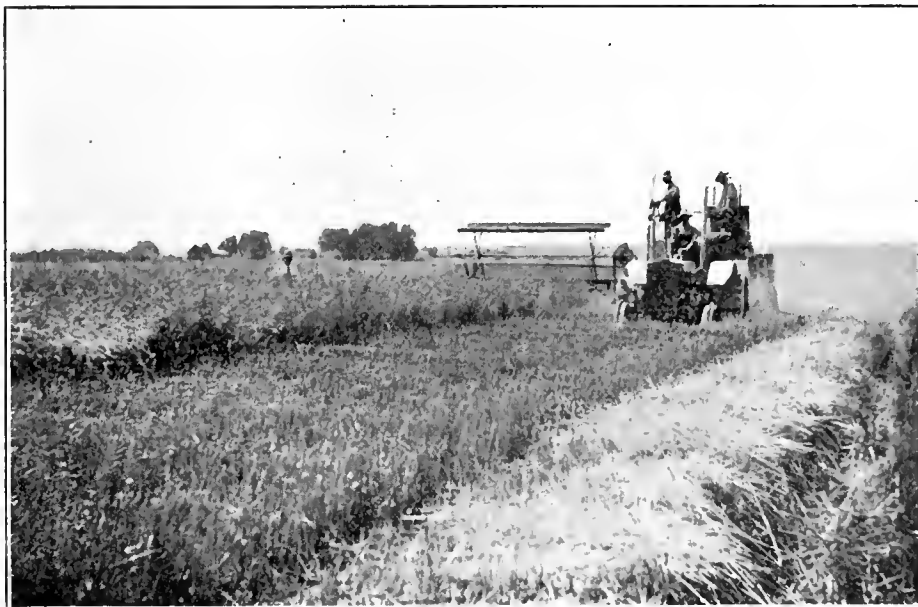
¹ Printed in Congressional Record of Dec. 7, 1928, p. 222.

give him a better opportunity to produce at a profit and will remove his export crops from competition with other surplus on world markets.

LACK OF SETTLERS ON OTHER IRRIGATION PROJECTS

The criticism that the building of more irrigation projects is unjustifiable at present because the Bureau of Reclamation is striving to get settlers on Federal reclamation projects and that some of them are probably not over 50 per cent settled, and in that case payments contemplated to be made to the Government can not be made, brings us a little nearer home and to the consideration of the most direct and serious criticism which can be made of reclamation to-day, namely, the lack of settlers on completed projects. It is true that there are some reclamation projects built 10 or 15 years ago which do not have settlers on more than 60 per cent of the land. In most cases, an analysis of the situation relative to the abandoned farms reveals that the titles are still held by owners who hope to sell out for more than the land is worth on a value determined by its probable producing ability. It is true that some purchasers paid too much for the land and that over-expansion and subsequent deflation finally caused them to quit farming and to hope for something to happen by which they might recover some of their losses.

Some settlers have failed on reclamation projects because of lack of capital in the same manner as any other business fails. Some projects or divisions of projects have in the past been built in localities where soil and climatic conditions were not favorable for success, at the insistence of the local people. However,



Harvesting wheat with a combine on the Owyhee project, Oregon-Idaho

it is believed if the abandoned farms on nearly all of these projects could be offered to purchasers at a price based on the actual producing power of the land in its present state of cultivation, that one of the most formidable obstructions in the way of settlement would be removed.

While we believe that the Vale and Owyhee projects are especially favored as to soil and climatic conditions, we can not expect that such a statement will be considered as conclusive argument that they will automatically settle promptly, as Congress and the Bureau of Reclamation have heard the stories of the exceptional opportunities of each irrigation project in the past while construction funds were being sought, which assumed a different color when payments were being requested by the Government after the projects were completed and in operation.

STEPS TAKEN BY GOVERNMENT TO ENCOURAGE SETTLEMENT ON VALE AND OWYHEE PROJECTS

As was mentioned in the beginning, Congress had already appropriated \$9,111,000 for the construction of the Vale and Owyhee projects, and the Interior Department and the Bureau of Reclamation have gone probably as far as they can under the law to encourage successful settlement, as follows:

(a) All of the raw land on the projects has been appraised at \$5 to \$15 per acre, and the owner agrees to sell for that price in case he owns more than 160 acres; and in case he owns 160 acres or less, he agrees that when he sells he will turn over one-half of the amount received over the appraised price to the irrigation district to apply as a credit on the construction

charge of the tract of land sold. This appraisal is to prevent the new settler from paying more than his land is worth. There is considerable difference between 6 per cent interest annually on \$50 per acre land and on \$15 per acre land.

(b) Congress has authorized the selection of settlers for the Government lands of the project. The applicant must have at least \$2,000 capital to have his application considered and must have the best qualifications as an irrigation farmer of any applicants for the particular piece of land desired.

(c) Farm unit plats have been published showing the irrigable area in each 40-acre tract which will receive water in 1930, and the Secretary, on August 10, announced that applications to enter public land were to be receivable beginning September 3.

(d) Bills have been introduced in Congress to provide a fund from which money could be loaned to settlers to finance building improvements on the raw lands, but such bills have not met with a great amount of support.

(e) The Bureau of Reclamation has also prepared and published maps and circulars of the Vale project and the Owyhee project which conservatively describe the features of each and furnish reliable information which concerns the prospective settler.

(f) The director of reclamation economics visited the projects on March 4, 1929, and suggested an organization for carrying out a program of settlement.

WORK DONE BY LOCAL AND STATE AGENCIES TO SECURE SETTLERS

The foregoing outline the principal activities of the Government in the settle-

ment of the projects and constitute about all that can be done by the Government under the law, except such advisory assistance as may be given by the division of reclamation economics, of which Mr. Kreutzer is the head. The problem of settling the projects is, therefore, a local one and a partial solution is required promptly as 4,012 irrigable acres in the vicinity of Harper and Little Valley will be served with water in 1930. These 4,012 acres will provide homes for 14 families on 823 acres of public land which may be acquired by compliance with the homestead laws and department regulations, and for 58 families which either own land now or will acquire it by completion of rights initiated or by purchase. There will be room, therefore, for the activities of 72 families.

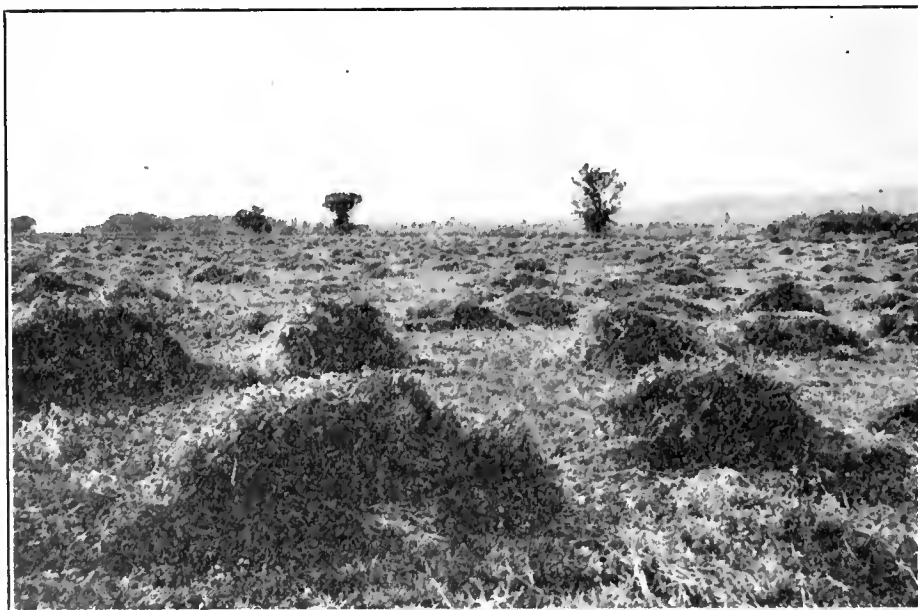
The full development of the two projects depends upon the success in colonization of the various units as they are completed; for, if settlers do not desire to locate on irrigation projects, Congress can see no good reason why some delay at least in the building program of those started will be harmful and that it may be beneficial to withhold appropriations until settlement catches up with construction, and can see no reason at all for undertaking new ones in those localities where settlement is delayed. The steps which have been taken by the local people interested in the two projects indicate that they are fully aware of the importance of settling the projects, and some of the items of work accomplished are as follows:

(a) Public meetings have been held for the purpose of organizing for carrying out a settlement program for the various units of the Vale project and of the Owyhee project.

(b) The Vale-Owyhee Government Projects Land Settlement Association was organized on March 13, 1929, and the membership of the board of directors is as follows:

J. D. Fairman, Harper, Ore., merchant, banker, and chairman of the board; Estes Morton, Harper, Ore., banker and secretary of the board; C. H. Oxman, Ontario, Ore., farmer and vice chairman; H. C. Boyer, Ontario, Ore., merchant; R. J. Davis, Nyssa, Ore., farmer; J. J. Sarazin, Nyssa, Ore., physician; E. P. Hendricks, Vale, Ore., farmer; Ike Robinette, Vale, Ore., merchant; S. D. Goshert, Nyssa, Ore., farmer and seed merchant; J. P. Dunaway, Nyssa, Ore., banker.

(c) A yearly budget to extend over a 5-year period, for advertising and other purposes of the land settlement committee, was subscribed as follows:



Alfalfa hay on the Vale project, Oregon

Harper Commercial Club.....	\$175
Vale Commercial Club.....	275
Ontario Commercial Club.....	275
Nyssa Commercial Club.....	275
Malheur County.....	1,000
Oregon State Chamber of Commerce.....	600
Total.....	2,600

(d) Ten thousand copies of a booklet descriptive of the two projects were prepared and printed and distributed. In the preparation of this booklet, the land settlement committee had the assistance of Mr. W. G. Ide, of the State Chamber of Commerce, and Mr. W. J. Martin, assistant supervisor of agriculture of the Union Pacific Railroad Co., who attended a number of the meetings.

(e) Arrangements were made for J. D. Fairman and Estes Morton to show prospective settlers over the lands in the Harper and Little Valley areas, for which water will be available in 1930.

(f) The Oregon State Chamber of Commerce is assisting in advertising the land for which water will be available by running short notices in about two dozen farm and daily papers in the States of Montana, Wyoming, Colorado, Utah, Washington, and California.

(g) The Vale, Oreg., irrigation district is paying for the services of an employee who will show prospective settlers over the Vale project.

(h) The association, through the Vale, Oreg., irrigation district, has mailed letters of inquiry to all landowners on the Harper and Little Valley areas with request that they advise if they desire to sell their land or if they intend to improve and farm it themselves.

RESULTS

The status of the settlement results of the Harper and Little Valley areas of the Vale project is as follows, and the success so far obtained in selling the private land is due largely to efforts of the local agency, the Vale-Owyhee Government Projects Land Settlement Association:

(a) Eight owners of private land have indicated their intention to farm and improve eight farms totaling 481 irrigable acres.

(b) A large number of applications have been received for the selection of the 14 available farm units of public land.

(c) Sales at appraised prices have been made to 19 purchasers of 1,129 irrigable acres of private land. At least 95 per cent of the land thus sold was owned by the Oregon & Western Colonization Co. These purchasers are mainly from Oregon and Idaho, who are familiar with conditions in the Snake River Valley.

(d) Eighteen tracts, amounting to 1,067 acres, are not for sale on account of being involved in the settlement of estates, lack of completion of fights initiated prior to

the withdrawal of the land from entry, and conformation of entries in excess of 160 acres.

(e) Thirteen tracts, covering an irrigable area of 512 acres, out of the 58 tracts previously mentioned, are available for sale at this time.

(f) While the main object has been the settlement of the Harper and Little Valley areas, there have been a number of people visit the project who are not ready to begin farming in 1930 or who, for various reasons, prefer land on other parts of the project, and sales of about 1,200 irrigable acres have been made to 14 purchasers from the States of Kansas, Utah, Colorado, Montana, Illinois, and West Virginia, from other points in Oregon, and from Canada.

(g) Hundreds of letters of inquiry have been received and answered by the various civic and commercial organizations and many people have visited the projects who expect to return later and purchase a location for a home.

SUGGESTIONS FOR SECURING ADDITIONAL SETTLERS

(a) The Vale-Owyhee Government Projects Land Settlement Association has accomplished some very creditable and commendable results and has laid the foundation for future accomplishments, but this organization must be kept active and must have funds with which to work.

(b) In order that the incoming settlers may be enabled to more quickly place their farms on a producing basis, the communities, through the Vale-Owyhee Government Projects Land Settlement Association, might work for the passage of legislation which would provide a

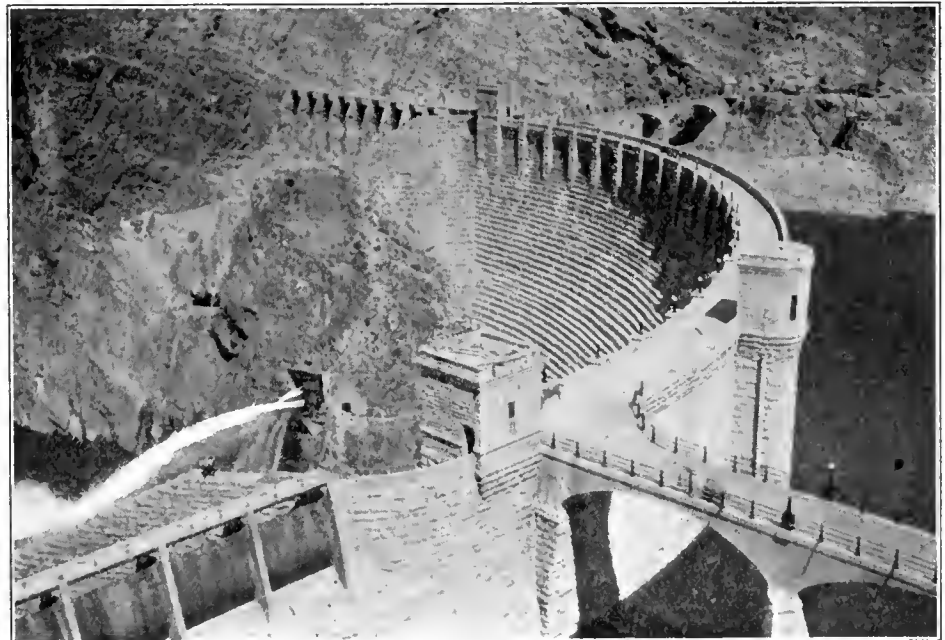
modest appropriation for financing settlers in the improvement of their farms.

(c) If Federal assistance in this connection is not considered necessary or acceptable, consideration might be given to forming a local finance corporation for assisting settlers in improving their lands.

Applications for Power at Boulder Dam

The Department of the Interior on September 10 sent out notices to all prospective purchasers of power to be generated at Boulder Dam that their applications for such power must be filed with the department in Washington not later than October 1. The parties concerned are principally municipalities in the lower Colorado basin, including the States of Arizona, California, and Nevada. The notice was as follows:

Notice is hereby given that all prospective purchasers of power to be generated at the proposed dam on the Colorado River, the construction of which is authorized by the Boulder Canyon project act of December 21, 1928 (48 Stat. 1057), should file applications therefor with the Secretary of the Interior, Washington, D. C., not later than October 1, 1929. Applications should state the quantity of power desired and should contain a general statement concerning the purposes and place of use of the power covered by the application, with such other information as may be considered necessary. The early submission of applications is desirable in order that a decision may be reached concerning the allotment of the power to be made available by this development.



Roosevelt dam, Salt River project, Arizona, showing taintor gates



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Assistant to the Commissioner and Associate Editor New Reclamation Era



Club Activities of Juniors on Federal Reclamation Projects

THE September issue gave an account and illustrations of the live Junior club activities on the Uncompahgre project, Colorado.

Shoshone Project, Wyoming

Juniors on this project vie for honors.

BOYS' CLUB WORK

This is in charge of Mr. A. Fellhauer, assistant county agent, who is shown in the group of four comprising the stock judging team of the club.

Mr. Fellhauer came to the project in August from the University of Wyoming, where he had been graduate assistant in the animal husbandry department. He taught stock judging and assisted with the university stock-judging teams. Consequently when he took charge of the work here he immediately gave the club members regular instruction and practice in judging livestock.

Five boys' 4-H clubs were organized in May and about 33 boys carried the work through the summer. Of these 21 entirely completed the work by turning in their records and stories. The sheep club was composed of 6 members, the dairy calf club 8 members, the poultry club 6 members (2 were girls), swine or pig club 8, and potato club 5 members.

No purebred livestock was used or available at prices that the boys could or

were willing to pay, except two pig club boys who each had a registered Duroc sow. One of these raised a ton litter. However, at the State fair the assistant agent purchased a registered Corriedale buck for Allan Swallow, sheep club member. In this way it is hoped to gradually work into better livestock for the clubs and the flat.

Regular club meetings were held through the summer except during the rush seasons, when the boys often could not attend. Meetings were scheduled twice a month for each club, at which time the local leaders and assistant agent gave the clubs instructions or information on their projects. Picnics were held from time to time.

The county fair was held the last of August, so there was not much time after the arrival of the assistant county agent on the project to prepare for it. Also only three demonstrations were prepared on account of lack of time. The Dairy Club prepared a demonstration on the production of clean milk, but at fair time one of the members was sick so this demonstration could not be given. The Potato Club gave a demonstration on potato diseases and their control. The Poultry Club gave a demonstration on feeding hens for increased egg production. The Potato Club team was adjudged winner and won the right to participate at the State fair held at Douglas, September

18-22. Hubert Hart and Joe Reis were on this team.

A judging contest was held at the county fair and a team of three boys, namely, Luther Moore, Allan Swallow, and Paul McLaughlin, were picked to go to the State fair and compete in the judging contest there. (See photograph.)

Sixteen club (boys) members exhibited at the county fair and competed for the prize money allowed for club work by the county and farm bureau. The county offered \$200 as prize money for boys and girls and the County Farm Bureau added \$100 to this sum in order to have more liberal prizes. This prize money is a real stimulant to do more and better club work by the boys and girls.

The stock-judging team took first prize at the State fair. In competition with eight other county teams they won the King Bros. trophy and a banner given by the fair for taking highest honors. Allan Swallow made 513 points out of a possible 600 and was second high individual of the contest. Paul McLaughlin made 474 points and Luther Moore made 464. Two of the boys were 13 years of age and the other 14, and they were rather skeptical about their chances of winning when they saw some of the older and bigger teams with which they had to compete. However, the Park County team (members are all from the project) was high and won the right to represent this State at the contest at the National Western Stock Show at Denver last January.

The achievement program for 4-H boys and girls was held in the Powell High School, October 19. Following is a copy of the program which may give an idea of what took place:

Picnic supper at 7 p. m. in the gymnasium.

Program upstairs in the auditorium at 8 p. m. (Mrs. J. R. Northrup, chairman).

Program to consist of the following:
Singing of club songs, led by Mr. Marston.

Club work in relation to the community, Mr. Earl Murray.

Club stunts, by the different clubs.
Model club meeting, by Mrs. Northrup's club.

Kitchen textiles, demonstration.
The girl's trip to the State fair, Viola Krause.

More club stunts, by the different clubs.
Two-minute talks, by the club leaders.
Our trip to the State fair, Paul McLaughlin.



Left to right: A. Fellhauer, assistant county agent; Luther Moore, Allan Swallow, Paul McLaughlin

Club work in Wyoming, Mr. B. W. Marston, State club leader.

Presentation of charters and pins.

A notable achievement of the year was that of Raymond Cles, a 14-year-old second-year pig club boy, who raised a ton litter from his Duroc sow in six months. The litter weighed 2,145 pounds. The sow farrowed 11 pigs and Raymond saved and raised 10 of these. During the gestation period the sow was on alfalfa and sweet clover pasture and was fed ground oats and skim milk. After farrowing she was fed a slop made of middlings, and ground wheat and barley were gradually added to the oats. Raymond grew and fattened the pigs, after weaning, on ground wheat, barley, and skim milk, and allowed them on sweet clover pasture. Raymond's record showed that he made \$118 on his litter, and in addition won \$22.50 in prize money at the county fair.

In January of this year the State champion stock-judging team went to the Denver contest at the stock show. They stopped off at the University of Wyoming and worked over some of the university livestock. Only three 4-H club teams were at the show to take part in the contest on January 12. The Colorado team took first, Wyoming second, and New Mexico third. The Wyoming team was high on reasons but fell down badly on placings. The Powell Farm Bureau, the County Farm Bureau, and the Powell Chamber of Commerce donated money to defray the greater part of the expenses of sending the team to Denver. The boys were in Denver a week, during which time they were shown about town, the park, the museum, and other places of educational value and interest.

GIRLS' CLUB WORK

This is in charge of Miss Marjorie Eells, home demonstration agent. Miss Eells states club work means much to the girls in Park County. Last summer 101 of them were enrolled; 53 in food clubs, 48 in clothing clubs, and about 80 of them completed the required work and sent in their records and stories. There were two clubs in the upper part of the county, at Sage Creek and North Fork; the rest were on the Powell Flat.

The home demonstration agent enrolled the members in May through the schools. Local leaders were then selected for each club and the clubs were organized by the end of the first week in June. There were first, second, third, and fourth year sewing clubs; each club had their work definitely outlined and each girl made four or five articles. The first year work is very simple and starts with hand sewing on an apron or bag, darning, machine sewing,

and ends with a dress or nightgown. The second year includes three articles of underwear and a dress; the third and fourth year girls take up work with silk and wool materials and tailored finishes for dresses and coats and household linens and curtains.

In the food clubs the girls start in with the simplest of foods and learn how to prepare toast and cocoa well, then take up fruits, cereals, eggs, milk dishes, table service, biscuits, cookies, and picnic menus. The second and third year girls take up more difficult work, which includes breads, cakes, desserts, canning, preserving, and pickling, also the canning of meats. The clubs meet once a week or in some cases once every two weeks with their leader and take up the work assigned for each meeting. They conduct regular business meetings with officers and committees, which gives them splendid business training and experience. The afternoon ends with a recreation period, which is planned by a committee, and refreshments are served, though some of the clubs dispense with this.

The social training and the art of conducting good business meetings is a valuable part of the club work in training for future leadership.

Last year Miss Birdseye, national nutrition specialist from Washington, D. C., was in the county and gave the club girls one day for special health work, including singing of club songs, health games and stunts, and contests in which the girls were divided into three squads and weighed, measured, checked up for proper posture, and prints taken of their feet. Some of the groups made the health work a part of their regular program and spent some

time at each meeting on posture exercises and games.

Each club girl was required to take part in a demonstration showing some practice they had learned in club work. They gave their demonstration before their own club members and the mothers and the best team from each club was selected to enter the county competition. This was given at the county fair in August and here the best county team was chosen to go to the State fair at Douglas. Last year Mrs. Lloyd Krause's team of third year food club girls, Ruth Miller and Viola Krause, won in the county contest on a demonstration in salad making.

The club puts up good looking and worth-while exhibits of both clothing and food club work at the county fair, and sent seven dozen jars of canned goods and 10 complete clothing exhibits to the State fair.

County club achievement day was held the evening of the 19th of October at Powell, at the Powell High School, with a picnic supper, followed by a program which was presided over by Mrs. J. R. Northrup, county club leader, and included talks by Mr. Marston, State club leader, and Mr. Earl Murray, a model business meeting by one of the clubs, a demonstration on kitchen textiles by another, and also talks by the leaders and presidents of the various clubs, and ended with the awarding of charters to 11 clubs and pins to 70 girls.

With such a showing of the training of the young girls on our projects we can look in the future with optimism as to the type of homemakers the combination of this club work, good home environment, and encouragement will develop.



Flower exhibits from the camp at the Owyhee dam take prizes at Nyssa Flower Show

Aided and Directed Settlement in Australia

THE State Rivers and Water Supply Commission of East Melbourne, Victoria, Australia, has furnished the following information regarding the development of irrigation projects in that State:

In order to induce settlement and assist the newcomer on an irrigation project the commission has undertaken to subdivide into holdings of suitable size the land acquired for irrigated closer settlement, and the land is fenced and served to the highest part of each farm unit with a water channel. As a further attraction to the prospective settler a house of four or five rooms is erected on the holding in order that the successful applicant may be able to take immediate possession. In some instances before occupation the holdings are plowed, graded, and planted to alfalfa, but this practice is not universal, and there is a general tendency on the part of the settlers to dispute the cost and general lay-out of the alfalfa stand after entering the occupancy.

Irrigation holdings are disposed of on a conditional purchase lease extending over a period of 36½ years, the purchase money being repayable in 73 half-yearly instalments consisting of 5 per cent interest and 1 per cent sinking fund per annum. A successful applicant is required to deposit 3 per cent of the capital value of the land when he takes possession, and thereafter meet instalments as they fall due.

The settlers are instructed in the best methods of laying out and developing their farms and erecting improvements by a farm supervisor, each irrigation district

having a resident engineer and one or more farm supervisors, as the district may require. The supervisor is required to report regularly to the commission regarding the progress of each settler, and also to report on applications of settlers for financial assistance to develop their holdings. The cost of this service was originally met by the difference between the current rate of interest and the 5 per cent charged on land and advances. However, as the interest rate on borrowed money is not too high to allow a profitable margin for administration, the matter of increasing the rate charged to settlers is under consideration.

During the first six years there is a statutory limit of advance against any one holding of \$3,125, the amount advanced varying with the class of farm, although in some cases, particularly in the dried-fruit areas, it has been necessary to exceed this sum. After six years, however, the act permits advances up to \$5,000.

The commission may advance as much as 80 per cent of the value of the improvements effected and 100 per cent on the security of stock and implements for the purchase thereof. The rate of interest is 5 per cent, the advances on improvements being for a period of 20 years and on stock and implements 5 years.

More than \$11,000,000 has been advanced for land settlement in irrigated closer areas in the State, of which slightly more than \$8,000,000 represents the capital value of the land disposed of and \$3,000,000 the amount advanced for improvements, stock, and implements.

Italy Plans Large Reclamation Program

The plan for reclamation, irrigation, and land improvement in Italy, which went into operation on July 1, provides for the following expenditures:

	Lire
Reclamation.....	4, 500, 000, 000
Irrigation.....	1, 000, 000, 000
Land improvement.....	1, 000, 000, 000
Potable water.....	200, 000, 000
Total.....	6, 700, 000, 000

Of this sum the State will provide 3,800,000,000 lire in 30 annual installments which will be discounted through the Associazione Nazionale delle Bonifiche, the balance being met by landowners in 30 annual installments.

Of Italy's total agrarian area of 28,500,000 hectares, the area to be improved amounts to 3,500,000 hectares or 12.33 per cent.

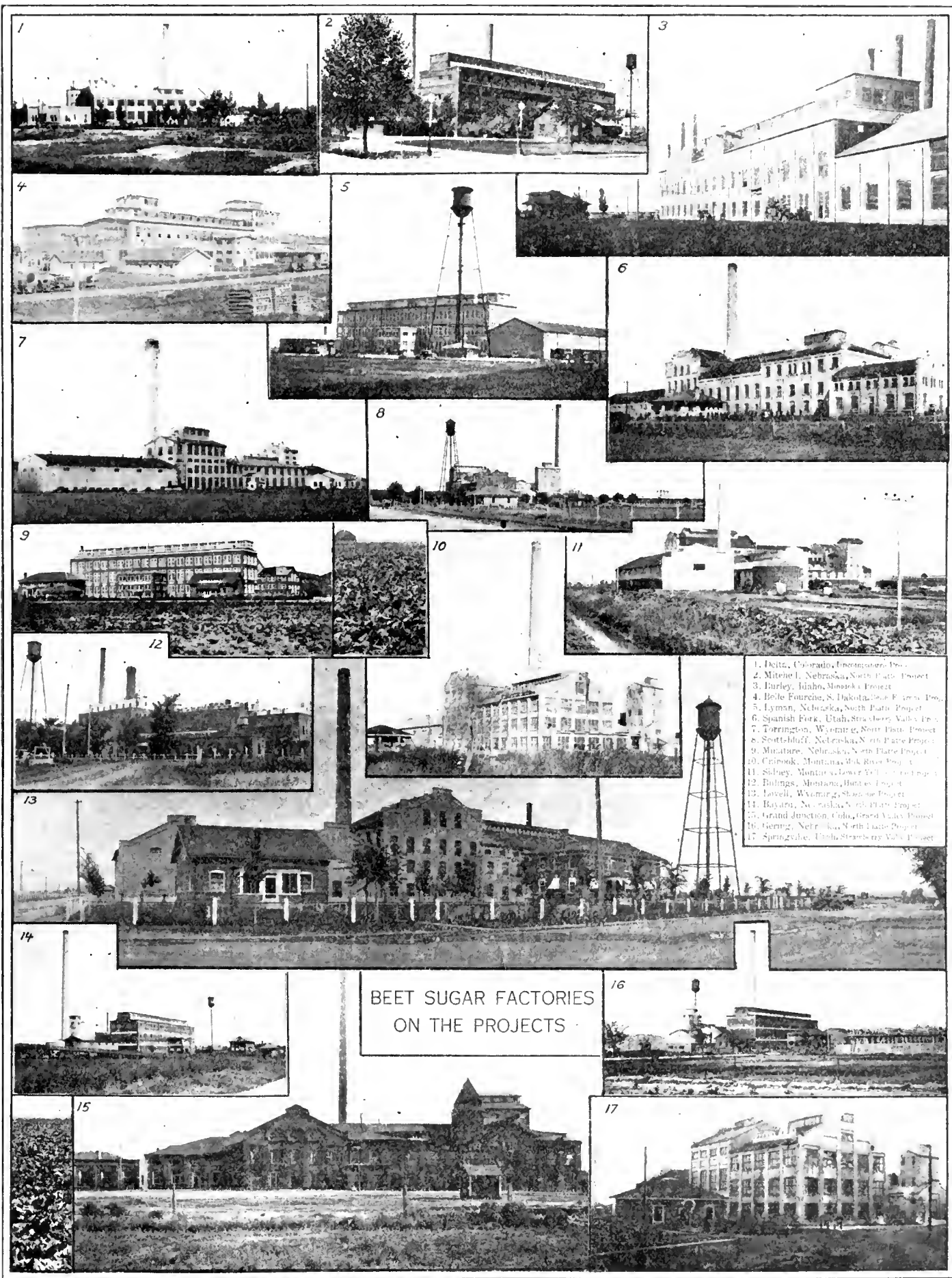
The Associazione Nazionale delle Bonifiche is an organization created under the auspices of the government in connection with Mussolini's vast program of reclamation. It is presided over by ex-Minister of Finance De Stefani, and is reported to be doing much good work in advising landowners and farmers, and arranging for loans on properties represented by consortiums of landowners.

A CONTRACT has been awarded for the construction of a potato meal plant at Burley, Minidoka project. The plant will cost \$100,000 for the initial installation, will operate 10 to 12 months per year, and will employ 25 men.

BEEF SUGAR FACTORIES ON THE FEDERAL RECLAMATION PROJECTS, 1928

Project	Location of factory	Rated daily capacity (tons of beets)	Tons of beets purchased 1928	Amount paid for beets	Pounds of sugar produced	Acreage of sugar beets on specified projects, 1928	Tons of beets produced on specified projects, 1928	Value of beets to water users 1928
Grand Valley, Colo.....	Grand Junction.....	950	35, 400	\$247, 803	8, 037, 500	1, 089	10, 452	\$73, 044
Uncompagire, Colo.....	Delta.....	950	44, 000	300, 000	15, 000, 000	2, 906	25, 085	175, 595
Minidoka, Idaho.....	Burley.....	800	19, 542	146, 560	5, 100, 000	1, 733	16, 718	125, 385
Huntley, Mont.....	Billings.....	2, 750	188, 959	1, 417, 190	60, 092, 600	2, 700	27, 000	202, 500
Milk River, Mont.....	Chinook.....	900	31, 880	223, 160	8, 823, 000	686	5, 575	39, 025
Lower Yellowstone, Mont.-N. Dak.	Sidney.....	1, 200	50, 394	352, 758	13, 347, 500	5, 825	44, 666	312, 662
North Platte, Nebr.-Wyo.	Torrington.....	2, 200						
Do.....	Scottsbluff.....	2, 000						
Do.....	Gering.....	1, 200						
Do.....	Bayard.....	1, 300	1, 100, 000	7, 735, 592	320, 000, 000	41, 271	479, 109	3, 425, 630
Do.....	Mitchell.....	1, 300						
Do.....	Minatare.....	1, 300						
Do.....	Lyman.....	1, 300						
Belle Fourche, S. Dak.....	Belle Fourche.....	1, 500	124, 475	\$71, 325	30, 000, 000	6, 929	83, 974	608, 811
Strawberry Valley, Utah.....	Spanish Fork.....	1, 275	61, 105	427, 735	20, 000, 000	3, 082	30, 006	252, 042
Do.....	Springville.....	550	28, 008	203, 867	7, 503, 000			
Shoshone, Wyo.....	Lovell.....	1, 000	116, 380	872, 873	20, 535, 000	4, 911	48, 997	367, 477
			1, 800, 143	12, 789, 863	508, 438, 600	171, 132	777, 582	5, 582, 171

¹ In addition sugar beets were grown to a minor extent on 4 other projects on 118 acres, producing 783 tons, valued at \$10,811.



1. Delta, Colorado, Upper Missouri Project
2. Mitene I, Nebraska, North Platte Project
3. Burley, Idaho, Moscow Project
4. Belle Fourche, S. Dakota, Great Plains Project
5. Lyman, Nebraska, North Platte Project
6. Spanish Fork, Utah, Strawberry Valley Project
7. Torrington, Wyoming, North Platte Project
8. Scottsbluff, Nebraska, North Platte Project
9. Minature, Nebraska, North Platte Project
10. Culbrook, Montana, Lower Yellowstone Project
11. Sidney, Montana, Lower Yellowstone Project
12. Billings, Montana, Huntley Project
13. Lovell, Wyoming, Snake River Project
14. Bayard, Nebraska, North Platte Project
15. Grand Junction, Colo., Grand Valley Project
16. Gering, Nebraska, North Platte Project
17. Springville, Utah, Strawberry Valley Project

BEET SUGAR FACTORIES
ON THE PROJECTS

Reclamation Organization Activities and Project Visitors

DR. Elwood Mead, Commissioner of Reclamation, and Miss Mae A. Schnurr, assistant to the commissioner, returned to Washington, D. C., on September 14 after a month's absence largely in attendance at a joint meeting of the American and Mexican sections of the International Water Commission in Mexico City. Doctor Mead is chairman and Miss Schnurr secretary of the American section.

D. C. Henny, consulting engineer, of Portland, Oreg., has been authorized to represent the Bureau of Reclamation at the World's Engineering Congress, which is to convene in Tokyo, Japan, October 29, 1929.

Ralph Lowry, construction engineer, assigned to the Gibson Dam, Sun River project, has reported for duty at the Denver office. After completing the feature history report on Gibson Dam he will work on designs and estimates for the proposed Cle Elum Dam, Yakima project.

Dr. Fredrik Vogt, consulting engineer, is returning to Norway to take up his regular work as assistant to the professor of applied mechanics, Norwegian Institute of Technology. Doctor Vogt was employed by the bureau in experimental and investigational work connected with the design of arch dams, the larger part of the work being carried on in cooperation with the Engineering Foundation Arch Dam Committee and the University of Colorado.

C. A. Bissell, engineer in charge of the engineering division of the Washington office, spent several days in the Denver office and then left to take charge of investigations of Red Bluff Reservoir, Tex.

Conferences were held at Denver during the month with representatives of the various interests which desire to obtain power from Boulder Dam, at which the question of allocation of power and the value of power at Boulder Dam was determined by the cost of substitute steam power, was discussed. A committee was appointed to make a study of the value of power at Boulder Dam, consisting of H. A. Barre, chief engineer of the Southern California Edison Co.; E. F. Scattergood,

chief electrical engineer of the Los Angeles Bureau of Power and Light; and L. N. McClellan, electrical engineer of the Bureau of Reclamation.

Estoppel to Question Government's Claim

On June 14, 1915, the Bridgeport irrigation district entered into a Warren Act contract with the United States for the purchase of a water supply from Pathfinder Reservoir, North Platte project. The contract was not authorized by a vote of the electorate of the district. The district paid the amounts due under the contract for the years 1915 to 1919, but failed to make the construction charge payments due under the terms of the contract for the years 1920 to 1924, amounting to \$54,334. Suit was brought by the United States to enforce collection. To the Government's complaint the district answered that the board of directors did not, under the Statutes of Nebraska, have the authority to execute the contract, unless authorized to do so by a vote of the electorate of the district. The Government demurred. On July 15, 1929, the District Court of the United States for the District of Nebraska held that the district board of directors was authorized, without an election, to make the contract under sections 3465 and 3466, Revised Statutes of Nebraska, 1913, and under chapter 69 of Nebraska Session Laws, 1915, amending section 3466. Furthermore, the court held that the defendant was estopped, by reason of its long delay to assert the claim of its answer against the Government. The court cited the following cases as upholding the contention of the United States: *Oshkosk v. Fairbanks, Morse & Co.*, 8 Feb. (2) 329; *N. Y. Trust Co. v. Farmers Irr. Dist.*, 280 Fed. 785; *State v. Gering Irr. Dist.*, 192 N. W. 212; *Gas Securities Co. v. Antero, etc., Co.*, 259 Fed. 423; *Omaha Gas Co. v. City of Omaha*, 249 Fed. 350; *Village of Davenport v. Meyer Hydro Elec. Co.*, 193 N. W. 719; *Central Power Co. v. Central City*, 282 Fed. 998; *Slocum v. North Platte*, 192 Fed. 252; *Rogers v. City of Omaha*, 80 Neb. 591; 107 N. W. 214; *Vicksburg v. Vicksburg Water Co.*, 206 U. S. 496; *Ohio & M. R. Co. v. McCarthy*, 96 U. S. 258; *Wyman v. Searle*, 128 N. W., 801; 23 C. J. 102, sec. 1901; *U. S. v. West Side Irr. Co.*, 230 Fed. 284; 246 Fed. 212; *U. S. v. Ramshorn Ditch Co.*, 254 Fed. 842.

C. S. Seofield, of the Department of Agriculture, and W. P. Kelley, of the experiment station of the University of California at Riverside, visited the Grand Valley and Uncompahgre projects recently to examine alkali conditions on the projects.

B. E. Hayden, reclamation economist, is on the Milk River project in charge of the survey for the possible elimination of temporarily unproductive lands in the Chino division.

E. R. Scheppelmann, chief clerk of the Lower Yellowstone project, returned to duty on September 1 after an absence of three months on account of illness.

Division Engineer Moberly and Assistant Division Engineer Petersen, of the Oregon Short Line Railroad, spent a day on the Vale project looking over the proposed wasteway crossings under the tracks of the railroad.

J. R. Iakisch, drainage engineer, spent several days on the Belle Fourche project to consider drainage problems and to confer on the procedure for the 1930 construction work.

Sr. Luciano Jacques de Moraes, of the Brazilian Department of Agriculture, visited the Yakima project recently and was shown its most interesting features.

L. J. Postisil, mechanical engineer, Washington Water Power Co. of Spokane, Wash., was a recent visitor at Guernsey Dam, North Platte project. He was particularly interested in the 50 by 50 foot sluice gate in the north spillway.

Barry Dibble, former project manager of the Minidoka project, was a recent visitor on the project.

H. R. McBirney, engineer in the Denver office, spent several days on the gravity extension unit of the Minidoka project studying local conditions in connection with the design of structures, applicability of canal gradients, sections, etc.

John G. Heinz, a former employee of the bureau on the Yakima project, visited the Klamath project recently.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

Jos. M. Dixon, First Assistant Secretary; **John H. Edwards**, Assistant Secretary; **E. C. Finney**, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary and Budget Officer;
Northcutt Ely and **Ernest W. Sawyer**, Executive Assistants

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Assistant to the Commissioner P. W. Dent, Assistant Commissioner George C. Krentzer, Director of Reclamation Economics
W. F. Kubach, Chief Accountant C. A. Bissell, Chief of Engineering Division Hugh A. Brown, Assistant Director of Reclamation Economics
C. N. McCulloch, Chief Clerk

Denver, Colorado, Wildo Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand O'Hutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....	J. P. Siebebeicher.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	W. L. Vernon.....	B. E. Stoutemyer.....	Portland, Ore.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	W. J. Chiesman.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....					
King Hill ³	King Hill, Idaho.....					
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....				R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubble.....	Virgil E. Hubble.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.....				B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Owyhee, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Fiock.....	Henry H. Berryhill.....		H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	Erle W. Shepard.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt Lake Basin.....	Salt Lake City, Utah.....					
Salt River ⁸	Phoenix, Ariz.....					
Shoshone ⁹	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....		E. E. Roddis.....	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah.....					
Sun River ¹¹	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹²	(Irrigon, Oreg.....					
Uncompahgre.....	Hermiston, Oreg.....					
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
Yuma.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹³	C. F. Williams.....		J. R. Alexander.....	Montrose, Colo.
Kititas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....		B. E. Stoutemyer.....	Portland, Oreg.
Sun River, main canal construction.....	Fairfield, Mont.....	A. W. Walker ¹³			E. E. Roddis.....	Billings, Mont.
Boise project, Deadwood Dam.....	Cascade, Idaho.....		C. B. Funk.....		B. E. Stoutemyer.....	Portland, Oreg.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927. E. E. Lewis, manager.

³ Operation of project assumed by King Hill Irrigation District on Mar. 1, 1926. F. L. Kinkade, manager.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926. D. S. Stuver, manager.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928. Joe C. Iddings, manager.

⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917. C. C. Cragin, general superintendent and chief engineer.

⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926. Lee R. Taylor, manager.

¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926. A. C. Houghton, manager; and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926. Enos D. Martin, manager.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
All-American Canal investigations.....	Yuma, Ariz.....	H. J. Gault.....	Arizona and New Mexico. State of Utah
Oila River cooperative investigations.....	Safford, Ariz.....	C. C. Fisber.....	
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	
Yakima project extensions.....	Yakima, Wash.....	P. J. Preston.....	
Alcova-Casper and Saratoga projects.....	Casper, Wyo.....	J. R. Iakisch.....	



THE HARVEST

NEW RECLAMATION ERA

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NO. 11



WATCHFUL WAITING

THESE THANKSGIVING AND CHRISTMAS BIRDS ARE BEING GROWN IN INCREASING NUMBERS ON THE FEDERAL IRRIGATION PROJECTS



COOPERATION

“COOPERATION among farmers, whether for marketing, for obtaining credit, or for the purchase of farm supplies, aims at providing a means whereby farmers may strengthen their economic position. Through cooperative marketing and purchasing, the farmer becomes a joint owner in large-scale business units which are directed toward rendering farm production and the distribution of farm products more efficient. Farmers, through cooperative organization, aim to eliminate waste, to improve the grading and standardization of farm products, to handle and distribute farm products efficiently, and to promote better production practices—in short, to achieve more efficient production and marketing. Cooperative organization also aims to improve the most important part of rural life, human relationships—to encourage the development of greater social unity in a community and an occupational consciousness and pride on the part of the farm population.”

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

RAY LYMAN WILBUR
Secretary of the Interior

Price 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

November, 1929

No. 11

Interesting High Lights on the Federal Reclamation Projects

THE new creamery located in Worden, Huntley project, has averaged 250 pounds of butter per day. The cheese factory opened recently at Ballantine has had an output of 100 pounds of cheese per day.

AVERY creditable showing of flowers was made recently at the public exhibit by the Mesa County Improvement Association, Grand Valley project. The exhibit included all fall flowers and filled the city auditorium. Prizes were offered for many varieties from funds provided by the local civic and business organizations.

AT the close of September 25 farms on the Orland project, with an aggregate area of 825 acres and an appraised value of \$97,500, had been placed under option to the United States for another period of 12 months, ending December 31, 1930. These farms will be sold to settlers on amortized payments over a period of 20 years.

SIX applications had been received on the Vale project to the end of September for the selection of seven farm units of public land, embracing 525 irrigable acres of the total of 823 irrigable acres opened to entry recently. Sales at appraised prices have been made to 24 purchasers of 1,398 irrigable acres of private land. Clearing and plowing are in progress on a number of the tracts of the Harper and Little Valley units.

THE Langell Valley cheese factory, Klamath project, has begun operations and at the end of the month was receiving 2,200 pounds of milk daily.

SEVERAL prospective settlers were shown over the Riverton project recently. Two applications for farm units were received and one applicant made homestead entry.

IT is estimated that the 76,000 acres of sugar beets in the North Platte Valley will average about 12½ tons per acre, for which the growers will be paid about \$6,650,000.

COUNTY fairs were held at Glasgow, Dodson, and Chinook, Milk River project, and in each instance the exhibits from the irrigated project land were outstanding. A large scale model of an irrigated farm was displayed by the county agent and attracted a great deal of favorable attention.

LOCAL officials of the Milwaukee Railroad visited the Sun River project recently and met the commissioners of the irrigation district for the purpose of securing their ideas as to settlement problems and to advise them that the railroad was ready to help in any way possible. An effort will be made to secure options on land at reasonable prices and terms of sale.

THE recent sale of Yuma County road bonds has inaugurated a program of road construction and improvement which will be of considerable value in the further development of Unit B, Mesa division of the Yuma project, Arizona.

A PLAN for furthering the development of the pecan industry in the Yuma Valley has recently been placed before the investors of the community. One of the pioneers of the industry on the Yuma project has agreed to donate his services in bringing a tract of pecans into bearing, turning the trees over to the purchaser at the end of a 5-year period.

SETTLERS in the Tule Lake division of the Klamath project have organized the Tule Lake Hay Growers' Association preparatory to handling next season's crop of hay.

THE Mini-Cassia Dairymen's Association, Minidoka project, has installed a new drying machine at its Burley casein plant and is shipping out the finished product in carload lots. Plans are being developed for the establishment of a similar plant at Rupert.

GOOD progress is being made on the erection by the Pecos Valley Alfalfa Mill Co., of Hagerman, N. Mex., of an alfalfa meal mill near Rupert, Minidoka project. The plant is expected to be in operation at the end of the year.

THE Cassia County Free Exhibits Fair was held recently at Burley, Minidoka project. Notable displays of dairy stock and products, sheep, and swine were presented, as well as a number of fine community exhibits, showing the wide variety and high quality of farm products grown in this locality.

A SPRAY painting firm has been busily engaged painting old farm buildings on the Belle Fourche project, and already a much improved appearance is noticeable.

THE contract was signed recently for developing recreational grounds at Belle Fourche Reservoir, and plans are being made to construct irrigation facilities so that plantings may be made next spring.

THE Santa Fe Railroad reports that 313 cars of household goods were received in the Mesilla Valley, Rio Grande project, during the first six months of 1929 compared with 119 cars for the same period last year.

THE Irrigon school band, West Extension, Umatilla project, furnished the music for the rodeo held recently at Heppner, Oreg.

Federal Reclamation—Its Achievements and Needs

Address before Western Section, United States Chamber of Commerce, Ogden, Utah, October 1, 1929

By Dr. Elwood Mead, Commissioner of Reclamation

DURING the 27 years of its operation the Federal reclamation policy has brought into profitable use nearly 3,000,000 acres of idle land and conserved the flow of a score of rivers that would have otherwise been wasted. It has made possible the founding of many thousands of contented and prosperous homes where without it there would be barren and lonesome deserts. More than half a million people live within the boundaries of its completed projects. A million people will live in comfort within the limits of those being constructed. On much of this reclaimed area jack rabbits and coyotes would be the principal inhabitants if Theodore Roosevelt and his farseeing associates had not framed this beneficent act.

The primary purpose of this legislation is to bring about the use of resources which would otherwise be untouched and to give to these isolated communities which have undertaken to subdue the desert, equal opportunities with those where Nature has been kinder and where large outlays for reclamation are not required.

The aid thus given is not discrimination. In no instance has it gone beyond what is needed to enable frugal, hard-working, worthy people to create homes. Sometimes it has not gone that far. In

not a single instance has the Government usurped the place of private enterprise, but more than half its projects are where private enterprises have been salvaged. They needed its reserve of resources and continuity of purpose not possible where interest has to be paid on stocks and bonds.

Carrying out this purpose has required the building of works which are among the greatest of their kind. The Reclamation Bureau is recognized the world over as a leader in advancing engineering knowledge and in improving irrigation practice. This does not mean that all the problems of reclamation have been solved. On the contrary, the economic and social conditions of the arid West are so radically different from those the original act was framed to meet that changes in legislation have not kept pace with them. The friends of reclamation, from President Hoover down, are seeking to ascertain what should be done to bring this policy into harmony with present economic and social requirements. In this effort it welcomes the attention and assistance of the able organization which to-day is considering its problems. Such an organization gives the right background for studying the problems and appreciating the achievements of Federal reclamation and for combating the aggressive but

mistaken propaganda which in recent months has been carried on against continuing this policy.

ECONOMIC VALUE OF FEDERAL RECLAMATION

Before discussing the economic problems of future reclamation I propose to show the great national advantages of this policy in the past and the imperative need for its continuance in the future.

When we attempt to appraise the value of Federal reclamation we must consider the conditions of the region where it operates. Shown on a map, the 24 widely scattered areas of land irrigated from Federal works are only a series of dots in the billion acres of the 15 States. They are made important by what surrounds them. They are still more insignificant when compared with nearly a billion acres of farm land in the whole country. The value of Robinson Crusoe's goat was not measured by its size but by the overwhelming need for a goat. So the value of the reclamation projects is not measured by their size but by the need of the States where they are located for irrigated land and irrigated crops.

FEDERAL RECLAMATION IN ARIZONA

The State of Arizona has two Federal projects. What have they done to make that State solvent and prosperous? For one thing, they have made Phoenix a beautiful and rich city. Its stores, its fine homes and costly hotels are as much the creation of irrigation as the orange groves and cotton fields watered from the canals of the Salt River project. Without the agricultural and economic background which the great irrigation district gives, this city would be little more than a whistling station on the railroad. It is a great business center because it is an attractive place for winter tourists, because its mines are kept open by the cheap food supply that the irrigated farms furnish, and because those farms turned out \$26,000,000 worth of products last year. The wealth in land created by this one project is greater than the whole cost of Federal irrigation works. Certainly, so far as the State of Arizona is concerned, and so far as Arizona's influence and prosperity have reacted on the Nation, Federal reclamation has amply justified itself as a national policy.



Pathfinder dam, North Platte project, Nebraska-Wyoming

WASHINGTON ALSO BENEFITS

The State of Washington would be a great State without Federal reclamation, but it is a far greater State because of the Yakima project. For more than 20 years the Government has been carrying on a consistent and continuous program of building reservoirs to store the flood waters and make the whole flow of the Yakima River available, and then building works to distribute the water. To-day that valley is one of the greatest revenue producers of the Northern Pacific Railroad. The immense fruit and vegetable warehouses that line its track at Yakima and other cities of the valley are evidences of this. But that is not all. From its irrigated orchards and those of smaller private projects this Nation had its trade balance increased last year by about \$10,000,000 from the export of fruits. This included over \$4,000,000 worth of apples and nearly \$400,000 of pears. Irrigated apples from Washington are found in the markets of every great city of Europe and Asia. It is a trade that is growing. It does not compete with the orchards of the humid States of the East because the product is different.

IDAHO PROFITS BY FEDERAL RECLAMATION

The Federal Government has built two reservoirs on Snake River in the State of Idaho to hold back the floods and give more water when the river is low. Before this regulation the river had little value in agriculture. To-day the irrigated farms along that river furnish more freight to the Union Pacific Railroad than came from the whole State before the first reservoir was built. That development has not hurt the farmers of the Mississippi Valley. On the contrary, it has helped them. The alfalfa grown on those irrigated farms provides winter feed for stock which feeds in summer on the forest reserves and public ranges. That means more wool, which the Nation needs.

It also means feeder cattle for the cornfields of the Mississippi Valley. They provide a large amount of clover and alfalfa seed for which the climate of the East is unsuited. They produce a large return in sugar beets, but we import sugar, hence this does not lower the price on surplus commodities but, on the contrary, furnishes a market for staples and manufactured goods for thousands of workers in beet fields and western sugar refineries.

SHIPMENTS TO AND FROM PROJECTS

These and other similar projects create a huge and growing market for products manufactured in eastern factories. Farm

Carload shipments to and from railroad stations on specified Federal irrigation projects in 1928

State and project	Carloads of products shipped to projects		Carloads of products shipped from projects	
	Total number	Total value	Total number	Total value
Arizona: Salt River.....	23,604	\$48,097,360	24,590	\$45,080,990
Arizona-California: Yuma.....	1,328	2,856,700	3,559	3,698,000
California: Orland.....	302	243,850	657	1,620,950
Colorado: Grand Valley.....	2,152	3,225,500	5,465	6,517,650
Idaho:				
Boise.....	13,141	18,747,885	10,104	27,963,910
Minidoka.....	2,840	2,126,347	6,302	5,509,709
Montana: Sun River.....	95	97,700	391	424,800
Nebraska-Wyoming: North Platte.....	10,739	7,591,890	14,283	30,139,650
New Mexico: Carlsbad.....	1,816	1,828,600	1,063	2,218,175
New Mexico-Texas: Rio Grande.....	7,758	9,997,650	3,850	2,218,175
Oregon:				
Umatilla.....	456	461,520	731	283,173
Vale.....	90	178,000	101	239,000
Oregon-California: Klamath.....	23,220	17,152,690	13,581	15,855,790
South Dakota: Belle Fourche.....	398	398,000	815	1,614,800
Utah: Strawberry Valley.....	4,072	2,771,595	4,825	3,817,880
Washington: Yakima.....	3,052	3,114,700	20,400	10,037,300
Wyoming: Shoshone.....	433	729,375	1,885	1,055,680
Total.....	95,496	119,619,362	112,602	158,295,632

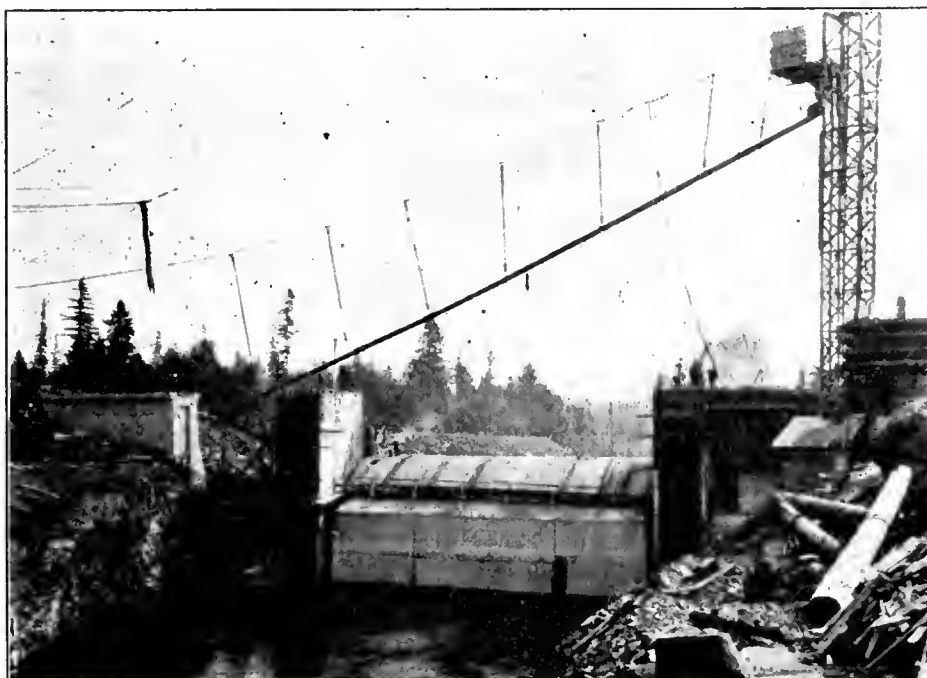
machinery, clothing, furniture, automobiles, worth millions of dollars, are sent to these farms from factories where workers are fed from the products of eastern farms. Statistics are usually dreary, but they are sometimes illuminating. In the latter class are the carload shipments to and from railway stations on the reclamation projects. Through the cooperation of the railroads we have these for 1928 on 17 Federal projects and I have incorporated them.

These 17 projects shipped in over the railroads goods worth \$120,000,000 and shipped out crops worth \$158,000,000. If to this could be added the goods and crops carried in trucks the showing would be still more impressive. But as it is these lands that only yesterday were unpeopled

deserts have a commerce that used over 200,000 cars for the year's business. I wish those who advocate stopping this development would think what it has done and is doing to lower freight rates and give business to clothing makers and automobile and farm machinery companies.

OPPOSITION MISGUIDED

Those who oppose Federal irrigation do so from a mistaken belief that it contributes to the agricultural surplus. They fail to recognize that irrigation operates in distinct zones, that its influence on markets is largely confined to those zones. Eastern trade in irrigated products is restricted mainly to products which can not be grown there or can not be grown for the season in which they are marketed.



Easton dam, Kittitas division, Yakima project, Washington



Glory hole at top of spillway shaft, Owyhee dam, Owyhee project, Oregon-Idaho

The thousands of carloads of winter lettuce grown outdoors in California and Arizona make this vegetable cheap. All classes enjoy it. They could not if it had to be grown in eastern hothouses.

I have referred to the fruit of Washington which is exported from Pacific points to the markets of Europe, Asia, and other eastern lands. That helps the Nation and injures no one. I could give a score of similar examples. Dairying is a great and growing industry in Idaho, but its shipments do not compete with the farms of Iowa and Illinois. Six million dollars worth went to Los Angeles last year. In other words, the industrial growth of the arid region and our expanding commerce of the Pacific Ocean are creating new markets and new agricultural needs which ought to be supplied by the West. The West is coming to have a business and commerce within its borders the importance of which is not realized by the Nation, and the irrigated farm is one of its leading factors. If these irrigated projects were wiped out, it would make little or no difference in the price of the staple products of the Mississippi Valley, such as corn, wheat, oats, and hay. As Secretary Wilbur said in a recent address, one timely rain in that region will increase the yields of these products more than all that is grown on these little oases of agricultural wealth scattered through the great expanse of the arid region. But to wipe out these projects or stop their growth would be a calamity to the West that needs them and to the eastern factories which serve them.

FOLLY TO STOP PRESENT PROGRAM

The achievements of Federal reclamation have thus far justified the policy. What about the future? The answer is that to interrupt the careful businesslike development now going on would be plain folly. It would be catering to regional prejudices that will disappear as soon as the facts are known. The Reclamation Bureau is now using all its funds to complete projects planned and begun many years ago. It will require all the money coming into the fund for the next seven years to do this. Certainly these works ought to be built. No one, so far as I have seen, disputes this. What they argue against and seem to fear is a sudden large expansion. They do not seem to know that the only money which can now be spent is that which comes into the fund each year in payments for water by settlers, from oil leases and power revenues. The total is less than \$10,000,000 a year. Population and the local consumption of irrigated products in the arid States are growing faster than the expansion of irrigation. Corn is being shipped from the Mississippi Valley to feed the mules that cultivate the irrigated orchards of Washington. Some of this fear of surplus grew out of the discussion of Boulder Dam. Its huge reservoir and great cost made this reaction natural. It is not realized that controlling the Colorado means the opening of mines and enlarging factories as well as creating farms. Five million people will be added to the consuming population of the Southwest before the

farms watered from Boulder Dam are able to feed them.

What the Nation needs is not a crippled reclamation policy but a more efficient one. Hereafter increase in the irrigated area must be based on the storage of floods. We have reached the limit of safe expansion from the unregulated flow of rivers. There is no longer any hope of providing water at from \$50 to \$100 an acre because reservoirs are costly. The large projects now being built have costs ranging from \$100 to \$160 an acre. These costs can only be repaid if the land is settled promptly and intensively cultivated. They can not be paid by land which lacks fertility or which requires costly treatment to be made fertile. More attention must be paid in the future to the quality of the soil.

STATE COOPERATION ESSENTIAL

Never since reclamation began has the pressure to take up new projects or to take over and reconstruct private projects in difficulty been as great as it is to-day. This pressure will increase with the further withdrawal from irrigation of private enterprise. This, together with the size and cost of the enterprises to be undertaken, make it of special importance that all factors which contribute to the solvency of reclamation and the prosperity of water users should be thoroughly understood and incorporated in the plans for future development. The thing which will certainly contribute to success is a greater measure of State responsibility and cooperation in the settlement of the land, the working out of plans for agricultural development, and securing cooperation in marketing and other business matters. Plans for the improvement and equipment of farms and reliable advice to settlers as to the cost of these are as important as plans for engineering structures and for financing their cost. Thus far the chief aid in securing settlers and in developing farms has come from railroads, although there has been a gratifying increase in interest and in aid from States and chambers of commerce in the past three or four years. More and more it is coming to be realized that solvency depends on a score of influences—economic, social, and political—some of which are now not being made as effective as they might be.

AMENDMENTS TO THE LAW NEEDED

Certain limitations on the operations of the Reclamation Bureau are out of harmony with existing conditions. Although the bureau is carrying on a work from which private enterprise has practically withdrawn because of its difficulties and small financial return, the bureau is

not allowed to charge for water anything above actual cost, and not allowed to charge that if costs are increased by accidents or mistakes. Yet it is expected to return to the reclamation fund all the money which has been spent, and it is held up as inefficient if this is not accomplished. No business enterprise on earth could carry on and meet these conditions, and in no other country is Government reclamation subjected to these limitations.

The law needs to be amended to conform to the actual facts. It will be good policy to undertake some enterprises where the entire amount of money can not be returned and where a definite subsidy should be provided, and there are instances, like power development, where all the income which can be obtained ought to be secured. In other words, reclamation ought to have as its fundamental principle, giving the settler a fair chance, but with that limit it should be conducted on sound business lines.

The changes in reclamation policy should not include any changes in the engineering and construction of works now being carried on. During the last quarter of a century the Reclamation Bureau has built up an engineering organization able to plan and build works more economically and efficiently than could be done if this work were turned over to the States. Besides, many of these works are interstate in character.

The time has come, however, when serious consideration should be given to the question of whether the task of settlement of lands and the operation of canals



Harper diversion dam, Vale project, Oregon

might not wisely be transferred to local control as soon as construction is completed. Good results have come from the policy of the bureau in transferring to the settlers the operation of canals as soon as agricultural development had gone far enough to make this possible.

The most beneficial change which could be made, however, has to do with the selection and approval of new projects. The State is so vitally interested in this that it is believed no future work should be undertaken until it has been thor-

oughly investigated by the State and approved as a sound and solvent enterprise by some formal action of the State authorities. Such action would postpone the beginning of projects, but when they were begun it would be with a better understanding of requirements, with a wider diffusion of interest and responsibility, and a practical certainty of more rapid and complete development when the engineering work was done.

We are at the beginning of a new era, and nothing could be more wise and timely than the recent action of the President in calling attention to the problems of reclamation and proposing to create a competent commission to study conditions and determine what should be done.

Articles Contributed To Other Publications

Conquering the Colorado, by Dr. Elwood Mead, commissioner, in *Review of Reviews*, September, 1929.

Three Great Projects in One, by Dr. Elwood Mead, commissioner, in *Southern California Business*, September, 1929.

Reclaiming Lost Land South and West, by Dr. Elwood Mead, commissioner, in *National Real Estate Journal*, September 16, 1929.

Making the American Desert Bloom, by Dr. Elwood Mead, commissioner, in *Current History*, October, 1929.

American Falls Dam, Minidoka Project, Idaho, by Ivan E. Houk, senior engineer, Denver office, in *Western Construction News*, September 25, 1929.



Tampers working on Echo dam fill, Salt Lake Basin project, Utah

Federal Reclamation Strongly Indorsed in Recent Resolutions

By Western Division, Chamber of Commerce of the United States

THE following resolutions concerning Federal reclamation, water resources, and the public land study, recommended recently by President Hoover, were adopted by the Western Division of the Chamber of Commerce of the United States at its meeting in Ogden, Utah, September 30 to October 1, 1929:

RECLAMATION

Whereas the achievements of Federal reclamation in the 27 years of its operation have fully justified the farseeing statesmanship of President Theodore Roosevelt and his associates in securing the passage of this beneficent measure, Federal reclamation is conceived to be a sound national policy for reasons, in part, as follows:

"(1) It has brought wasted water into use and dotted unpeopled deserts with contented and prosperous homes. More than half a million people now live on these projects, and it has been one of the chief factors in increasing the population of the Western States.

"(2) Additional taxable assets of immense amounts have been created to the material advantage of State and Nation.

"(3) Western irrigation projects provide extensive markets for the agricultural Middle West and the industrial East.

"(4) Crops produced upon western irrigation projects are supplemental to, rather than competitive with, crops produced upon agricultural lands of other sections, for the reason that the principal products of western irrigated lands are alfalfa, sugar beets, wool, and fruits, many of which are in demand in the Central and Eastern States, while most of the forage crops are consumed locally in the livestock industry. The protection in continental United States of sugar and wool, two of the major products of Federal irrigation projects, approximate only 50 per cent of our total requirements.

"(5) The situation relating to the national defense is greatly helped by the substantial development of the intermountain region, comprising, as it does, a vast area lying between the populous Middle West and the Pacific coast. Federal reclamation is playing an important part in attaining such development.

"(6) All money used in Federal reclamation work is provided by a revolving fund created by revenues accruing from the sale, lease, and development of the natural resources of the Western States.

This fund is in the nature of a trust administered by the Federal Government for the benefit of the territory from which the moneys are actually derived. There is no draft upon the pocket of the taxpayer for reclamation development.

"(7) Recommendation No. 2 of Referendum No. 52 on agriculture does not apply to economically sound Federal reclamation projects, as such projects are not constructed at public expense and do not add burdensome surpluses to American agricultural production. To the contrary, our Western States declare the need for a progressive program of reclamation development in order to meet the growing demand for products of the character which are supplemental to those of other sections." Now, therefore, be it

Resolved by the Western Division of the Chamber of Commerce of the United States, at its seventh annual division meeting, That we heartily indorse Federal reclamation in the West as a sound national policy and urge its continuance upon a progressive scale.

WATER RESOURCES

Whereas the water resources of the Nation, and especially of 11 western States, constitute a great asset that has been our most neglected source of wealth; and

Whereas the President of these United States has declared for a broad national policy that should coordinate the construction forces of all our people in a sound, economic program work: Now, therefore, be it

Resolved, That this convention of the Western Division of the Chamber of Commerce of the United States of America declare its profound approval of such a program in the form that conference may determine most effective; and be it further

Resolved, That this conference recommend to the Chamber of Commerce of the United States that the national organization of business force accept the principle as a major activity and the proper machinery be set in motion to bring the combined strength of America's business to the cause; and be it further

Resolved, That this convention urges upon all western States such organized efforts as will result in the people of the whole West joining their economic and political energies in the proper execution of a national plan for development of latent water resources.

PUBLIC-LAND STUDY

The Western Division of the Chamber of Commerce of the United States in its deliberation at the mid-year meeting held at Ogden, Utah, September 30 and October 1, wishes to record its appreciation of the recent declaration and suggestion which has come from President Hoover, involving the appointment of a committee of 9 or 10, 5 of which shall be selected from the western public land States, for the purpose of making a study relative to the public domain, construction of flood-control dams, and reclamation, and voice our opinion as being in accord with the action as proposed by the President of the United States.

By Western Governors

The following resolution concerning Federal reclamation was adopted by the Conference of Governors and Representatives of Public Land States, held in Salt Lake City, Utah, August 26 and 27, 1929:

Whereas there is much misunderstanding throughout the country with regard to the purpose and results of Federal reclamation, resulting in opposition to the expansion or continuance of the policy of Federal reclamation: Therefore be it

Resolved, That the Conference of Governors and Representatives of Public Land States, held at Salt Lake City August 26 and 27, 1929, submits the following statement of facts with regard to Federal reclamation:

The development of the West would have been impossible except for irrigation. If the West had not been developed, adding its billions in new wealth and providing opportunities for millions in new population, the growth and prosperity of the Nation would have been retarded and its present position in wealth, prestige, and power would not have been possible. Therefore, irrigation development has been a matter of national concern.

Reclamation by the Federal Government has heretofore been an important although minor factor in western development, but in the future should play a major part. Practically all of the enterprises within the financial ability of private capital have been developed. Those great irrigable areas now remaining, by reason of the larger problems involved, greater costs of storage, canal construction, settlement, etc., should be classed as governmental enterprises. If the development of the West, and to this extent the full

development of the Nation, is to be realized the policy of Federal reclamation must be continued. The real effort should be to get as much land as possible into continuous and profitable use.

The absurdity of the claim that western reclamation is harmful to the general welfare and is responsible in any substantial way for surpluses of the cereal farm products of the Nation is shown by the following facts: The principal products of western irrigated lands are alfalfa, sugar beets, potatoes, and fruits. No one familiar with the meat production of the United States but realizes that the alfalfa of the West has resulted in the maintenance of vast flocks and herds furnishing a pure and relatively cheap meat supply to the laborers and artisans of the East; the sugar beets of the West do not displace sugar beets in any other part of the country, and furnish cheaper sugar; the potatoes of the West move to eastern markets only when there is a shortage in eastern production; the fruits of the West are the results of the greatest of all irrigated farm activities and a wonderful source of wealth, and do not displace fruit of corresponding quality anywhere in the United States, but do furnish the best of fruit to the farmers and people of the Middle West.

The use of the reclamation revolving fund is not a subsidy, but on the contrary is only fair and just, for the reason that this fund is a loan of only part of the income from the natural resources of the Western States. Appropriations made by Congress for western reclamation are made from this special fund obtained from western resources, and not from the pockets of the taxpayers.

The progressive nations of the world, notably England, France, Italy, Holland (and Germany prior to the Great War), gave scope to the ingenuity and energy of their people in the development of extensive colonies as a sound national policy and without thought of repayment of the outlay. The United States, owing to its vast resources, has been able to pursue a different policy in this, that it has encouraged its people to develop these great natural resources. If our Nation is not to retrogress, this policy must be continued.

REPORTS from the Shoshone project regarding maximum returns from potatoes and beans indicate the possibilities of intensive agriculture there. One potato grower received returns of over \$400 per acre from a field of about 20 acres of Netted Gems. The returns from some of the best bean crops were \$200 per acre, net.

Yuma Project Offers Opportunity to Expand Dairy Industry

A RECENT issue of the Arizona Producer tells the story of H. L. Kryger, an ex-service man on the Yuma project, Arizona-California, who started four years ago with very little capital and to-day is one of the leading dairymen on the project.

Mr. Kryger is a descendant of a Dutch family that milked cows and made butter and cheese for generations, so that he is by birth and instinct and training and preference a dairyman. He has demonstrated that on the Yuma project cows plus science plus hard work constitute a winning combination.

Keeping of rather elaborate records Mr. Kryger has found serves another purpose aside from enabling him to check the performance of each cow. It aids in keeping his employees interested and satisfied. He has to hire several men to care for his herd of 50 of the finest grade Holsteins in Arizona. Milkers have favorite cows that they like to champion. Friendly arguments are continually arising that can be settled only by reference to the figures. All of which tends to prevent life falling into a monotonous rut.

Up to the first of this year Mr. Kryger bought all his feed. Now he has 60 acres of land rented and is making it produce plenty of hay and pasturage for his entire herd. For this he has Sudan grass to thank in large measure. He planted a large patch in the spring and now his dry cows and his young stuff are turned in there to pasture. They are fed nothing else whatever, yet they have steadily thrived and put on flesh.

Sudan grass grows and flourishes in the Yuma Valley the year around, except for the three winter months. It is Mr. Kryger's plan to have green wheat pasturage ready for his stock then. In late fall he disks wheat right into his alfalfa, irrigating it frequently, and will have lush pasturage up to the time Sudan grass is ready again in March. Mr. Kryger prefers wheat to barley because the latter tends to give milk an unpleasant flavor. For nine months of the year he mows and stores all the alfalfa hay his fields will yield. That is the main feed for his milking cows. It is fed whole, but he is giving serious thought to choppers and grinders.

Mr. Kryger states that the dairy situation in Yuma Valley is unique and seems to provide a genuine opportunity for

expansion. Altogether the number of dairy cows in the valley is not over 1,000. The main reason for this is that California buyers have combed the district again and again for cows and have shipped to the coast all they could possibly purchase. As a result barely enough whole milk is produced to supply the local demand. No butter is made in Yuma Valley except perhaps an insignificant amount for family use. No ice cream is manufactured there. The one creamery imports unfrozen ice cream, ready mixed, from Imperial Valley and freezes it for the wholesale trade.

There is no prospect that there will soon be any milk to spare for ice cream or butter or cheese. Yuma and the other towns are growing steadily, and so far the demand for whole milk is increasing more rapidly than the supply. Mr. Kryger is convinced that this fall will show a real shortage, stating that "we dairymen simply must produce more milk or the community will be forced to import it from somewhere outside."

R. M. Priest, superintendent of the Yuma project, adds that "this is an industry that I would like to see developed here, as conditions are ideal for it."

Desert Grapefruit Under New Organization

The Desert Citrus Exchange, with headquarters at El Centro, Calif., has been formed by growers in California and Arizona affiliated with the California Fruit Growers Exchange. The new association plans to make a specialty of marketing the grapefruit produced in the desert sections of the Southwest. Although the membership is now made up of citrus associations in the Imperial and Yuma Valleys, opportunity will be given to citrus growers in the Coachella Valley of California and the Salt River Valley of Arizona to join the new organization. Officials of the new exchange estimate that with normal crop conditions the association will market from 700 to 800 cars of grapefruit in the 1929-30 season. As most of the trees are very young, the quantity of fruit will naturally increase from year to year.



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Assistant to the Commissioner and Associate Editor New Reclamation Era



Club Activities of Juniors on Federal Reclamation Projects

THESE activities on the Uncompahgre project, Colorado, and the Shoshone project, Wyoming, were stated in the September and October issues, respectively, of the NEW RECLAMATION ERA.

Practically all of our projects have organizations for juniors, and facts secured from the projects will be printed, to stimulate their activities, in consecutive issues until all have been treated.

Yuma Project—Arizona-California

There are eighteen 4-H National Girls' Clubs, each with its adult leader, under the supervision of the home demonstration agent. These clubs are located on or adjacent to the project. The project and adjoining territory is divided into what is termed nine communities, which are in reality school districts, the names of which are Gadsden, Alameda, Fairview, Sunnyside, Rood, Crane, Wellton, Roll, and Laguna.

There is a 4-H Health Club in each of the above districts, 4-H Sewing Clubs in Gadsden, Alameda, Rood, Crane, Wellton, Roll, and Laguna, and 4-H Food Clubs at Gadsden and Crane. The total active membership of the above clubs is 137, all of which completed the club work

and received pins for the season of October, 1928, to June, 1929.

The organization has been active to some extent for the past seven or eight years, but has only reached its present proportions during the last two or three years.

The clubs are organized in the regular manner, and conduct their meetings at intervals decided upon by each club, which vary from one each week to two a month. Each club holds an achievement day at the close of the club year, when the work of each member is judged and blue, red, and white ribbons are awarded by the University of Arizona Extension Service. Each child who completes the required club work receives a 4-H Club pin which has the national emblem on it.

A County Club Day completes each year's work in which all the clubs join in an exhibit of work accomplished and have a joint club picnic. Last year at the close of the 1927-28 club year the work the sewing and cooking clubs had accomplished during the club year was placed on display in a show window of one of the local merchants. This display attracted quite a little attention and many favorable comments. The girls take a keen interest in their club work, and the various clubs vie with each other in the quality of their work and in the number of achievements.

Rewards of special merit have been won by Yuma County Club girls in the nature of free trips to the University of Arizona, at Tucson, for Boys' and Girls' Club camp. This year two girls were awarded this trip; and one of the two girls, Lucille Smith, who is denoted by an arrow in the picture, won second place in the Girls' State Health Center contest, with an average score of 96.3 per cent. Last year another girl, Vida Benton, who is a member of the Willing Workers' Club of the Crane community, was one of four girls selected as a reward of special merit to represent the State of Arizona at the National Club Congress held at Washington, D. C., during June, 1928.

There is only one 4-H Boys' Club on the project. This club is composed of 18 members, all being sons of project ranchers, and an adult leader. Their work is under the supervision of Mr. O. P. Thorn-

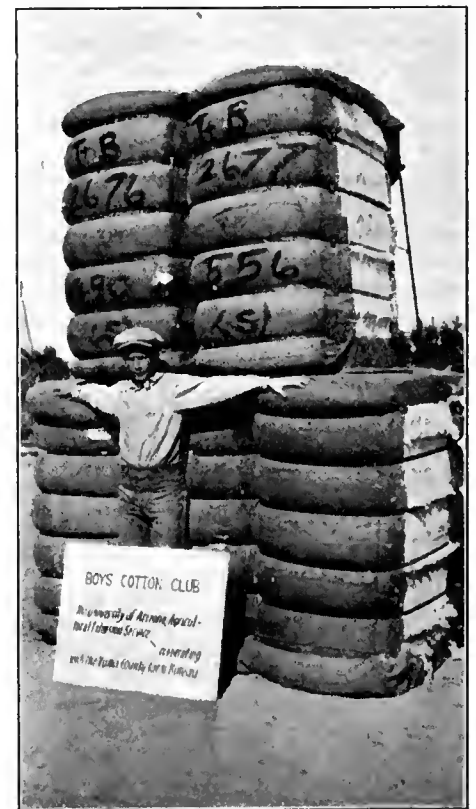
ton, the county agent stationed at Yuma. This club is known as a Boys' Cotton Club and deals entirely with the successful raising of cotton, which is one of the major crops on this project.

Last year the various cotton-ginning associations and several prominent ranchers contributed \$110 toward prizes to be awarded to the successful contestants in the club. The first prize of \$40 was awarded to Forest Blue, whose score was 88 points. This boy grew 5 full bales of cotton on his 2-acre piece of ground. (See picture of Forest Blue with his 5 bales of cotton.)

These boys are required to have 2 acres of land upon which they may grow cotton. They usually lease this land from their parents or have it donated to them. Each boy then plows his ground and prepares it for planting. He then plants the 2 acres to cotton and does all the cultivating and irrigating. The time he is employed in this work is charged



4-H Health Club group, Gadsden Sunshine Club. Lucille Smith, winner, indicated by arrow



Forest Blue and the five bales of cotton he raised on two acres

out at 25 cents per hour, and if his parents assist him their time is charged at 35 cents per hour. His costs must also include specified rentals for the stock and equipment he uses. At the completion of the year each boy is required to write a story of the methods employed by him and a description of the results obtained, together with all costs and his gross and net profit. The results at the close of the year are graded by the following system: Report and story, 40 points; yield, 25 points; profit, 20 points; attendance at club meetings and tours, 15 points.

Forest Blue's story of how he grew his cotton, which he submitted in accordance with requirements of the club, appears at the end of this story on club work on the Yuma project.

This club has regular meetings once each month and twice during the year makes a tour of the various members' fields where a study is made of the methods employed and the condition of the plants. In addition, they also visit the fields of the most successful cotton growers on the project, and these men analyze their methods and answer all inquiries. (See illustration.) These tours are generally ended at Haughtelin Lake, where a picnic dinner and swim are enjoyed.

How I Grew my Cotton

By Forest Blue

(Submitted in connection with his 4-H Club work)

I joined the cotton club to learn all I could about cotton growing. I think this club will be a help to me as a future farmer.

My land is a sandy loam. It is a good type of land for cotton growing. It is one of the best pieces of cotton land in the valley. I did not have much to do to my land because it was in the best of shape already. To get rid of the cotton stalks is all I had to do to the land. After I had plowed up the stalks I raked and burned them. I think it is best to burn the stalks because if you do not a good level and firm seed bed can not be made. After this was done I watered the land good and heavy. I let the ground get good and dry, and on March 1 I listed up my seed beds with a tractor lister.

The beds were made 12 inches high and 4 feet wide from one furrow to the other. I think a well-prepared seed bed is a very good thing to raise good cotton. After the beds are made a single stalk furrow opener is used to run out the furrows a day or two before the irrigation. Then the ends of each furrow are shoveled out so that the water can run out and turn back. Both



4-H Club members visiting farm of a successful cotton grower to observe methods employed

ends of furrows are shoveled out. I gave the beds a good irrigation, keeping the water on for six hours. Six hours is about the average. I let the beds dry out for 10 days; then I knocked off the ridges with a spike-toothed harrow, the teeth being straight, running lengthwise of the row. This left the ridges about 8 inches high.

This harrowing was done to knock off the dry dirt that was on top of the beds. Then I planted pure Mebane seed, using a single-row riding planter. I planted on March 15. The seed was planted about 2 inches deep. I went over the field with a hoe and planted seed where the planter could not. My cotton began to come up on March 22. I had a good stand of cotton by April 10. My first cultivation was on April 10, when my cotton came to a good stand. For my first cultivation I used small shovel plows. This cultivation was to kill weeds and to loosen up the ground. I started thinning my cotton on April 16 and finished on April 19. I thinned my cotton to 9 inches the first thinning. On April 25 I cultivated my cotton again. This was done just 15 days after first cultivation. This time I used large twisting shovels to throw the dirt up to the plants. The furrows were then run out and the ends of the furrows were shoveled out. Then I irrigated on April 30. This was just a light irrigation.

The water was held on the land for two hours. This first irrigation was 45 days after my cotton was planted, practically 3 inches of water being used per acre. I let the water run slowly so the beds would get good and wet. This sort of irrigation is better than a fast irrigation.

On May 11, eleven days after irrigation, I cultivated my cotton again. This was the third cultivation. I used small shovels to loosen the soil and to kill

weeds. Beginning May 21 and ending May 30, I rethinned my cotton. This time I took out every other stalk. This time I studied each plant so as to leave the best plants. I only left one stalk to the hill. This is the best, because each plant can get all the required plant food to make a good strong healthy plant.

My cotton is now thinned to 18 inches. On June 4 I irrigated my cotton the second time after planting. This time I did not run out the furrows. I wanted to see if it made much difference. It made a little difference, not much. On June 12, eight days after irrigation, I cultivated my cotton the third time, using large shovels. This was next to the last cultivation. On June 22 I gave my cotton a heavy irrigation, keeping the water on for three hours. I cultivated my cotton the last time on July 4. My cotton was 111 days old. I irrigated my cotton the fourth time on July 9—this was a light irrigation, because it was too hot to give the cotton much water—and then my last irrigation was July 22. This was a light irrigation.

I began picking my cotton on September 3. I picked out 3 bales the first picking and sold them at 18.55 cents per pound, and I picked 2 bales the second picking and sold them for 19.25 cents per pound. My expenses amounted to about \$50, including picking and labor charges. My net profit was \$190. I did most of the work myself. I wasn't bothered with any kind of pest or disease.

There were 18 members in our cotton club when it started. We visited the different boys' fields and had some interesting talks from men who knew cotton. We made two trips during the summer.

The object of club work is to show boys how they can make more money out of cotton, by knowing how to grow cotton.

Boulder Dam Power Conference and Allocation of Power

SECRETARY WILBUR states that a number of requests for power to be generated at Boulder Dam have been received at the Department of the Interior, and that those requests insured such a demand for power as to more than consume all that would be generated, and insure repayment of the cost of the dam as contemplated in the law.

The principal applicants for this power came to Washington on October 14 to discuss with the officials of the department definite arrangements for the production and distribution of this power. L. N. McClellan, chief electrical engineer for the Reclamation Bureau, with headquarters in Denver, also was present at the meeting, as well as Prof. W. F. Durand, of Stanford, consulting engineer for the bureau. The Secretary asked those participating to be prepared to discuss the technical, legal, and financial aspects of the problem of handling this power.

The applicants for large amounts of power are city of Los Angeles metropolitan water district, Southern California Edison Co., Southern Sierras Power Co., and the States of Nevada and Utah.

"What we want to do," said Secretary Wilbur "is to sell falling water. There are several alternative plans. The one which seems to fit the conditions best is to have the Government build the dam and power houses and to arrange with the lessees to install the machinery to produce and distribute the power. This will place the technical problems of generation and transmission of power in the hands of the purchasers. Since a number of them are involved, it becomes obvious that they should work together in accordance with some agreed-upon plan.

"From the standpoints of efficiency and common sense this is a unit undertaking, and cooperation will be necessary in its execution. Provision needs to be made for certain applicants with small requirements of power. There are so many details to be worked out that a preliminary conference to determine upon certain principles of action is requisite before allotments of power can wisely be made."

The Secretary of the Interior announced on October 21, his decision in regard to the allocation of Boulder Dam power. He appointed November 12, as the date for a formal hearing in case of any protest.

The power to be developed at the Boulder Dam subject to certain deductions is to be contracted for as follows:

To the Metropolitan Water District of Southern California, 50 per cent, or so much thereof as may be needed and used for the pumping of Colorado River water.

To the city of Los Angeles, 25 per cent; and

To the Southern California Edison and associated companies, 25 per cent.

These allotments are to be subject to certain deductions which may arise through the exercise of preference rights, i. e.:

(a) Not exceeding 18 per cent of the total power developed for the State of Nevada for use in Nevada;

(b) Not exceeding 18 per cent of the total power for the State of Arizona for use in Arizona, as above, and should either of the States not exercise its preference rights the other may absorb them up to 4 per cent;

(c) Not exceeding 4 per cent for municipalities which have heretofore filed applications.

All such preference rights in whole or in part are to be exercised by the execution of valid contracts with the respective States and municipalities satisfactory to the Secretary and the exercise of such preference rights is to reduce proportionately the above allotments to the district, the city, and the company.

Any State desiring to withdraw power within the limitations above stated must serve on the Secretary of the Interior written notice within not less than 12 months of the amount of power desired and for the purchase of which valid contracts satisfactory to the Secretary must be executed.

Power contracted for but not required within a State shall be allocated to the city and the company on a 50-50 basis, with the reservation that it can again be called for within a reasonable time for use within the State. All power provided a State shall be at actual cost.

Should the 50 per cent allocated to the Metropolitan Water District be not required for pumping, this shall become available to the city of Los Angeles, 66% per cent; to the Southern California Edison and associated companies, 33% per cent.

Any municipalities desiring power within the limitation prescribed must execute the necessary contract therefor within 12 months from the date the contracts are made with the district and the city.

Any firm power available at the Boulder Canyon Dam for the payment of which other contractors do not become and remain liable, aside from that allocated to the Metropolitan District, shall be taken and paid for by the city of Los Angeles and the Edison Company on a 50-50 basis.

The contract for the available power is to be made with the city of Los Angeles and the Metropolitan Water District, with various subcontracts assuring the

above and providing for a board of control made up of two members nominated by the city of Los Angeles and the Metropolitan Water District, two by the Southern California Edison and associated companies, and one by the Secretary of the Interior to act with the city of Los Angeles in the operation of the plant.

The Federal Government will install the dam, tunnels, power house, and penstocks. The machinery for the generation and distribution of power is to be provided and installed by the lessee. The costs of installation and operation are to be borne by those contracting for the power in proportion to the amounts received. When the dam and power house are actually in operation, the lessees may have the right to ask for a review of the actual cost of units of power and be entitled to deductions which will still permit the charge made to return to the Government all advances and interest in accordance with the Boulder Dam act, and provided further that if such review indicates that a higher rate should be paid for power to meet the obligation to the Federal Government such an advance in rate will be put into effect.

There be a clause inserted in all of the contracts which will insure the distribution of all power developed at the Boulder Dam at such a price as in the opinion of the Federal Power Commission is fair to all consumers. Should certain municipalities operating their own power plants desire to make separate agreements with the city of Los Angeles and the Metropolitan Water District, they shall be supplied with power at cost price.

The charge for storing water for the Metropolitan Water District will be 25 cents per acre-foot.

Marathon Dam, Greece, Mosaic Marble-Faced

A recent issue of commerce reports states that the works now being built at Marathon, Greece, include the construction of a dam near the village of Marathon, to impound the waters of the Haradra and Varnava Rivers, together with a tunnel, aqueduct, reservoirs, and distribution system. The dam is a solid concrete wall 47 meters wide at the base and 4½ meters on top. It is 285 meters long and rises 54 meters above the river bed.

This dam is stated to be the only mosaic marble-faced dam in the world. The structure will contain 178,000 cubic meters of concrete and masonry, requiring 40,000 tons of Portland cement and 10,000 tons of Santorin earth (Pozzulan cement).

International Water Commission Meets in Washington, D. C.

To discuss the equitable division of the waters of the Rio Grande, Colorado, and Tia Juana Rivers

THE International Water Commission for the study of the respective rights of the United States and Mexico in the flow of international streams reconvened in Washington, D. C., at the Pan American Building, on October 22.

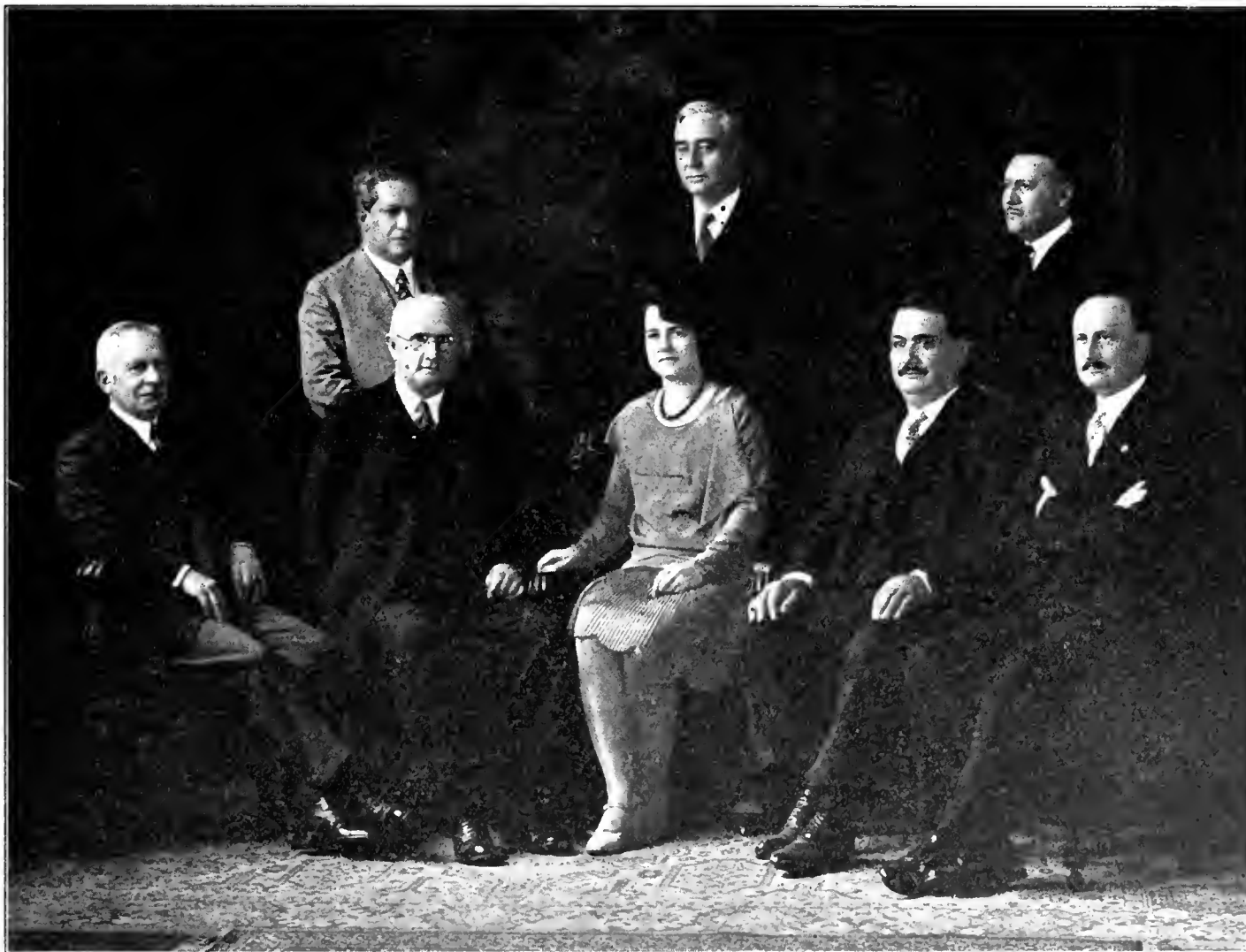
This commission consists of three members, all engineers, from each of the interested countries. It met in Mexico City on August 20 last and was in session for three weeks. It was appointed by the two countries to work out an equitable division of the waters of the Rio Grande, Colorado, and Tia Juana Rivers, streams which flow on both sides of the international boundary. It is only within the last 10 or 15 years that the overshadowing importance of these water supplies to the people of the two countries has begun to be realized.

The Tia Juana River, for example, has tributaries on both sides of the boundary. It begins south of the line and empties into the Pacific Ocean about 2 miles north of it. During the Spanish occupation of Mexico it was valuable only as a watering place for the long-horned herds of cattle that ranged on both sides of the boundary. To-day it is doubtful if there is anywhere a water supply where an acre-foot has greater value. This value has developed because the location of the stream in the vicinity of San Diego, Calif., where the climate is attractive but the water scarce, presents great possibilities. The river is now looked to by San Diego as a means of reinforcing its water supply.

To hold and make available the waters of one tributary of the Tia Juana River, the Mexican Government is spending

\$3,500,000 on a dam and reservoir. The United States is prepared to spend whatever money is required to conserve the entire surplus water in a reservoir located on the international boundary.

The waters of the mighty Rio Grande are of much greater importance. On the American side the progressive efforts and skill of irrigators in southwestern Texas since 1890 have converted 560,095 acres into continuous market gardens interspersed with orange and grapefruit orchards. The crops are about one-half cotton, one-fourth truck, one-eighth citrus, and the balance miscellaneous. There are about 145 separate irrigation enterprises now operating, and almost all take their water by pumping. The total diversion is estimated at 856,000 acre-feet in 1928. The total value of existing ir-



INTERNATIONAL WATER COMMISSION: UNITED STATES AND MEXICO

Left to right, sitting: General Lansing H. Beach; Dr. Elwood Mead, chairman, American section; Miss Mae A. Schnurr, secretary, American section; Sr. Fortunato Dozal, chairman, Mexican section; Sr. Gustavo P. Serrano. Standing: Sr. Ignacio Lopez Bancalari; Mr. W. E. Anderson; Sr. Federico Ramos, secretary, Mexican section.

rigation works is about \$20,000,000. This has stimulated development on the south side of the boundary in Mexico, which, though smaller, is making great strides, because it has the active support of the Mexican Government, which is building a costly dam and irrigation work at Don Martin, on the Salado River, and projecting other equally important works on the Conchos and San Juan Rivers, tributaries of the Rio Grande.

There are 291,000 acres of land now being irrigated in Mexico. Private development has now reached a point where the entire low-water flow of the unregulated river is required. The extension of the area, without injury to what is being already cultivated, requires the building of two or more large storage dams in the channel of the main stream. One of the problems which confronted this commission was to work out the plans and program for the building of these works as international enterprises. When it has reached an agreement its recommendations will be submitted to the State Departments of the two countries, to be used as the basis for negotiation of a treaty. Its importance is seen by the fact that last year 4,000,000 acre-feet of flood water ran to waste, the total river yield of the Rio Grande Basin being 7,757,000 acre-feet. Forty-eight per cent of this comes from the United States and 52 per cent from Mexico. The effective drainage area of the Rio Grande is 177,500 square miles, of which 54.8 per cent lies in the United States and 45.2 per cent in Mexico. If the waste water were stored it would be sufficient to irrigate a million acres of land on each side of the boundary, and that would mean a comfortable living for 2,000,000 people.

On the Colorado the commission confronts these conditions: Two hundred and forty-two thousand square miles of the watershed of the Colorado are in the United States. Two thousand square miles are in Mexico. Mexico contributes nothing to the water of the stream. It all comes from the United States. Approximately 100 miles of the river channel are in Mexico. This traverses the delta which has been built up in ages past by the silt deposited by the Colorado. Before irrigation began, the river in flood wandered all over the delta, without any defined channel, or with a channel likely to be changed by each successive flood. Since irrigation began in Imperial Valley the irrigators there have sought by means of levees to keep the river within bounds, or at least to keep it from breaking over and flooding the irrigated farms. The difficulty of doing this grows out of the fact that where formerly the silt carried down by the river was spread over a large

territory each year, the levees keep it confined to a narrow strip which is being built up at an accelerated rate, and the rise in the level of the channel of the river makes it necessary to keep raising the levees.

It is evident that this can not continue much longer, and it is the conviction that levees are not a solution of the permanent protection of these lands that led to the movement to control floods by building a reservoir in the main stream large enough to hold at least one year's flow of the river. That was the origin of Boulder Dam. Without it the inundation of the lands

between the United States and Mexico, within a brief period, was almost inevitable. Building Boulder Dam, therefore, is of as great benefit to Mexico as it is to the Imperial Valley.

The commission therefore is confronted with the questions of the proper division of the water and some arrangement for the control of floods between now and the time when Boulder Dam is far enough advanced to regulate them. An outlet channel to the Gulf for whatever surplus waters flow down beyond the United States after Boulder Dam is completed must be provided.

Aided and Directed Settlement in Ceylon

ACCORDING to a recent issue of the Christian Science Monitor, the leasing out of blocks from 5 to 25 acres, partly with a permanent crop, probably coconut, partly with yams and other short-life crops, as a means of providing employment for the middle classes in the country districts of Ceylon, has been arranged by the Forest Department. The land released for the purposes is low-lying jungle land in the Kalutara district.

The growing of gingilli, chillies, mustard, and other condiments, and of papaya and plaintain will be encouraged. In the larger allotments principal attention will be given to the growing of lucerne and fodder grasses.

The Department of Agriculture hopes to supply the required stock of superior quality and to supervise rearing conditions in all stages of growth and marketing.

Middle-class farm settlers will be given lessons in the most modern methods of

poultry farming adapted to local conditions. Literature and instruction will also be available on such subjects as the preservation of products of milk, butter, and cheese. Cottage industries, suitable for women and children, will have the necessary attention at the rural agricultural school of each colony.

It is expected to draw 10 per cent of the return in cash or kind of all allotments, which yield beyond a certain measure, as an interest upon the stocks and seed supplied free of cost by the Department of Agriculture. When necessary, the taxed produce will be sold at the market of the colony and a reserve fund created for the establishment of a crop and stock insurance scheme, which will be run in conjunction with a cooperative credit society.

In the manner described above, it is hoped to establish, in the healthier parts of the island, self-contained colonies of middle-class folk who would otherwise be unemployed.

APPLES GROWN ON RECLAMATION PROJECTS IN 1928

Project	Area	Yield		Value	
		Total	Average per acre	Total	Per acre
	<i>Acres</i>	<i>Pounds</i>	<i>Pounds</i>		
Oriand, Calif.....	6	17,500	2,916	\$438	\$73.00
Uncompahgre, Colo.....	1,407	4,430,960	3,149	44,310	31.49
Boise, Idaho.....	2,409	12,194,035	5,062	170,854	70.92
King Hill, Idaho.....	155	462,516	2,988	4,625	29.88
Minidoka, Idaho.....	86	265,500	3,087	3,771	43.72
Rio Grande, N. Mex.-Tex.....	125			8,082	64.65
Umatilla, Oreg.....	298	677,450	2,273	6,138	20.60
Strawberry Valley, Utah.....	226	1,555,860	6,884	12,966	57.33
Okanogan, Wash.....	3,388	170,000,000	20,000	1,067,404	315.00
Yakima, Wash.....	15,657	239,094,854	15,278	3,463,004	221.17
Shoshone, Wyo.....	55	228,105	4,165	2,281	41.66
Total and average.....	23,812	328,926,880	13,814	4,783,873	200.90

1 1,403,367 boxes.

Control of Grasshoppers by use of Poisoned Bran Mash and Egg Bed Cultivation

By C. A. Henderson, Extension Agent, Klamath Project, Oregon-California

GRASSHOPPERS have long been known as a plague in unsettled districts containing large bodies of fertile but nontilled land. This condition has been particularly pronounced in the reclaimed lake bed of Tule Lake, extending from the southern part of Klamath County, Oreg., into Modoc and Siskiyou Counties, Calif. This lake bed was reclaimed for agricultural purposes, the process of drying up taking less time than calculated, leaving exposed thousands of acres of productive organic soil. This was leased in large bodies to stockmen, resulting in little or no cultivation.

Conditions were so favorable that this district immediately became the home of a heavy grasshopper infestation that grew and multiplied from year to year. Efforts at poisoning were undertaken annually with a combination of poison bran mash and burning. Residents in that district just about held their own until 1928, when the pest became so damaging that it was realized that different plans must be adopted for extermination. It was decided to discontinue all burning operations, center activities mainly on poisoning, and to supplement this with cultivation of egg beds.

A complete survey was made of the district during the fall of 1927 and a small amount of egg-bed cultivation undertaken that winter and in the spring of 1928. This resulted in considerable saving and demonstrated the feasibility of this method. A close check was kept upon time of hatching, and as soon as the young hoppers appeared on the beds poisoning started in earnest, using the following mixture: 60 pounds of bran, 6 pounds of commercial white arsenic, 2 ounces of amyl acetate, 30 pounds of fine sawdust, 1½ gallons of stock molasses, and 12 to 15 gallons of water.

The quantity of water was changeable, sufficient being used to give the right water content to the mash. A mixing machine was constructed, with a capacity of 30,000 pounds of mash daily. This machine was somewhat on the order of a concrete mixer, except that it was constructed of wood and did not contain an internal agitator. Dimensions of the mixing box were 38 by 36 by 40 inches and it was operated at the rate of 36 to 40 revolutions per minute. The bran, sawdust, and arsenic were thoroughly mixed dry for a 2-minute period. The water, molasses, and amyl acetate were mixed together and added to the dry mixture in the

machine and revolved for an additional three minutes. Double the amount of the above formula was the capacity of the machine. A 42-inch wooden pulley on the mixer, with a 5-inch pulley on a 3-horsepower gasoline motor gave the right speed to the machine. Hand mixing has been used in several isolated districts, but it was found to be much less effective than that mixed by a machine.

The mixing plant was located in the center of the infested district and poisoning crews were put to work spreading poison daily under the direction of competent field men. Egg beds were designated by number, with a record kept of the date of the last poisoning. Egg beds were poisoned at regular intervals in order to kill the young hoppers constantly hatching.

The habits of the grasshoppers were observed daily by the field men and orders given to the poisoning crews as to time of day to poison, and the kind of weather in which best results were secured. During cold, windy weather all operations were suspended; but during warm, still weather very fine results were secured from 6.30 until 11.30 a. m. and fairly good results from 3 until 5 p. m. Generally from four to six weeks were required for grasshoppers to complete their hatching, necessitating poisoning each egg bed about every third day until hatching stopped.

Constant poisoning was continued for two months or until the flying stage was reached, after which operations were discontinued until the grasshoppers began congregating on the chosen egg beds for the purpose of depositing their eggs. All such areas were plotted and poisoned every second day, resulting in heavy kills. A check on results showed that 65 per cent of all females were killed by this method before eggs could be deposited in the ground. As soon as this work was complete, cultivation of all beds on tillable land was undertaken, resulting sometimes in complete eradication of the eggs. It was found that light harrowing at intervals of two weeks exposed a large percentage of the eggs to the wind and rain. A large percentage of the egg beds were located on rocky, gravelly land at the edge of the surrounding hill, making it impossible to cultivate. These beds were watched carefully for poisoning the following spring.

The main campaign was conducted during 1928, resulting in the mixing and spreading of 1,000,000 pounds of poison

bran mash. The spring of 1929 showed less than 20 per cent as many eggs deposited as in the spring of 1928.

The same methods are being pursued this season, and at the present time practically no damage has been sustained. Crop loss in 1928 was in the neighborhood of 1,500 acres of good grain, whereas the loss in 1929 was reduced to less than 100 acres. Less than one-third as much material was required for the campaign of 1929 in comparison with the huge quantity used in 1928, and the general condition is much improved over any previous year since the drying up of the lake bottom was completed.

Materials for poisoning were all purchased in car-lot quantities several months previous to the start of the campaign, thereby greatly reducing the cost. Total cost of the 1928 campaign, involving 25,000 acres of grasshopper-infested land, was \$13,000, not counting labor, machinery, and equipment provided by lessees. The cost for the 1929 campaign will be less than \$4,000.

To show the effectiveness of the poison, a definite check was made in 1928 on a 5-mile front where grasshoppers were moving from the higher land into the heavy grain land on the lake bottom, showing an average of over 800 dead grasshoppers per square foot to a depth of 500 feet.

Experience has proven that grasshoppers can be controlled by the use of poisoned bran mash, but that every precaution should be taken to see that it is properly mixed and spread out. This can be done only through the proper organization properly financed, and through the employment of competent field men who thoroughly understand the habits of this insect.

A thorough knowledge of the fundamental principles of economic law is the basis on which the individual must act in the prosecution of his business, whether it is growing potatoes, making binders, or running a bank.

Dealers in all big alfalfa hay distributing markets annually receive thousands of orders from dairymen for high-grade alfalfa hay which they can not fill because an insufficient quantity of such hay is produced.

Community Park and Pool At Delta, Uncompahgre Project

BACK in 1922 the people of Delta, Colo., a town of some 3,000 population on the Uncompahgre project, Colorado, decided that they should have a park. A park board was organized and secured about 20 acres of land near the edge of the town. They hired a landscape architect who agreed to give them a preliminary general plan and also a planting plan, under which they could do as little or as much as they could afford each year, with the assurance that when the park was finally completed it would not be an unrelated series of yearly efforts but the culmination of a unified program. To-day the park is a reality and is serving the people of the community in no uncertain fashion.

Feeling the need of recreation in some form for the young people of the town, about 75 of the business men subscribed about \$15,000 to build a swimming pool in connection with the park and high school athletic field. The pool was finished July 31, 1927. It is constructed of concrete, steel reinforced, and is 60 by 120 feet, with a depth varying from 1½ to 8½ feet. The pool is an open-air structure and is kept open three months. It is heated by pumping the water through a large boiler.

The water in the pool is thoroughly chlorinated, is changed every week, and the pool thoroughly cleaned every time

it is emptied. A 12-inch gate valve is at the outlet, and the pool can be emptied in 55 minutes. The apparatus at the pool includes a large slide, water top, diving tower, and springboard. The dressing rooms are located under a walk above the pool, where spectators can look down on the pool and the swimmers.

The attendants include a life guard who also acts as a swimming instructor, an assistant life guard, a fireman who also washes the suits, towels, etc., and a ticket seller. J. S. Wolyniec, the life guard, started a Brownie Club in Delta last summer, and it is understood that the Red Cross has taken up the idea and is starting the movement all over the country. The authorities have insisted on good behavior around the pool on the part of the patrons, and during the three seasons the pool has been open it has been unnecessary to exclude anyone. This matter is considered very important, as once a pool gets a bad name, the right kind of trade will not patronize it.

Delta now has 7 acres of developed park in connection with the swimming pool grounds. They are now planning a community building for dancing, card parties, etc., the erection of which will make a complete combination for the entertainment of young and old in any rural community.

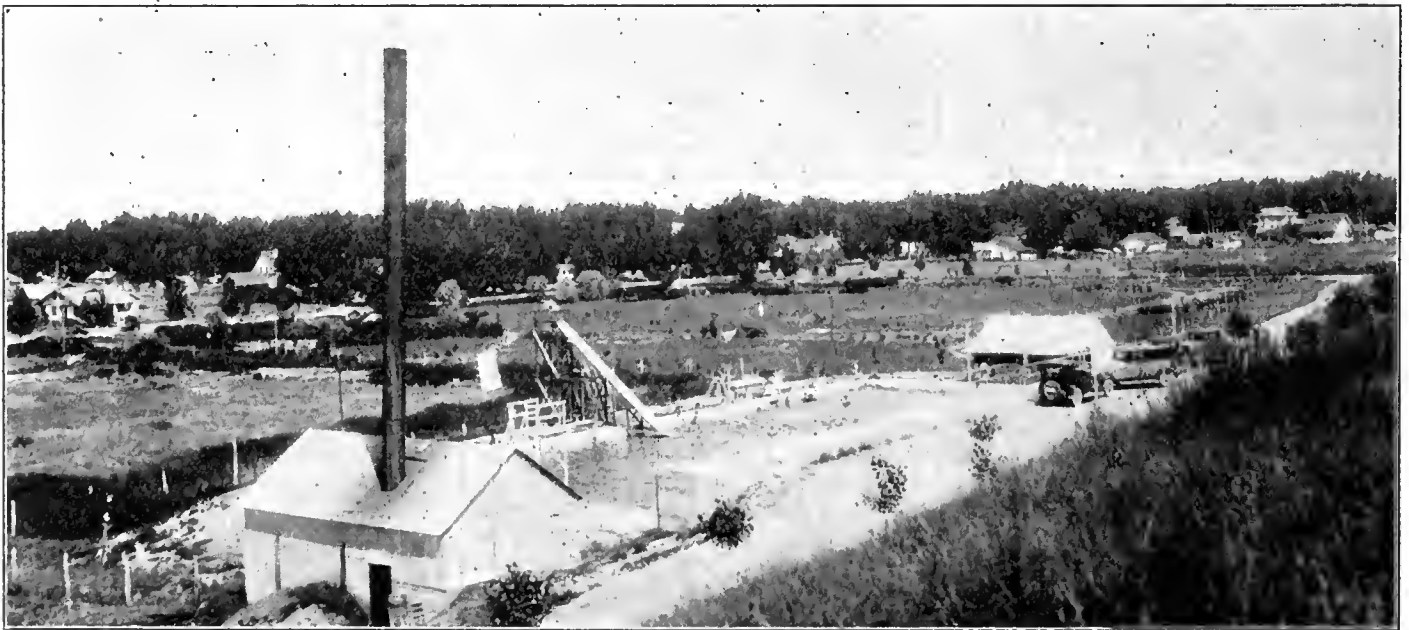
More Settlers Come To Lower Yellowstone

Through the activities of the Lower Yellowstone Development Association, 75 people have been brought to the Lower Yellowstone project, Montana-North Dakota, according to a recent report, by H. E. Meisenbach, secretary of the association.

In addition to sales made to outside people, the activities of the association have caused some of the best renters on the project, who have been there a number of years, to buy because they saw that farms were being sold. The association also arranged with the Richland County Fair Board to issue free tickets to the fair to all Colorado men and their families who came to the project during fair time, September 10 to 13.

Most of the purchasers of project farms made small deposits on their places. They plan to make the remainder of the down payment this fall and move to the project immediately after they have harvested their crops in Colorado and Nebraska. They are all reported to be high-class farmers and beet growers.

In this campaign for settlers the association has enjoyed splendid cooperation all up and down the Yellowstone Valley, at Fairview, Sidney, Savage, and by farmers and others. It is believed that this nucleus of new settlers will be the means of attracting many more to the Lower Yellowstone project.



Swimming pool and community park, Delta, Uncompahgre project, Colorado

Cotton Grown on the Projects in 1928

Cotton was grown during 1928 on five Federal irrigation projects under the Bureau of Reclamation. The area devoted to this crop on the Salt River project, Arizona; the Yuma project, Arizona-California; the Orland project, California; the Carlsbad project, New Mexico; and the Rio Grande project, New Mexico-Texas, amounted to 229,560 acres, which in 1928 produced 193,480 bales of lint and 89,836 tons of seed, having a total value of \$22,450,340, or \$97.80 per acre. In 1927 cotton was grown on the same projects on 178,875 acres and the crop of lint and seed was valued at \$16,705,727, or \$93.40 per acre.

The largest acreage, yield, and value in 1928 were on the Rio Grande project, New Mexico-Texas, where the 104,172 acres devoted to the crop produced 95,311 bales of lint and 42,209 tons of seed, valued at \$10,434,707, or \$100.17 per acre. The highest value per acre of \$104.09 was on the Salt River project, Arizona where 71,923 acres produced lint and seed valued at \$7,486,772.

Detailed statistics are given in the accompanying table.

Cost of Growing Cotton On Yuma Project

Steve Owen, county agent of Yuma County, Ariz., has compiled figures showing the itemized cost of producing cotton on three farms in the valley division of the Yuma project, Arizona. These figures show that an average yield of three-fourths of a bale of lint cotton per acre, with cotton at 17 cents a pound, will pay the grower wages and 8 per cent on his investment.

A survey of past years' cotton yields on the Yuma project shows that the average production has been a little in excess of three-fourths of a bale per acre. It can therefore be concluded that were it not for interest payments on borrowed money, the cotton farmers on this project would be in a healthy, economic condition. These loans are being liquidated and in a few years their burden will be largely removed.

The growing of truck crops is increasing slowly, and it is noted that the farmers of other crops are beginning to realize that greater yields can be produced by better farming methods, for it is demanded of the produce grower that he farm along specified lines or financing will be refused, and he is now applying these methods to other crops with better results.

Cotton grown in reclamation projects, 1928

Project	Area	Total yield		Average per acre		Value	
		Lint	Seed	Lint	Seed	Total	Per acre
Salt River.....	71,923	29,267,053	58,534,107	406.92	813.84	\$7,486,772	\$104.09
Yuma.....	34,342	15,157,651	28,942,148	441.36	842.75	3,498,103	101.86
Orland.....	36	15,000	19,000	138.88	250.00	2,625	73.00
Carlsbad.....	19,087	4,654,791	7,770,000	243.87	407.08	1,028,133	54.13
Rio Grande.....	104,172	47,655,505	84,418,005	457.00	810.37	10,434,707	100.17
Total and average...	229,560	96,740,000	179,673,260	421.41	782.73	22,450,340	97.80

¹ Estimated.

Lower Yellowstone Man Tops Stock Market

A recent item in the Sidney Herald shows the quality of stock produced on the Lower Yellowstone project. Mr. Ludington is one of the newer settlers on the project, coming from the adjacent dry-land area.

"E. J. Ludington, prominent stockman and valley farmer, between Sidney and Fairview, returned this week from St. Paul, where he took a car of yearling cattle to market, which topped the yearling market and incidentally brought him quite a little publicity in the South St. Paul Stockyards' official publication. Mr. Ludington fed the shipment of yearlings for market at his ranch and, knowing his business thoroughly, had them in prime condition, so that in unloading they attracted the instant attention of the commission men at the stockyards in St. Paul, who wanted to know how he did it and where."

Yuma Mesa Truck Farming Experiment

A very successful experiment in truck farming is being carried on at the present time on a small tract of land in Unit B, Yuma Mesa division, Yuma project, Arizona. Squash, cucumbers, honeydew melons, tomatoes, eggplant, and a number of other vegetables were planted within the last two months and are succeeding exceptionally well.

As an example of the rapidity of growth, summer squash on this tract reached maturity 33 days from the date of planting. If this experiment, which looks very encouraging, proves successful, it is considered certain that a considerable acreage on the mesa will be devoted to winter and early spring vegetables and melons, for these crops can be placed on the market at a season when there is no competition from other localities.



Combination section of Kittitas Main Canal, near Morrison Canyon, Yakima project, Washington

Reclamation Organization Activities and Project Visitors

DR. Elwood Mead, Commissioner of Reclamation, addressed the conference of the Western Division of the Chamber of Commerce of the United States, held at Ogden, Utah, September 30 to October 1, on the subject of Federal Reclamation—Its Achievements and Needs. Doctor Mead returned to the Washington office on October 5.

R. F. Walter, chief engineer, made an official inspection during the month of the Riverton, Shoshone, Sun River, Milk River, and Lower Yellowstone projects.

Madam Tatiana Kolpakova, S. Zaprometov, A. Jimsky, Boris N. Abrahamoff Michiloff, Victor A. Staricoff, and Mr. Pyrim, engineers from Turkestan, Union of Socialist-Soviet-Republics, visited the Denver office recently to study construction plans and methods used by the Bureau of Reclamation.

Prof. John G. Alexandrov, director of the State Institute for Hydraulic Construction of Moscow, Union of Socialist-Soviet-Republics, spent several days in the Denver office studying irrigation works and methods, followed by a field inspection of a number of the projects.

Hugh A. Brown, Assistant Director of Reclamation Economics, was designated recently by the Secretary of the Interior to represent the department on a special subcommittee of the Interdepartmental Board of Simplified Office Procedure for the purpose of considering the adoption of a standard practice in the handling of motion-picture films as regards storage, loaning, shipping, indexing, cataloguing, and issuing of relevant publications.

R. J. Coffey, district counsel, spent several days in the Washington office in connection with the Boulder Dam power contracts.

Col. B. F. Fly, the father of the Yuma Mesa, Yuma project, Arizona-California, was a recent visitor at the Washington office.

Capt. Edward Gillings, president of the board of directors of the Okanogan irrigation district, Okanogan project, Washington, was found dead in his orchard recently.

L. N. McClellan, electrical engineer, Denver office, arrived at the Washington office on October 8 for the conference in connection with the production and distribution of power at Boulder Dam.

Prof. Harald M. Westergaard has reported for duty in the Denver office for assignment as senior mathematician in connection with special studies of a highly technical nature pertaining to the mathematical treatment of arch dam designs, with particular reference to the designs for the Boulder Dam.

R. J. Tipton, engineer in the hydrographic section of the Denver office, has resigned to accept a position with the State of Colorado, in charge of engineering matters connected with the allocation of the waters of interstate streams.

Bruce Lampson, office of the Director of Markets of Colorado, visited the Grand Valley project recently to make a survey of the dairy and poultry industries.

Five Cows on a Farm

Much has been said and written concerning the advisability of keeping a few cows on every farm. General statements advising such a course are more or less effective, but a more definite illustration recently set forth by a country banker is even more convincing.

He declared that if each farmer in his county had five good cows and sold the milk or cream which they produced the cash returns would do these things in a year:

Pay the farmer's State and county taxes.

Pay his automobile license and buy two new tires.

Provide a \$40 kitchen cabinet, a \$50 sewing machine, and a \$40 suite of furniture for the farm home, and school books for the children.

Clothe a farm family of five persons.

Buy \$50 worth of paint for the farm buildings.

Besides doing all these, the fertilizer produced would increase the soil fertility of the farm, and the farmer would in addition have all his calves for sale or for keeping to augment his herd.—*Pocatello Tribune.*

Hon. James Rudolph Garfield, former Secretary of the Interior, was a recent visitor at the Washington office.

Recent visitors on the Orland project included Representative Clarence F. Lea, of the first California district, and George J. Evatt, irrigation commissioner of Sydney, New South Wales, Australia.

The Oregon Irrigation Congress was in session at Ontario, Oreg., during September. Their program included a visit to various construction features of the Vale project.

Miguel E. Montalva and Luis Eyquem, Government engineers from Santiago de Chile, were recent visitors at the Washington office, making a study of the organization and administration of the bureau. They plan to visit the Denver office and a number of the projects, particularly Vale, Owyhee, Kittitas, Minidoka Gravity Extension, and Salt Lake Basin.

John A. Keimig, junior engineer, North Platte project, has been temporarily transferred to Casper, Wyo., to assist in the classification of the lands of the Casper-Alcova project.

R. K. Tiffany, supervisor of hydraulics of the State of Washington, and George J. Evatt, irrigation commissioner for New South Wales, Australia, were recent visitors on the Yakima project.

Lee D. Purdin, concrete inspector, Kittitas division of the Yakima project, has been transferred to Yuma, Ariz., for service as instrument man on the All American Canal surveys.

Recent visitors on the Minidoka project included J. H. Rothrock, A. W. Harrington, and G. G. Paulsen, members of a commission to study allocation of power profits; F. M. Goodwin, formerly Assistant Secretary of the Interior; Barry Dibble, consulting engineer and former project manager; and Fred F. Henshaw, engineer, Federal Power Commission.

The bureau has heard with regret of the death, in October, of Hervey Lindley, president of the Columbia Basin League.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

Jos. M. Dixon, First Assistant Secretary; **John H. Edwards**, Assistant Secretary; **E. C. Finney**, Solicitor of the Interior Department;
E. K. Burtew, Administrative Assistant to the Secretary and Budget Officer;
Northcutt Ely and **Ernest W. Sawyer**, Executive Assistants

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Assistant to the Commissioner P. W. Dent, Assistant Commissioner George C. Krentzer, Director of Reclamation Economics
W. F. Kubach, Chief Accountant C. A. Bissell, Chief of Engineering Division Hugh A. Brown, Assistant Director of Reclamation Economics
C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche	Newell, S. Dak.	F. C. Youngblutt	J. P. Siebeneicher	J. P. Siebeneicher	Wm. J. Burke	Mitchell, Nebr.
Boise ¹	Boise, Idaho	R. J. Newell	W. L. Vernon	W. C. Berger	B. E. Stoutemyer	Portland, Oreg.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	W. C. Berger	W. C. Berger	H. J. S. Devries	El Paso, Tex.
Grand Valley	Grand Junction, Colo.	J. C. Page	W. J. Chiesman	W. J. Chiesman	J. R. Alexander	Montrose, Colo.
Huntley ²	Ballantine, Mont.					
King Hill ³	King Hill, Idaho					
Klamath	Klamath Falls, Oreg.	H. D. Newell	N. G. Wheeler	Joseph C. Avery	R. J. Coffey	Berkeley, Calif.
Lower Yellowstone	Savage, Mont.	H. A. Parker	E. R. Scheppelmann	E. R. Scheppelmann	E. E. Roddis	Billings, Mont.
Milk River	Malta, Mont.	H. H. Johnson	E. E. Chabot	E. E. Chabot	do.	Do.
Minidoka ⁴	Burley, Idaho	E. B. Darlington	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Newlands ⁵	Faloo, Nev.				R. J. Coffey	Portland, Calif.
North Platte ⁶	Mitchell, Nebr.	H. C. Stetson	Virgil E. Hubbell	Virgil E. Hubbell	Wm. J. Burke	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.				B. E. Stoutemyer	Portland, Oreg.
Orland	Orland, Calif.	R. C. E. Weber	C. H. Lillingston	C. H. Lillingston	R. J. Coffey	Berkeley, Calif.
Owyhee	Owyhee, Oreg.	F. A. Banks	H. N. Bickel	Frank P. Greene	B. E. Stoutemyer	Portland, Oreg.
Rio Grande	El Paso, Tex.	L. R. Fiock	Henry H. Berryhill	Henry H. Berryhill	H. J. S. Devries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	R. B. Smith	Erle W. Shepard	Wm. J. Burke	Mitchell, Nebr.
Salt Lake Basin	Salt Lake City, Utah					
Salt River ⁸	Phoenix, Ariz.					
Shoshone ⁹	Powell, Wyo.	L. H. Mitchell	W. F. Sha		E. E. Roddis	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah					
Sun River ¹¹	Fairfield, Mont.	G. O. Sanford	H. W. Johnson	H. W. Johnson	E. E. Roddis	Do.
Umatilla ¹²	Irrigon, Oreg.					
Uncompahgre	Hermiston, Oreg.					
Vale	Montrose, Colo.	L. J. Foster	G. H. Bolt	F. D. Helm	J. R. Alexander	Montrose, Colo.
Yakima	Vale, Oreg.	H. W. Bashore	C. M. Voyer	C. M. Voyer	B. E. Stoutemyer	Portland, Oreg.
Yuma	Yakima, Wash.	P. J. Preston	R. K. Cunningham	J. C. Gawler	do.	Do.
Yuma	Yuma, Ariz.	R. M. Priest	H. R. Pasewalk	E. M. Philebaum	R. J. Coffey	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam	Coalville, Utah	F. F. Smith ¹³	C. F. Williams		J. R. Alexander	Montrose, Colo.
Kittitas	Ellensburg, Wash.	Walker R. Young ¹³	E. R. Mills		B. E. Stoutemyer	Portland, Oreg.
Sun River, main canal Construction	Fairfield, Mont.	A. W. Walker ¹³			E. E. Roddis	Billings, Mont.
Boise project, Deadwood Dam	Cascade, Idaho		C. B. Funk		B. E. Stoutemyer	Portland, Oreg.

¹ Operation of Arrowroek Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927. E. E. Lewis, manager.

³ Operation of project assumed by King Hill Irrigation District on Mar. 1, 1926. F. L. Kinkade, manager.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926. D. S. Stuver, manager.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926; Fort Laramie Division by Goshen Irrigation District and Oering and Fort Laramie Irrigation District on Dec. 31, 1926; and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928. Joe C. Iddings, manager.

⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917. C. C. Cragin, general superintendent and chief engineer.

⁹ Operation of Orland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926. Lee R. Taylor, manager.

¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

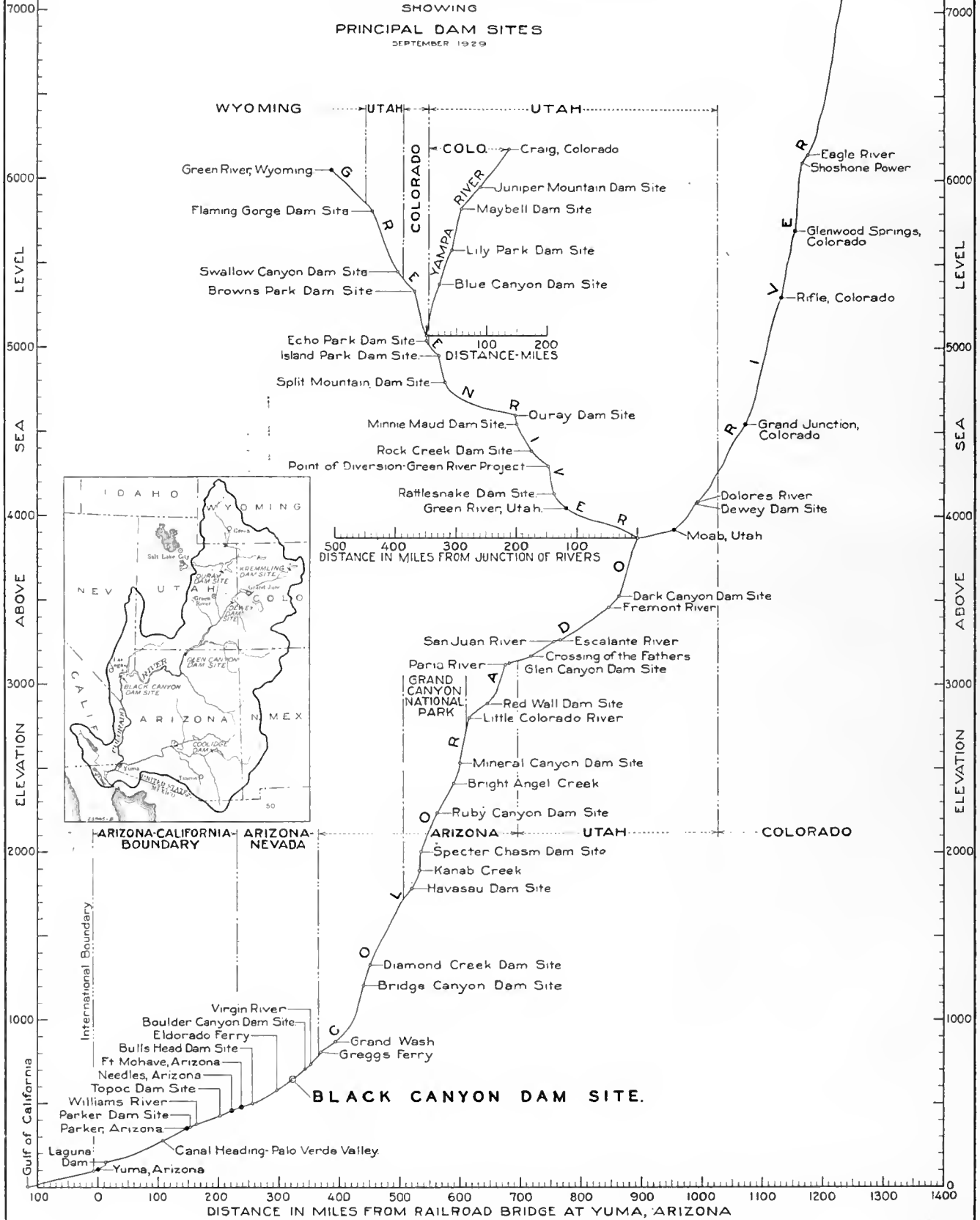
¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926. A. C. Houghton, manager; and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926. Enos D. Martin, manager.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
All-American Canal investigations	Yuma, Ariz.	H. J. Gault	Arizona and New Mexico. State of Utah.
Gila River cooperative investigations	Safford, Ariz.	C. C. Fisher	
Utah investigations	Salt Lake City, Utah	E. O. Larson	
Yakima project extensions	Yakima, Wash.	P. J. Preston	
Aleocva-Casper and Saratoga projects	Casper, Wyo.	J. R. Iakisch	

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROFILE OF COLORADO RIVER AND TRIBUTARIES
SHOWING
PRINCIPAL DAM SITES
SEPTEMBER 1929



Drawn C.A.M. 23845

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NEW RECLAMATION ERA

VOL. 20

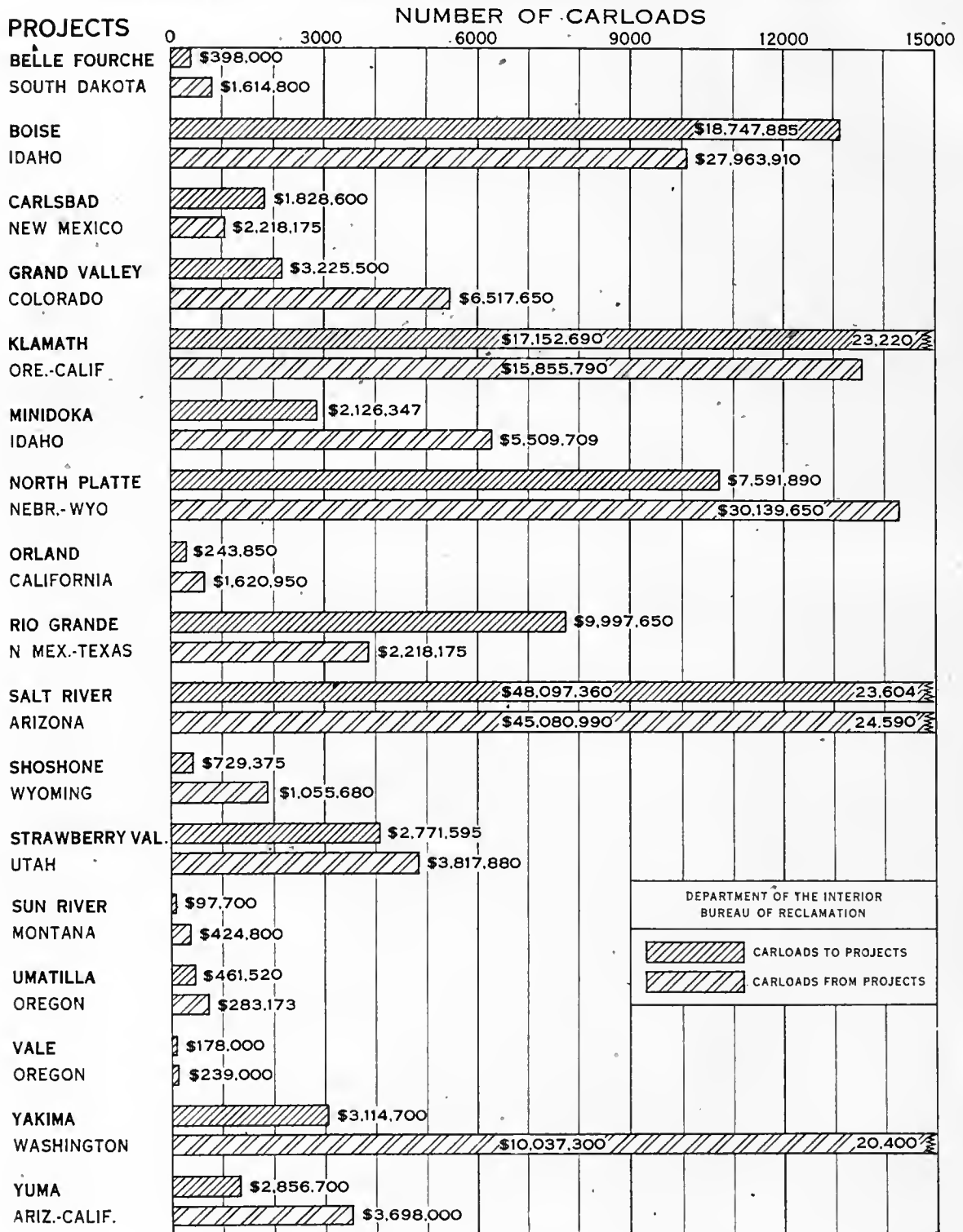
DECEMBER, 1929

NO. 12



BLACK CANYON ON THE COLORADO RIVER WHERE IT IS PROPOSED TO BUILD THE BOULDER DAM

CARLOADS AND VALUE OF PRODUCTS SHIPPED TO AND FROM PROJECTS IN 1928



NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

RAY LYMAN WILBUR
Secretary of the Interior

Price 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 20

December, 1929

No. 12

Interesting High Lights on the Federal Reclamation Projects

SUGAR-BEET yields on the Uncompahgre project are better than they have been for several years. Prices are excellent for all crops except onions, most of which were going into storage in anticipation of better prices next spring.

THOMAS R. SMITH, of Harper, Oreg., was the first to file a water-rental application for water from the Vale project and the first to make homestead entry on the project. A number of settlers are clearing their lands of sagebrush in preparation for irrigation next year.

A CONTRACT has been awarded by the Oregon State Highway Commission for the surfacing of the 22-mile section of the Central Oregon Highway between Vale and Harper, Vale project, and for the widening of 6½ miles of this section, at a total cost of \$114,581.

AT the Owyhee Dam, Owyhee project, excavation for the foundation continued and the power outlet tunnel was completed. At the end of the month the dam was 22 per cent completed.

THE development of the natural-gas resources of the Milk River project, now in progress by two companies, will be a material factor in project development. A considerable portion of the irrigable area will be tributary to the several supply lines now under construction, making this fuel available for use on the farms.

FORTY-FIVE farms in private ownership on the Orland project have been placed under option to the United States for advertisement and sale to prospective settlers. These farms contain 1,297.6 acres and are appraised at \$161,025. The directors of the Orland Unit Water Users' Association plan to advertise these farms in Portland and Los Angeles papers during the present winter.

MORE than 10,000 persons attended the annual Glenn County Fair at Orland, Orland project, during October. The livestock and agricultural exhibits were especially attractive. The fair showed a profit of \$1,200.

THE potato-meal factory at Burley, Minidoka project, being erected by the Otato Corporation, is expected to be ready to start operations during the present season.

THE SEASON'S GREETINGS FROM THE SECRETARY

WITH the Yuletide season approaching I am glad to send, through the medium of the NEW RECLAMATION ERA, a message of greetings and best wishes to the personnel of the Bureau of Reclamation, the people they serve, and all the readers of this magazine. By cooperation we have made some strides forward, and by a continuation of the same we hope to solve some of the other problems confronting us. I wish you all a very Merry Christmas.

RAY LYMAN WILBUR.

UNUSUALLY heavy yields of crops, especially of potatoes, with correspondingly large returns, were reported from the Minidoka project. Many farms reported returns of \$300 to \$500 per acre. On the Gravity division the returns from the potato crop will this year amount to \$2,000,000, which is more than the amount received for all crops last year.

THREE Belle Fourche project dairy-men each had seven cows producing more than 40 pounds of butterfat during September, as reported by the Black Hills Dairy Improvement Association. The number of dairy cows on the project has increased considerably during the past year.

A COMMUNITY club has been organized on the Greenfields division of the Sun River project for the purpose of holding meetings and discussing farming subjects intimately related to the successful development of the project.

AN estimate of the citrus fruit crop this year on the Mesa division of the Yuma project is 65,000 to 70,000 boxes from approximately 500 acres of bearing trees on Unit "B," and an additional 10,000 boxes from groves outside this unit.

THE second annual pecan day was celebrated on November 1 by the pecan growers and others interested in the industry on the Yuma project. A tour was made of the larger pecan groves on the project. The acreage planted to pecans is increasing steadily.

THE Langwell Valley cheese factory, Klamath project, has increased its daily milk supply from 1,600 to 2,600 pounds.

THIS year's pear crop on the Rio Grande project is reported to have brought the largest returns in the history of the project, the gross returns being about \$290,000.

SEVERAL prospective homesteaders were shown over the Riverton project during the month, one application was received, and two applicants made homestead entry.

WORK continued on the construction of Echo Dam, Salt Lake Basin project, and good progress was made on all features of the work. The amount of material placed in the clay, sand, and gravel section of the dam amounted, during the month, to 196,341 cubic yards, or 83,611 cubic yards more than the previous record made in the month of August.

Settling Land in Private Ownership on the Orland Project, California

By R. C. E. Weber, Superintendent

PRIOR to 1920, progress in settlement of the Orland project continued at a satisfactory rate, each year showing a marked increase in the project acreage brought under irrigation over that for the previous year. In 1920 a water shortage, amounting to about 50 per cent of a normal supply for the acreage under irrigation, resulted in a decrease of 1,400 acres in the area irrigated. This was the first break in steady upward trend of the graph showing the settlement rate on the project since the beginning of its operation by the Government in 1911, when stored water was first available from the project system. Notwithstanding the adverse effects of the 1920 water shortage and the still greater depressing effect on agricultural progress resulting from the deflation period following the World War, advance was made in the project development during 1921, 1922, and 1923, culminating in the latter year, when 15,500 acres—the largest in the history of the project—were under irrigation.

Full development of the project by 1923 would have occurred had the rate at which new lands were coming under irrigation, which prevailed prior to 1920, continued subsequent to that year. Notwithstanding the drought year of 1920 and the post-war deflation of prices for farm products, progress during 1921, 1922, and 1923 was such that had the rate for these three years continued, full development of the project would have been attained in 1936, with some 17,500 acres under irrigation during 1928. This anticipated rate of progress, however, suffered a serious setback as a result of the acute and unprecedented water shortage of 1924, when only one-fourth of the normal irrigation requirement was available for slightly more than one-half of the project area, which was irrigated that season. The acreage under irrigation decreased from 15,500 during 1923 to slightly less than 12,000 for 1924. Although remarkable recovery in many ways from the effects of the drought year have since been made in the project's economic fabric, a definite and satisfactory trend in the rate of progress in bringing more project lands under irrigation has not yet been established.

THE PLAN OF DEVELOPMENT

In the farms operated on the project are some 16,800 irrigable acres, of which 14,500 are irrigated, the difference of 2,300 acres representing the acreage in the process of reclamation. Assuming the ultimate acreage of the project to be 20,750 acres, there are about 4,000 acres of inoperative lands as far as utilization of the

project works is concerned. It was with the purpose of stimulating the development of this area that Commissioner Elwood Mead in 1926 met at Orland with representatives of landowners and officials of the water users' association regarding a plan for placing these lands in the ownership of operating farmers.

Briefly, the plan contemplated the listing of the lands by the owners with the Reclamation Bureau under an agreement, whereby the sale price would be controlled for a definite period of time, and during which efforts would be made to secure qualified purchasers. Prices were to be based on independent appraisals by a disinterested board appointed by the Reclamation Bureau and the directors of the water users' association. Sales were to be made under a uniform selling contract, providing for 10 per cent cash payment at the time of sale, 6 per cent semiannual interest payments only during the following two years, and the balance payable during the ensuing 18 years in

semiannual amortized installments, also carrying 6 per cent interest. Farming experience and certain capital requirements were contemplated in connection with prospective land buyers.

The plan met with approbation and early in 1927 the form of agreement between the landowners and the United States, as well as the uniform contract of sale, were prepared and approved. The approved form of land options provided the following salient features:

1. Use of the approved uniform contract of sale in effectuating sale of the lands.

2. Purchasers to be qualified on the basis of sufficient industry, experience, character, and capital to efficiently and profitably operate a farm on the Orland project.

3. Capital requirements of prospective land buyers to consist of cash, or unencumbered negotiable securities readily convertible into cash, in the following amounts:

Size of farm	Required capital
To and including 10 acres.....	\$2,500
Over 10 and not exceeding 20 acres.....	3,250
Over 20 and not exceeding 30 acres.....	4,000
Over 30 and not exceeding 40 acres.....	5,500

It was recognized that insufficient capital with which to effect immediate improvements and bring a farm into early production was a serious handicap for a new settler, and consequently the above capital requirements were considered essentially necessary.

4. Agreement by the landowners that if further subdivision of the lands described in the option is necessary or desirable in order to provide suitably sized farms for purchasers, such subdivisions shall be made and the smaller units shall be sold at prices so that the aggregate selling price of the several parts comprising the subdivision shall equal the selling price fixed in the option for the farm before subdivision. This was to prevent subdivision of a tract into smaller units and selling the subdivision at prices, the aggregate of which would exceed the selling price of the original farm or unit.

5. Provision for payment by the landowners of a commission, amounting to 5 per cent of the selling price of the land, to any real estate operator or other selling agency, other than the United States, for selling the land under such terms and conditions as might be agreed upon by the landowner and the selling agency.

6. Provision for the landowner to seek a buyer and sell the land himself at the

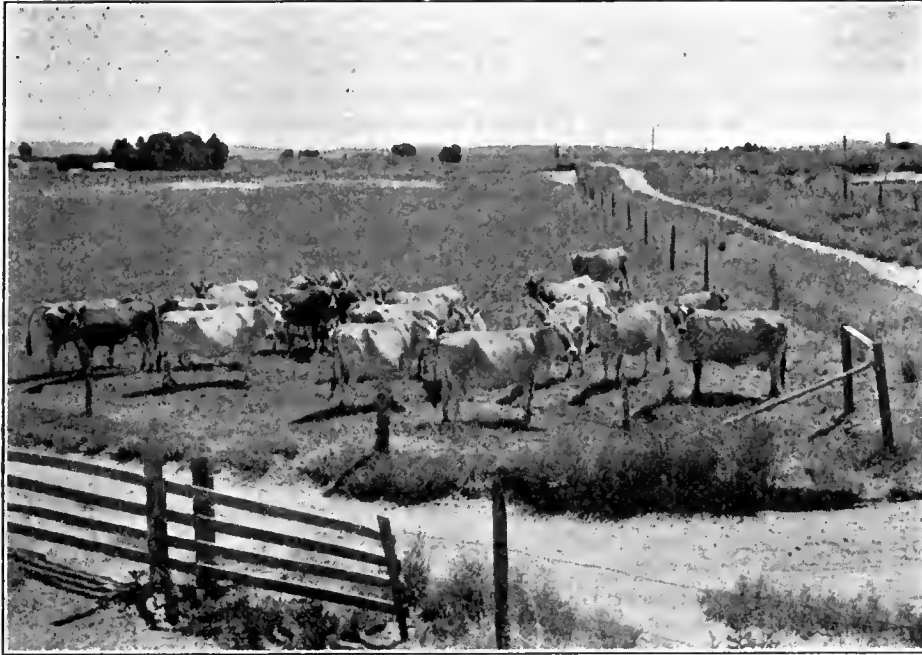
GEORGE C. KREUTZER DIES IN OFFICE

George C. Kreutzer, Director of Reclamation Economics, died in the Washington office of the Bureau of Reclamation on November 23, 1929, following an acute attack of angina pectoris.

Mr. Kreutzer came to the bureau five years ago to take charge of the economic work, for which he was eminently qualified through his years of experience in Australia, where he was associated with Dr. Elwood Mead, Commissioner of Reclamation, and at that time chairman of the Rivers and Water Supply Commission of Victoria. Before coming to the bureau Mr. Kreutzer had been manager of the California State land settlement irrigation project at Durham. His marked ability, excellent judgment, and engaging personality won the respect and friendship of all with whom he came in contact.

Mr. Kreutzer is survived by his widow, Mrs. Dorothy McFarlane Kreutzer, and two children, Elwood William, a page in the United States Senate, and Adelaide Dorothy.

Funeral services were held on Monday, November 25, and were attended by the force in the Washington office and many other friends in Washington.



Pure-bred Jersey herd on the Sunnyside division of the Yakima project, Washington

appraised valuation and upon the terms provided in the uniform contract of sale.

7. Options to continue until December 31, 1928.

In addition to containing the selling terms hereinbefore enumerated, the uniform contract of sale also provides that during the first year, following the sale of the land, the purchaser will effect improvements equal in value to one-half of the total purchase price, not less than one-fourth of such improvements to consist of preparing, leveling, planting, and seeding the land for the growing of crops. All county taxes, together with charges for operation and maintenance and construction, which become due after the date of the sale contract, shall be paid by the purchaser. Good and sufficient merchantable title to the land purchased (at the expense of the land seller) is guaranteed by a policy of title insurance, issued by a reliable title insurance company, in the full amount of the entire purchase price of the property. The contract also provides that the purchaser at the request of the land seller will apply for a Federal or a joint-stock land-bank loan, or a loan from a similar loaning institution making loans on real property on the installment repayment plan, in an amount sufficient to enable the purchaser to liquidate the balance of the purchase price, including interest, then remaining unpaid. Inasmuch as such loans are made only in connection with farms in a producing state, it will usually be from three to five years after purchase before application for such loan will be required. Assuming that five years after purchase, the land buyer is qualified to procure a Federal loan, he will have had a total of 39½ years in which to make full repayment of the purchase

price of his farm, five years of which will be under the uniform contract of sale and 34½ years under the Federal farm loan.

APPRAISAL OF THE LANDS

After approval and preparation of the approved forms of the agreement and uniform selling contract in March, 1927, an appraisal board was appointed by the bureau and the water users' association. The latter designated two members of its board of directors, and the project superintendent was appointed by the commissioner to serve as the bureau's representative. An appraisal fee of \$6

for each farm was established to defray the cost incurred in making an appraisal, this sum to be advanced to the water users' association, after which the property was appraised and a report furnished the landowner. If the appraisal was satisfactory, the owner then executed the agreement, placing the land under option to the United States for advertisement and sale.

Letters were mailed to all interested landowners regarding the subject of land appraisals and 36 responded by depositing with the water users' association the required appraisal fees, the aggregate amount of which was \$462. The appraisal board convened at various times during the latter part of April, in May, and in June, spending the equivalent of seven days in the field appraising 77 farms for which appraisal fees were remitted. The total acreage appraised was 2,121.5 and the valuation was \$285,400 for the 77 farms. The appraised valuation varied from \$70 to \$175 per acre for unimproved land and from \$95 to \$235 for improved property. Subsequently 64 of the farms appraised were placed under option by the owners to the United States for the period ending December 31, 1928; the area comprised 1,787.6 acres and the valuation was \$238,000.

Listing of the property with the Government was concluded in July, 1927, at which time a description of each farm and other related information concerning the project and the Orland community was sent to Washington for incorporation in an illustrated, color-covered booklet, describing opportunities for farm owner-



Picking red raspberries on the Minidoka project Idaho

ship on the Orland project with particular reference to the farms under option to the United States. An edition of 15,000 booklets was printed and available for distribution early in November. These were immediately given wide distribution through various agencies. A large number were mailed to the list of inquiries on file in the project office. Over 1,000 copies were sent to the Los Angeles office of the Sacramento Region Citizen's Council for distribution by the council's representative stationed in the chamber of commerce at that place. The Grants Pass (Oreg.) and the Salt Lake City offices of the council were also provided with a supply for distribution, together with the Denver Tourist and Publicity Bureau.

During the summer of 1927 a contract was executed between the members of the Orland Realty Board and the Reclamation Bureau in connection with the procedure relative to selling lands under option to such qualified land buyers as might be referred to the board for viewing and examining the farms available for sale. This contract provided that the project office would refer qualified land buyers to the various members of the board in rotation. The members of the board agreed to furnish such land buyers with all available information concerning the farms under option to the United States and also to furnish transportation facilities in order that the land might be viewed and examined. It was also provided that the board members would make no effort to sell such prospective buyers any lands other than those on which the Government holds optional agreements, unless and until such land purchasers were first brought to the project office and there had executed a statement, stating that having viewed the lands under option, they now desire to acquire lands other than those listed by the bureau.

THE EXAMINING BOARD

In the fall of the year an examining board to consider and pass upon the applications of prospective buyers of farms under option to the United States was appointed by the Secretary of the Interior. The three members of the appraisal board were so designated. A special form of inquiry blank was prepared and printed for use in this connection.

In November the directors' board of the water users' association appropriated \$250 for a fund to be used in advertising the farms under option; local interests consisting of members of the Orland Realty Board and interested land owners also contributed, so that a sum of \$500 was raised for advertising purposes. Advertisements were placed in 11 papers—

mostly agricultural periodicals published in the mid-Central States as well as in the Sunday editions of the newspapers of largest circulation in Los Angeles. These advertisements were run during December, 1927, and continued into March and April of the following year.

RESULTS OF ADVERTISING

As a result of this advertisement, approximately 500 inquiries were received at the project office. These were answered by letters, with which was inclosed a copy of the illustrated Orland booklet published by the bureau, a leaflet also prepared by the bureau, and an illustrated folder of the Orland Chamber of Commerce, all containing general information regarding the project and contiguous farming community. A copy of the inquiry blank used in determining the financial, farming, and other qualifications of land buyers was also inclosed with the literature.

In addition to the advertising financed by local interests, the Southern Pacific Co., through R. E. Kelly, manager of development and colonization, effectively cooperated with the bureau in advertising the farms under option to the Government. At its own expense, the company advertised the farms in six agricultural publications in the mid-Central States, as a result of which 86 inquiries were received. Copies of Mr. Kelly's replies were furnished the project office and follow-up letters with supplemental literature were forwarded. Other effective advertising, also involving no expense to the project, was afforded through the medium of the Standard Oil Bulletin, published by the Standard Oil Co. of California. In the April, 1928, issue of this publication, there appeared an illustrated article regarding the Orland project, in which mention was made of the farms available for sale under Government supervision. A number of inquiries originated from this article.

The advertising during the winter and spring of 1927-28 resulted in the filing of 21 applications. These were promptly rated by the examining board upon receipt of replies from the references submitted by the applicants. Only one or two applications were disapproved on account of lack of the necessary requirements, both as to finances and farming experience. Three farms were sold or otherwise disposed of by the owners, only one of which, however, was purchased by a buyer who qualified before the examining board. The effort and expense, however, was not altogether without some encouraging benefits and results. A number of people were attracted to the project through the advertising, and the attention thus focused on the community was doubtless well worth the expense incurred. It is known

that there were two instances where farms were purchased, other than those under option to the bureau, the buyers of which were attracted to Orland by the advertising campaign. These particular farms—for a number of years inoperative—were thus brought into production.

In view of the large number of inquiries received during 1927-28, it was considered advisable to renew the options, which expired December 31, 1928, and to continue advertising during the winter of 1928-29. Most of the landowners were receptive to the plan as evidenced by the fact that nearly all the land under option during 1928 was again placed under agreement for sale during 1929; 60 farms, involving 1,661.4 acres and an appraised valuation of \$217,275, were signed up by the owners.

Funds for the advertising campaign during 1928-29 were readily forthcoming from the same organizations and interests which contributed to the fund during the previous year; a total of \$405 was subscribed. Advertisements were inserted in the Sunday editions of Los Angeles, Portland, and Seattle newspapers in an endeavor to attract land buyers who are located nearer the project, rather than advertise in mid-Central States as was done during the preceding year.

The advertising resulted in more than 400 inquiries being received; 18 applications were filed, and 3 of the farms under option were sold. In addition, two buyers were attracted to Orland and purchased project property other than farms under option.

At the close of November, 45 farms, with an aggregate area of 1,298 acres and an appraised value of \$161,025, had been placed under option for another period of 12 months ending December 31, 1930.

General Survey of Danish Agriculture

A recent issue of the Records of the National Agricultural Institute of France contains an interesting extract from the report of the mission in 1928 of M. Jean de Gibon, agricultural engineer, on a general survey of Danish agriculture. The introduction and part 1 of the report are included in the publication, parts 2 and 3 to be printed later. The following chapter headings of part 1 indicate the scope of this portion of the survey:

Generalities; three types of farms; breeding associations; agricultural cooperation; grain producers' organizations; organizations for purchasing hay and other forage; office of agricultural accounting; the Danish agricultural crisis; agricultural instruction; state seed experiment station; and a large establishment for the selection of seeds.

Essential Factors in Determining the Feasibility of a Project

From Bulletin No. 21; Irrigation Districts in California, Division of Engineering and Irrigation, Department of Public Works, California

By Prof. Frank Adams, University of California

THE more important matters to consider are the following:

(a) The character of the soils in sufficient detail to show the location and areas of alkali and other unprofitable or marginal lands. These are always the first to go delinquent and thus pass their burden of assessments on to the better lands. A soil map, prepared by a competent soil specialist, is the most effective way to present this information.

(b) The best use that can be made of the land after irrigation water is available, with a showing of the yield of different crops to which the land is suited, and evidence that the market for those crops has a favorable outlook, at least during the period of settlement and development.

(c) The capital cost of the proposed irrigation system for each of the principal grades of land to be included, with a showing in each case that these costs are justified. No estimate of capital cost is a safe guide that does not include all important items, whether needed immediately or at some future time, unless it is certain that such items can be postponed beyond the main development period, and this is practically never the case. The cost of lateral distribution, whether included in the district system or to be built at the expense of landowners, is as much a part of the total capital cost as is the cost of the main canal and other principal works. Another needed capital item that irrigation districts have frequently left out of their calculations is drainage, or such type of construction as will lessen the need for it; a third is storage for late summer supply, now, however, less frequently left out of consideration because most new projects are predicated on storage.

(d) The cost of farm irrigation distribution systems and structures and of the preparation of the land for planting and irrigation, to be determined by surveys of typical areas generally representative of the whole project. The irrigation district that starts its construction program without this information, definitely obtained through field study by a competent irrigation or agricultural engineer experienced in such matters, lacks the answer to one of the first of the settlement problems that must be met before the project becomes successful.

(e) The probable annual irrigation cost to water users, including interest and principal of bonds. This information is satisfactory only if it is shown for each of the principal grades of land included. Average project costs of maintenance and operation in districts in which the range

of land valuations for purposes of district assessment is considerable are obviously misleading and unsatisfactory.

(f) The size of farm units necessary for successful farming within the district, with due regard to the economic types of farming to which it has been found the project is suited.

(g) The probable cost of land to those who are to farm it and the terms on which it can be purchased. The speculative increase in the price of unirrigated land which almost always follows the organization and development of an irrigation project adds greatly to the difficulties of the project, and frequently results in the failure of many of the settlers who might otherwise have succeeded. There is need for some means by which this speculative increase can be prevented. The present Federal reclamation policy is to require binding agreements from landowners to sell to settlers at fixed, nonspeculative prices. A similar effort has been made in one California irrigation district which recently completed its irrigation system.

(h) The probable cost of farm development, including the cost of such major items as the farm irrigation system, preparation of the land for planting and irrigation, planting, livestock, building, equipment, interest on deferred payments, and irrigation and other assessments, both general and special, and annual water tolls, if any.

(i) Where it is proposed to obtain the "settlers" with the necessary capital (as

well as the experience and agricultural temperament needed for success in farming) to utilize the land for which water is to be made available. In this connection it is justifiable to require a definite showing by the promoters of the new irrigation district enterprise which will open for settlement large areas of land that with completion of construction enough land will be promptly brought under irrigation and be planted to crops that can be grown at a profit to insure payment to the district of district carrying charges. General assurances that the land will be promptly utilized are not sufficient.

The amount of land in a district that can remain unutilized and still pay the added costs resulting from the development and operation of an irrigation system is of course dependent on the financial resources of its owners. In some California irrigation districts the amount has been fairly large, but in many of them it has been relatively small, if the amount of delinquencies in "new" districts after interest and operation costs have begun to accrue can be taken as a criterion.

(j) The capital and credit facilities needed for settlement and development of the land and where they are to be obtained. The amount of money or credit required to carry farms of different types to the point of sustaining themselves can now be estimated with reasonable accuracy, and the failure to consider this factor inevitably results in disaster to many individuals and to some projects.



Alfalfa hay grown on cultivated land adjacent to the Vale project, Oregon

Problems in Handling Large Construction Work by Contract

By F. A. Banks, Construction Engineer, Owyhee project, Oregon-Idaho

OF the \$13,000,000 appropriated by Congress from the reclamation fund for expenditure during the past fiscal year, over \$10,000,000 was for construction work to be handled by contract, the remainder being for surveys, construction by Government forces, operation, maintenance, and miscellaneous work.

In addition, the unexpended balances of previous appropriations were also, in some instances, made available for expenditure. In the administration of this volume of work, involving the expenditure of 75 per cent of the bureau's funds, certain problems were bound to arise.

The construction of public works involves a service to the general public and in many instances the acceptance of a vital responsibility by those to whom the work is intrusted. The work must be worth what it costs to those against whom the cost is assessed and it must perform the service for which it was intended. In the construction of works of a major character upon the safety of which the public must rely, too much stress can not be laid upon employing such methods and surrounding them with such safeguards as will yield the best results.

CONSTRUCTION BY CONTRACT

One of the methods of handling public work is by contract through competitive

bidding. It is with this method that this paper deals.

The policy of constructing public works by contract is predicated upon the proper correlation of the ability, training, experience, and other necessary qualifications of those two groups of professional and business men ordinarily referred to as engineers and contractors. Upon the engineer rests the responsibility for the preparation of the plans and specifications for the work and the execution of the work by the contractor in accordance therewith. Upon the contractor rests the responsibility of so organizing his forces, developing his methods, and utilizing his resources that he can perform the work at a rate and cost and in a manner that will justify the award of the work to him. Under this plan, when properly administered, every item or phase of public interest is properly served and safeguarded. The great public works of this country that have been constructed by this method are monuments to its success.

ORGANIZATION AND ADMINISTRATION

Whenever a task exceeds the capabilities of one individual its accomplishment becomes a problem in organization and administration, and this, in my opinion, is the greatest problem in handling any large work. In administering the civil-service rules and the regulations govern-

ing appointments in the field service I presume that most of us have discovered some problems for solution. It is sometimes just as important to the efficiency of an organization to effect a separation as to secure an appointment; but the process is liable to be even more difficult. If it so happens that the desire for the separation of an undesirable is coincidental with a general reduction in forces, it is easily gratified; but during the period of expansion of an organization the weeding out process becomes a real problem so far as it affects classified employees and emphasizes the necessity for a careful survey of the employees during their probationary period.

In developing an organization it is not merely essential to fit the round pegs into the round holes; there must be teamwork and a spirit of cooperation and loyalty if the best results are to be obtained.

Too little attention is frequently paid to personnel matters, yet this is a most important factor in developing an efficient organization. In adjusting salaries a graph can be used to good advantage to indicate at a glance the compensation of each employee and the dates of changes. Every effort should be made to secure the proper relationship between the capabilities of the men and their compensation.

SELECTION OF THE CONTRACTOR

The multiplicity of the problems of construction and their seriousness from the standpoint of the engineer are very closely associated with the selection of the contractor, and in this matter the engineer engaged in public work has little or no voice. It is common practice among private corporations when advertising for construction work to invite proposals from a half dozen or so contractors who they are satisfied are well qualified to handle the contemplated work. Ample competition is secured and satisfactory results are obtained. Many of the difficulties encountered in the construction of public works by contract could be avoided if some such plan could be followed by the Government. A recent decision, however, by the comptroller (A-24906) fore-stalls any limitation of bidders on Government work and is of interest to Government officers in charge of construction work being handled by contract. In this case the Treasury Department attempted to limit the bidders on the new Internal Revenue Building at Washington, D. C., to contractors who had, within the past four years, constructed a building costing \$2,500,000 or more. The comptroller



Blasting stumps in land-clearing operations, Kittitas division, Yakima project, Washington

ruled that "there may be no exclusion of bidders for the performance of Government work; but in awarding contracts for such work, there may be taken into consideration, when specified in the advertisement for bids, the business and technical organization or nucleus thereof of a contractor available for Government construction work, his experience in building, and the financial resources of the contractor sufficient to enable it to finance such part of the work as is not financed by the United States." The comptroller also, in this decision, drafted a paragraph which, with some modification, might be inserted to advantage in future notifications to prospective bidders. Without some such paragraph, it has been very difficult in the past to justify the rejection of the lowest bid, even though there were ample evidence to support such action. In the future, upon proper showing, such action may be possible.

THE SUPERINTENDENT OF CONSTRUCTION

The selection to be made by the contractor of the superintendent to represent him on the job is a most important factor in the success of the undertaking. A superintendent, who is experienced in the particular class of work covered by the contract, not only has a large personal advantage over others not so experienced; but, what is fully as important, he usually has a following of experienced men in the minor positions who are ready to undertake their respective duties with a minimum of instruction. It does not take a crew of this kind long to get under way. Plans and programs are worked out well in advance and reviewed by the engineering staff, with the result that errors, if any, are detected and corrected before they become of consequence and the work progresses with the smoothness of a well-operated machine. Obstacles mean little to an organization of this kind and there is some satisfaction in working with it. A superintendent of my acquaintance always introduced the principal inspector to each new foreman or subforeman in some such manner as this: "This is the Government inspector. He will tell you how he wants this work done. I want you to do it just that way and get it done to the best interest of the company." This, I believe, represents the attitude of many of the most reliable and experienced contractors and promotes a spirit of mutuality that goes a long way in solving the problems that arise.

With an inexperienced superintendent, the problems are too numerous to mention. His own subordinates are quick to notice the mistakes, their support is lost, inefficiency develops, attempts are made to shift the responsibility, losses occur, the contract is suspended, litigation and

delay result. Perhaps the bondsmen undertake the contract or it is readvertised, all of which add materially to the problems of the engineer.

REDUCING THE CONTRACTOR'S RISK

In handling large construction work by contract a saving to the Government generally results when the risk to be taken by the contractor and the contractor's investment is reduced to a minimum consistent with protection of the Government's interest. This is usually accomplished through the furnishing by the Government of materials becoming a part of the completed work, through a thorough exploration of the site of the work to develop subsurface conditions as to bedrock and materials to be excavated, through a proper preparation of the schedule of quantities and classification of materials, through the location of sources of such material as concrete aggregates, riprap, earth borrow, etc., through the furnishing of power and transportation facilities, and through the submission of plans and specifications in sufficient detail to permit the contractor to prepare an intelligent bid. Best results are more liable to be obtained in cases where the contractor has been furnished with complete information with respect to the work, and most of the contractor's difficulties have developed from a lack of information furnished him or his inability to interpret such as he had.

EXPLORATION OF DAM FOUNDATION

The exploration of the foundation for a large dam is one of the interesting and

important functions of the engineer and is usually accomplished in cooperation with the geologist, the value of whose advice in laying out exploration programs and in interpreting their results has long been recognized by the Bureau of Reclamation in the selection of sites for dams and reservoirs.

At Arrowrock the foundation consisted of massive granite to unknown depths with a relatively small cap of lava plainly exposed to view on the left abutment. The exploration in this case merely served to determine the depth of alluvium over the bedrock and confirm previous impressions as to the quality and extent of bedrock. This was done by wash boring and diamond drilling.

At American Falls the geology of the dam site could be determined with reasonable accuracy from exposures in the canyon below the falls and a study of faulting in the immediate vicinity of the dam site. Prior to exploration it was suspected that the site was crossed by a fault, that the sequence of strata from the surface down was basalt, spherulitic obsidian, and tuff overlain by volcanic ash on either side of the river bed. The exploration, which was done with an ordinary well-drilling rig, determined the depth of soil over bedrock on either side of the river, the thickness of the basalt and obsidian strata, and not only located the fault but determined the amount of its displacement at different points, and permitted the location of the dam at a point where the displacement and resulting shattering were negligible.



Looking down the Main Canal, near Easton, Washington, Kittitas division, Yakima project

At the Owyhee Dam site, the height and magnitude of the structure and the resulting high pressures and stresses justified a most searching examination of the dam site involving over 3,000 linear feet of wash boring and 4,000 linear feet of core drilling in connection with which the river bed was penetrated to a depth of 264 feet and the right and left abutments 435 feet and 140 feet, respectively. The drilling confirmed the early impressions of the geologist that the canyon comprising the dam site was formed by the river cutting through a tongue of felsite or rhyolite enveloped in pitchstone agglomerate all of which was extruded over tuffaceous conglomerate or tuff. The topography indicated that the thickness of the rhyolite at the dam site was about 325 feet above low water and that its width corresponding to the length of the box canyon was about 2,000 feet. The borings developed the additional information that the rhyolite extended for 200 feet below low water with an average of 20 feet of pitchstone agglomerate and an indeterminate amount of tuff below it and that it extended in a horizontal direction normal to the canyon beyond the limits that it was possible to explore with the available equipment. One of the important facts developed by the borings and one that played an important part in the location of the dam was that there was a material increase in the thickness of the rhyolite below low water as the testing progressed downstream from the upper end of the box. This led to the selection of the present site, which is about 600 feet downstream from the upper edge of the rhyolite or about a third of the distance through the canyon.

Another important development as a result of drilling was the discovery of a

fault through the dam site that undoubtedly started the formation of the canyon. The fault zone is about 10 feet wide and is filled with crushed rhyolite that indicates little movement in the mass. It was located while attempting to determine the lowest point in the foundation which is so essential in computing quantities and planning cofferdams. Its location was subsequently verified by crosscutting the base of the canyon with inclined holes. The discovery of this fault of course promptly raised the question as to the probable amount of movement and the chance of its recurrence. What seems to be an extension of the fault into the canyon walls was explored, from which it appears that the movement was slight and in a horizontal direction. Although assurance that future movement will not take place can not be given, the probability of it is more or less remote. The presence of the fault was an important factor in influencing the change in the design from a light to a heavy arch section and in embodying a provision for the treatment of the fault zone in the plans and specifications and emphasizes the necessity for thorough exploration.

LOCATION OF CONCRETE AGGREGATES

The location of a sufficient volume of suitable concrete aggregates is of major importance in the production of large volumes of concrete. Prior to the construction of the American Falls Dam a large part of the concrete aggregates used in that vicinity were hauled by train for 65 miles. A careful search of the adjacent territory revealed an almost unlimited supply of most excellent material adjacent to the railroad with a haul of only 15 miles. When tested by the

Bureau of Standards at Denver it developed to be one of the heaviest aggregates ever tested there and to produce concrete of the highest strength. The sand, however, had a fineness modulus of about 4, which was too coarse, and grinding was attempted. The material was so hard that grinding proved to be impractical, and the problem was solved by introducing sufficient sand with a fineness modulus of about 2 to make a workable mix. The finer sand was located within a mile of the dam, hauled on trucks, and blended on the belt running from the stock pile to the mixing plant. It so happened that a shortage of sand developed in the main pit, so that all material taken from this pit could be used in the concrete without wasting any aggregates.

Preliminary plans for the construction of the Owyhee Dam, which was originally planned as a thin arch structure, contemplated the use of local sand, gravel, and crushed rock. Suitable materials in sufficient quantities could not be located nearer than Adrian, 22 miles away, and a railroad was consequently located to connect the Owyhee Dam site with a branch line of the Oregon Short Line Railroad at that point. Subsequently a large body of sand, gravel, and cobbles of excellent quality and of sufficient volume to satisfy the requirements of the entire project was located near Dunaway Siding, 24 miles from Owyhee Dam site and 7 miles from Adrian, and the location of the lower 10 miles of the railroad was changed to connect with the same branch line at this pit. The superiority of these aggregates for the production of a strong, impervious concrete with a minimum amount of



Typical farm home under pumping district, Owyhee project, Oregon-Idaho. Field of red clover in foreground

cement has been verified by numerous tests in the laboratory of the Bureau of Standards at Denver and in the field laboratory at the Owyhee Dam site.

CONCRETE MIXES

The importance of design and field control of concrete mixes to produce required uniformity, workability, impermeability, and strength in the construction of dams and other structures of magnitude is quite generally recognized. The problems involved emphasize the necessity for the establishment of a field laboratory equipped not only for the testing of the cement, but, what is of much greater importance, for the mechanical analysis of aggregates and the testing of compression of concrete produced from them.

INSPECTION

The matter of inspection is one concerning which much might be said without covering any new ground. That it is of major importance on construction work being handled by contract is well understood. A contractor on important construction work is entitled to the services of a high-grade inspector with training, experience, and ability commensurate with his duties. He should be the point of contact between the engineer and the contractor, and it is important that all orders and instructions to the contractor be given through him in order that he may have first-hand knowledge as to all details and be at all times sure of his ground. An inspector who is merely a critic has not sensed his real function in the organization. His work should be

constructive. By frequent conferences with the contractor's representatives, he should make sure that a satisfactory program is contemplated and have his engineering work far enough in advance to prevent delay to the contractor. It is his duty to see that the contractor has been furnished with the latest drawings, that the old ones have been plainly marked "superseded," and that all work is laid out, checked from every angle, and performed in accordance with the plans and specifications.

CLASSIFICATION OF MATERIAL

Although the classification of material does not usually develop to be a matter of very great importance in the construction of large dams, particularly masonry dams, it does constitute one of the principal problems in handling large excavation projects by contract. This is due partly to the fact that our specifications for classification have not kept pace with progress made in excavation methods, with the result that an attempt is now being made to classify dragline and shovel work with a team specification.

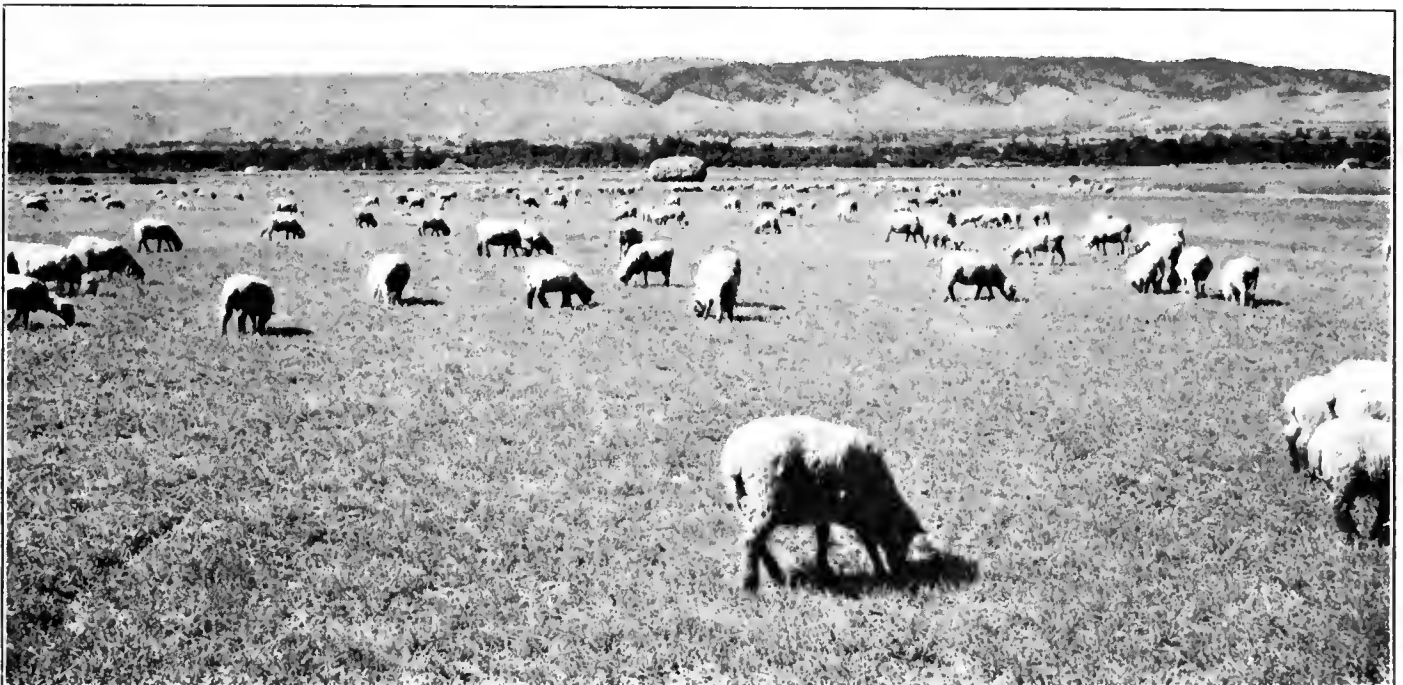
THE PLANS AND SPECIFICATIONS

The essence of success in handling construction work by contract is embodied in the plans and specifications. No phase of engineering requires such keen vision and forethought or such a thorough knowledge of engineering principles and their application to construction in the field as must be utilized in taking a mass of data in the form of topographic maps, diamond-drilling and test-pit records,

hydrometric studies, and reports on geology and preparing from them a set of plans and specifications in which are illustrated and described the most intimate details of the work and just how it should be performed. The engineers of this bureau responsible for this type of engineering are to be commended in the highest terms for the excellency of their work. The recent act of Congress intrusting to this bureau the design and construction of one of the world's largest structures is ample testimony of the public's appraisal of its ability.

Production Program For An Individual Farm

In planning and budgeting a production program for an individual farm crops and a cropping system should be selected that are adapted to the soil conditions of the farm in question and for which there is a market outlet. Crop yields which experience has shown may be expected on this farm should be used in figuring production. Expense items should be estimates with due regard to the type and condition of the soil to be worked and the labor and equipment available for use. Finally, though perhaps most important of all, prices which are likely to prevail when the products are to be marketed should be used in estimating expected receipts. Too frequently the prices which prevail at planting time or which were received for the previous year's crops are used in deciding how much of this and that crop to plant.—*Extension Circular No. 60, University of Arizona.*



Sheep on alfalfa pasture on the Kittitas division of the Yakima project, Washington



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Assistant to the Commissioner and Associate Editor *New Reclamation Era*



Junior Club Activities on Reclamation Projects

Yakima Project, Washington

YAKIMA project boys and girls are of the same high quality as some of its more widely advertised agricultural products, and they have accomplished some excellent results in their 4-H clubs. This year Yakima County has 66 junior clubs, with an enrollment of 194 boys and 343 girls. Of this number 150 boys and 214 girls completed the year's work.

The boys' clubs are confined to farming and stock raising, the various projects including cereals, horticulture, live stock, and bee keeping. The girls' projects this year covered home demonstration work, foods, clothing and house furnishings, and a few enrolled in stock-raising clubs.

The corn clubs made an especially good showing this year. For the third successive year Wallace Gregg, of the Harrah Corn Club, won the corn sweepstakes at the Pacific International Live Stock Show at Portland, and at the Yakima Valley Corn Show the exhibits of the junior clubs showed a higher quality and more care in their selection than those of the adult exhibitors. In the acre contest, in which only club members competed, Lawrence Faulkner, of Harrah, was first with 81.1 bushels, and five others raised from 64.5 bushels to 58.8 bushels per acre. Yields per acre averaged much lower than for the previous year, but the lowest was more than 20 bushels higher than the average

production for the county. Club members sold seed corn to adult growers in the county for 1 cent per bushel more than ordinary seed, and the demand was good.

The sheep clubs, which originally raised only orphan or "bummer" lambs, have now developed until 15 boys have purebred sheep.

Ten swine clubs have a membership of 68 boys and 6 girls. Perry B. Woodall, of Zillah, won the honor of being the outstanding pig club boy of the State, which included a trip to the International Live Stock Show at Chicago as a guest of Armour & Co.

Six dairy clubs, with an enrollment of 47 boys and 8 girls, include one purebred Holstein and one pruebred Jersey club, sponsored by the dairy committee of the Sunnyside Chamber of Commerce. Yakima business men have formed a perpetual calf club by presenting nine boys with as many registered Holstein calves, and it is hoped that an equal number of Jersey and Guernsey calves will soon be secured.

With the girls the most popular club activity is the sewing club, of which there are 244 members, divided into 22 clubs. Cooking and canning come next, with 13 clubs and 112 members.

An excellent showing was made in club members' exhibits at the State fair this year. Prize money won for all classes of exhibits totaled \$868.75, in addition to which 73 hogs belonging to club members

were sold by the county agent to a local packing company for 11 cents a pound, amounting to \$1,552, and 25 head of sheep, at 10 cents per pound, brought \$220.70, making the total return to club members from the State fair \$2,641.45.

Forty-five 4-H Club members attended the club camp at Pullman, Wash., in June, and on July 12 delegates to the camp held a picnic for the club members of the county at the State fair grounds at Yakima. Five hundred and thirty members attended. Games were played in the morning, there was a big picnic lunch at noon, and in the afternoon there was a short program and charters were presented to new clubs and seals to those who had successfully completed the previous year's work. The day closed with a kitty ball contest between club members who went to camp and those who stayed at home, with the stay at homes winning 5 to 4.

Junior club activities in Yakima County have for several years been under the supervision of Assistant County Agent Henry M. Walker, and after his resignation on September 1, 1929, the year's work was completed by County Agent A. E. Lovett.

Minidoka Project, Idaho

In Minidoka County there are now 5 clubs, which include a calf club with 13 members, 3 beet clubs with 20 members, and a turkey club with 7 members. The calf club has been especially vigorous and has taken part in stock-judging contests and similar activities.

There are 13 clubs in Cassia County, which comprise 3 sewing clubs with 30 members, 6 beet clubs, with 50 members, and 4 calf clubs with 50 members.

A number of prizes have been offered the clubs, in contests, for excellence in various activities. The Amalgamated Sugar Co. offered \$75 in each of Minidoka and Cassia Counties; the city of Burley offered a prize of \$50, while the Union Pacific Railroad offered \$100 in cash and transportation to and from the State University at Moscow to the best club boy or girl in each county who would attend the university for one year. Last year the Dairy Calf Club at Malta won medals for their work in demonstration teams and in judging at the Blackfoot Fair.



4-H Club heifers at spring Dairy Show, Minidoka project, Idaho

All the clubs, both in Minidoka and Cassia Counties, have succeeded in arousing a keen interest among the young people in the various activities of the farm and home.

During the spring of 1929 there were 5 calf club shows on the project, at which 71 calves were shown. One of these shows was given at Rupert, and was in the form of a picnic, attended by some 60 club members and their parents and friends. Demonstrations were given by the young people of judging and feeding cattle, milk testing, and fitting animals for shows. The young judges are reported to have shown remarkable ability and knowledge of their subjects in these demonstrations.

Klamath Project, Oregon-California

Four-H Club work was organized in Klamath County 10 years ago, with about 125 members. The number has been steadily increasing until at the present time we have enrolled over 500 boys and girls in the various projects. Sewing, cooking, potato, poultry, dairy calf, and rabbit clubs have the largest enrollment.

Teams have been trained to judge four classes of livestock, and these teams have competed at State fairs and at the Pacific International Livestock Exposition with other teams of Oregon. They have invariably made a very creditable showing. Mr. Frank Sexton, county club agent, is in charge of the work.

This year 40 boys were enrolled in the potato work. Each member is required to plant at least one-eighth of an acre of potatoes of a standard variety. The boys care for these potatoes during the growing season and follow the instructions given them in the bulletins distributed. The boys are trained to grade and judge potatoes, select seed and exhibits. Fine exhibits of potatoes have been shown at the county and State fairs during the past five years. Prizes have been awarded several times to Klamath County potato exhibitors.

During the past four years a team consisting of two boys has competed with other potato-grading teams at the Pacific International.

Girls' demonstration teams are being trained this year and demonstrate the methods of cooking and sewing at the county and State fairs.

Several reels of pictures have been made showing the activities of the Klamath County boys' and girls' club work at the county fair and at the summer school. These pictures are shown in practically every community of the county and stimulate interest. Large delegations of boys and girls have attended the summer



Members of the Marion Calf Club judging sheep, Minidoka project, Idaho

school held at Corvallis during the past seven years. Klamath County has usually had the largest delegation at summer school. The course takes two weeks and consists of a short course in gardening, potato growing, livestock work, including

judging, cooking, sewing, and canning.

Klamath County has a larger per cent of boys and girls of club age enrolled in club work than any other county in the State. A great pride is felt in this showing.

International Water Commission United States and Mexico

THE third session of the commission, held in Washington, D. C., extended from October 22 to November 9, inclusive.

Its meetings were held in the board of directors' room of the Pan American Union. Entertainment and many courtesies were extended by the Pan American Union, the Ambassador of Mexico, Sr. Don Manuel C. Tellez, the Secretary of State, the Secretary of War, and the Secretary of the Interior.

The American commission was created by an act of Congress, which requires the submission of a report to Congress. The Mexican commission was created by administrative act, but after a discussion of the information gathered, it was the conclusion of both sections that the time had arrived for making a report to their respective Governments.

The American section is engaged in the preparation of its report, which will be transmitted through the Department of State to Congress for consideration at its next meeting, to convene December 2, 1929.

A photograph of the personnel of the commission appeared in the November issue of the ERA. Two reclamation people are serving on this commission. The

Commissioner of Reclamation, Doctor Elwood Mead, is chairman of the American section, and assistant to the commissioner, Miss M. A. Schnurr, is secretary.

Prosperity Figures for Mesilla Valley

That the Mesilla Valley, under the Rio Grande project, is enjoying a year of prosperity is clearly shown by the following figures submitted by shippers, bankers, railroad men, and agricultural specialists.

Cotton shipments for 1929 will increase at least 20 per cent over 1928. Fruit growers will ship out this season 1,000 cars of cantaloupes, 25 cars of pears, and 300 cars of apples.

Since the first of January, 1929, 60 cars of cabbages and 177 cars of cotton seed products have been shipped from Las Cruces.

Cattlemen report better range conditions than for many years previous, and calves are contracted at \$45.

The banks of Dona Ana County show an increase of 75 per cent in deposits over the same period a year ago.

Producing Palisade Peaches, Grand Valley Project, Colorado

By J. C. Page, Superintendent, Grand Valley Project

TWO facts concerning the peach industry at Palisade, Colo., were self-evident to a group of 80 peach growers from Utah who recently investigated the orchards in this vicinity. These were, first, that the growers are making money; second, that the orchards are uniformly well cared for.

Peach culture in a small area near Palisade, where surrounding mountains and good air drainage along the Colorado River insure immunity from spring frosts, has been carried on for nearly 25 years. The favored area was relatively small until the reconstruction of the irrigation system for Orchard Mesa by the Bureau of Reclamation made possible the development of some 2,000 acres which will, when in full production, about double the output.

Practically all fruit is shipped fresh, and during 1929 a total of 1,600 carloads were supplied to markets in the Middle West. It is estimated that 2,500 to 3,000 cars will be required when young orchards reach full production.

YIELDS AND PROFITS LARGE

The returns to the producers are high and profits great when conditions are normal. Losses occur occasionally on marginal lands from spring frosts, and also from failure of transportation and marketing facilities, but the average profits over a long period for good commercial orchards are exceeded by very few agricultural or horticultural products.

Yields of 1,500 to 2,000 boxes (600 to 800 bushels) per acre are common and net profits of \$500 to \$1,000 per acre are realized in normal years. These returns are reflected in land valuations, since orchards sell at \$1,500 to \$2,500 per acre with only reasonable improvements in the way of buildings and appurtenances.

Such returns and valuations are possible only through production of maximum yields of quality fruit, well processed by careful grading and packing, marketed with a minimum expense and loss, and of most vital importance, the concentration by the entire community on a few standard varieties and grades.

PROPER ORCHARD MANAGEMENT ESSENTIAL

Although it is recognized that there are relatively few localities where peaches can be produced successfully and that Palisade has a favorable climatic condition

combined with good natural soil and an ample water supply, the enormous yields there must, to a large extent, depend on the methods of culture almost universally adopted after many years' experience. These practices are apparent to any visitor and consist of the major requirements for proper orchard management, i. e., cultivation, pruning, fertilizing, hand thinning, irrigation, and spraying.

The beginning is made before the orchard is planted, when the ground is carefully prepared for uniform and easy irrigation. Best results have been obtained when the virgin land is then sowed to alfalfa and hay produced for two or three years. This is then plowed under and good trees of the variety selected are set with spacing from 16 to 20 feet. The orchard is then cultivated after each irrigation and crops between the rows are restricted to those which do not sap the soil to the detriment of the trees.

"TOP PRUNING" VERSUS "LONG PRUNING"

The young trees are formed to the proper shape by early pruning and as they grow are annually pruned to remove old wood and force the growth of new limbs and fruit spurs. Practically all trees are "top pruned," but some agitation has arisen for a change from this practice to conform to that of California's so-called "long pruning," which is also recommended by a local experiment station. The former method results in a flat-topped spreading tree forced out by the cutting of the top shoots, whereas the latter causes the spreading by thinning the inside limbs and by the weight of the fruit on longer limbs. The essential results sought are a maximum of fruit-bearing twigs and a tree sufficiently open to permit penetration of sunshine necessary for uniform ripening and coloring of the fruit.

Fertilizing is usually by a combination of green and barnyard manures with a limited use of minerals. Clean cultivation is maintained until late in the summer when weeds are allowed to grow or oats or vetch are sown to be plowed under in the fall. Sweet clover is not favored because of difficulty in irrigating and harvesting and a tendency to smother the trees. Barnyard manure shipped in from outside areas is applied heavily during winter months.

All orchards are carefully thinned by hand, removing all excess fruit from indi-

vidual limbs, with special care to pick all undersized or deformed fruit. This is usually finished in June.

IRRIGATION AND SPRAYING

All irrigation is by means of furrows usually with six between the tree rows. The frequency of application and duration of runs varies with the soil and weather conditions as well as with the size of the trees. A heavy application is essential shortly before harvest, resulting in a rapid growth after the pit is formed. Late irrigation is not practiced since it retards seasoning of the wood for winter cold.

Spraying is necessary to control the usual pests and ordinarily is required once in two years. Cutworms are controlled by circling the trunk of the tree with sticky preparations. Loss of fruit from such causes is maintained at a very nominal amount.

ELBERTAS MOST FAVORED

The early orchards were of many varieties but until recently the Elberta was most favored and almost entirely grown. The improved J. H. Hale is growing in popularity and considerable of the new plantings are of this variety. Both are harvested at the same time, usually late in August and early in September. When the harvest season approaches many transient pickers and packers arrive to handle the crop and seldom is there a shortage of labor even though the fruit must be moved at a rate from 100 to 200 cars daily.

The better fruit is mostly paper wrapped and packed in 2-tier wooden boxes holding about 20 pounds each. These are stamped with name of variety, grade, and size and shipped in refrigerator cars. In the last few years a ring-faced, paper-lined bushel basket pack has gained favor especially for fruit slightly smaller and with less color or where conditions force very rapid marketing. The crop can be moved more rapidly and somewhat cheaper in this package, but the returns are generally lower.

The peach production in this section has resulted in the development of a happy, contented community with good homes in pleasant surroundings with all modern conveniences. Everywhere are evidence of prosperity, which is sure to result when returns of \$1,500,000 are received from some 2,000 acres.

A Model Town on the World's Greatest Artificial Lake

A new type of frontier town, to be built on the brink of the Colorado River, for the housing of the workmen who will construct Boulder Dam, is being planned by the Department of the Interior as a model community which is expected to live after the construction period has passed.

Secretary Wilbur and Elwood Mead, Commissioner of Reclamation, selected the site for this town when they visited the Colorado early in the summer. It is on the Nevada side of the river on the nearest level land and a little more than a mile from the dam site. They have often conferred regarding the project since that time, and experts are working on details of the town plan.

The new model community will be located at a point where Black Canyon widens out and affords a favorable setting. The dam itself will be a mile away over a chaos of broken hills. The bottom of the canyon, where the work must begin and where the greater part of it must be done, will be at a level 1,600 feet below the rim and the town. Into the bottom of the great canyon there will go every day a thousand men, who will emerge again when their work is done and return to the town.

The task of lowering these men into the canyon and bringing them out again presents in itself a bit of spectacular engineering. It will be accomplished through the installation of huge elevators which will lift their passengers a perpendicular 1,000 feet, which is practically twice as great a lift as that which carries passengers to the top floors of our tallest skyscrapers.

The Federal Government will retain ownership of the land on which the town is to be built, and will lease it to those who live on it or use it for commercial purposes. One of the features of these leases will be that they will continue only under the period of good behavior of the tenant. It is the intention of the Government that the bootlegger or other law violator shall not interfere with the well-being of its workmen while assigned to this huge task. The power to terminate leases, and therefore residence, in this town will be used as one of the means of enforcing proper conduct. Instead of a boisterous frontier town, it is hoped that here simple homes, gardens with fruits and flowers, schools, and playgrounds will

make this a wholesome American community.

The construction of the great works at Black Canyon will require a period of eight years. Something like a thousand workmen will be constantly employed. With their families and those who are drawn to the dam site by the general activity, it is estimated that this town will have a population of some 4,000 people. It should be borne in mind, however, that there is no employment at present nor will there be any for, perhaps, another year.

When the reservoir is full, the water will come up the valley almost to the town, and the great lake will stretch away a hundred miles through a region of rare scenic beauty. The region is one of admirable healthfulness and it is thought that a popular resort may grow up here when the reservoir has been so developed as to provide its incidental attractions.

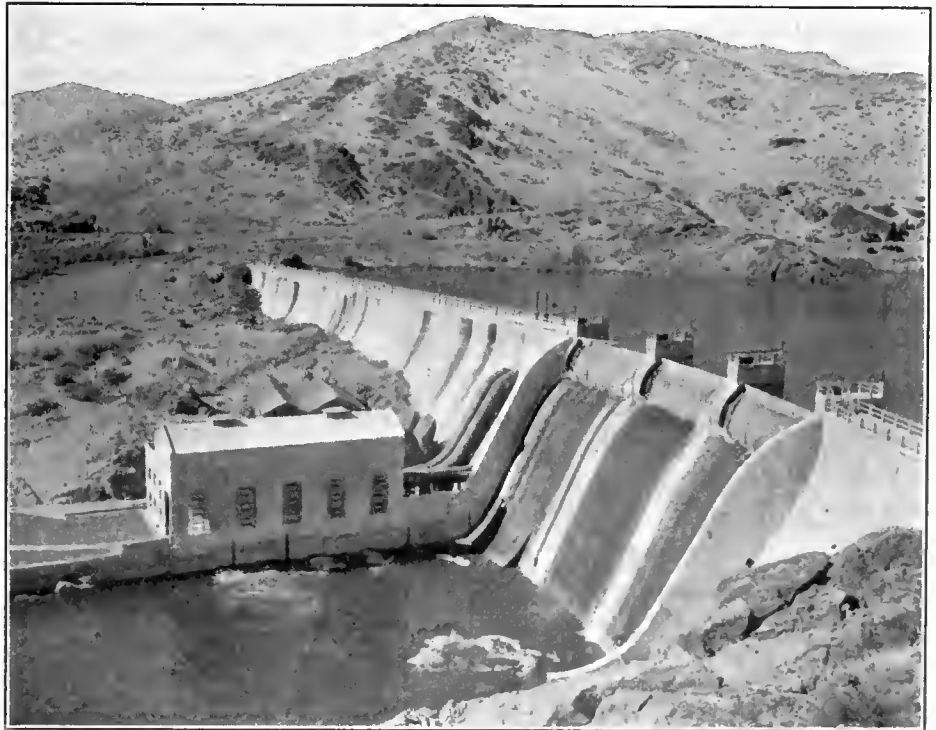
Plans are already well developed for the construction of automobile highways from Las Vegas, Nev., and Kingman, Ariz., to the dam. When the dam is completed it will become a bridge as well, and link these two roads together. It will then become possible to come past

this dam and see the reservoir on a trans-continental trip with little or no increase of the distance traveled. Eventually this will doubtless be a popular tourist route which will develop possibilities for the model town that is to look out upon the world's greatest artificial lake.—*The American City*, November, 1929.

Report on Economic Survey of Reclamation

The committee of economic advisers appointed to correlate the reports of the investigators who made the economic survey of reclamation this summer and to make recommendations thereon to the Secretary of the Interior, met in Washington, D. C., during October. The advisers comprised Dr. Alvin Johnson, associate editor of the *Encyclopedia of Social Science*; Dean Anson Marston, Iowa State College; President Charles A. Lory, State Agricultural College of Colorado; Prof. Frank Adams, University of California; John W. Haw, director of agricultural development, Northern Pacific Railroad; A. C. Cooley, in charge of demonstrations on reclamation projects; George C. Kreutzer, director of reclamation economics, Bureau of Reclamation, chairman; and Hugh A. Brown, assistant director of reclamation economics, secretary.

The advisers met again in Chicago on November 15 and 16 for the preparation of the final draft of the report.



Black Canyon diversion dam, Boise project, Idaho

Cost and Efficiency in Producing Alfalfa Hay in Oregon

THE following summary is from Station Bulletin 241, of the agricultural experiment station, Oregon State Agricultural College, by H. E. Selby:

SUMMARY

1. This bulletin presents information on the cost of producing alfalfa hay in Oregon, the factors affecting it, and ways of reducing it. It has two objects: First, to establish facts and principles for the use of (1) prospective and present alfalfa growers, (2) teachers and students of agriculture, and (3) those concerned with public problems and policies; second, to indicate to present alfalfa hay producers possibilities of reducing their costs.

2. The facts presented were obtained in a state-wide study by the survey method of costs and practices in producing forage crops in Oregon during 1925, 1926, and 1927. This bulletin deals chiefly with alfalfa hay in the six principal alfalfa regions—Malheur, Baker-Union, Umatilla, Deschutes, Klamath, and Rogue River—which represent 80 per cent of the alfalfa acreage in the State.

3. The average cost of production, weighted by the census acreage of alfalfa in each region, was \$27.06 per acre and \$7.96 per ton. The average cost of harvesting a ton of hay was \$3.42 for the farms using wagons or slips and \$2.94 for those using buck rakes.

4. In considering or using these cost figures as well as the detailed figures given

in the cost summaries, three points should be kept in mind: (1) They include noncash as well as cash items of expense, and give the grower wages for his work and 5 per cent interest on his investment. (2) They are averages of widely varying cost of individual growers, and consideration should be given to the range and variation in cost. (3) Cost of production is only one of several factors affecting alfalfa hay production, all of which should be considered in connection with the crop.

5. Averaging the six regions together, cash items were 41 per cent of the total cost; the unpaid labor of the operator and his family was 22 per cent; depreciation was 9 per cent; and interest was 28 per cent.

6. There was little variation in the average cost in each region from year to year, but considerable variation in costs on different farms in the same year and in different years on the same farm. This variation in costs is caused partly by factors that the grower can not control—for example, climatic conditions—and partly by management factors that he can control.

7. The factors affecting cost are classified and discussed in four groups, as follows:

(1) *Harvesting methods and equipment.*—Slips were little, if any, more efficient than wagons, the ease of loading apparently being offset by the smaller loads. Haul-

ing and stacking crews using slings stacked a third of a ton more hay per man per day than crews using Jackson forks. Crews using buck rakes stacked 5 tons per man per day as compared with 3½ tons for crews using wagons or slips. A hay derrick with outstanding features of construction was found and a plan for making it is given.

(2) *Other factors in efficient haying.*—With an increase from a ton to a ton and a half in yield per cutting there was a decrease in man labor for harvesting of an hour per ton. Haying crews hauling for 80 rods and over, averaging 108 rods, stacked a third of a ton less per man per day than crews hauling less than 80 rods, averaging 40. There was wide variation in size and organization of the haying crews, but no greater efficiency was apparent for either large or small crews, or for crews with any particular organization.

(3) *Yield.*—With yields of less than 2 tons per acre the average cost was \$15.34 per ton, as compared with \$5.78 per ton with yields of 6 tons or over. Stands of alfalfa that were 90 per cent or over in thickness yielded 4.2 tons per acre as compared with 2.8 tons for stands of less than 75 per cent thickness. There is probably more opportunity to reduce the cost of alfalfa hay by plowing up poor stands of alfalfa and replacing them with good stands than by any other way. In general that older stands were the poorer, but many old stands were still good, and many new stands were thin and should be plowed up. Alfalfa that was fertilized yielded 3.8 tons per acre as compared with 3 tons for that not fertilized.

(4) *Method of establishing the stand.*—Seeding alfalfa with grain cost only \$5.43 per acre as compared with \$21.33 per acre for seeding alone. Under certain conditions, however, seeding alone is necessary, and for as long lived a crop as alfalfa the extra cost is justified if it gives a materially better stand.

8. Data on labor practices and requirements are given to show (1) the amount of each labor operation in each region; (2) the total labor requirement of each operation; (3) the labor requirement for an acre of each operation on the average farm on the more efficient farms, and on the less efficient farms; and (4) the seasonal distribution of the labor. The seasonal distribution is characterized, of course, by the high-peak labor requirements for harvesting.

9. Alfalfa comprised 90 per cent of the hay acreage and 50 per cent of the total crop acreage on the farms that were



Irrigating sugar beets near Burley Mindoka project, Idaho

studied, and the type of farming followed was based to a large extent on alfalfa production. Other farm enterprises were usually combined with the alfalfa production, however, for (1) it is desirable to have other crops to rotate with the alfalfa; (2) other enterprises combined with alfalfa give a sufficient volume of business for a good income with less land and with less hired help, and (3) feeding the hay provides remunerative winter work and manure to help maintain fertility. Three-fifths of the hay was fed by the growers, the remainder being sold.

10. The weighted average of the prices received was \$10.03 per ton, as compared with the average cost of \$7.96, but as the capital investment averaged \$156 per acre the percentage return on capital was not large and an extensive acreage was necessary for a satisfactory income from alfalfa alone.

PROJECT WATER SUPPLY

DURING October, the weather was generally favorable for harvest and farm work on all except the north-eastern projects, where rains and snows during the latter part of the month hampered the beet harvest.

The rainfall and stream flow of the more western projects continued to be subnormal, with the result that the carry-over storage on these projects will be less than average.

Rains and snows during the month throughout the high Rocky Mountain region maintained average or better flows on the streams originating therein and materially increased the available hold-over storage on such streams.

The demand for irrigation water has practically ceased on all but the most southern projects.

For reservoirs with concurrent data available, the storage on hand at the end of October, 1929, was 4,045,000 acre-feet, compared with 3,833,000 acre-feet for the same date in 1928.

On the whole this has been a highly successful irrigation year, without material damage on any project on account of deficient water supply, conditions gradually improving as the season advanced, from early prospects of serious shortages on a number of projects.

Large heads of water require careful, and in many cases expensive, preparation of land for irrigation, else they can not be handled at all, whereas smaller streams may be guided over relatively uneven surfaces.

Irrigation a World Influence

MR. J. Rupert Mason, of California, has returned recently from an eight months' trip around the world, made primarily to study at first hand the present day results of the reclamation policies of Great Britain, France, Italy, Egypt, Ceylon, Java, and Japan. What he has seen has given new impulse to his enthusiasm as an ardent supporter of the Federal reclamation policy in the United States. A few of his impressions are included in the following statement prepared for the NEW RECLAMATION ERA:

In Egypt, inscribed on the tomb of Queen Semiramis, who lived and ruled Egypt 2,069 years before Christ, appears the following: "I constrained the mighty rivers to flow according to my will, and I led their waters to fertilize lands that had been before barren and without inhabitants."

In the guide books to Egypt we are told: "The Nile has exerted a unique influence on the history of civilization."

Quoting from a Government report of recent date: "In Egypt, all irrigation and drainage work is undertaken by the central Government, which has not only to dig the drains in a strip of land which it has bought for the purpose, and to build all the bridges and other works required, but also to maintain it afterwards—cut the weeds and dig out the accumulated mud from the bed. This maintenance is a troublesome business and costly. No special drainage tax has so far been imposed. Drainage is included in the services rendered by the Government to the landowner, in return for the fixed land tax he pays every year."

Egypt to-day is among the world's most prosperous and sound nations, with some \$150,000,000 surplus in her treasury. Her wealth is mainly from the soil, and her farms and gardens are irrigated from works built by the Government, without any more special tax or charge on the benefited land than our Government contemplates making against the benefited lands in our great Mississippi Valley. The better irrigated land in Egypt to-day is valued as high as \$3,000 per acre. Cairo is a rapidly growing city of about 1,550,000 people, with fine new buildings and homes going up on all sides.

In Greece, the Government has entered the field of irrigation only recently. The countryside is irrigated from occasional hand-operated wells. The remains of vast stone aqueducts, built by the Romans many centuries ago, wrecked by invading enemies, and never restored, dot the landscape.

In Java, the Dutch Government has installed river-regulating works for irrigation, flood control, navigation, drainage, and hydro-electric power costing over \$60,000,000. In fact all such improvements in the Dutch East Indies are made only by the Government itself, and in Java, which is far less arid than most parts of our own West. Irrigation is ranked first in public importance, even ahead of harbors, roads, or schools. When the Dutch first came to Java, the population of that small island was about 5,000,000, against over 30,000,000 to-day.

China was the only country visited by Mr. Mason where the Government has not engaged in irrigation work, but where this field has been left entirely to private enterprise.

In conclusion, Mr. Mason refers to the statement of President Roosevelt at the time the reclamation act was passed in the United States in 1902, when he said:

"It is as right for the National Government to make the streams and rivers of the arid region useful by irrigation works for water storage as to make useful the rivers and harbors of the humid region by engineering works of another kind. The reclamation and settlement of the arid lands will enrich every portion of our country. Our people, as a whole, will profit, for successful homemaking is but another name for the upbuilding of a nation."

Employment of Engineers and Economists

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is authorized, in his judgment and discretion, to employ for consultation purposes on important reclamation work five consulting engineers, geologists, and economists, at rates of compensation to be fixed by him, but not to exceed \$50 per day for any engineer, geologist, or economist so employed: Provided, That the total compensation paid to any engineer, geologist, or economist during any fiscal year shall not exceed \$5,000: Provided further, That notwithstanding the provisions of any other act, retired officers of the Army or Navy may be employed by the Secretary of the Interior as consulting engineers in accordance with the provisions of this act.

Sec. 2. The joint resolution approved June 28, 1926, authorizing the Secretary of the Interior to employ engineers for consultation in connection with the construction of dams for irrigation purposes, is hereby repealed.

Approved, February 28, 1929.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, commissioner of reclamation, went to Chicago on November 13 to confer with representatives of the American Association of Land Grant Colleges on reclamation problems and to meet with the special advisers on the economic survey of reclamation undertaken this past summer.

R. F. Walter, chief engineer, and L. N. McClellan, electrical engineer, Denver office, arrived at the Washington office on November 11, and District Counsel Coffey on November 12, in connection with the allocation of power from Boulder Dam.

Walter E. Blomgren, engineer, has been transferred to the Denver office from the Indian Service.

Foster Towle, associate engineer, Denver office, has been transferred to the All-American surveys, Yuma, Ariz.

C. A. Bissell, engineer, Washington office, who has been engaged for several months on the Red Bluff Reservoir investigations, returned to Washington on October 29.

Messrs. Hakopian, Ginsky, Zaprometov, and Madam Kolpakova, irrigation engineers for the Central Asia Water Economy and the Caucasus Water Economy of the U. S. S. R., spent several days on the Uncompahgre project, inspecting various project structures.

C. M. Day, mechanical engineer, Denver office, was on the Belle Fourche project early in October to inspect the outlet works at the Belle Fourche Dam and the pipe erection work at the Indian Creek and Horse Creek siphons.



White Leghorns on an irrigated farm, Minidoka project, Idaho



Home and garden of L. H. Mitchell, Superintendent, Shoshone project, Wyoming

Recent visitors on the Kittitas division of the Yakima project included L. R. Coffin, manager of the Eastern District Puget Sound Power & Light Co.; Mr. Hayward, district engineer, and H. C. Ruppel, division road master, Northern Pacific Railway; and Asabel Curtis, president of the Seattle Chamber of Commerce.

W. Sanford Evans, commissioner, Royal Commission on Fruit Industry, Victoria, British Columbia, was a recent visitor on the Yakima project.

Mr. Mayfield, president of the Elephant Butte Irrigation District, Rio Grande project, and Mr. Fleming, manager of the district, spent a day recently on the Yuma project.

B. E. Hayden, reclamation economist, has been appointed superintendent of the Klamath project, Oregon-California.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. RAY LYMAN WILBUR, SECRETARY OF THE INTERIOR

Jos. M. Dixon, First Assistant Secretary; **John H. Edwards**, Assistant Secretary; **E. C. Finney**, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary and Budget Officer;
Northcutt Ely and **Ernest W. Sawyer**, Executive Assistants

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Assistant to the Commissioner P. W. Dent, Assistant Commissioner Hugh A. Brown, Assistant Director of Reclamation Economics
W. F. Kubach, Chief Accountant C. A. Bissell, Chief of Engineering Division C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer

S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Cadou, Fiscal Agent; C. A. Lyman, Field Representative.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche	Newell, S. Dak.	F. C. Youngblutt	J. P. Siebeneicher	J. P. Siebeneicher	Wm. J. Burke	Mitchell, Nebr.
Boise ¹	Boise, Idaho	R. J. Newell	W. L. Vernon		B. E. Stoutemyer	Portland, Oreg.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	W. C. Berger	W. C. Berger	H. J. S. Devries	El Paso, Tex.
Grand Valley	Grand Junction, Colo.	J. C. Page	W. J. Chiesman	W. J. Chiesman	J. R. Alexander	Montrose, Colo.
Huntley ²	Ballantine, Mont.					
King Hill ³	King Hill, Idaho					
Klamath	Klamath Falls, Oreg.	B. E. Hayden	N. G. Wheeler	Joseph C. Avery	R. J. Coffey	Berkeley, Calif.
Lower Yellowstone	Savage, Mont.	H. A. Parker	E. R. Schepplmann	E. R. Schepplmann	E. E. Roddis	Billings, Mont.
Milk River	Malta, Mont.	H. H. Johnson	E. E. Chabot	E. E. Chabot	do.	Do.
Minidoka ⁴	Burley, Idaho	E. B. Darlington	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Newlands ⁵	Fallon, Nev.				R. J. Coffey	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.	H. C. Stetson	Virgil E. Hubbell	Virgil E. Hubbell	Wm. J. Burke	Mitchell, Nebr.
Okanogan ⁷	Okanogan, Wash.				B. E. Stoutemyer	Portland, Oreg.
Orland	Orland, Calif.	R. C. E. Weber	C. H. Lillingston	C. H. Lillingston	R. J. Coffey	Berkeley, Calif.
Owyhee	Owyhee, Oreg.	F. A. Banks	H. N. Bickel	Frank P. Greene	B. E. Stoutemyer	Portland, Oreg.
Rio Grande	El Paso, Tex.	L. R. Fiock	Henry H. Berryhill	Henry H. Berryhill	H. J. S. Devries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	R. B. Smith	Erle W. Shepard	Wm. J. Burke	Mitchell, Nebr.
Salt Lake Basin	Salt Lake City, Utah					
Salt River ⁸	Phoenix, Ariz.					
Shoshone ⁹	Powell, Wyo.	L. H. Mitchell	W. F. Sha		E. E. Roddis	Billings, Mont.
Strawberry Valley ¹⁰	Payson, Utah					
Snu River ¹¹	Fairfield, Mont.	G. O. Sanford	H. W. Johnson	H. W. Johnson	E. E. Roddis	Do.
Umatilla ¹²	(Irrigon, Oreg.) Hermiston, Oreg.					
Uncompahgre	Montrose, Colo.	L. J. Foster	G. H. Bolt	F. D. Helm	J. R. Alexander	Montrose, Colo.
Vale	Vale, Oreg.	H. W. Bashore	C. M. Voven	C. M. Voven	B. E. Stoutemyer	Portland, Oreg.
Yakima	Yakima, Wash.	P. J. Prestou	R. K. Cunningham	J. C. Gawler	do.	Do.
Yuma	Yuma, Ariz.	R. M. Priest	H. R. Pasewalk	E. M. Philebaum	R. J. Coffey	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam	Coalville, Utah	F. F. Smith ¹³	C. F. Williams		J. R. Alexander	Montrose, Colo.
Kittitas	Ellensburg, Wash.	Walker R. Young ¹³	E. R. Mills		B. E. Stoutemyer	Portland, Oreg.
Sun River, main canal Construction	Fairfield, Mont.	A. W. Walker ¹³			E. E. Roddis	Billings, Mont.
Boise project, Deadwood Dam	Cascade, Idaho		C. B. Funk		B. E. Stoutemyer	Portland, Oreg.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1925.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927. E. E. Lewis, manager.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926. F. L. Kinkade, manager.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926. D. S. Stuver, manager.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926; Fort Laramie Division by Goshute Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926; and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Okanogan Irrigation District on Dec. 31, 1928. Joe C. Iddings, manager.

⁸ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917. C. C. Cragin, general superintendent and chief engineer.

⁹ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1928.

¹⁰ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926. Lee R. Taylor, manager.

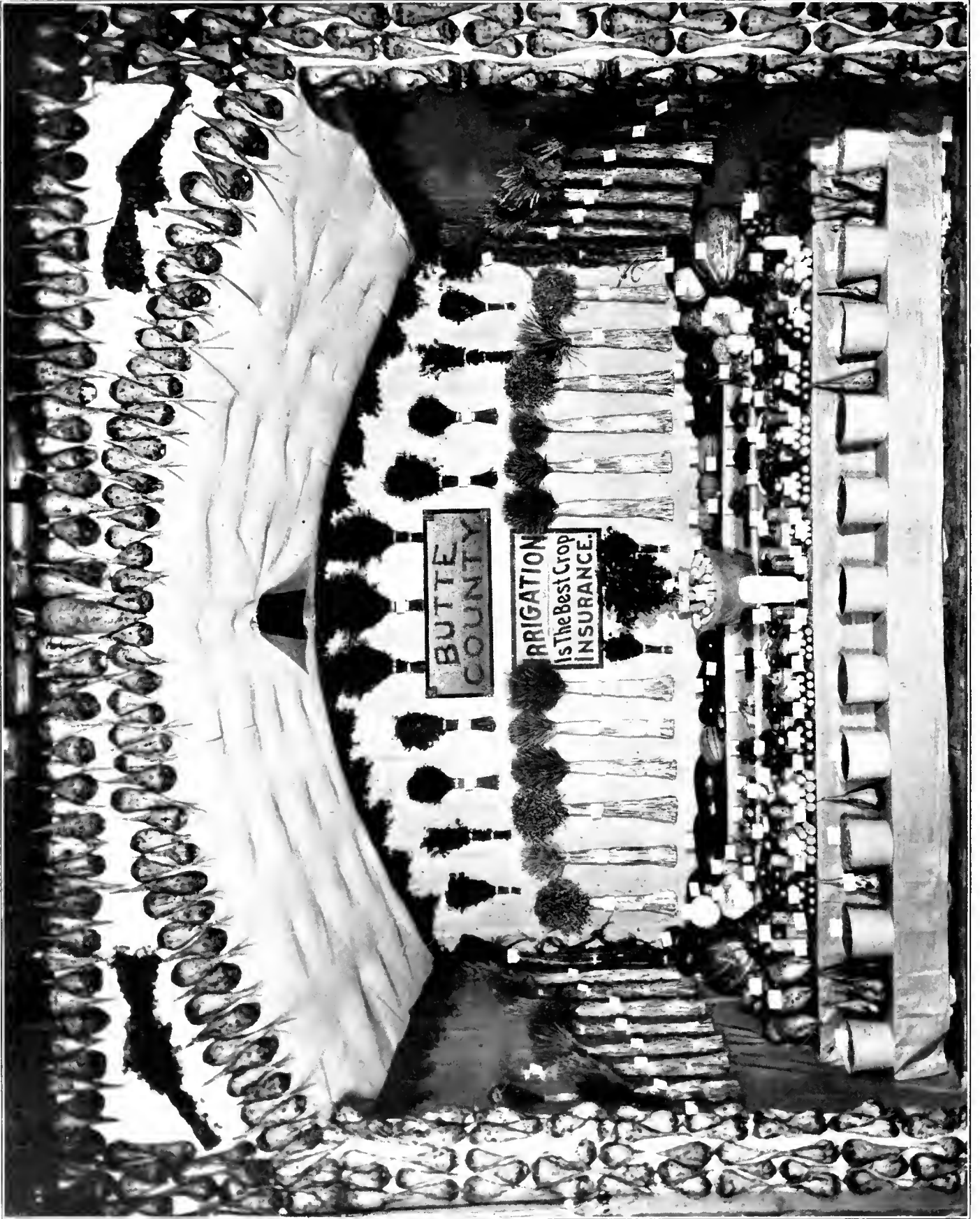
¹¹ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹² Operation of West Division assumed by West Extension Irrigation District on July 1, 1926. A. C. Houghton, manager; and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926. Enos D. Martin, manager.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
All-American Canal investigations	Yuma, Ariz.	H. J. Gault	Arizona and New Mexico.
Gila River cooperative investigations	Safford, Ariz.	C. C. Fisher	
Boulder Canyon reservoir investigations	Las Vegas, Nev.	W. R. Young	State of Utah.
Red Bluff (Pecos River) investigations	Washington, D. C.	C. A. Bissell	
Salt Lake Basin investigations	Salt Lake City, Utah	E. O. Larson	
Alcova-Casper and Saratoga projects	Casper, Wyo.	J. R. Iakisch	



THIS EXHIBIT AT THE STATE FAIR HELD IN SEPTEMBER AT HURON, S. DAK., WAS MADE UP CHIEFLY OF PRODUCTS GROWN ON THE BELLE FOURCHE FEDERAL IRRIGATION PROJECT





