THE RECLAMATION ERA

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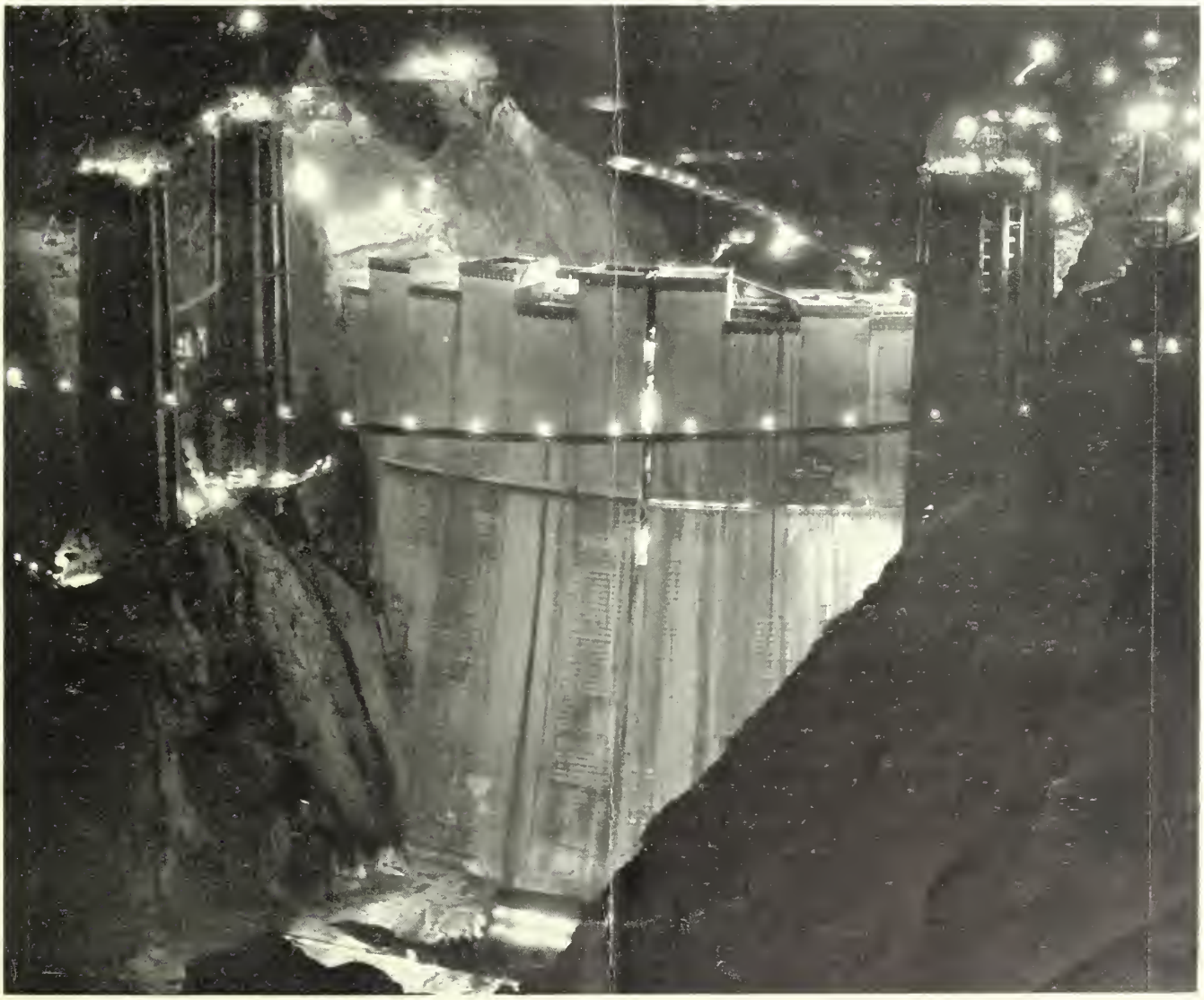

NIGHT SCENE ON BOULDER DAM, BOULDER CANYON PROJECT, ARIZONA-NEVADA

Secretary Ickes Writes on Reclamation in Collier's

"Thought for the Morrow" is the subject of an illuminating article appearing in Collier's magazine for December 8, 1934, by Hon. Harold L. Ickes, Secretary of the Interior. Secretary Ickes tells in a simple and logical manner the purposes of the construction now in progress on reclamation projects in the West. The following brief quotations from this article bring out points of particular importance:

"Instead of marshaling our streams and building great storage dams for the salvation of a restricted area, we are using them to solve such kindred problems as flood control, navigation, prevention of erosion, development of hydroelectricity, protection of our waters from sewage pollution.

"Contrary to the cries of uninformed, sideline critics, we are not proceeding in a hasty or haphazard manner. The very word 'planning' negatives that notion. We are undertaking no projects without reference to their special service in our national program of conservation. Reclamation such as we propose means building a new empire when, as, and if needed for the welfare of the people—all the people. It will do more than bring in new land. It will provide homes for people who will live on land capable of producing crops which, in quality and quantity, will equal, if they do not surpass, anything the world has known. It will create a profitable and substantial market for manufactured goods.

"To sit back and wait until immediate need forces upon us an ill-advised and hastily contrived scheme would be a national disgrace. We have seen all too many examples of such criminal folly in dealing with other great national assets. It would be trifling with human needs. For, in deepening rivers, in erecting potential power dams, in constructing vast storage pools, in nailing down the land so that it shall not blow away on every breeze, in arranging for new acreage as human requirements warrant, we are reclaiming, not land alone, but a people.

"The present status of reclamation work answers the charge that we are pursuing a blind policy. Since the passage of the National Recovery Act, we have been allotted $108,945,000 for construction on projects where the total cost is estimated at $225,000,000. These, however, are not new undertakings. Almost every one had been well-established by preceding administrations. Since people were already living on them under promises made long ago by the Government, we thought it only just and humane to furnish more water as a means toward continued profitable production."

Separates of the Secretary's article in its entirety may be obtained by addressing the Commissioner, Bureau of Reclamation, Department of the Interior, Washington, D. C.

THE

RECLAMATION ERA

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Price 75 cents a year

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Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 1 JANUARY 1935

Reclamation Under the New Deal[1]

By Dr. Elwood Mead, Commissioner, Bureau of Reclamation

TWO years ago the Governors of the Western States met in this city for a conference. Reclamation was to be the subject of their first day's discussion. Mindful of its importance, Governor Dern invited reclamation authorities of the arid region to meet here 1 day in advance of the Governors and through the discussion of the irrigation situation give the Governors the benefit of their ideas and experience.

This conference showed irrigation was in distress. There was influential opposition to any further construction of works. There was a mistaken belief that the crops from these widely scattered areas, amounting to less than 1 percent of the farmed area of the whole country, were creating a surplus which caused ruinous depression of prices.

NATIONAL RECLAMATION ASSOCIATION AN EDUCATIONAL INFLUENCE

At that time there was no independent organization to gather facts about the irrigation needs of the West or to defend the broad policies of Federal reclamation. There were ardent advocates of individual projects and there was opposition to payments on some completed projects. But organized, cooperative action to explain what Federal reclamation was doing and the imperative water needs of the arid States, was lacking. The influence of the Reclamation Bureau was restricted because in the East what it said was regarded as voicing bureaucratic interests. The National Reclamation Association was the outcome of this situation. It became at once an educational influence.

Its first task was to show the wide-spread and ruinous scarcity of water under existing privately built canals. This included some of the oldest and most highly developed irrigation districts. The only means of providing the needed water was reservoirs to hold back floods and the water which ran to waste in the nonirrigation period. Building reservoirs is a costly and difficult undertaking. The Bureau of Reclamation had become almost the sole agency for doing this. It was not keeping pace with the increasing water needs of the West because it lacked money. It needed 10 times the reclamation income. The situation which confronted reclamation was ably stated at that meeting by John Haw. The paper which he read then is worth rereading at this time.

I believe that conference averted a serious interruption in Federal reclamation and hence was of untold value to the West. What was said here and afterward, helped the country to understand that Federal reclamation is not mainly devoted to bringing new lands into cultivation but is a rescue agency for the lands already being farmed; that the reservoirs it has built have saved the civilization of many important western communities.

FEDERAL RECLAMATION IS A BUSINESS POLICY

The doctrine that Federal reclamation is a business policy and that canals and reservoirs built by it are not a gift but are to be paid for and are being paid for by those who benefit from them, took the edge off the bitter opposition to Federal reclamation. Much of the credit for this is due to Marshall Dana, president of the association. He has the courage and vision to state clearly the water needs of the arid West.

Now we are again meeting in Salt Lake. It seems appropriate that we should review the events of the past 2 years and appraise the progress which has been made. One outstanding fact is that the entire arid region has become water-minded. This is shown in the increased activity of State authorities, and of commercial interests, as well as of the irrigators in every State of the arid region. Part of this activity grows out of the great drought of this year. The complete failure of unirrigated crops in so large a part of the arid and semiarid area and the failure of crops in many irrigation districts have emphasized the fact that the wealth, the population, and security of rural life in all these arid States is measured by water.

PUBLIC WORKS ADMINISTRATION AIDS RECLAMATION

This awakening of irrigators had results because it became a part of the New Deal. It helped the Bureau to present to the Public Works Administration an employment and water conservation program and gain for it a sympathetic hearing. As a result Federal reclamation has been allotted $105,000,000 with which to carry on its work and help solve the problem of unemployment in one-third of this country. With that money the Bureau is building 17 reservoirs in 11 States and completing canals which will supplement the scanty water supply of a score of drought-stricken communities.

To our Subscribers

After these long months of silence the Reclamation Era is glad, indeed, again to serve you, and it is with renewed vigor after this period of rest that we come back to a task which we trust will prove not only of present interest and enjoyment, but of real profit to each of our readers.

We desire, first of all, to maintain an accurate mailing list. You are therefore requested to look at your address label and notify us promptly of any inaccuracy, which you may be assured will be corrected before the release of the February number.

This month's issue is being sent to a number of water users on self-operating projects or divisions who have failed to subscribe. This courtesy is being extended at this time to remind you of the reestablishment of the Era. Continuance will be impossible without the proper remittance. Sign the coupon attached to this issue and return, with check or money order, to Commissioner, Bureau of Reclamation, Washington, D. C.

[1] Address delivered at third annual meeting of National Reclamation Association at Salt Lake City, Utah, Dec. 7-8, 1934.

There has been unavoidable delay in getting this construction program under way because Federal reclamation is a business undertaking. Contracts for repayment of the money spent have to be prepared and signed. Estimates and plans have to be made with thoroughness and care if these enterprises are to be truly self-liquidating. Many of the works undertaken are of a magnitude that makes it impossible to complete them in 1 year. Some, like the Boulder Canyon project, Grand Coulee, and the All-American Canal, are monumental irrigation works both in size and the difficulties which have had to be overcome. They rank among the great structures of all countries and all times. In addition to the $105,000,000 allotted, the completion of the projects approved will require an additional $123,000,000. They will immeasurably improve agricultural conditions in many irrigated valleys. Of the money allotted, $31,000,000 has been spent, and 300,000 man-months of employment have been given. These structures are giving contracts to factories in nearly half the States of the Union and furnishing direct and indirect employment with good wages to 25,000 workers. As the contracts for construction increase there is like increase in the number employed and wages paid.

P. W. A. FUNDS FOR RECLAMATION AID IN ADMINISTRATION'S DROUGHT RELIEF AND UNEMPLOYMENT PROGRAMS

It is hard to state adequately the benefits which have come to the West from this enlarged program of construction. While none of the works has been completed and they could not add anything to this year's water supply, they were being built and the sufferers from drought knew that this year's disaster would not be repeated. If this had not been so there are valleys where settlers would have been driven to despair and desparation. In the Imperial Valley, for instance, there were times when no water was available; water for domestic purposes and livestock had to be shipped in by train. There was danger that the 10,000 acres of citrus orchards would be killed, and that would have been calamitous. As it was, there was a crop loss of $9,000,000. But the people who saw their crops shrivel knew that Boulder Dam was building and that its great reservoir would put an end to fears of drought in the future.

On the North Fork of the Snake River a fine pioneer community made homes many years ago. They extended the irrigated area beyond the water supply of unregulated streams. For several years there has been an acute shortage of water and this year many farmers lost all their crops, but they are holding out because the Public Works Administration has allotted $4,000,000 to build a reservoir. A suitable site has been found. Plans are being made and in a short time another dam will be under way. I do not believe that any expenditure will bring more enduring and larger benefits than those which will flow from these allotments to conserve the water supplies of the West.

COMPLETE WATER BASIN DEVELOPMENT ON LONG TERM PLANNING RECOMMENDED

I wish now to state briefly some features of the western water situation which I hope will have your attention at this session. One is that along many streams we have either reached the limits of our water supply or we are nearing the limit. The time has come when we should be sure that there is an unused water supply available before we build an additional work. Also in the location of development we must have in mind the fact that this is all the water supply we have; that if we use it in the wrong place or build up a development which requires more water than we have, all our efforts will be wasted and the whole scheme will have to be worked over again. We must, therefore, discourage all development which will interfere with larger and better developments in the future. We must select locations where the water supply will have the greatest value for agriculture or for industry. The difference between the value of irrigated land at different places on the same stream is very great. Difference in soil, difference in markets, difference in planting the crops which can be grown—all these need as much attention as the engineering studies now given to the planning and construction of canals and reservoirs.

We must try to visualize the situation which will confront the settler in paying for these additional works if he lives in an irrigation district, or what he will have to do to convert unploughed deserts into homes if he is in a new area.

AID AND DIRECTION IN SETTLEMENT ARE NEEDED

The pioneer idea was that if a settler could get hold of a piece of land and secure a share in the water of a canal he would in some way dig in and succeed. We now know that was a mistake and that it has imposed unnecessary hardship on families and caused delay in development. Irrigated farming requires intense culture. The irrigated farmer has to be a skilled irrigator and a skilled cultivator. He must work with good tools, have good stock, and know how to select his crops and how to irrigate and cultivate.

We must study the size of farms suited to different types of agriculture or horticulture and to the money and capacity of a settler. One hundred and sixty acres is not too much for the energetic farmer with a family. It is too much for the man of little means who intends to plant an orchard or a garden. We need to include in our settlement program what other countries have included with great success, and that is, small areas for farm laborers' homes, where the children of the farm worker can have on their acre or two the same sense of independence and price as the children on much larger areas.

POWER AND IRRIGATION COMPLEMENT EACH OTHER

Hydroelectric power has to be considered in planning for the use of our mountain streams. Power and irrigation development must be studied together. We need a definite power policy and we need an irrigation program not only for single States but for all the States along rivers like the Columbia, the Colorado, and the Platte. It is a great satisfaction to inform you that the State irrigation authorities and the Bureau are working together as never before to complete a rounded-out program of development.

The present construction program, large as it is, does not include all of the streams where there is a water shortage. It does not straighten out the situation which is a result of the unplanned, uncoordinated development of the past 50 years. In a score of valleys loss of crops from water shortage is chronic. It is not only ruinous to the farmers but is a menace to the solvency of banks and stores, because their prosperity depends on the success of the irrigated farm.

RECLAMATION PROJECTS OFFER SECURITY TO DRY LAND FARMERS

What we are doing now does not include the conservation of two of the greatest water supplies of the arid region which now run to waste. I refer to the Columbia and Sacramento Rivers. The Columbia River is the largest and the most dependable water supply for irrigation of the whole arid region. Its flow last year was more than all the other arid rivers combined and it all ran to waste. While this happened there were thousands of farmers being dislocated by the drought, discouraged and disheartened by dependence on rain, and seeking the security that goes along with irrigated farming. Four thousand of these migratory people have shown up in the Yakima Valley since August this year. More than 1,000 of them are in Idaho. Provision should be made to care for these dispossessed worthy people because of their needs and because of the needs of the arid West.

A REPORT ON FEDERAL RECLAMATION BEING PREPARED

The old problems of reclamation and this new conception of reclamation plan-

(Continued on p. 5)

Reclamation[1]

By Hon. James P. Pope, United States Senator from Idaho

DURING the past 2 years, as the United States has been engaged in the process of evolving a system of planned economy from the haphazard inconsistencies of laissez faire, every business enterprise, every national undertaking, has been subjected to careful scrutiny. Since the time that Egyptian farmers staked their livelihood upon the whims of the River Nile, since man first attempted to control the natural productions of life's necessities, he has been vitally concerned with securing an adequate water supply. Probably no other element has had greater effect upon progress in civilization than this. Cities have grown where water was available. Agricultural interests concentrated themselves in areas of abundant precipitation. As is the nature of things, however, men are constantly seeking to work out systems whereby they are less dependent upon whimsical nature, where they can be assured that the things necessary to life can be attained. A comparatively small portion of the earth's surface is naturally suited to agricultural production.

KNOWING RECLAMATION

The problem with which we are faced is to convert unproductive waste land into satisfactory productive areas. That is a tremendous task. Obstacles constantly beset our path. In this period of social and economic reorganization, wherein criticism of the financial foundations of our institutions is the fashion, we advocates of reclamation must know our subject. Much criticism has of late been directed at irrigation. It is said by some that reclamation is uneconomical; a waste of public funds. It is also contended that reclamation, as a policy, is inconsistent with the planned economy of our Government. As the National Reclamation Association convenes for its third annual meeting, its members are duty bound to again consider and seriously reflect upon the facts. Should it appear that the vigorous criticisms are in fact warranted, it is our duty as citizens to refrain from urging further reclamation development. If, on the other hand, we find, after honest and careful study, that reclamation is as worthy and beneficial as we believe it to be, we should spare no effort or opportunity to carry on.

OPPORTUNITIES FOR EXPERIENCED FARMERS

It is my opinion that those sections of the United States which have been reclaimed from deserts have a golden opportunity, an opportunity which can result in a period of unprecedented development of the western United States. Thousands of families of dependable and substantial citizens in the Middle West and East are becoming disgusted and disheartened by the many uncertainties of dry farming. They are living again in the age of pioneers. They are searching for new homes. The West wants and needs such men as these; home builders who have the means with which to build new homes. An opportunity unequaled elsewhere in the Nation awaits them in the reclaimed West. From the standpoint of the homeseeker, however, a different situation exists. He is not familiar with the economies of irrigation districts. He is unacquainted with the high efficiency of irrigated farms. He has heard much unwarranted and, in some instances, unfair criticism.

NO CONFLICT IN GOVERNMENT'S LAND POLICY

To cope with this situation in part your National Government has undertaken a resettlement program. The Department of Agriculture and the Federal Emergency Relief Administration are cooperating in a program of retiring from production submarginal lands and moving farmers thereon into other lands on which they may expect to make a living. Many of these farmers will be moved on irrigation districts which are not now completely settled. In a dition to that, however, there are many, many farmers who do not need Government assistance but who would move to the more productive areas of the reclaimed West if they were fully acquainted with the opportunities that really exist. They do not hear of the benefits of irrigation in eastern United States. They hear that in a few years irrigated lands will be worn out. They hear that irrigation farming is inefficient. They hear that reclamation need not expect much future development because the reclamation of lands is inconsistent with governmental policy of retiring submarginal lands from production. It would be well to examine some of these objections and impartially judge their merit.

In my opinion, there is not an actual inconsistency between these two phases of governmental policy. The question is one of efficiency in farming. It is one of the unusual good features of the economic planning of this administration that consideration is given to the future, the future not only of the State but of the individual. Thus from two points of view the problem may be considered.

The Agricultural Adjustment Administration is seeking to retire from production a portion of the land now under cultivation. It is not intended that the land thus retired from production lie entirely idle to become a wilderness. It is intended, we are told, that forests be grown to replenish our rapidly diminishing timber supplies. It is a natural conclusion of a logical mind that this generation should conserve resources and if possible build resources for our progeny. It happens that one of the first and most essential requirements for growing a forest is that the land in question be capable of sustaining a growth of timber. Throughout the eastern and middle western United States there are great tracts of land which are not particularly suited for agricultural crops but which receive sufficient precipitation to grow timber. On these lands resources can be developed for a probable future need. On the other hand, if we were to return any of the land now under irrigation to its natural state it would again become a desert. Nothing of intrinsic value to man has yet been grown on the arid waste lands of the West. Exceptional crops can be produced under irrigation, but an irrigated forest would be too costly to deserve consideration. The question, then, is one of practical economy as to which lands should be converted into forests and which lands should continue to be cultivated.

The answer is obvious. The Government has a choice of removing from cultivation land which may be devoted to growing timber but is not particularly desirable for farming, or removing from cultivation vast tracts of reclaimed desert which are noted for commodity production but are worthless in their natural state. For the sake of an efficient, logical and practical Government economy, reclamation should be continued on a broader scale to care for worth-while industrious citizens who gradually give up the battle against nature on inefficient and unprofitable eastern dry farms.

During this period of economic depression, we have not requested further reclamation development. We have asked merely that an adequate water supply be obtained for lands already under cultivation. We hope, however, in the near future as business conditions are gradually restored to normalcy to request and receive further development through cooperation with the National Government. From the standpoint of a constructive national planning, the retirement of unproductive acreage from cultivation and

[1] Address delivered at third annual meeting of National Reclamation Association at Salt Lake City, Utah, Dec. 7-8, 1934.

the expansion of reclamation development go hand in hand, beneficial in purpose and profitable in operation. The coordination through Government foresight of the two programs cannot fail to work toward a more permanent and lasting prosperity.

COMPARATIVE AGRLICUTURAL STATISTICS

There is, however, another and equally important point in the argument when it is viewed with the critical eye of the individual engaged in farming. The very basis of liberalism is consideration of the welfare of individual human beings. How then, we must ask, fare the farmers of irrigated lands as compared to their eastern competitors? Consider these comparative production figures from both areas.

These statistics were obtained from the Agricultural Census for 1930. In 1929 the acreage of irrigated crops harvested was 4 percent of the acreage utilized to produce all the crops harvested in the United States. The value of crops harvested from irrigated fields was 11.1 percent of the total value of all crops harvested in the United States.

The average value per acre of all crops harvested in the United States during the same year was $22.32 as compared with an average value of $61.50 per acre for irrigated land.

Considering specific crops, it is found that on 1.6 percent of the acreage devoted to growing cereals in the United States, irrigation was responsible for 2.5 percent of the total production in quantity, and 3 percent of total production in value.

On 10.4 percent of the total acreage devoted to hay, irrigation farmers produced 15.8 percent of the total quantity of hay in the United States and 17.1 percent of the total value.

Irrigated farms contained 5.3 percent of the total United States acreage devoted to growing small fruits. On that acreage was produced 8.1 percent of the total national crop and 9.9 percent of the total national value in small fruits.

In other words, a farmer on an irrigation project can produce crops vastly superior in yield and quality to those grown elsewhere in the United States. In 1932 in Idaho, farmers produced 200 bushels of potatoes per acre as compared with 78 bushels per acre in Minnesota and 87 bushels per acre in Wisconsin. During the same year one Midwestern State had 390,000 more acres in alfalfa than Idaho and produced 28,000 tons less.

There are a number of commodities for which the Nation is largely dependent upon irrigated lands. Subtropical fruits grown on irrigated farms constitute 79.2 percent of the total production in the United States. Irrigated grapes account for 66.5 percent of the total national production. Irrigated nuts harvested are equal to 63.5 percent of total domestic production. Irrigated sugar constitutes 49.1 percent of domestic production. Our orchard fruits are 37.2 percent of national harvests.

It may be fairly deduced that irrigation is responsible for better farming and is making a very substantial contribution toward domestic production of commodities heretofore imported. Individuals who locate on irrigated farms can produce more crops of higher quality and value on a given piece of land than can their competitors. In other words, they receive a greater income for their labors and investment.

If consideration is given to the welfare of the individual, then, it is natural and desirable that the Government look toward moving home seekers into reclamation States. Agricultural experts advise me that the high productivity of irrigated lands can, by rotation of crops and proper development of great natural stores of fertilizer such as the enormous deposits of phosphates in Idaho, be maintained almost indefinitely. In contrast to this picture consider the thousands of farmers now living on land unfit for profitable cultivation in other sections of the United States. Much of the land is worn out. Much of it, at its best, could never begin to equal the production record of reclaimed deserts in the irrigated West.

As well as to adhere to a broad constructive national policy, it is to better the condition of individual farmers and to give them an opportunity to earn a better living that we are encouraging further reclamation development in conjunction with the program of retiring submarginal land.

WISDOM IN CONTINUED RECLAMATION

Any questions of policy or governmental finance can and in my opinion will be resolved in favor of continued reclamation. In this day of practical economics and economy it is well to consider the cold, hard facts of the actual financial condition of reclamation. In all lines of business endeavor and financial enterprise, inventories are being taken and refinancing is the vogue. Irrigation districts and water users' associations have been adversely affected by the depression. That was to be expected. It is a compliment to the West that those districts which have suffered financially are considered of sufficient value and sufficient public merit to warrant a long-term investment of the public fund in refinancing bonds.

The West has been particularly fortunate in being represented in the Drainage, Levee and Irrigation Division of the Reconstruction Finance Corporation by a well-trained, efficient personnel. Remarkable work has been done in making loans for the purpose of enabling districts, companies, or associations to reduce and refinance their outstanding indebtedness incurred in connection with the projects. Real adjustments of the financial structures of borrowers have been carried out on an economically sound basis, providing maximum relief to holders of outstanding obligations. Valuable information has been obtained by appraisals and recapitulations, incident to the work. One hundred and forty-seven loans to irrigation districts have been authorized amounting to $50,069,962 to refinance $115,353,105 of outstanding indebtedness. On 2,441,762 assessed acres, on irrigation districts a ratio of indebtedness of $47.24 has been reduced to $20.51. The water users' associations now owe only 43.4 percent of the sums for which they were formerly obligated.

Many legal difficulties have been encountered in the refinance work which have delayed the authorization of many other loans. Irrigation is considered a good investment by the Reconstruction Finance Corporation. The allocation of $120,000,000 of Public Works funds for further reclamation developments demonstrates that the corps of P. W. A. engineers, who are some of the most highly trained engineers in the world, is another indication of reclamation's solvency.

SOLVENCY OF RECLAMATION

The most complete refutation of any purportedly expert financial criticism of irrigation, however, is furnished by a review of the liquidation of moneys advanced by the Bureau of Reclamation for initial irrigation development. At this writing, $48,000,000 has become due the reclamation fund from water users. Of that amount only $350,000 has not been paid. In other words, the account of farmers with the Bureau of Reclamation is at present 99.3 percent paid. Moreover, the Bureau of Reclamation is holding for certain irrigation districts $1,200,000 in actual cash which is not due, but is being held as a cash credit. I very seriously doubt that any other line of business endeavor could, after a comprehensive survey, boast a similar record of solvency in its capital investments. It is important to note and should be remembered that these reclamation funds are not taken from tax receipts but are gained from proceeds from the sale and lease of the public domain. Operating and maintenance costs of our irrigation districts are paid by the districts themselves. Reclamation, then, as a business enterprise, has come within 0.7 percent of paying for itself and in doing so is supporting the operators of 44,000 farms and the inhabitants of 227 towns. The total expenditure of $216,000,000 in reclamation construction costs has created $1,000,000,000 of taxable property

which inures to the benefit of the body politic. It furnishes a livelihood to about 700,000 persons who are now located on the various projects.

ENTIRE NATION BENEFITED BY RECLAMATION

These inhabitants of reclaimed deserts purchase about $120,000,000 worth of manufactured articles annually from their eastern friends.

Although I digress slightly, I believe it important to note that several millions of dollars have been saved the Federal Government during the recent drought period by reclamation. Thousands of starving cattle have been fed from the produce of irrigated lands because the dry farming areas were barren. Hundreds of thousands of dollars of transportation charges may be added to the intrinsic value of the cattle thus saved and the entire amount can be credited directly to Federal reclamation.

Reclamation, then, from the standpoint of public policy and from the standpoint of practical economics is an unequivocal and undeniable success.

The case is clear. Any impartial judge of the facts would, I believe, endorse a continuation of reclamation as a national policy. Any great undertaking is surrounded by difficulties. The Louisiana Purchase was once frowned upon by men of small vision, and the Panama Canal project once met with vigorous criticism. However, the fog of criticism vanished as the sunlight of understanding came. The facts illuminated the dark places in men's minds, and the wisdom of the great policies became clear. Likewise, the wisdom of our national reclamation policy will become clearer as time goes on. No greater work could be undertaken by the National Reclamation Association than the enlightenment of other sections of the United States regarding the opportunities available in the West. With full cooperation of other public-spirited organizations remarkable progress could be made. Homeseekers with sufficient capital to support themselves could be attracted to the West.

Several millions of acres of productive, desirable land are available for cultivation. When those acres are permitted to release a stream of new wealth into business channels, when we produce more abundantly those commodities for which our respective States are famous, development will come spontaneously. When our now idle lands are settled industries will seek our power sites.

These events, while desirable, cannot be obtained merely for the asking. We must build that confidence in ourselves which will inspire the confidence of other portions of the United States. We must not deviate from the path of progress but continually seek further development. To this cause, I have dedicated my efforts.

DEVELOPMENT OF WATER RESOURCES

During the past year various departments of the Federal Government have quietly worked toward evolving a logical plan for reclamation development. President Roosevelt ordered a complete survey of water resources by the Mississippi Valley Committee and the National Resources Board. The Delano-Elliot committee will soon deliver a report to the Secretary of the Interior on the utilization and use of watersheds.

Existing and proposed plans for water conservation and development will soon be available for consideration by Congress, and in the past few days press reports indicate that the President is planning to devote all Federal relief funds to public development. We must take advantage of these developments. After several months of careful study I plan to introduce legislation into Congress to provide for a 5-year program of development, utilization, and conservation of watersheds, water supplies, and irrigable acreage. It is my purpose to work toward the complete development of the agricultural West. Not only could adequate water be secured for lands already under cultivation but the Federal Bureau of Reclamation could carry on its work.

In every reclamation State there are enormous tracts of land available for cultivation. In the States of Idaho, Oregon, and Washington alone approximately 3½ million acres could be easily converted into valuable, productive farms. In this area remain many power sites of fabulous potentialities which could be developed at comparatively low cost when distributed over a 5-year period of constructive progress. I submit this proposal for the consideration of the National Reclamation Congress.

Opposition, based largely on misunderstanding, but opposition none the less, is expected. If we are to succeed, the united effort of every reclamation State is necessary.

A program of development based on carefully studied plans could not fail to pave the way for an expected and almost inevitable population movement to the West. At the same time the National Reclamation Association could attract settlers by disseminating the facts regarding opportunities open to homeseekers.

New markets can be created. New and efficient production can add to our national wealth. Our neighbors and ourselves can enjoy a more abundant existence. The continued development of the western United States will constitute the day's march toward a greater America.

Reclamation Under New Deal

(Continued from p. 2)

ning led Secretary Ickes to appoint this year a committee to make a detached study of Federal reclamation and an appraisal of the operation of reclamation laws and of the Bureau's administration of those laws. This report when issued will, I am sure, aid State agencies in their thinking and planning and do much to broaden our understanding of the kind of irrigation development the West needs.

I have read with pleasure some of the subjects listed for discussion. They show how alert the thoughtful minds of the West are in finding an enduring solution of its water problems. They show that we are beginning to plan for all time, and for this the generations to come will bless us.

Additional PWA Allotment for Caballo Construction

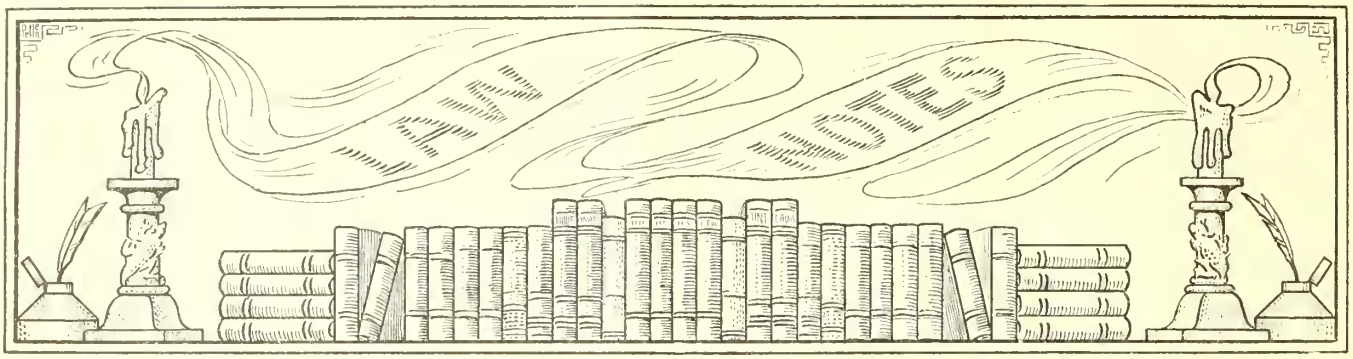
An allotment of $100,000 additional for the Caballo Dam on the Rio Grande in New Mexico was announced on December 11 by Public Works Administrator Harold L. Ickes. The additional allotment will provide for raising the dam at a later date to make possible the development of power at the Elephant Butte Dam, which is above the Caballo Dam.

The Caballo low dam is being built with PWA funds allotted to the International Boundary Commission, United States and Mexico, for rectification of the Rio Grande in El Paso and Hudspeth Counties, Tex. The dam and reservoir are in Sierra County, N. Mex., and will be constructed under supervision of the International Boundary Commission.

It is estimated that the low dam will cost approximately $1,500,000 and the high dam approximately $1,000,000 more. The allotment announced is for foundations making it possible to increase the height of the dam in the future if that is desired. The low dam will provide a reservoir storage of 100,000 acre-feet and the high dam 350,000 acre-feet.

The resolution authorizing the additional $100,000 for the Caballo project provides that the money shall be repaid to the Government from revenues derived from the sale of power developed at Elephant Butte. The allotment was made to the Bureau of Reclamation, Department of the Interior.

The Sun River project reports continued settlement activity. Many prospective settlers are visiting the project looking for a permanent home.



Secretary Upheld in Shoshone Power Plant Case

By Sol Rothbard, Counsel, Bureau of Reclamation

THE Shoshone Irrigation District, a corporation organized under the laws of Wyoming, entered into a contract with the United States in 1926 providing among other things that the district take over the care, operation, and maintenance of the Garland division, 1 of the 5 divisions constituting the Shoshone project.

The district subsequently claimed that under the terms of the contract it was entitled to a proportionate share of the profits derived from the operation of the power plant. This the Secretary denied on the grounds that there was no such provision in the contract and even if there was he was prevented from so doing by the act of March 4, 1929 (45 Stat. 1592) which provides "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 converted into the reclamation fund."

The district filed a petition for a writ of mandamus against the Secretary of the Interior, in the Supreme Court of the District of Columbia, to compel the Secretary to make a statement annually in writing of the net profits received by the United States from the operation of the Shoshone power plant and to determine and state the portion of such net profits to which the plaintiff district was entitled and to credit the same annually to the plaintiff district to be applied on its construction charge due to the United States. It was contended by the district that the act of March 4, 1929, was unconstitutional and void in that it deprived the plaintiff district of vested rights which it acquired under its contract. The Secretary contended among other things that if the act operated to impair or breach the contract, the remedy for recovery was in recourse to the Court of Claims.

From an order denying the writ, the district appealed to the Court of Appeals of the District of Columbia.

The Court of Appeals, in affirming the judgment of the lower court, held:

"The suit here is in the nature of an action to compel the specific performance of a contract between plaintiff company and the United States. Such a suit is one against the United States, and one in which the courts are without jurisdiction, unless specially accorded jurisdiction by authority of Congress, which has not been done in this case. It is elementary that where the purpose of a suit is in effect to enforce the specific performance of a contract, this cannot be accomplished by indirect actions, either against Federal officers or by mandamus. *In Re Ayers*, 123 U. S. 443; *Hagood* v. *Southern*, 117 U. S. 52; *Louisiana* v. *Jumel*, 107 U. S. 711; *Pennoyer* v. *McConnaugh*, 140 U. S. 1.

"But if plaintiff's contract was impaired by the act of 1929, and if this is not in effect a suit against the United States, the position of the appellant is still clearly untenable; since the construction of the act of 1924, coupled with the interpretation to be placed upon appellant's contract relating to the distribution and allocation of the profits derived from the operation of the power plant, and the interest which appellant company would have in relation to the other divisions constructed and under construction in the Shoshone project, are matters so completely within the discretion of the Secretary of the Interior as to forbid interference by writ of mandamus."

The Shoshone Irrigation District on June 25, 1934, petitioned the Supreme Court of the United States to review the decision of the Court of Appeals of the District of Columbia. On October 9, 1934, the Supreme Court denied the petition, holding in effect that the district was not entitled to receive a proportionate share of the net profits made by the Shoshone power plant.

Recent Legislation

Relief for Government Contractors

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Comptroller General of the United States be, and he is hereby, authorized and directed to adjust and settle on a fair and equitable basis claims of persons who entered into a contract or contracts with the United States prior to August 10, 1933, including subcontractors and materialmen performing work or furnishing material or necessary fuel direct to the contractor under such contracts, for additional costs incurred by reason of compliance on and after August 10, 1933, with a code or codes of fair competition approved by the President under section 3 of the act approved June 16, 1933, known as the "National Industrial Recovery Act", or by reason of compliance with an agreement with the President executed under section 4 (a) of said act in the performance after August 10, 1933, of the contract or any part thereof. In the event that such contract was performed wholly or in part by a surety on the bond of the contractor, the claim may be presented by and settlement made with such surety, but such surety shall have no greater rights than would have accrued to the contractor had such contractor completed the contract. Any contractor, subcontractor, or completing surety desiring an adjustment and settlement with respect to any such contract under this act for increased costs incurred after August 10, 1933, by reason of compliance with the codes or reemployment agreements shall file with the department or administrative establishment concerned a verified claim itemizing such additional costs, and any subcontractor on any such contract may file his claim directly with the head of the department or independent establishment concerned or through

Continued on p. 7

Résumé of Preliminary Report on Development of the Rivers of the United States

DEVELOPMENT of the rivers of the United States: A preliminary report on a comprehensive plan for the improvement of the rivers of the United States with a view to giving the Congress information for the guidance of legislation which will provide for the maximum amount of flood control, navigation, irrigation, and development of hydroelectric power, by the President's Committee on Water Flow, June 4, 1934, House Document No. 395, Seventy-third Congress, second session, 423 pages, 63 maps, Government Printing Office, Washington, D. C., price 80 cents.

This report, which was prepared under the direction of the President's Committee on Water Flow, consisting of the Secretaries of Interior, War, Agriculture, and Labor, was forwarded to Congress by the President on June 4, 1934, in accordance with congressional resolution of February 2, 1934. It is divided into 10 parts as follows: 1, Report of the Committee; 2, Organization and Policies; 3, The Atlantic Region; 4, The Gulf Region; 5, The Eastern Mississippi Region; 6, The Western Mississippi Region; 7, The Great Lakes Region; 8, The Pacific Region; 9, Arid and Semiarid Section; and 10, General Review of Reports. Commissioner Elwood Mead represented the Interior Department in the preparation of the parts devoted to the Western Mississippi and Pacific Regions.

The report contains a list of the technical subcommittees and personnel cooperating in its preparation and discusses briefly water supply, including run-off and underground water, pollution and sewage treatment, water and soil erosion, forests, wildlife, power development, and water interests of the General Land Office. For the purposes of the study the country has been divided into 6 regions, and maps of the 60 river basins discussed are included.

Part 4, The Gulf Region, includes a description of the Rio Grande Basin with the transmountain diversion, middle Rio Grande, and El Paso areas, and Mariscal, El Jardin, Salineno, Alamogordo, and Red Bluff Reservoirs.

Part 6, The Western Mississippi Region, discusses the Missouri, Platte, Yellowstone, and Arkansas Rivers and includes maps and estimates of cost of new works, as well as the transmountain diversions from the Colorado River.

Part 8, The Pacific Region, discusses the Sacramento-San Joaquin, Colorado, Columbia, Snake, and Gila Rivers and the Utah Lake Basin.

Part 9, The Arid and Semiarid section, was contributed by George O. Sanford, chief, engineering division, and described briefly the Rio Grande, Arkansas, Platte, Sacramento-San Joaquin, Colorado, and Columbia Rivers with estimates of cost of construction of additional irrigation works costing $288,000,000.

Part 10, General Review of Reports, gives a résumé of the reports of the different regions, with appendices regarding navigation, power, municipal water supplies, land use, soil erosion, forest protection, flood control, recreation, and protection of wildlife.

Under Basis of a Plan the committee reports as follows:

"The reports of the technical subcommittees and the recommendations of the Cabinet committee are directional in character. Further surveys and adequate planning would be required if they are adopted as the program of development. The work once planned could proceed progressively and the initial units undertaken would not commit the Government to the completion of the whole program until financial and other considerations permit. There would be considerable advantage in the adoption of the comprehensive program because of the opportunity for orderly planning and development of the Nation's most valuable resources. * * * It is considered essential that the organization which prepared the present study should continue to function in connection with the development of more specific plans for the projects selected and in addition that a definite planning body be established for the coordination of this and similar work."

The committee selected 10 projects or drainage basins for further development when comprehensive plans have been prepared. Of these 10, 5 are in whole or in part in the arid or semiarid regions as follows: Missouri, including the Platte, Sacramento-San Joaquin, Columbia River Basin, Colorado River Basin, and Great Salt Lake Basin.

The report, containing much engineering data of vital interest, should prove a valuable aid in solving the problems of orderly development of the water resources of the United States for the benefit of all of the people.—*W. I. Swanton.*

Recent Legislation

(Continued from p. 6)

the contractor. After the claim has been examined by the head of the department or independent establishment concerned, or such person or persons as he shall designate, the claim shall be transmitted to the Comptroller General of the United States, accompanied with an administrative finding of fact and recommendation with respect to the claim.

SEC. 2. In no event shall any allowance exceed the amount by which the cost of performance of such part of the contract as was performed subsequently to August 10, 1933, was directly increased by reason of compliance with a code or codes of fair competition, or with an agreement with the President, as aforesaid.

SEC. 3. In no event shall any allowance be made which would result in a profit to the claimant exceeding 7 per centum on the cost of performance of the contract in respect of which the claim is made. The head of the department or establishment concerned, subject to the approval of the Comptroller General, shall have the authority, from time to time to determine the actual cost and profit thereon.

SEC. 4. No claim hereunder shall be considered or allowed unless presented within six months from the date of approval of this act or, at the option of the claimant, within six months after the completion of the contract, except in the discretion of the Comptroller General for good cause shown by the claimant.

SEC. 5. Appropriations for the purpose of paying claims allowed hereunder and the expenses of determining the claims are hereby authorized.

SEC. 6. In all proceedings under this act witnesses may be compelled to attend, appear, and testify and produce books, papers, and letters, or other documents; and the claim that any such testimony or evidence may tend to incriminate the person giving the same shall not excuse such witness from testifying, but such evidence or testimony shall not be used against such person in the trial of any criminal proceeding. Nothing in this act shall in any way relieve or excuse any officer of the United States or any claimant from prosecution under any statute of the United States for any fraud or criminal conduct.

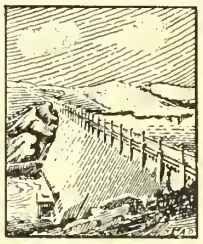
Approved, June 16, 1934.

MAJOR FLEMING COMMENDS BOULDER ENGINEERING

Major Philip B. Fleming, Acting Deputy Administrator, Federal Emergency Administration of Public Works, on his return from a recent visit to Boulder Dam, stated in a letter to Walker R. Young, Construction Engineer:

"It is the finest and most imposing bit of engineering that I have ever seen. You are certainly to be congratulated on doing a marvelous piece of work."

ENGINEERING



Progress of Construction at Boulder Dam

By Wesley R. Nelson, Associate Engineer, Boulder Canyon Project

IN THE year and eight months since the last description of construction work at Boulder Dam appeared in the Reclamation Era, great strides have been made toward completion of its many features, the pattern of its growth has altered, and the tempo of activity has changed.

In May 1933 construction was centered upon the preparation of foundations, featured by the drum fire of blasting, and the interminable procession of trucks moving their heavy loads up steep grades out of the river channel. Now the various structures are rapidly assuming their permanent form, the huge concrete mixers are turning out their product in an unending stream, electric trains are moving rapidly from plants to positions beneath cableways, or derricks, and heavy buckets of concrete are swung out over the canyon and lowered smoothly to pouring sites.

Before continuing with the narrative of construction it is best to review the work that has been completed in order that the previous construction may be correlated with that now in progress.

The magnitude of the undertaking, the immense amounts and dimensions of materials to be used, and the desirability of building the dam and power plant in the shortest feasible time, made it necessary that adequate transportation facilities should be furnished to the project and to Black Canyon, and that electrical energy be supplied in large quantities for construction power. The Union Pacific Railroad built 22.7 miles of standard-gage railroad from a point on its trunk line to Boulder City; the Government extended the line 10.2 miles to the top of the dam site, and the contractor, Six Companies, Inc., later laid approximately 20 miles of standard gage line from the United States railroad to Black Canyon, the Arizona gravel deposit, the screening plant, and other salient points.

Oil-surfaced highways were built by the State of Nevada and Federal aid funds from Las Vegas, to Boulder City, a distance of 23 miles, continued 7 miles by the Bureau of Reclamation to the top of the dam site, and augmented by 8 miles of roads constructed by Six Companies, Inc., to the inlets and outlets of diversion tunnels in Black Canyon.

Electrical energy was brought to the project by a 222-mile transmission line, built by the Southern Sierras and Nevada-California Power Cos., from San Bernardino, Calif., to a substation erected near the dam site. The transmission line is operated at 88,000 volts, is insulated for 132-000 volts, and will be used to carry power to California from the Boulder power plant after completion of the dam. The line was first operated on June 27, 1931, and at the end of December 1934 approximately 151,500,000 kilowatt-hours of electrical energy had been used on the project.

FOUNDING OF BOULDER CITY

The general climatic conditions on the project are of the type found throughout the desert regions between the Rocky Mountains and the Sierras. The elevations at the dam site and Boulder City range between 645 and 2,500 feet above sea level, and the shade temperatures are similar to those in Death Valley, only 100 miles to the northwest, climbing to 128° F. in Black Canyon where the reddish-black walls throw off furnacelike waves of heat. The most beneficial living conditions were not only desirable but necessary if the work was to be continued without interruption during the summer months. Having these conditions and others of similar import in mind, the Government laid out the town of Boulder City at the most favorable location available in the vicinity of the dam site and built for the workers a small modern city which has now grown to a population of 6,000 persons.

The Government has constructed its buildings in a permanent manner, as it is expected that they will be used to house the Government administrative officials and operators of the dam, power plant, and reservoir when construction is completed. Most of the persons holding permits for business enterprises in Boulder City have also built in a permanent manner, but the residences, dormitories, and other structures of the contractors being of a temporary character have of course been less substantially constructed.

PRINCIPAL CONTRACT AWARDED

The largest contract on the project—the building of the dam, power plant, and appurtenant works—was awarded to Six Companies, Inc., of San Francisco, in March 1931, and the contractor immediately commenced the accumulation on the project of a vast amount of heavy equipment, and the building of railroads, highways, shops, compressor plants, bridges, cableways, concrete - aggregate - screening plant, and concrete-mixing plants. Some of the major equipment, structures, and plants used in construction were 223 trucks, including several of 30-ton and 2 of 50-ton capacity; 12 electric shovels and draglines, most of 3½-cubic yard capacity; a railroad system comprising 20 miles of standard-gage tracks; one hundred and fifteen 50-ton gravel cars, and eight 90-ton or larger locomotives; 7 miles of oil surfaced highways; a 500-ton-per-hour gravel and sand screening and washing plant; 2 concrete mixing plants, 1 containing 3 and the other five 4-cubic yard mixers; a group of 8- and 10-ton cableways and five 25-ton cableways, these latter equipped with self-supporting movable end towers.

Actual construction in Black Canyon was started on May 16, 1931, when the first blasts were set off at portals of adits to diversion tunnels. Tunnel history was made the following year as the four 56-foot diameter diversion bores were driven through the canyon walls around the dam site, removing 1,500,000 cubic yards of rock in the 3 miles of tunnel, sometimes excavating 256 linear feet of 41 by 56 feet heading in which 17,000 cubic yards of rock were brought down in a single day of three 8-hour shifts.

Placing a 36-inch average thickness of concrete lining in the diversion tunnels was accomplished in the same efficient manner. The 74° section of invert was formed with screeds; the 176° of side walls was poured behind steel forms and the 110° in the arch was shot in above steel forms by compressed-air guns operating at 100 pounds per square inch pressure. Lining was started on March 16, 1932, and completed on March 8, 1933, with the

exception of arch sections in tunnel plugs. More than 375,000 cubic yards of concrete were placed in the linings at a rate of 40 linear feet of tunnel each day, including portal structures and transitions.

COLORADO RIVER DIVERTED

The two diversion tunnels on the Arizona side were lined preceding those on the Nevada side, and on November 13, 1932, temporary dams at inlets and outlets of the Arizona tunnels were blasted, allowing the river to flow unmolested through the Arizona bores. Muck was then dumped on both sides of a pile trestle bridge located immediately downstream from tunnel inlets, and formed a dam across the river in the following 24 hours which turned the entire flow of the river from its channel. An end-dump fill was then completed at a site upstream from the tunnel outlets, and the area between these temporary dams pumped dry.

Excavation to a suitable foundation for the upper cofferdam had been started in September 1932, working behind a temporary dike which shut out the river. After diversion, the excavation was attacked with new vigor, and on October 31, 1932, the first load of the half million cubic yards of earth fill was placed and compacted. This latter work was completed on January 1, 1933, and the steel sheet piling cut-off, concrete face paving, and most of the downstream rock blanket were completed within the next 60 days so that the cofferdam was built in a period of approximately 5½ months. Principal items of construction were 203,000 cubic yards of excavation, 515,000 cubic yards of earth fill, 111,000 cubic yards of rock, and 3,400 cubic yards of concrete. The base thickness of the cofferdam is 750 feet, its height 98 feet, and width 480 feet.

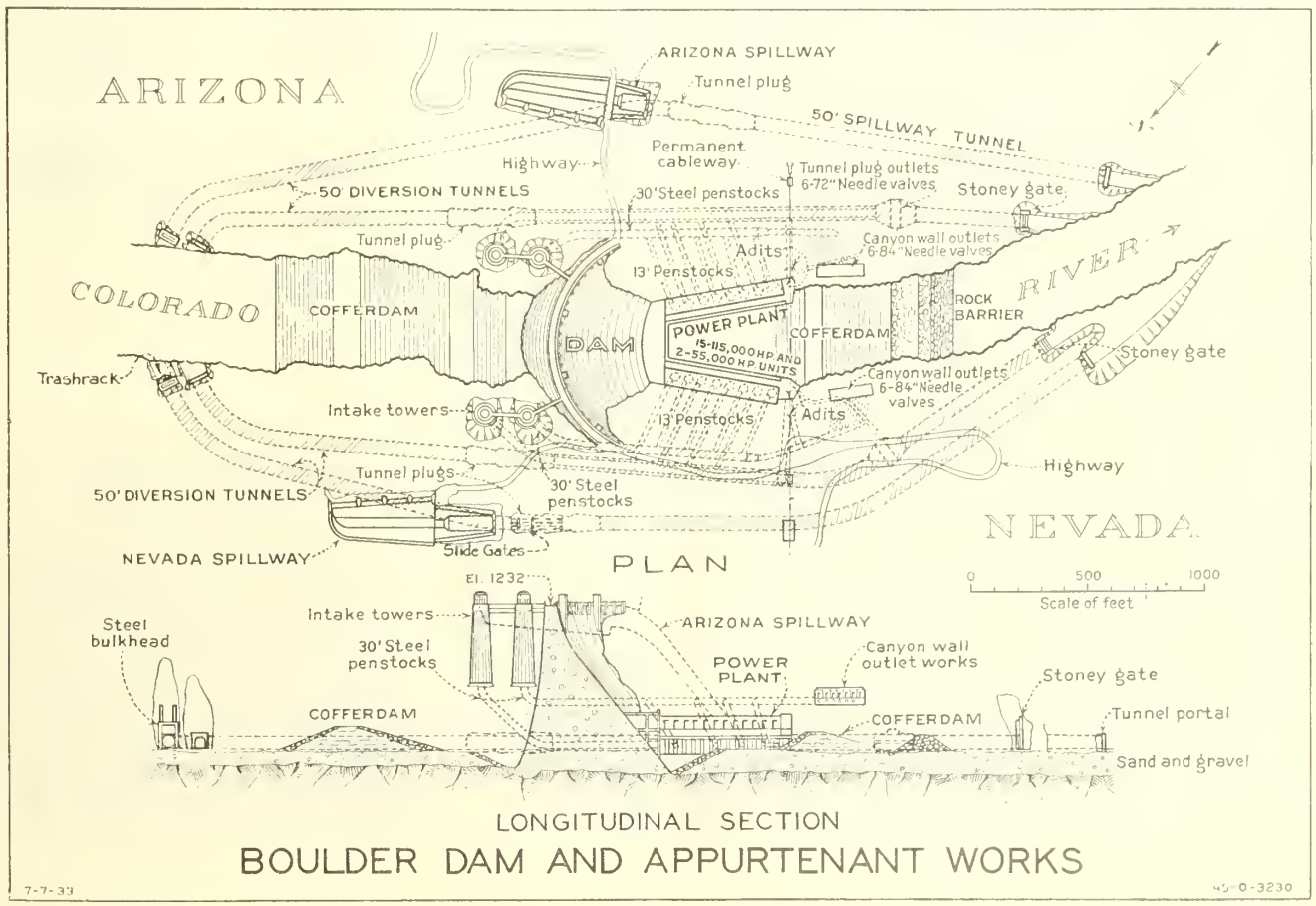
Work on the lower cofferdam and rock barrier was hindered by the stripping of the canyon walls above the outlet works. However, by April 15, 1933, these structures had been practically completed, the principal amounts of material moved being 160,000 cubic yards of excavation, 200,000 cubic yards of earth fill, and 130,000 cubic yards of rock blanket or rock fill.

Stripping loose and projecting rock from canyon walls to protect the workmen during construction and the structures after they are completed was among the first of the operations undertaken and was practically completed in February 1934. A small amount of trimming may be required at the sites of canyon wall valve houses, but in general this spectacular work is done.

CONSTRUCTION OF SPILLWAYS

Drilling and blasting for the spillway channels was started in February 1932, and excavation was practically completed on April 1, 1933. The first concrete was placed in the weir crest of the Nevada spillway in March 1933 after the crest foundations had been thoroughly drilled and grouted. Pouring was started soon after at the Arizona spillway and has been practically completed for both structures. Designed to carry the overflow from the reservoir, the dimensions of each channel are average length of 650 feet from upstream end to inclined tunnel entrance, average width of 150 feet, and maximum depth of 120 feet. Rock excavation amounted to 320,000 cubic yards on the Nevada side and 250,000 cubic yards in Arizona. Concrete in the two structures has totaled approximately 125,000 cubic yards.

A 7- by 14-foot top heading was driven from each outer diversion tunnel to spillway channels from January to May 1932. Inclined tunnels were later enlarged to full 56-feet diameter sections by excavating in horizontal cuts, starting from the upper end. The muck was dumped into the top heading and removed from the diversion tunnels by power shovels and trucks. The tunnel enlargements were practically completed by January 1934, the rock removed amounting to approximately 72,000 cubic yards on the Nevada side and 93,000 cubic yards in the Arizona tunnel.



LONGITUDINAL SECTION

BOULDER DAM AND APPURTENANT WORKS

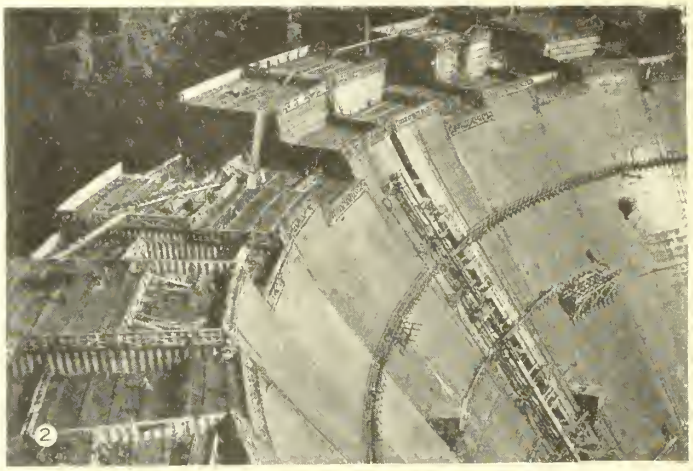
TUNNEL LININGS

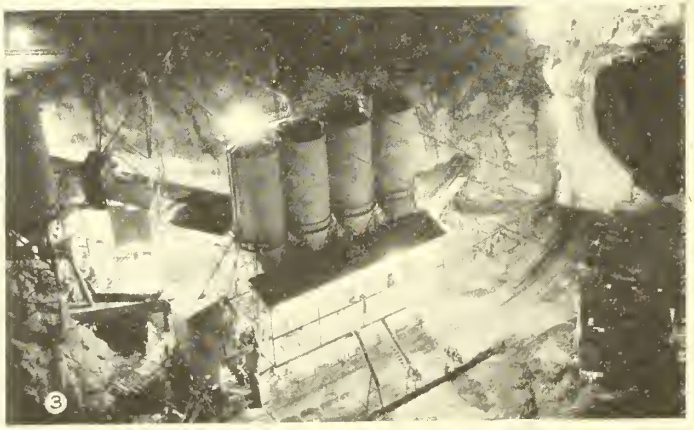
Placing a 3-foot thickness of concrete lining in the Nevada inclined tunnel commenced in August 1933; the operations were shut down from October 1933 to May 1934, and lining was finally completed in October 1934. The concrete was placed behind wooden forms, being conveyed from the Hi-Mix plants first by train, then by cableway to an inclined track running down the tunnels, and finally by belt conveyor to pouring site. The length of the Nevada tunnel is 560 feet and the Arizona bore 680 feet.

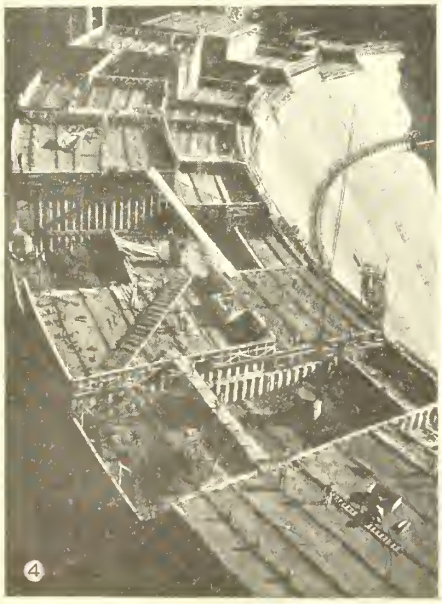
Erection of the 16- by 100-foot steel drum gates, each weighing 500,000 pounds (4 gates for each spillway) was inaugurated in March 1934, and all 8 have been practically assembled.

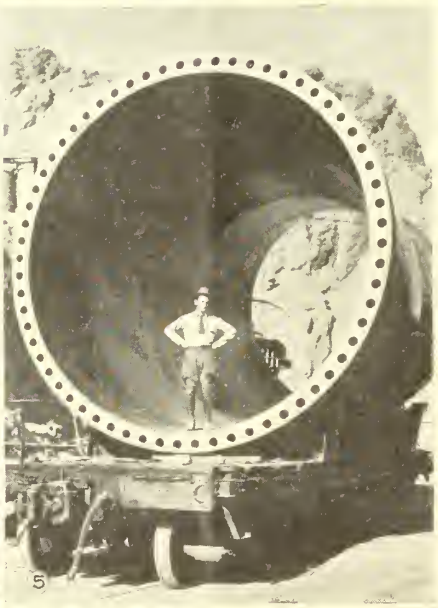
The four huge grooves for the intake towers were cut from canyon walls, requiring the blasting and removal of 333,000 cubic yards of rock. Work on the tower sites commenced on March 10, 1932, and was practically finished on April 1, 1933. The maximum cuts in the

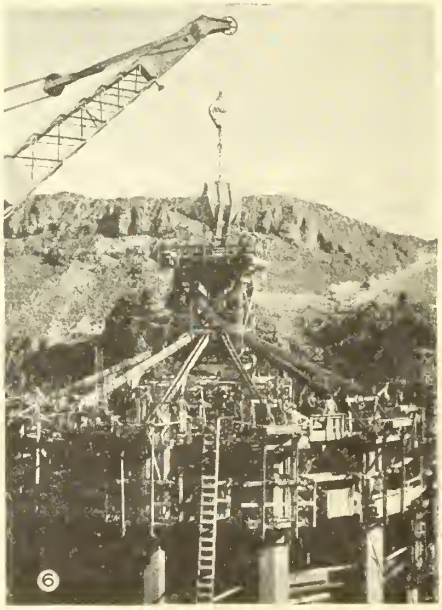
BOULDER CANYON PROJECT











1, Model of Boulder Dam; 2 and 4, dam from break on Nevada abutment. High forms at elevation 1100; 3, night view of high-level concrete mixing plant and Nevada rim operations; 5, Section of 13-foot diameter penstock pipe on car awaiting handling into position in penstock tunnel; 6, downstream Nevada intake tower. Placing concrete in the 12 buttresses making up the tower.

walls range from 206 to 336 feet in depth and are approximately 110 feet in diameter across at the bases.

Concrete was first placed in the Nevada downstream tower in November 1933, and by the end of 1934 all were nearing completion. When finished the highest point of each tower will be at elevation 1,288, or 394 feet above its base. The two 32-foot diameter, 10-foot high cylindrical gates in each tower, one at the base, the other 150 feet higher, which will control the flow of water from the reservoir to the power plant or outlet works, have been installed, and placement of the first of the more than 6 million pounds of trash racks will be started early in 1935.

Excavations for the abutments of the main dam structure were commenced at the crest elevation 1,232 during December 1932 and were practically finished down to the bench at elevation 600 in the following 4 months. Removal of the channel fills was completed down to the low point of elevation 505.6 in June.

FIRST CONCRETE IN DAM POURED JUNE 6, 1933

The first concrete in the dam was poured in block J-3 on June 6, 1933; a million yards were in place 6 months later when the top of the dam was at elevation 740; the two-millionth yard was poured at approximate elevation 915 a year after the first concrete was placed; and the third-millionth was placed in December 1934 near elevation 1,170, leaving approximately 225,000 cubic yards yet to be placed.

Concrete was furnished first by the contractor's Lo-Mix plant containing four 4-cubic yard mixers, later by the Lo-Mix and Hi-Mix plants, and finally altogether by the five 4-cubic yard mixers at the latter plant. Transportation was generally in 8-cubic-yard bottom dump buckets, hauled by electric or gasoline locomotives from plant to position beneath cableways in specially constructed compartment flat cars, and carried to pouring site by the 25-ton cableways.

POWERHOUSE UNDER WAY

The foundations for the powerhouse have been excavated and concrete has been placed to the elevation of the generator floor. The U-shaped structure is located immediately downstream from the dam, the wings nestling against the canyon walls and the connecting sections resting on the downstream face of the dam. The length of each wing is approximately 625 feet and the dam section 300 feet, or a total of more than one-fourth mile.

Installed capacities of the power plant will be 1,835,000 horsepower consisting of fifteen 115,000-horsepower units and two of 55,000 horsepower. Four of the larger units and one of the smaller units will be installed during the present period of construction and the others as required to supply the growing demand for power. The turbines will operate under a maximum head of 582 feet, a minimum head of 422 feet, and an average head of 520 feet.

The cuts for the valve houses, downstream from the power house and 180 feet above the river channel, have been completed, and the outlet tunnels of 11 by 11 feet horseshoe sections have been driven. Construction adits have been excavated from canyon walls to penstock header tunnels and to inner diversion tunnels. These have sections 26 feet wide by 43 feet high and are excavated of this size to provide means of access for installing the 24-foot length of 30-foot diameter steel-penstock headers. The floors of the adits have been partially paved and tracks installed.

All of the tunnels of the penstock and outlet system have been driven, and all are lined except at anchors. This system comprises inclined tunnels from upstream intake towers to inner diversion tunnels, the penstock headers leading from bases of downstream intake towers to outlet tunnels, penstocks running from penstock header tunnels and from inner diversion tunnels to canyon wall sides of powerhouse wings, and the outlets leading from penstock header tunnels to canyon wall valve houses.

Excavation of most of the tunnels was accomplised by drilling jumbos, mounting as many as 30 drills, 1¼-cubic-yard electric shovels for mucking and 6-cubic-yard trucks for hauling rock from heading to muck train or to dump ground. Lining of the tunnels was accomplished behind steel or wooden forms in a manner similar to that for the diversion tunnels.

FABRICATING OUTLET PIPES

The contract for fabricating and installing the steel pipe of the penstock system was awarded to the Babcock & Wilcox Co., of Barberton, Ohio, on July 9, 1932, for its low bid of $10,908,000. Owing to the fact that many of the pipes were 25 and 30 feet in diameter, it was necessary to erect a fabricating plant near the dam site. The location chosen was on the United States construction railroad and the Boulder City-Dam Highway approximately 1½ miles west of the Nevada dam abutment. The plant was completed in the spring of 1933, and the first pipe finished in April of that year. Features of unusual interest in the plant are the steel factory building, crane runway and storage warehouse, 1,120 feet long, 90 feet wide, and 56 feet high; the three 75-ton bridge cranes; a stress relieving furnace 36 feet wide, 39 feet long, and 36 feet high; the largest diameter plate roll and the most powerful ever built; a planer 50 feet in length; and a facing lathe more than 30 feet in width between tool carriages.

The Government is required to transport the pipe from plant to construction adits, and for the purpose of moving the pipe, as well as conveying machinery to the power plant and outlet works, has built, under contract, a railroad line from the United States construction railroad to the canyon rim above the Nevada construction adits and erected a 6-track cableway spanning the canyon above the portals of the four construction adits. This latter installation has its head tower located near the top of the Nevada abutment and immediately to the west of the Black Canyon Highway. The cableway is designed for normal operation with 150-ton loads and infrequent greater loads in order to convey and lower the heavier sections of penstock header pipe, some of which will weigh more than 185 tons. The cableway was furnished and erected under contract with the Lidgerwood Manufacturing Co., of Elizabeth, N. J. Six Companies, Inc., has the contract for transporting the pipe from the fabrication plant to the portals of construction adits and has furnished a 200-ton trailer for moving the 25-foot and 30-foot diameter sections via the highway to the canyon rim.

All of the 8½-foot diameter pipe has been installed in the tunnels leading from canyon-wall valve houses, and erection is in progress of the 30-foot pipe in the 37-foot tunnels leading from the downstream intake towers. On December 1, 1934, the contractor had fabricated approximately 20,000 tons of the 44,000 tons of pipe that will be required and had installed approximately 2,500 tons.

Interest at present is focused on the lowering of the bulkhead gate at the inlet of the Arizona outer diversion tunnel and commencement of storage in the reservoir under control of slide gates installed in the plug in the outer Nevada diversion tunnel just upstream from the intersection with the Nevada spillway inclined tunnel. For this purpose, a 2,000,000-pound steel bulkhead gate has been installed and tested at each of the inlets of the outer diversion tunnels, concrete is being poured in the plugs in inner diversion tunnels upstream from the intersections of tunnels from the upstream intake towers, and preparations are being made to pour the plug and install the gates upstream from the intersection with the Nevada spillway inclined tunnel.

Among other things with which the people of Yakima Valley have a right to be highly pleased is their supply of irrigation water. The storage reservoirs are all full and running over, even at this early date.—*Yakima Daily Republic, Dec. 1934.*

Columbia Basin Project

By F. A. Banks, Construction Engineer, Bureau of Reclamation, Almira, Washington

IN THE eastern part of north central Washington, 80 miles west of Spokane and 20 miles north of the small town of Almira, another great project of the Bureau of Reclamation is in the preliminary stages of construction. The Grand Coulee Dam, the second barrier for harnessing the power of the Columbia River, will eventually be the means of establishing an empire of 20,000 to 50,000 drought-free farms in an area that has been semiarid since time began.

Through the ages the Columbia River has cut a narrow canyon 1,000 feet in depth below the level of the surrounding plain for a distance of 300 miles south of the Canadian border. In the vicinity of the dam, which is about 150 miles by river from the border, this canyon has been carved through the overlying basalt and for a depth of 500 feet into the fine-grained granite which underlies the entire area. On each side of the river at the dam site is an exposed outcrop of these granite walls, forming natural abutments, and core drill exploration has shown ideal foundation conditions over the area upon which the dam will be constructed.

At some time in the past ages an ice barrier turned the course of the river immediately upstream from the dam site almost at right angles to its present channel, causing it to cut a new bed through the lava flows. This ancient river bed, geologically one of the most interesting areas in the world, is known as the Grand Coulee. Sheer basalt cliffs up to 900 feet in height border the mile width of this prehistoric stream bed for the first 30 miles of its course, at which point the mighty river plunged over a fall 6 miles wide and 400 feet in height to the floor of the Lower Coulee, which extends another 25 miles through a chain of cliff-bordered lakes before opening out into a wide alluvial plain. Geologists from all parts of the world have visited this area, studying the processes by which this great natural marvel was brought into being.

PROGRESS OF CONSTRUCTION

Six different contracting companies are busy rushing to completion the preliminary work that is necessary before the construction of the dam proper can be speeded up. The Mason-Walsh-Atkinson-Kier Co., which has the contract for the actual construction of the dam, has made rapid progress since they started construction. One of their first operations was the building of a temporary timber trestle for their hauling across the river. Encountering current velocities of 8 miles per hour in the middle of the river, in water over 45 feet in depth, the contractors completed this 45-bent structure in less than 3 weeks after commencing construction. For more than one-third of the length of the bridge it was necessary to brace each pile before the hammer could be lifted from it.

Excavation operations by this company have also made rapid progress. About 375,000 yards of common excavation has been moved to date, most of it being placed in the canyon of Fiddle Creek, which separates the north and south sections of the Government camp. A fleet of shovels of 2 to 5 cubic yards capacity and a rented fleet of trucks of 5 to 14 cubic yards capacity are eating into the overburden that must be moved before construction operations on the dam can be gotten under way.

MASON CITY

The busiest spot on the project at present is Mason City, the contractor's town site. Carpenters are working three shifts on the erection of one hundred and ninety-two 4- and 5-room houses, 24 dormitories housing 24 men each, 8 foremen's dormitories, office girls' dormitory, a 2-story administration building, recreation building, movie theater, general mercantile store, bank and post office, mess hall, hospital, school, fire station, and jail. The hospital will be a modern structure equipped with the latest in hospital conveniences, air-cooled, and estimated to cost between $100,000 and $150,000.

The mess hall, which is now in operation, has a capacity for feeding 1,000 men at one time. The administration building is now housing the main offices of the contracting company.

Sewer and water systems have been laid in the camp and the streets have been graded and are being surfaced with 6 inches of gravel. This will be followed in the spring with a 1½-inch bituminous mat coat.

Water supply.—The water supply for the camp will be pumped from the Columbia River, chlorinated at the pumps and settled in two 100,000-gallon reservoirs. The settled water is to be stored in a third reservoir of 150,000-gallon capacity, from which the supply for the camp is drawn. If this settlement does not prove effective, arrangements have been made for filters to be installed.

Contractor's railroad.—From the end of the Government railroad the Mason-

COLUMBIA I

1. Start Crick and Kuney project; 2. Spoil bank from railroad and highway cut at (4); 3. 86-foot rock cut by Crick and Kuney; 4. Heavy cut on railroad and highway; 5. Toe o bridge; 9. Terminus of M. W. A. K. railroad; 10. M. W. A. K.'s temporary trucking trestle; 11. M. W. A. K.'s office build

Walsh-Atkinson-Kier Co. will continue a track downstream about one-quarter of a mile, across the river on a wooden truss bridge, and thence extend it up along the east bank to yards below their camp.

Railroad-highway grade.—Contract for constructing the highway and railroad grade from the floor of Grand Coulee to the Government town site is held by Crick and Kuney, and the work will be completed within a short time. This grade is benched out of the granite walls of the canyon, the two grades being on the same level for about one-half the distance down, at which point the highway separates from the railroad, dropping on an 8-percent grade for that part down into the Government camp.

The railroad, with maximum grade 5 percent, continues on around the side of the canyon wall, leading down into the Government warehouse site by means of two switchbacks.

An average of 187 men working three shifts have been employed on this contract since the 1st of July.

United States construction railroad.—Under his contract for building the United States construction railroad from a connection with the Northern Pacific at Odair, Wash., 28 miles through Grand Coulee and laying track on the 2 miles of roadbed prepared by Crick and Kuney from the coulee floor to the dam site, David H. Ryan has completed the roadbed through the coulee and has laid 21 miles of track. Laying about 1 mile of track per day, he hopes to reach the head of the coulee by the first week in December.

Government bridge.—High water in the spring and early summer of 1934 seriously delayed operations of the Western Construction Co., which has the contract for constructing the river piers for the Columbia River highway bridge.

The concrete caisson for the east pier has now been sunk to bedrock through 60 feet of overburden, and work on the caisson in the west pier is well under way.

The contract for the steel superstructure and concrete approaches for the bridge has recently been let to J. H. Pomeroy & Co. and is to be completed in 8 months.

GOVERNMENT CAMP

The National Construction Co. is well along with the first 30 houses in the Government camp and an affiliate is low bidder on the second 30, on which bids were recently opened.

American Builders, Inc., low bidders on the school in the Government camp, has completed excavation for the building and is setting forms for basement walls.

Bids have been invited on the administration building and are expected to be called soon on the dormitories and warehouse.

The laying of pipe and accessories for sewer and water systems in the camp has been completed by Arcorace & Co., who are now completing the concrete reservoirs. Water for domestic use is obtained from springs in Fiddle Creek Canyon; utility water will be pumped from the Columbia River. Facilities are provided for pumping and chlorinating water from the utility reservoir for domestic use in case of shortage in the springs and for overflow from the domestic water reservoir into the utility reservoir in case of oversupply from the springs.

Reclamation offices.—Offices of the Bureau of Reclamation are located at present in the town of Almira, Wash., about 20 miles from the dam site, with a field office established at the dam. Besides the field parties stationed at the dam site to supervise the construction work, parties are retracing and reestablishing cadastral corners in the reservoir area and are completing first and second order triangulation networks over that area as part of the survey for the right-of-way required. Offices of the Bureau will be moved to the dam in the spring of 1935.

One Contractor Eleven Contracts

J. A. Terteling & Sons, of Boise, Idaho, dirt movers of note, at the present time have 11 Bureau of Reclamation contracts as follows:

Specification 546, Owyhee project, North Canal earthwork and structures	$492, 075. 75
Specification 552, Hyrum project, construction of Hyrum Dam	337, 211. 00
Specification 564, Casper-Alcova project, Casper Canal, schedule 2	89, 865. 00
Specification 568, Stanfield project; siphons, tunnel, drain, and structures	49, 593. 50
Specification 503-0, Owyhee project, Kingman sub-laterals	5, 650. 00
Specification 504-0, Owyhee project, Kingman sub-laterals	5, 382. 50
Specification 597, Humboldt project, Rye Patch Dam	256, 322. 50
Specification 627-D, Hyrum canals	27, 316. 00
Specification 502-0, Owyhee Kingman laterals	6, 967. 00
Specification 507-0, Owyhee laterals	4, 414. 50
Specification 600, Owyhee; North Canal, earthwork and structures	124, 000, 00

WASHINGTON

A. K. Co. excavation; 6. 150-foot railroad tunnel to be driven by M. W. A. K.; 7. M. W. A. K.'s 400,000-cubic yard fill in Fiddle Creek; 8. M. W. A. K.'s permanent railroad all, Mason City; 13. Screening plant, Western Construction Co.; 14. West pier, U. S. highway bridge; 15. Government camp.

Construction Activities with P. W. A. Allotments[1]

WITH a P. W. A. allotment of $6,500,000 available to complete the Owyhee project in Oregon-Idaho, good progress is being made in constructing the North Canal and lateral systems for the Mitchell Butte and Dead Ox Flat divisions. On November 10, 1933, the first large contract was awarded to J. A. Terteling & Sons, Boise, Idaho, for building 29 miles of the North Canal. The bid price was $492,075.75, and the work is now practically completed. Twenty-seven additional miles of the canal have just been contracted which will complete the canal from the Malheur River to station 3703 near Weiser. Large siphons have been necessary at river and creek crossings. The Owyhee River and Snively Gulch siphons have been completed, and bids were opened on December 3 for the Malheur River and Dead Ox Flat siphons. The Malheur River structure is more than 4 miles in length, alternate bids being asked for either 80-inch diameter welded plate-steel pipe of 78-inch precast concrete pipe. The maximum hydrostatic head will be about 283 feet. The South Canal, which will supply the Succor Creek division, is soon to be advertised. A number of small lateral contracts are being let to local contractors.

Work on the Agency Valley storage dam and reservoir on the North Fork of the Malheur River, on the Vale project, Oregon, was started in February 1934, an allotment of $1,000,000 being available for additional storage. Hinman Bros., of Denver, Colo., has the contract at a price of $496,286.10. The Willow Creek Canal, 20 miles in length, is also to be built under the allotment.

ALL-AMERICAN CANAL

An allotment of $9,000,000 was made available for beginning construction of the All-American Canal, and bids were invited on December 4, 1933, for constructing 14 miles of canal. These bids were recalled and a second opening took place on December 20. The bids then received were considered too high and all were rejected. On June 7, 1934, bids were opened for the construction of 30 miles of canal from station 260 to 1860. Schedules 1 to 6, inclusive, were awarded to the W. E. Callahan Construction Co., St. Louis, Mo., and Gunther & Shirley, Dallas, Tex., for $4,859,587.50; schedule 7 went to the Griffith Co., Los Angeles, Calif., for $226,800. The P. W. A. has made $1,000,000 of the allotment available for force account work to relieve unemployment in the Imperial Valley. This work is being carried on at the western end of the canal location in the vicinity of Calexico, Calif., residents of the valley being given employment. The Callahan-Gunther contractors are using dragline excavators of special construction, equipped with caterpillar traction, 175-foot booms, and adapted to the use of buckets of 7 to 10 cubic yard capacity.

GRAND COULEE

An initial allotment of $15,000,000 was made by the P. W. A. for starting construction of the Grand Coulee (low) dam and power plant, Columbia Basin project, Washington. Work was initiated in January 1934, when a contract was awarded to David H. Ryan, San Diego, Calif., for excavation of overburden at the dam site, at a price of $534,500. The main contract for building the dam and power plant was awarded on September 28 to the Silas Mason Co., Inc., New York City; Walsh Construction Co., Davenport, Iowa; and Atkinson-Kier Co., San Francisco, Calif., at their joint bid of $29,339,301.50. The construction railroad from the Northern Pacific to the dam site has been completed under a contract with David H. Ryan, San Diego, Calif., the price being $235,570. J. H. Pomeroy & Co., Inc., San Francisco, Calif. has the contract for the Columbia River highway bridge, the price being $241,868. Work on the various features of the Government camp site is in progress.

The first contract on the Casper-Alcova project in Wyoming was awarded in October 1933 to the Lawlor-Woodward Co., of Seattle, Wash., for constructing a diversion and outlet tunnel at the Alcova dam site, which was completed in October 1934. In March 1934 work was commenced on the first section of the Casper Canal, with three contracts totaling $609,320, all of which are now in progress. Other work completed to date includes telephone and transmission lines, substations, and roads.

UTAH PROJECTS

An allotment of $930,000 was made available for the construction of the Hyrum Dam and Reservoir, on Little Bear River near Wellsville, Utah, and the Hyrum-Mendon Canal, 14 miles in length, both for the Hyrum project. J. A. Terteling & Sons, of Boise, Idaho, was awarded the contract for the dam in January 1934 for $337,211.

The Ogden River project has available $3,000,000 for construction of the Pine View Dam and Reservoir on Ogden River near Huntsville, canals, and canal structures. The Utah Construction Co. and Morrison-Knudsen Co., of Ogden, Utah, with a bid of $677,898.10, were awarded the contract for the dam in October 1934.

The start of construction work on the Provo River project, Utah, is awaiting agreements with the various interests involved. Principal construction features are the Deer Creek storage dam, canals, and structures, Weber-Provo canal enlargement, and Utah Lake levees. An initial allotment of $2,700,000 is now available.

An allotment of $1,500,000 has been made for the Moon Lake project in Utah which involves the building of a storage reservoir near Duchesne. Bids for building the Moon Lake Dam will be opened at Salt Lake City on February 4. Another Utah project for which $300,000 has been allotted is the Sanpete in Sanpete County, which will be used for tunnel construction, and the Ephraim Tunnel is the first work to be undertaken.

The Humboldt project, near Lovelock, Nev., to cost $2,000,000 is under way and the first contract for construction of the Rye Patch storage dam was awarded on December 1 to J. A. Terteling & Sons, Boise, Idaho, for $256,322.50. The Sun River project in Montana has $600,000 to spend for drains, laterals, and structures, and satisfactory progress is being made. Other work in progress with P. W. A. allotments is as follows: Yuma: Drains and drainage structures, Valley division, $120,000; Boise: Drains and drainage structures, Boise-Kuna, $31,000, Notus, $9,000; Rio Grande: Laterals, drains, and structures in Elephant Butte district, $500,000; Milk River: Laterals and structures, $65,000; Klamath: Levees in Tule Lake division, $25,000; Bitter Root: Reconstruction of distribution systems, $100,000; Stanfield: Reconstruction of laterals and structures, $100,000.

Boulder Dam Surpassed

The proposed Grand Coulee "high" Dam and power plant will surpass, in several features, the Boulder Dam and power plant, highest dam and largest capacity plant in the world, now nearing completion on the Colorado River in Arizona-Nevada. Here are some comparative figures, those for Grand Coulee being tentative:

	Boulder	Grand Coulee
Height ... feet	730	500
Crest length ... do	1,180	4,000
Volume of concrete cubic yards	3,250,000	11,000,000
Power plant capacity horsepower	1,835,000	2,520,000
Generating units kilovolt-amperes	82,500	105,000
Cost of dam and power plant (without interest)	$109,000,000	$168,000,000

[1] Projects other than Boulder Canyon. See special article on Boulder Canyon and Columbia Basin.

The Reclamation Era

Issued monthly by the Bureau of Reclamation, Department of the Interior.

Subscription 75 cents a year, to other than water users, payable in advance by check or postal money order drawn in favor of the Bureau of Reclamation.

Water-user owners on reclamation projects or divisions of projects *which are being operated by the Bureau of Reclamation* are furnished copies without direct charge to them.

A special price of 36 cents a year is made to all water-user owners on other projects or divisions thereof which are entirely or partly self-operating.

JANUARY 1935

Welcome

With the May 1933 issue the Reclamation Era was discontinued for economic reasons. The intervening 19 months have resulted in many communications urging the reestablishment of this magazine as the Bureau's official mouthpiece.

It is therefore with pleasure that with this issue we announce the approval of the Secretary of the Interior to resume the printing of this monthly magazine.

We hope in the pages of the Era to print matters of especial interest to water users on Federal reclamation projects, and we hope to use its pages as an educational medium for the rest of the country. It is only by a better understanding of reclamation's worth that the program under the national reclamation policy can go forward as a planned development on a long-term basis.

ADMINISTRATION'S SUPPORT

President Roosevelt and Secretary Ickes have, during the past year, demonstrated their confidence in the national reclamation policy by generous allotments of Federal funds to continue the construction of needed storage works on streams in the arid region for irrigation purposes, and the development of hydroelectric power at a rate which will influence the establishment of commercial enterprises and the development of natural resources.

While President Roosevelt was in the Missouri River watershed this past summer, he stated:

"We are going to make every ounce of every gallon of water that flows from the heavens and the hills count before it makes its way down to the Gulf of Mexico. This will take more than a generation to complete."

With that sort of an announcement by the Chief Executive of the United States and the generous allotments for carrying on the work of the Bureau made by the Public Works Administration, we have only thankfulness in our hearts that this policy, so important to a development spread over one-third of the country, can go forward.

MORE ACRES VERSUS STABILIZED WATER SUPPLY

Operation of the Federal reclamation policy does not necessarily mean the commencement of new projects. Supplemental storages are needed where every few years a dry year means serious losses in established agricultural communities. The drought has entered into the picture favorable public opinion which will be tremendously helpful in January when Congress convenes and the subject of complete beneficial utilization of land and water on a long-time planning program comes up for serious consideration.

COUNT OUR BLESSINGS

Reports from Federal reclamation projects show good crops, better prices, and a greater demand for their products, largely due to the shortage as the result of the drought. The irrigation season found the majority of projects with an ample water supply. Three projects—Carlsbad in New Mexico, Newlands in Nevada, and Strawberry Valley in Utah—had an acute water shortage; a moderate water shortage occurred on the Boise and Minidoka projects in Idaho, North Platte in Nebraska-Wyoming, and Uncompahgre in Colorado.

The effects of a dry year were shown in depleted water storages. At the end of October the storage in reservoirs was a little over 1,000,000 acre-feet as against 3,000,000 acre-feet in October of last year. The most important thing to round out the reclamation program is the building of supplemental storages so that the acres to be included within a project will have a full water supply.

PUBLIC RELATIONS SERVICE

Since the discontinuance of the Era there has been established in Washington a Division of Public Relations whose duty it is to act as an educational medium on the operations of the Bureau in carrying out the Federal reclamation policy. Word and visual education in the form of articles, press releases, talks before various groups, lantern slide lectures, and motion pictures are being resorted to with a view to developing an enlightened public as to the very important place these Federal reclamation projects, completed or under construction, hold in the composite economic picture of the United States.

Not the least of our public relations work is offering assistance to settlers on established projects and securing settlers for vacant farms or new units thrown open as the distribution system of projects is extended. We hope shortly to establish in the field experienced reclamation economists to assist in settlement problems and advise with farmers as to the best methods of operations in irrigation and agricultural practice. By placing such men at strategic points we hope to improve conditions on a number of our projects where assistance is needed. This service will be supervised from Washington and it is hoped will be a popular branch of our service to the public and to the water users.—*M. A. Schnurr*

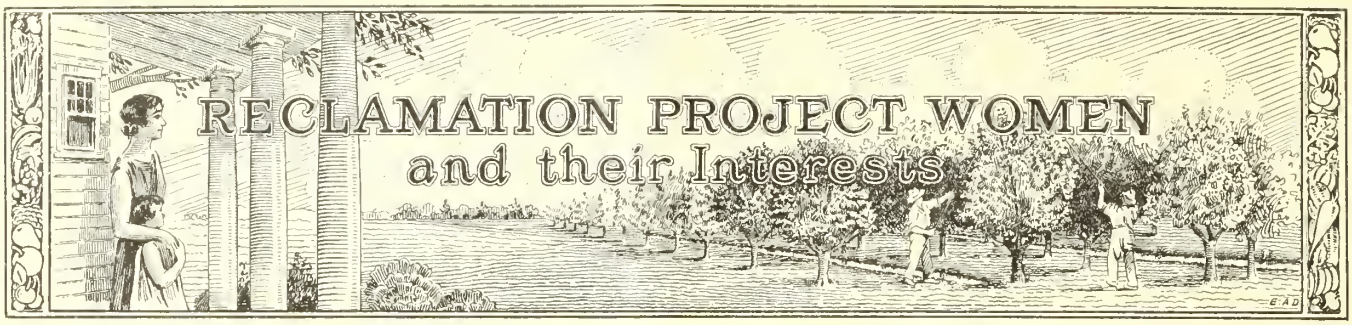
National Reclamation Association Meets at Salt Lake City, Utah

The third annual conference of the National Reclamation Association held at Salt Lake City, December 7–8, was attended and addressed by representative irrigation leaders in various parts of the country. Honorable Henry H. Blood, Governor of Utah, presided at the dinner on the opening date and addresses were made by John W. Haw, member of the Committee on Federal Reclamation Policy, whose subject was "As I See Reclamation", and Marshall N. Dana, district chairman, National Resources Board, and president, National Reclamation Association, who spoke on the subject "The Place of Reclamation in the National Land and Water Program."

On December 8 Dr. Elwood Mead, Commissioner, Bureau of Reclamation, delivered an address on the subject "Reclamation Under the New Deal." Other speakers on the second day of the conference included F. L. Ballard, vice director of extension, Oregon State College, whose subject was "Crops Raised on Reclamation Districts"; Hon. J. P. Pope, United States Senator from Idaho, whose subject was "Reclamation"; and William R. Wallace, of Salt Lake City, with the subject "Usefulness of National Reclamation Association in Development of Reclamation."

The addresses are full of interest to the readers of the Era, and in addition to those of Dr. Mead and Senator Pope, which are carried in this issue, we hope to publish some, if not all, of the addresses delivered.

On the Carlsbad project, New Mexico, one improved farm was recently sold in the Otis district to a man who had been a renter on the project for the past 5 years.



To Project Women—Greetings

I am happy to extend my greetings to project women in this first issue of the resumed publication of The Reclamation Era. The dictionary definition of a pioneer is "one who goes before to remove obstacles and prepare the way for others." Surely the fine enterprise that is characteristic of reclamation project families deserves the description of "pioneering" in its highest sense. It is the same quality that was always present in our early settlers who pushed back frontiers and made homes and communities where there had been only wilderness.

May I express here my appreciative recognition of the part you play in the success of the Federal reclamation projects.

Anna Wilmarth Ickes.

Introducing Mrs. Homesteader

By Charlotte S. Smith, Chief of Community Development Section, Division of Subsistence Homesteads

TEN thousand or more women will have a chance to satisfy that ever-present desire to own their own house and garden with Uncle Sam acting as their landlord.

Seventeen months ago the Federal Government undertook an experiment in a new way of living. Its purpose was, and is, to show the possibility of families being continuously self-supporting. It goes further than mere independence on a nonstarvation basis. It aims to provide a comfortable and adequate manner of living for families with a small income.

With its $25,000,000 fund, the Division of Subsistence Homesteads, under the Department of the Interior, is demonstrating the worth of a system intended to provide greater security for the small-wage earner through a combination of industrial employment and subsistence farming. This is nothing more than an application of that old adage, that it is unwise to put all your eggs in one basket. Insufficient cash to meet the grocery bills has driven more than one family on the relief rolls. Most families can weather a depression in their financial budget when they are assured of a roof over their heads and sufficient food.

With its present appropriation, the Division is developing some 60 projects throughout the country, 40 of which have now been publicly announced. A score of additional projects are being planned. Ten thousand families with small means will be enabled to realize their desire to buy and own a home.

GOOD BUSINESS

This is not charity, but business of the benevolent type, directed first of all to the family's rehabilitation, but, nevertheless, expecting repayment for every dollar loaned. The families will buy their homesteads on a long-term payment plan extending over 20 or 30 years, and involving small monthly payments. The cost of the homestead, including a house with modern conveniences, land, and outbuildings, will be $1,700 to $4,000. The homesteaders' payments applied against the purchase price of their home, will be returned to the Division's revolving fund for use in new projects.

There is no shortage of people who want to try their hand at subsistence farming. On the contrary, one of the major problems is the necessity of choosing a limited number from among the thousands applying. Letters by the score come to the Washington office repeating the writer's assurance that "everything would be all right if we could just get back to the country and have a garden, eggs, and vegetables."

GOOD BUSINESS REQUIRES GOOD RISKS

Of all members of the family, the general attitude and encouragement of the wife and mother is the most important. She is the one who will finally determine the success or failure of the family's subsistence homesteading. An exaggeration? Not in the least.

In 1931 Germany undertook a subsistence homestead program. An appropriation of $20,000,000 was made for this purpose, and approximately half a million people were involved. The results show that 9 out of 10 of the failures reported were directly due to the woman of the family. Her failure to adapt herself to this new way of living was sufficient alone to cause the entire family to become discouraged, slack up in their work, and eventually decide not to go on with homesteading.

And that is why those in charge of the subsistence homestead program in this country are particularly interested in the wife of every homesteader. On their ability to choose those women suitable for life in a subsistence-homestead community may depend the entire future of the homestead movement.

What tests can be applied to the woman? Who can measure her sense of humor with a yardstick, or her ability to keep a temper when the children are running riot, the dishes stacked high in the kitchen, and a speech to prepare for the next meeting of the Mothers' Guild? And who can tell just how she will spend her leisure time. Does she like gardening, fixing up her own home, reading, preserving, community activities, and making the best of what she has? Does she really? Or does she consider a subsistence homestead only as a temporary and dreary escape from present economic difficulties.

THE PROFITS ARE SUBSTANTIAL HOMES

The families who move into subsistence homesteads are not being aided to move into new quarters by a benevolent government merely to change their addresses. It is expected that this move will provide a stimulus and means for each family to raise its standard of living.

Every Mrs. Homesteader must realize that this new way of living will necessitate more work for her. Her husband's enthusiasm for a subsistence homestead must not blind her to the fact that as a rule his job will keep him away from home all day, and she will be the one who remains at home. She may find it necessary to lend a hand in the garden, the care of the poultry and, sometimes, the cow, in addition to her regular household duties. She must be adaptable to meeting such a situation and to making the best of what she has. In fact, she must be contented—if the proper community spirit is to be developed and the subsistence-homesteads project is to be successful.

Self-respect and happiness here. Typical new home of homesteader in Reedsville Experimental Community, West Virginia

In the first years, the homestead wife will have to learn to do a number of things she perhaps has never done before. She must plan the quantity and variety of canned goods necessary to take care of the family's food supply for the winter. She must learn pressure canning and cold packing; she may want to attempt weaving and mattress making.

A great deal of her knowledge will come from community gatherings. Classes in cooking, sewing, gardening, and children's care will form part of every community program. In the Crossville, Tenn., project, 14,000 cans of fruit, vegetables, and berries were preserved in the Community Canning Kitchen this last summer; while at Tygart Valley, W. Va., the homesteaders ran up a record of 36,000 cans. And these "cans" are not the small size ordinarily used by a housewife, but are of the 1-gallon size.

In Reedsville, W. Va., every Mrs. Homesteader makes it a point to lay in a goodly supply of tomato juice. She has learned that a diet of tomato juice is the best cure for the family's colds.

A system of trade and barter is already in operation in some of the projects now under way. An oft-repeated conversation is, "You teach me to knit and I'll teach you to quilt." And, of course, there is the usual exchange of cooking recipes, diets, dress and sock patterns, and the best way to treat the measles. In most of the community centers there will be a library where the housewife can solve any knotty questions on the best way to put eggs in water glass or to preserve the color of her canned strawberries.

Yes, there is plenty of work for the woman in a subsistence homestead community, all of which shrinks to little when she takes into consideration the advantages offered by this new way of living. There are a comfortable home, schools, adequate diet, and healthy environment

(Continued on p. 23)

Former mere existence. Typical quarters of mining families now homesteaders in the Reedsville Experimental Community, West Virginia

Notes for Contractors

Uncompahgre project, Colorado.—Specifications No. 594 and drawings will be available for distribution about January 14 and bids will be opened at Gunnison, Colo., on February 18 for construction of the Taylor Park Dam. Bids are invited on two alternative types—a concrete arch dam and an earth- and rock-fill dam. The advance estimated quantities involved in a concrete dam are as follows: 61,000 cubic yards of common or open-cut excavation; 28,500 cubic yards of rock of open-cut excavation; 4,000 cubic yards of backfill; 1,400 cubic yards of rubble masonry; 100,000 cubic yards of concrete; 13,000 cubic feet of grout; drilling 21,000 linear feet of grout holes; placing 90,000 pounds of reinforcement bars; installing 111,000 pounds of small metal tubing, pipe, and fittings; installing 10,000 linear feet of metal sealing strips in contraction joints; and installing 362,000 pounds of gates, gate hoists, control mechanism, conduit lining, needle valves, hoist, crane, and trash rack metal work.

For an earth- and rock-fill dam the advance estimated quantities are as follows: 95,000 cubic yards of excavation in open cut, common; 63,000 cubic yards of excavation in open cut, rock; 853,000 cubic yards of excavation in borrow pit, common; 35,000 cubic yards of excavation in borrow pit, loose rock; 6,000 cubic yards of tunnel excavation; 825,000 cubic yards of earth fill in embankment; 130,000 cubic yards of rock fill on downstream slope of embankment; 26,000 cubic yards of riprap on upstream slope of embankment; 2,500 cubic yards of concrete in tunnel and gate chamber; 7,300 cubic yards of concrete in other parts of dam; 7,000 cubic feet of pressure grouting; drilling 7,500 linear feet of grout holes; placing 451,000 pounds of reinforcement bars; constructing 8,500 linear feet of pipe drains; and installing 521,000 pounds of gates, valves, and other metal work.

Contractors were notified in November of the proposed work in order to give prospective bidders an opportunity to visit the site of the work near Gunnison while weather conditions permitted. The work must be completed within 600 calendar days from the date of receipt of notice to proceed. The total allotment for the dam and reservoir is $2,000,000.

Moon Lake project, Utah.—Bids will be opened at Salt Lake City, Utah, on February 4, for constructing the Moon Lake Dam, Moon Lake project, Utah (Specifications No. 605). This is to be an earth- and rock-fill structure and the advance estimated quantities involved are as follows: 116,000 cubic yards open-cut excavation, common; 394,000 cubic yards excavation from borrow pits, common; 17,000 cubic yards open-cut excavation, rock; 32,000 cubic yards excavation from borrow pits, rock; 700 cubic yards stoped excavation, all classes; 12,400 cubic yards tunnel excavation, all classes; 6,000 cubic yards back fill about structures; 400,000 cubic yards earth fill in embankment; 77,000 cubic yards rock fill on downstream slope of embankment; 29,000 cubic yards dumped riprap on embankments; 200 cubic yards screened gravel under structures; 3,900 cubic yards concrete in tunnels and gate chamber; 4,000 cubic yards concrete in spillway intake, parapet, and other structures; 350 cubic yards rubble concrete paving; 1,000 cubic feet pressure grouting; 90,000 pounds of steel tunnel liner plates; 175,000 pounds of gates and other metal work; 870,000 pounds of reinforcement bars; 1,500 linear feet of pipe drains; and 740 linear feet of electrical metal conduit. The work is located near Duchesne, Utah, and must be completed within 600 calendar days from the date of receipt of notice to proceed. The total allotment for the dam and reservoir is $1,500,000.

Humboldt project, Nevada.—Bids were opened at Lovelock, Nev., on November 12 for construction of the Rye Patch storage dam (Specification 597), an earth- and rock-fill structure on the Humboldt River. Twenty bids were received ranging from $256,322.50 to $463,273.25. The low bidder was J. A. Terteling & Sons of Boise, Idaho, who was awarded the contract on December 1. This contractor is also building the Hyrum Dam in Utah, and is carrying out several other reclamation contracts.

Columbia Basin (Grand Coulee) project, Washington.—At Almira, Wash., on December 6, bids were received for the following construction work in the Government camp at the Grand Coulee Dam site: Highway, street, alley, and parking area surfacing; sidewalks, curbs, and gutters, catch basins, and storm sewers. The successful bidder will have 150 calendar days to complete the work after he is notified to proceed.

Inland Steel Co., Chicago, Ill., was awarded a contract on November 30 for furnishing 20,000 tons of interlocking steel-sheet piling and 1,000 tons of wyes, tees, crosses, etc., for the Grand Coulee Dam. This piling is being purchased by the Government for the Mason-Atkinson-Kier-Walsh contractors, who are constructing the dam and power plant. Bids were opened at Denver on November 16, under Specifications No. 642-D. Five identical bids of $1,180,401.40, delivery Odair, Wash., were received from the Carnegie Steel Co., Pittsburgh, Pa.; Illinois Steel Co., South Chicago, Ill.; Jones & Laughlin Steel Corporation, Munhall, Pa.; Inland Steel Corporation, Indiana Harbor, Ind.; and Bethlehem Steel Co., Buffalo, N. Y. All bidders offered to equalize freight rates, and drawing by lot determined the successful bidder.

New building construction planned for the Government camp comprise two dormitories and a warehouse. Two contracts for 3- and 4-room residences, and a contract for a school building are already under way.

Bids were opened at Almira on December 21 for the construction of an administration building (Specification 603), which will be one story, of wood construction, approximately 48 feet by 144 feet in size, with a full basement and attic storeroom.

On December 3 bids were received at Almira for furnishing two motor-driven, vertical, deep well pumping units, with control equipment.

Boulder Canyon project, Arizona-Nevada.—Within the next 90 days a considerable amount of materials and machinery will be advertised for bids, including the following: 86-inch Paradox gates, hoists and conduit; 72-inch needle valves, discharges and piping; intake tower crane and rails; elevators in dam and power plant; control equipment, cable and wire, oil purifiers, station service transfer and switchyard structure for the power plant.

Bids were received at Denver on December 3, under Specifications No. 641-D, for furnishing machine tools for the power plant comprising lathes, drill, shaper, pedestal grinder, and equipment.

On December 27 bids were received at Denver under Specifications No. 604 for furnishing 4 motor-driven cylinder gate hoists and 24 bulkhead gates for the intake towers at Boulder Dam. The gate hoists and gates are to be installed by the Government.

Low bidders under Specifications No. 589, under which bids were opened on October 10, for furnishing switching equipment, oil circuit breakers, lightning arresters, disconnecting switches, bus structures, and generator neutral reactors for the power plant were as follows: Schedule 1, 2,300-volt switching equipment, Delta Star Electric Co., Chicago, Ill., $108,430; schedule 2, 287.5-kilovolt oil circuit breakers, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $421,452 or $431,520; schedule 3, 287.5-kilovolt lightning arresters, General Electric Co., Pittsfield, Mass., $37,120; schedule 4, 287.5-kilovolt disconnecting switches (seven equal bids of $106,000), Pacific Electric Manufacturing Corporation, Delta Star Electric Co., Bowie Switch Co., General Electric Co., Railway & Industrial Engineering Co., Westinghouse Electric & Manufacturing

Co., Electric Power Equipment Corporation; schedule 5, 23-kilovolt bus structures, I. T. E. Circuit Breaker Co., Philadelphia, Pa., $264,603; schedule 6, 15-kilovolt oil circuit breakers and reactors, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $21,070.

Owyhee project, Oregon.—Bids were opened at Ontario, Oreg., on December 3 for the construction of 27 miles of the North Canal (Specifications 600) involving earthwork and concrete structures. On December 4 bids were received under specifications no. 639–D for construction of the Coyote Gulch drain on the Dead Ox Flat division.

Work now advertised is the construction of 14 miles of the South Canal, station 0 to station 736, for which work bids will be opened at Ontario on January 7. The Denver office is preparing specifications for radial gates for the South Canal.

All-American Canal, Ariz.-Calif.—One of the important construction jobs on this project is the Imperial diversion dam and desilting works, which will soon be advertised for bids. The dam site is on the Colorado River about 15 miles north of Yuma, Ariz.

Sanpete project, Utah.—All bids received under specifications no. 587 on October 18, 1934, for construction of the Ephraim Tunnel, were rejected, and the work is to be readvertised as specifications no. 602. Work will be started as early in the spring as possible. The Black Canyon Tunnel on the Spring City division will soon be advertised for bids.

Casper-Alcova project, Wyoming.—The Denver office is preparing specifications and plans for the Seminoe Dam, power plant, and appurtenant works; turbines, generators, governors, transformers, and oil circuit breakers for power plant; outlet pipes and bulkheads gates for Seminoe Dam. Work proposed for advertisement within 60 days includes Alcova Dam, trash racks for outlet works at Alcova Dam, and the second and third sections of the Casper Canal.

Chain Lakes storage project, Montana.—Advertising for bids on the construction of Fresno Dam on the Milk River, near Havre, is awaiting the negotiation of a repayment contract with the water users. There is a P. W. A. allotment of $2,000,000 for this project.

Truckee River storage project, California.—Bids for construction of the Little Truckee storage dam on the Little Truckee River will be called for as soon as the Truckee River agreement is approved. The allotment is $1,500,000.

Upper Snake River storage project, Idaho.—The Island Park site on North Fork of Snake River, about 25 miles due north of Ashton, has been selected for a storage reservoir, and plans and specifications are now being prepared in the Denver office.

Ogden River project, Utah.—The next important construction job to be advertised on this project will be the North Ogden Canal Tunnel.

Sun River project, Montana.—Tomlinson & Arkwright, of Great Falls, Mont., submitted low bid of $44,847.10 at the opening of bids under Specification No. 596 at Fairfield, Mont., on November 27. The work comprises earthwork and structures for the Mill Coulee Canal and laterals.

Some Characteristics of Snake River

By E. B. Darlington, Superintendent, Minidoka Project

THE Snake River Valley is an irrigated empire. Artificial application of water to otherwise arid land in this domain has produced one of the outstanding agricultural areas in the United States. The length of Snake River through its basin is about 1,000 miles, but much of its course is in canyons and between steep slopes. Therefore the continuity of the reaches in which irrigation is practicable is interrupted, and the valley may be regarded as a series of irrigable bottoms or benches. However, the total area now under irrigation development in the entire Snake River Basin is close to 3,000,000 acres, of which about 1,000,000 acres lie in the valley of the main stream, the remainder in the valleys of tributary streams. Inasmuch as the principal branches, formerly called the North Fork and the South Fork (the latter now being designated as a part of the main river), water areas that are more or less integral, the North Fork need not be considered a tributary, and the Snake River Valley is usually understood to embrace both streams.

The facilities for diversion and the expected advantages to diverse interests from the use of separate systems have resulted in the construction of a large number of canals, some of which parallel each other, making deliveries complicated and uneconomic of water and upkeep expense. It is estimated that there are at least 60 diversions between Heise and Blackfoot River.

SOURCE OF WATER SUPPLY

The main river, or South Fork, rises in Wyoming, on the eastern slopes of the Teton Range and the western slopes of the Rockies. Numerous glacial lakes through that locality form a part of the headwaters and contribute to stream flow, supplementing the waters originating in springs and through melting snows. The river flows southerly out of Yellowstone National Park and for a further distance of about 65 miles, then turns westerly, entering Idaho after it leaves the Grand Canyon, a gorge through which the Teton barricade is passed (photo 1). Near the mouth of the canyon the Snake is joined by Salt and Grays Rivers. Turning northerly and westerly the basin widens into a series of valleys, designated as Grand, Swan, and Conant Valleys, and the stream finally debouches upon a fanlike flood plain at Heise, where there is a gaging station. Just below this point a number of large canal headings have been constructed, and water is diverted to lands on both sides of the river. Canals from the North Fork, or Henry Fork, and from Teton River, also bring water into the territory between the two main branches, their confluence being about 17 miles below the apex of this V-shaped delta. The North Fork heads near the east boundary line of Idaho, the principal sources being Big Spring and Henry Lake, supplemented by larger tributaries such as Warm River, Robinson Creek, Buffalo River, and Shot Gun Creek. The country so drained is at lower elevation than the headwaters of the South Fork, and the run-off usually comes earlier.

1. The Grand Canyon through the Tetons

Between the mouth of Blackfoot River and American Falls the river bottom, now expanded into a reservoir by an impounding dam at the latter point, is bordered on the north by the Aberdeen-Springfield project and on the south by the Fort Hall project, the latter having diversion works

on both Snake and Blackfoot Rivers. A notable phenomenon of this section is the rise of ground water from numerous springs and an inflow from Portneuf River which flows in from the south through Pocatello and a tributary valley. The augmentation to the water supply from these sources ordinarily fluctuates between 2,000 and 3,000 second-feet. There is much evidence to support the belief that the gain in stream flow is affected by the irrigation of lands in the upper valley.

LOCATION OF MAIN PROJECTS

Below American Falls the river enters what is known as the Lower Valley, the stream flowing in a general westerly direction. The first diversions west of American Falls are at Minidoka Dam, where canals command large areas on both sides of the river, embracing about 120,000 acres in the Minidoka project. Another dam at Milner, about 30 miles farther downstream, makes it possible to divert water to the North and South Side Twin Falls projects and to the Gooding division of the Minidoka project. Two pumping plants lift water from the lake formed by this dam. In all, about 470,000 acres are brought under irrigation by the Milner diversion.

Here the river enters a deep canyon and the flow, which within the next 50 miles again receives large secretions from springs and wasteways, is not available for diversion for irrigation until it reaches the western part of the State.

In this section also are the great cascades, which were far more spectacular before reservoirs impounded the voluminous floods which passed over them on the way to the ocean. The most conspicuous and important, the 210-foot head of which is now utilized in power development, is well known in the Snake River Basin as Shoshone Falls (photo 2).

2. Shoshone Falls

Tributary agricultural areas, such as the Oakley, the Wood River, the Salmon, the Hagerman, the King Hill, and parts of the Boise and Owyhee projects, lie in the Snake River Basin but receive water from other sources.

There are 10 or more canals diverting from the North Fork, between Warm River and its confluence with the South Fork, or main river, and other headings are located on Fall River, Teton River, and smaller tributaries.

MAINTENANCE PROBLEMS

Other irrigation systems have been constructed farther downstream, with headworks on right and left banks, most of them being owned by cooperative organizations having early water rights. It was comparatively easy to divert the water in this section, as the river banks are low and the topography favorable. Because the gravel fan slopes away from the river, as well as rather steeply downstream, numerous channels have been formed along lines of least resistance, and considerable effort from time to time is required to maintain and stabilize the water courses, the conditions sometimes being precarious during flood periods. Channel changes near the head of the delta threaten to cause much damage to agricultural land and to leave many headgates high and dry.

Successful irrigation of a large part of the land in Snake River Valley is made possible by storage of the winter and flood flow of the river and tributary streams. The construction of reservoirs, for providing a supplemental water supply, is an important and comprehensive subject in itself, and might well be treated in a separate discussion.

Experimentation

By D. S. Stuver, Reclamation Economist, Bureau of Reclamation, Washington, D.C.

MANY farm operators are prone to place their reliance for income and returns from their efforts upon the same crop or farming methods from year to year, oftentimes overlooking the opportunities which another crop or different and improved farm practices might produce in the way of increased soil fertility and revenues. Unfortunately, this is apparently true wherever farms are located, whether in a region where irrigation is necessary or where rainfall, except during periods of drought, provides ample moisture for plant maturity.

While it may not be altogether obvious why full advantage is not always taken by some farmers of the successful attainments of others, there may be a number of reasons. A farmer may conclude, because of the fact his father or grandfather, and perhaps with fair success, grew only wheat or alfalfa, that he should continue to grow those crops exclusively. Others may reason, and possibly with a great deal of logic, that in the face of uncertain markets and prices, experimentation with different crops or methods might be too expensive and risky, and hence decide to stick to the old crops. Variations in the character and quality of soils as between farms, even in the same locality, where some notable success may have followed a venture with an unusual kind of a crop on an individual farm, may be responsible for the feeling of uncertainty as to whether the same crop will be similarly successful if its production is attempted on all of the farms in such locality.

Experimentation, unless a practical and conclusive demonstration has already been made by some qualified agency, or unless a farmer is so fortunately situated that he can afford to attempt untried things in a large way, should be conducted on a small scale, followed by reasonable expansion, if the initial trial appears to indicate that satisfactory progress has been made. Such a program can be readily undertaken by any farmer at relatively small expense without jeopardizing his returns for a whole season, which might be the result if the entire farm were to be turned into an experimental tract.

Another thing which may have to be taken into consideration in determining upon new crops is the adequacy of the water supply, the moisture requirement of some crops being greater than for others. Then, too, whether artificial drainage is necessary or is feasible may be an important element.

Introductions of new crops have, in many localities, created pronounced

changes for the better with resultant increased agricultural stability and community prosperity. Sugar-beet culture is an outstanding example of what has been accomplished from a small start following intelligent and careful experimentation in many of the irrigated sections of the western United States. It is unnecessary in this article to cite the numerous localities where the growing of sugar beets, and the conversion of the crop into a finished product in factories generally established in the immediate vicinity of the farms where the beets are raised, has materially aided the advancement of agriculture and the livestock and other incidental industries in those localities.

SAFFLOWER, A NEW IRRIGATION CROP

Experiments which have been carried on during recent years by Mr. Alfred Rahbein, a progressive farmer of the Lambert territory, a dry-land farming area near the Lower Yellowstone project in Montana, have been sufficiently encouraging, according to an account in the September 20, 1934 issue of the Sidney (Mont.) Herald, to indicate that in safflower an important development for the production of another cash crop on irrigation projects, where conditions are favorable for its culture, appears to be in the making.

Safflower (*Carthamus tinctorius L.*) is an oilseed crop which has been found adapted to the small-grain belt of the West and Northwest and to Mr. Frank Rabak, associate biochemist, Office of Drug and Related Plants, Bureau of Plant Industry, United States Department of Agriculture, and to that Department, the public is indebted for a bulletin giving general information and directions for the production of this plant. It is stated by Mr. Rabak in his bulletin that the crop is grown and handled by the usual methods employed in the production of small grains and that safflower of good quality, weighing from 42 to 48 pounds per bushel, yields from 22 to 28 percent of oil, which oil, obtained by crushing the seed, has been found useful in the paint and varnish industries, and the cake or meal possesses value as a stock feed. The bulletin continues with the comment that with a normal season and an average rainfall a good stand of safflower should yield 15 to 25 bushels of seed per acre under dry-land conditions, and under irrigation those yields should be approximately doubled. This latter assertion tends to further confirm the importance of irrigation and the part it so frequently plays in the production of crops.

Through Mr. Rahbein's promotion and the cooperation of other farmers and land owners, particularly Mr. A. H. Philips, who the Herald credits with having been active ever since the area became an irrigation project in every worthwhile new production undertaking which would increase the status of diversified agriculture in the community, some 16 small fields, aggregating 200 acres on both irrigated and dry land tracts, were planted to safflower on the Lower Yellowstone project near Fairview and in the vicinity of Lambert during 1934.

Mr. Rabak, of the Department of Agriculture, the newspaper states, inspected the safflower fields during September and found the quality of the seed to be up to the best standard for oil content and the prospects for good yields were very favorable, a 100 percent stand being observed on one of the irrigated tracts. In disposing of the season's production in the Lambert and Fairview districts it was being planned to ship four cars of the safflower seed to Milwaukee for crushing and oil extraction, the remaining seed to be used for the planting of an increased acreage by a greater number of farmers during 1935.

The writer frankly admits that until reading the Sidney Herald and Mr. Rabak's bulletin, he had never heard of safflower and he is equally frank in stating that prior to about 1900 he had never had the rare pleasure of crawling along seemingly, and actually, many miles of rows of sugar beets for blocking and thinning a crop then new in northern Colorado. A recent trip through the same region, where irrigation practice has reached a high degree of perfection as compared to many of the later but equally promising localities of the West, was conclusive evidence to him that the careful and persistent planning of a new undertaking had resulted in the establishment of a stable industry, and the upbuilding of a great community. His knowledge has progressed to the point where he doubts whether it is necessary for anyone to crawl along a row of safflower, and similar research on the part of many others may lead to a recognition of the further advantages and possibilities of this plant as a farm crop.

Notwithstanding the fact that many of the farmers on our irrigation projects probably have little or no familiarity with safflower, the experiments being conducted on the Lower Yellowstone project to determine its possibilities for development as a marketable and staple crop will no doubt be followed with great interest by all those who derive pleasure and satisfaction in seeing a pioneer effort attain success, even though in its success they may not be personally benefited, and the general welfare of irrigated agriculture promoted.

If not safflower, then it may be another plant or the improvement of practices and methods for the production of some of our old and more familiar plants which will do the trick. Safflower, for the instant, serves the purpose of an illustration, but here is hoping that it proves to become more than an illustration, and that the efforts of Messrs. Rabak and Rahbein, and their associates on the Lower Yellowstone project, will be crowned with success.

RECLAMATION—A NATIONAL ASSET

A questionnaire was recently submitted by a committee on Federal reclamation policy to the presidents of colleges and railroads in the West, one item of which is as follows:

"Relation of irrigated agriculture to the economic well-being, present and future, of the West in particular and the Nation in general."

The colonization agent for the Chicago, Burlington & Quincy Railroad has answered this question as follows:

"Development of irrigated lands has a direct and favorable bearing upon all other communities, just as development of foreign markets means increased employment and revenue for our factories and farms. Surely everyone would consider it folly to curtail our exports, yet there are many who would check our own expanding markets by limiting reclamation development, a development which creates a local buying power and constitutes a consuming market for commodities produced elsewhere, which, in turn, involve employment of labor, utilization of natural resources, and the subsequent development of other localities. Then they, in the endless chain of production and consumption, exert a similar influence by creating a market to supply their needs. Thus does the growth of a single community have a far-reaching effect on the rest of the world.

"Furthermore, crops produced upon western irrigation projects are supplemental to, rather than competitive with, crops grown upon agricultural lands of other sections. Also, irrigated sections are surrounded by less favorable crop-producing areas so they constitute a source of feed supply for the livestock generally produced on the cheaper, neighboring lands. Irrigated lands add stability not only to the owner but to the community, the State, and the Nation. The words of that great builder of prosperous homes and farms in the Northwest, James J. Hill, ring truer than ever: 'Land without population is a wilderness, and population without land is a mob.' "

On the Riverton project, Wyoming, 2 homestead entries were made during a recent month, and 2 purchases of private land were completed.

Civilian Conservation Corps Work on Reclamation Projects

By Dr. H. T. Cory, Consulting Engineer

THERE have been allotted to the Bureau of Reclamation nine Emergency Conservation Work camps, averaging more than 200 men each. Three of these are fourth period regular E. C. W. camps operating from October 1, 1934, to March 31, 1935; and six are so-called drought relief camps, operating 12 months to June 30, 1935. The enrollees in all the camps are called Civilian Conservation Corps (C. C. C.) men.

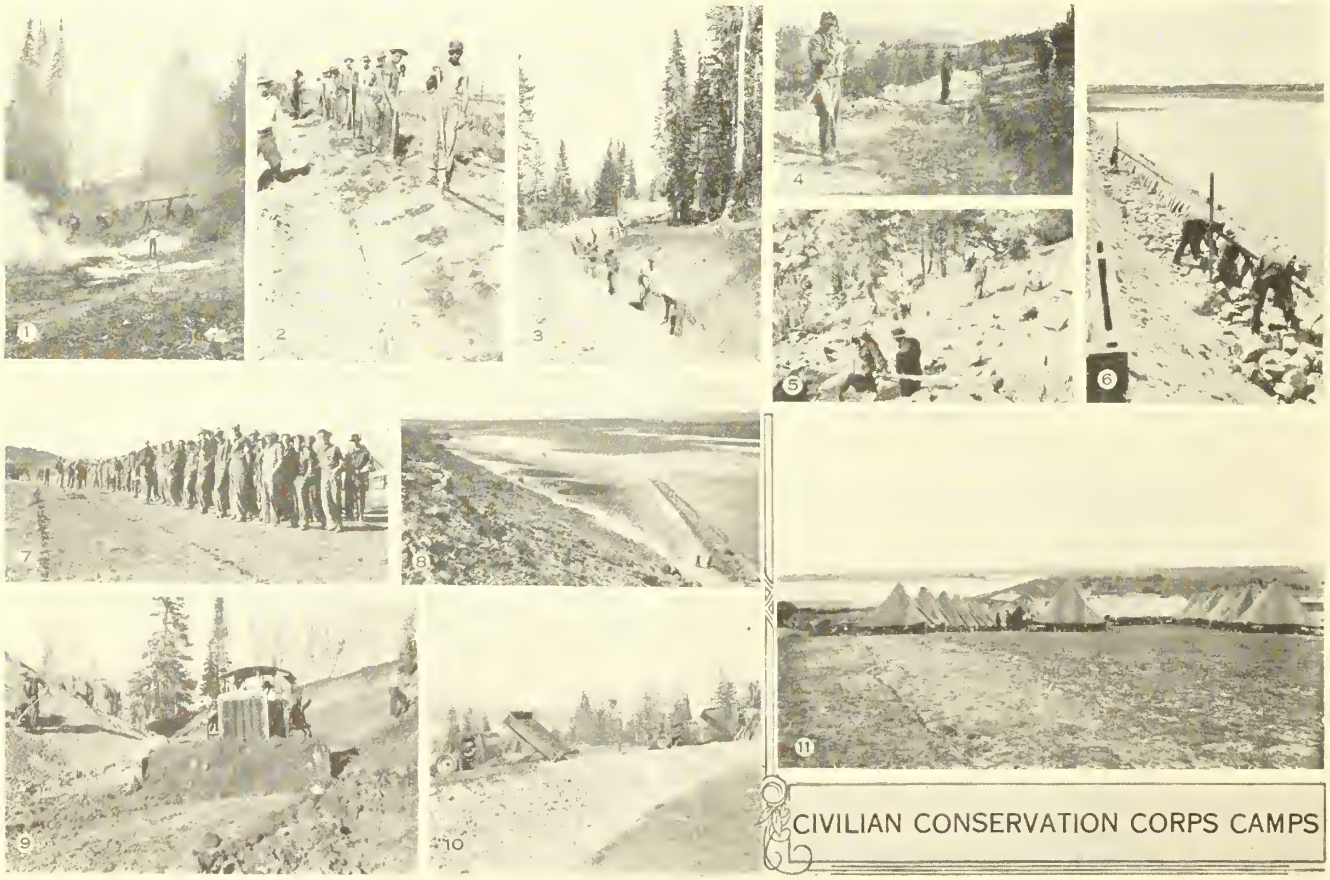
During the first and second periods, each lasting 6 months, of the regular E. C. W. camps, the Bureau of Reclamation was unable to obtain the assignment of any C. C. C. men, largely because of prior requirements under the E. C. W. laws and regulations of the National Park, Forest, and Soil Erosion Services. During the third period one camp was obtained under a cooperative agreement with the National Park Service. This camp was established at Guernsey Lake, a reservoir of the North Platte project, in Wyoming, and designated RS-1 (Reclamation Service No. 1) camp. It has been continued for another 6 months, throughout the fourth period, and designated as BR-8 (Bureau of Reclamation No. 8) camp. In addition there was allotted to Lake Guernsey a 12 months' camp, designated as DBR-1 (Drought Relief Bureau of Reclamation No. 1) continuing until June 30, 1935. As the drought relief and the regular E. C. W. camps are essentially the same except that they are financed from different appropriations, Guernsey Lake will have had on termination of the existing camps the equivalent of 2 years with one camp.

A second fourth-period camp, on a like cooperative basis with the National Park Service, was allotted to the Elephant Butte Reservoir on the Rio Grande project in New Mexico, known as BR-9. As this camp cannot complete the desirable work by its termination on March 31, 1935, it will doubtless be continued through the fifth period of another 6 months, and perhaps even longer.

These E. C. W. camps at Lake Guernsey and Elephant Butte Reservoir are preparing the shores of these water bodies for the maximum possible recreational uses of the general public, building roads and trails, doing forestry work, landscaping, constructing and revamping buildings for occupation of visitors, preparing camping sites, installing water supplies and sanitary provisions, building boat landings, etc. On completion of the work in hand, both these water bodies will be completely developed as recreational areas, and, located as they are in semiarid regions, they will be greatly appreciated by the public.

DROUGHT-RELIEF CAMPS

The remaining six camps allotted to the Bureau of Reclamation are drought-relief camps. These are identical in principle with the regular E. C. W. camps but are confined to States which suffered severely from the past summer's drought, and run for a year. The six camps are DBR-1 at Lake Minatare, Nebr., on the North Platte project; DBR-2 at Fruitdale, S. Dak., on the Belle Fourche project; DBR-3 at Carlsbad, N. Mex., on the Carlsbad project; DBR-4 at Ysleta, Tex., on the Rio Grande project; DBR-5 at Heber, Utah, on the Strawberry Valley project; and DBR-6 at Ephraim, on the Sanpete project.



1. Strawberry Valley Project, Utah. Removing trees and burning brush along canal line, DBR-5. 2. Rio Grande Project, New Mexico-Texas. Crew trenching canal bank for concrete to corewall, DBR-4. 3. Ephraim Project, Utah. Excavation of bottom of South Feeder Canal, DBR-6. 4. Guernsey Lake. Road under construction, DBR-10-W. 5. Guernsey Lake. Valley trail—construction east side steps, SP-1. 6. Carlsbad Project, New Mexico. East embankment extension, McMillan Reservoir, DBR-3. 7. Ephraim Project. Enrollees waiting for roll call, DBR-6. 8. Carlsbad Project. East embankment extension. McMillan Reservoir, DBR-3. 9. Strawberry Valley Project. Excavation of cut and removal of logs by enrollees, DBR-5. 10. Ephraim Project, South Feeder Canal, DBR-7. 11. Belle Fourche Project, South Dakota. Temporary quarters, DBR-2.

The first four of these camps are doing a variety of work, chiefly deferred maintenance, on the several irrigation systems; the first camp is also improving the storage reservoir, Lake Minatare, as a recreational area and park.

The last two camps, in Utah, have been constructing canals to divert flood waters from adjacent watersheds and one of them into existing and proposed reservoirs. Both were at such high elevation that only summer work is possible. Consequently both camps were moved to lower elevations on October 15, 1934, and for accounting purposes were assigned new numbers, DBR–11 and DBR–12. DBR–11 is located for the winter at Moon Lake, Bridgeland, Utah, and DBR–12 at Huntsville, near Ogden, Utah. When spring opens up again at least half of the men in these DBR–11 and DBR–12 camps will be moved back to the former locations and the camps restyled DBR–5 and DBR–6.

Some pictures illustrative of the work done by some of these camps are given in this issue.

It seems assured that the Civilian Conservation Corps operations, known technically as Emergency Conservation Work, will be continued after March 31, 1935, and that there will be as many enrollees and camps during the fifth and sixth periods as there have been in the first, second, third, and fourth periods. In such case it is probable that more of these camps than heretofore will be allotted to the Bureau of Reclamation. In anticipation of this, plans are being prepared for the effective utilization of quite a number of such units.

Colonizing Kennewick Division Yakima Project

The late fall report (1934) from the Kennewick Highlands division of the Yakima project, Washington, gives interesting facts and figures relative to the progress of colonization work on the lands in the district for the period from January 1 to October 1. Thirty-two sales of tracts ranging in size from 4 to 40 acres and two leases of land were reported. Purchases of 18 of the 32 tracts sold were made by local people; 6 tracts represented additions to existing farms; and 26 constituted independent farm units. Practically all of the sales were of district lands which had never been in production or which had been out of production for a considerable length of time and had not been contributing to the financial upkeep of the district. On each sale 20 percent or more was paid in cash by the purchaser.

The interest shown by the local people, which resulted in the purchase by them of 18 tracts, is especially gratifying to those who are participating in the colonization work of the district, as they have thus evidenced their faith in the future of the district, of which they have intimate knowledge by virtue of a residence in the area for a number of years.

This record has meant painstaking and systematic effort on the part of individuals and organizations, and, no doubt, without cooperation between these individuals and organizations the results would not have been possible. To W. C. Larsen, immigration agent of the Northern Pacific Railroad with headquarters at Pasco, representing W. P. Stapleton, western agricultural development agent, is due credit for an untiring energy and willingness to serve in any required capacity to promote the welfare of the division. The business men at Kennewick, operating through their local chamber of commerce, the local newspapers, the farmers on the project, and the local real-estate men, all are deserving of high commendation. The local farmers have given to prospects a true statement of project conditions without the use of glossy or extravagant statements; the press has been generous in spreading the news of farm opportunities; and the real-estate firms have been fair and considerate in their treatment of the prospects.

Emphasis should also be given to the warmth of the welcome, the spirit of helpfulness, and the neighborly atmosphere accorded the new settlers by those already established on the project. No line of settlement effort can achieve satisfactory results without an attitude of this character on the part of farmers in the area being colonized.

Vale Project Makes Watermelon Record

Malheur County farmers are growing watermelons large enough to have been grown by Paul Bunyan himself. Recently J. B. Jones, of Brogan, reported that he had picked one weighing 43½ pounds from his garden tract. Later A. R. Turner of Harper reported that on the last day of haying the hay hands enjoyed one for dinner so large that two men had to carry it on a sack. It measured 46 inches the small way, and Mr. Turner estimated that it weighed at least 75 pounds. Another one, considerably smaller, weighed 59 pounds. No scales were available to weigh the larger one. Still another one weighing 40 pounds grew on the same vine.

The Cow and the Hen

Butter and egg men are faring well, and that means almost the entire farm population of southern Idaho, especially in communities where diversity is the key to farm success.

The price of butter, worth 35 cents a pound in Boise, is more than three times higher than the low level of the depression. Eggs, now quoted at 22 cents a dozen, are bringing the poultry flock keeper more than twice the cash return of a few short months ago.

It means the dairyman and the poultryman can make a profit. It means that the bulk of Idaho's farmers may now enjoy a steady reasonable income. Few farms in Idaho, no matter how large or how small, fail to harbor a dairy herd or a poultry flock.

Unlike the sometimes more profitable but equally risky big crops, which give but one yield a year, butter and eggs provide a monthly income. They are bought and sold daily and shipped to outside markets. With these products again selling at profitable figures, it means a more stable financial status for Idaho's farmers.

Hail the cow and the hen.

Horace M. Gilbert, dean of the Yakima Valley's fruit industry, died of pneumonia at his home in Yakima, Wash., on November 17.

PAYETTE TREE YIELDS TWO CROPS OF APPLES

Two crops of apples in 1 year seems to be crowding Mother Nature a bit, but that was the experience of a tree in the back yard at the I. C. Levers home in Payette.

The tree, an Early Transparent variety, bore an average crop early this spring of eating and cooking apples.

The other day Mrs. Levers picked more than 2 dozen apples from the same tree, ranging up to the size of a turkey egg. They were ripe enough to eat or cook, looked like apples from the outside, but, strangest of all, they were entirely free from seeds.—*Idaho Statesman.*

Introducing Mrs. Homesteader

(Continued from p. 17)

for her children. There is a social life in which she, her husband, and children may take part. Unlike her grandmother, the modern Mrs. Homesteader is pioneering with all the advantages of paved roads, telephones, electric power and light. Busses and family cars have made the movies and theaters of the town available. The radio, magazines, and books keep her in touch with style trends and happenings of the world. In addition to all this, there is the great comfort and happiness which comes from economic security and an adequate standard of living.

Reclamation Organization Activities

Dr. Elwood Mead, Commissioner of Reclamation, left Washington on December 1 to attend the annual meeting on December 7 and 8 of the National Reclamation Association in Salt Lake City. Dr. Mead stopped en route at Denver for a brief visit. He was accompanied on the trip by Chief Accountant W. F. Kubach.

During the Commissioner's absence Miss Mae A. Schnurr, Assistant to the Commissioner, was Acting Commissioner.

Miss Mae A. Schnurr, Assistant to the Commissioner, was promoted to the position of First Assistant to the Commissioner on February 1, 1934.

Miss Mary E. Gallagher, on the Commissioner's staff for the past 10 years, was promoted to the position of Secretary to the Commissioner, effective March 1, 1934.

Robert P. Storey, property and supplies clerk in the Washington office, retired on August 31 last on account of ill health.

Miss Glenna F. Sinclair, connected with the Washington office since 1907, retired on account of disability effective January 1, 1934. Miss Sinclair now holds her residence in Florida.

Miss Gertrude M. Athey, stenographer in the Engineering Division, retired after 30 years faithful service at the close of December 31, 1933. Miss Athey continues to hold her residence in Washington.

P. W. Dent, Assistant Commissioner and Chief Counsel, severed his connections with the Bureau of Reclamation on October 31, 1933.

S. O. Harper, Assistant Chief Engineer, Bureau of Reclamation, was notified by the Secretary of the Interior of his designation as representative of President Roosevelt to preside at the meeting in Santa Fe, N. Mex., on December 10 of commissioners representing Colorado, New Mexico, and Texas, to confer for the purpose of negotiating a new interstate compact regarding the waters of the Rio Grande to replace the temporary compact to which the United States is a party. The next meeting of the commission will be held on January 28, 1935.

Raymond M. Priest, 1883–1934

Raymond M. Priest, construction engineer, All-American Canal project, died suddenly of a heart attack at Phoenix, Ariz., on the evening of July 6, 1934. He had gone to Phoenix earlier in the day with Commissioner Mead and Chief Engineer Walter to discuss Colorado River matters with Governor Moeur and the Arizona-Colorado River Commission.

Mr. Priest was born at Tombstone, Ariz., on November 7, 1883, and in 1894 went with his parents to Yuma, where he attended school, receiving his later education at the University of Arizona. He was married in 1912, and his wife and two daughters survive him.

He was employed continuously by the Bureau of Reclamation from 1903 to the date of his untimely death. His first employment was as rodman on the Yuma project, where he later served in the various capacities of instrumentman, superintendent of construction, and engineer. He became project superintendent in February 1928, which position he held until January 1934 when he was placed in responsible charge of the construction of the All-American Canal project as construction engineer.

Mr. Priest was held in high esteem by the Yuma Valley farmers, and upon leaving his post as project superintendent was presented by the Yuma County Water Users' Association with a token of appreciation of his dealings with the association and the individual farmers over his long period of service on the project.

Mr. Priest was an able engineer and through many years of experience became an expert in matters connected with the Colorado River. His death, which will be keenly felt by a host of friends in Arizona, is also a distinct loss to the Government service.

D. S. Stuver, formerly superintendent of the Newlands project, Nevada, resigned on January 1, 1927, to become project manager of that project for the Truckee Carson Irrigation District. On October 8, 1934, Mr. Stuver was reinstated in the Bureau and he is now connected with the Public Relations Division in the Washington office.

L. H. Mitchell, reclamation economist, returned to the Washington office on October 27 from Salt Lake City, having spent practically 8 months in Utah and Colorado on rural rehabilitation and other economic work. On his return trip Mr. Mitchell visited eight additional projects in connection with general reclamation matters.

All-American Canal Celebration

In commemoration of the commencement of operations on the All-American Canal construction, valley-wide celebrations were staged on December 16, 1934, at Araz and Calexico in Imperial Valley. The largest gathering ever held in the valley attended this double celebration. At Araz the huge excavating machines dug into the ground along the canal route for the start of that section of the canal work. The guests then repaired to Calexico, where the ceremonies were concluded.

Dr. Mead and Miss Schnurr greatly regretted their inability to accept the invitation to attend this historic celebration, to which the President and Vice President of the United States, the Secretary of the Interior and other Cabinet Members, Members of Congress, and many others prominent in official circles were also invited.

Edward A. Dacey, draftsman in the Washington office, was appointed on June 16, 1934, to the position of Chief Draftsman, vice John H. Pellen, retired.

James H. Miner, who resigned from the Bureau after 14 years' service on the Uncompahgre and King Hill projects, was reinstated on April 21, 1934, and assumed the duties of office engineer on the Columbia Basin project. Mr. Miner after his separation from our service was connected with the Dwight P. Robinson Co. and the United Engineers and Contractors on construction work in South America and this country.

ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead,** Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; Mrs. Mary E. Gallagher, Secretary to the Commissioner; George O. Sanford, Chief, Engineering Division; Wm. F. Kuhach, Chief, Accounting Division; Charles N. McCulloch, Chief Clerk

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; E. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Canyon	Boulder City, Nev	Walker R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	J. T. Davenport	do	Do.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	do	Do.
Carlsbad	Carlsbad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen	C. M. Voyen	W. J. Burke	Billings, Mont.
Columbia Basin, Grand Coulee.	Almira, Wash	F. A. Banks	do	C. B. Funk		B. E. Stoutemyer	Portland, Oreg.
Grand Valley	Grand Junction, Colo	W. J. Chiesman	Superintendent	E. A. Peak	E. A. Peak	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Engineer			do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent	N. G. Wheeler	C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Salt Lake City, Utah	E. O. Larson	Associate engr			J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Resident engr	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [1]	Earp, Calif	Olaf Laurgaard	do	E. W. Shepard	E. W. Shepard	R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O. Larson	Associate engr			J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wentzell	C. B. Wentzell	W. J. Burke	Billings, Mont.
San Luis Valley	Denver, Colo	R. F. Walter	Chief engineer				
Sanpete	Salt Lake City, Utah	E. O. Larson	Associate engr			J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo	H. A. Parker	Superintendent	L. J. Windle	Harry Caden	W. J. Burke	Billings, Mont.
Stanfield	Stanfield, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Harry Caden	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Engineer			J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		Denver office	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Constr. engr	W. F. Sha	Denver office	J. R. Alexander	Salt Lake City, Utah.
Upper Snake River Storage	Idaho Falls, Idaho	H. F. Bahmeier	Associate engr			B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Non-Federal.

Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker	Lower Powder River irrig. dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	C. W. Tharp	Superintendent	C. J. McCormick	Grand Junction.
Huntley	Huntley irrigation district	Ballantine, Mont	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
King Hill	King Hill irrigation district	King Hill, Idaho	F. L. Kinkade	do	Chas. Stout	Glenns Ferry.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Irl Davis	President	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	D. E. Norton	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Goodiug, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	F. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district.	Gering, Nebr	W. O. Fleenor	Superinteudent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo	Bert L. Adams	do	Nellie Armitage	Torrington.
Northport division	Northport irrigation district	Bridgeport, Nebr	Mark Iddings	do	Mabel J. Thompsou	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
Salt Lake Basin (Echo Reservoir.)	Weber River Water Users' Association.	Layton, Utah	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Gen. supt. and ch. engr	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	Snperintendent	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigatiou district	Fairfield, Mont	A. W. Walker	do	A. W. Walker	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg	E. D. Martin	do	Enos D. Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley Water Users' Association.	Montrose, Colo	C. B. Elliott	do	Wm. W. Price	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	do	R. E. Randolph	Ellensburg.

Important investigations in progress

Project	Office	In charge of—	Title
Buffalo Rapids			
Colorado River Basin, sec. 15	Denver, Colo	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes investigations	Bend, Oreg	C. C. Fisher	Engineer.
Gila Valley	Denver, Colo	P. J. Preston	Senior engineer.
Grande Ronde investigations	Stanfield, Oreg	Foster Towle	Associate engineer.
Umatilla River investigations	do	do	Do.
Upper Colorado River investigations			

SALLIE A. B. COE, *Editor.*

DEPARTMENT OF THE INTERIOR

HAROLD L. ICKES, Secretary

BUREAU OF RECLAMATION

ELWOOD MEAD, Commissioner — M. A. SCHNURR, Assistant to the Commissioner

The Commissioner, under supervision of the Secretary of the Interior, is charged with the responsibility for the operation of all branches of the Bureau including: Investigation of irrigation resources, preparation of plans; construction, operation, and maintenance of irrigation projects including power development; administration of funds provided for under the reclamation laws; the settlement and improvement of irrigated lands; the repayment of sums due from irrigators; and the investigation of reclamation and farm development projects outside of the arid region of the United States. 3 clerical and 1 custodial employees.

ENGINEERING DIVISION

Geo. O. Sanforn, Chief

P. I. Taylor, Assistant Chief

Has charge of engineering work in Washington office, including review of reports, plans, and estimates submitted by Ch. Engr. or other agencies of Government; also the drafting section, comprising engineering and cartographic drafting, illustrating, planning exhibits, and reproduction of maps and drawings.

Carries out engineering investigations in cooperation with the Denver office.

Is engineering adviser to the Commissioner on independent engineering investigations or studies.

4 professional, 5 subprofessional, and 2 clerical employees.

LEGAL

Under general supervision of
Nathan R. Margold
Solicitor of Department

Advises the Commissioner upon all legal and related questions; drafts and reviews important contracts.

3 professional and 1 clerical employees.

FIELD LEGAL OFFICES

District counsel at:
- Denver, Colo.
- Portland, Oreg.
- Billings, Mont.
- El Paso, Tex.
- Salt Lake City, Utah.
- Los Angeles, Calif.

8 professional and 7 clerical employees.

CHIEF CLERK'S DIVISION

C. N. McCulloch
Chief Clerk

Has charge of Stenographic Section; personnel matters, purchases and supplies; property and office equipment, stationery and printing; assignment of office space, and messenger force.

16 clerical and 2 custodial employees.

MAILS AND FILES DIVISION

J. W. Myer, Chief

J. C. Beveringe, Jr., Asst. Chief

In charge of the receiving and dispatching of mails, custody, and responsibility for extensive technical files; routes all correspondence received.

6 clerical and 1 custodial employees

ACCOUNTING DIVISION

W. F. Kubach, Chief Accountant

H. R. Pasewalk, Asst. Chief Accountant

Has charge of all accounting and financial work of the Bureau, including standardization and coordination of accounting in all field offices; designs accounting systems which are prescribed by manual regulations he initiates; maintains control accounts in the Washington office; is Budget Officer of the Bureau and contact officer of the Bureau with other Government offices on fiscal and budget matters.

13 clerical employees.

PUBLIC RELATIONS DIVISION

M. A. Schnurr, Chief

Has charge of reclamation economics work; directs activities of field agents engaged in giving advice to settlers on selection of land, equipment and livestock and in formation of cooperative organizations for promoting the economic and social welfare of projects; gives talks and illustrated lectures; prepares pamphlets giving information about projects and their development; distributes material for illustrated lectures; has charge of photographic laboratory.

Has charge of publication of Bureau's monthly magazine, The Reclamation Era.

4 clerical employees, 2 professional employees.

FIELD

Reclamation Economists at:
(3 districts to be created; strategic points for headquarters not yet decided).

3 professional employees.

FIELD SERVICE

Chief Engineer
R. F. WALTER

Assistant Chief Engineer
S. O. HARPER

The Chief Engineer, with headquarters in Denver, Colorado, under the general supervision of the Commissioner, is in responsible field charge of all matters relating to the management and execution of the work in the field, with the exception of legal work. He has general supervision over all the employees engaged in engineering investigations, and the design, construction, operation, and maintenance of the projects and the works incident thereto. All engineering designs and specifications are prepared in the Denver office and major purchases, such as construction materials, supplies, machinery, etc., are purchased through this office. Certain accounts and cost records are kept in the Denver office. The Chief Engineer is the contracting officer in carrying out works approved by the Commissioner and the Secretary of the Interior.

(OTHER PRINCIPAL POSITIONS)

- J. L. Savage, Chief Designing Engineer
- W. H. Nalder, Assistant Chief Designing Engineer.
- L. N. McClellan, Chief Electrical Engineer.
- B. W. Steele, Senior Engineer, Dams.
- C. M. Day, Senior Engineer, Mechanical.
- H. R. McBirney, Senior Engineer, Canals.
- E. B. Debler, Sr. Engr., Investigation & Hydrography.
- I. E. Houk, Senior Engineer, Technical Studies.
- L. R. Smith, Chief Clerk.

608 professional and subprofessional, 46 clerical, and 39 registered and unclassified employees, permanent and temporary, in the Denver office.

PROJECTS UNDER INVESTIGATION, CONSTRUCTION, AND/OR OPERATION IN WHOLE OR IN PART BY BUREAU OF RECLAMATION

PROJECT	OFFICER IN CHARGE: NAME	OFFICER IN CHARGE: TITLE	OFFICE
Belle Fourche	F. C. Youngblutt	Superintendent	Newell, S. Dak.
Boise	R. J. Newell	Constn. engr.	Ontario, Oreg.
Boulder Canyon:			
All-American Canal	R. B. Williams	do	Yuma, Ariz.
Boulder Dam & Power Plant	W. R. Young	do	Boulder City, Nev.
Colorado River Basin investigations, Sec. 15	P. J. Preston	Senior engr.	Denver, Colo.
Colorado River, Indian	do	do	Do.
Gila Valley	do	do	Do.
Parker Dam	O. Laurgaard	Constn. engr.	Earp, Calif.
Carlsbad	L. E. Foster	Superintendent	Carlsbad, N. Mex.
Casper-Alcova	H. W. Bashore	Constn. engr.	Casper, Wyo.
Columbia Basin:			
Grand Coulee Dam	F. A Banks	do	Almira, Wash.
Deschutes Investigations	C. C Fisher	Engineer	Bend, Oreg.
Grand Valley	W. J. Chiesman	Superintendent	Grand Junction, Colo.
Humboldt	L. J. Foster	Engineer	Lovelock, Nev.
Hyrum	B. J. Paul	Resident engr.	Hyrum, Utah.
Klamath	B. E. Hayden	Superintendent	Klamath Falls, Oreg.
Milk River	H. H. Johnson	do	Malta, Mont.
Fresno Reservoir	do	do	Do.
Minidoka	E B Darlington	do	Burley, Idaho.
Moon Lake	E. O. Larson	Engineer	Salt Lake City, Utah.
Nortb Platte	C. F. Gleason	Supt. of power	Guernsey, Wyo.
Ogden River	J. R. Iakisch	Resident engr.	Ogden, Utah.
Orland	D L. Carmody	Superintendent	Orland, Calif.
Owyhee	R. J. Newell	Constn. engr.	Ontario, Oreg.
Provo River	E. O. Larson	Engineer	Salt Lake City, Utab.
Rio Grande	L. R. Fiock	Superintendent	El Paso, Texas.
Riverton	H. D. Comstock	do	Riverton, Wyo.
Sanpete	E. O. Larson	Engineer	Salt Lake City, Utah.
Shoshone	H. A. Parker	Superintendent	Powell, Wyo.
Stanfield	R. J. Newell	Constn. engr.	Stanfield, Oreg.
Sun River	A. W. Walker	Superintendent	Fairfield, Mont.
Truckee Storage	L. J. Foster	Engineer	Lovelock, Nev.
Umatilla, McKay Dam	C. L. Tice	Reservoir supt.	Pendleton, Oreg.
Uncompahgre:			
Taylor Park Reservoir	A. A. Whitmore	Constn. engr.	Gunnison, Colo.
Rehabilitation work	C. B. Elliott	Engineer	Montrose, Colo.
Upper Snake River Invest.	H. F. Bahmeier	Assoc. engr.	Idaho Falls, Idaho.
Vale	C. C. Ketchum	Superintendent	Vale, Oreg.
Agency Valley Dam	do	do	Beulah, Oreg.
Yakima	J. S. Moore	do	Yakima, Wash.
Yuma	R. C. E. Weber	do	Yuma, Ariz.
Yuma Auxiliary	do	do	Do.

170 professional and subprofessional, 86 clerical, 1,283 registered and unclassified employees.

A TYPICAL CONSTRUCTION PROJECT ORGANIZATION consists of a construction engineer, office engineers, field engineers, draftsmen, inspectors, chief clerk, and other clerical assistants.

A TYPICAL OPERATION AND MAINTENANCE PROJECT ORGANIZATION consists of a superintendent, chief clerk and assistants, and operation and maintenance staff such as watermaster, ditchriders, and laborers.

COMPLETED PROJECTS OR UNITS THEREOF BEING OPERATED BY WATER USERS' ORGANIZATIONS

PROJECT	OFFICER IN CHARGE: NAME	OFFICER IN CHARGE: TITLE	ADDRESS
Baker:			
Lower Powder River I. D.	A. J. Ritter	President	Baker, Oreg.
Bitter Root:			
Bitter Root I. D	N. W. Blindauer	Engineer-manager.	Hamilton, Mont
Boise	Wm. H. Tuller	Project manager	Boise, Idaho.
Grand Valley, Orchard Mesa:			
Orchard Mesa I. D.	C. W. Tharp	Superintendent	Palisade, Colo.
Huntley:			
Huntley I. D	E. E. Lewis	Manager	Ballantine, Mont.
King Hill:			
King Hill I. D	F. L. Kinkade	do	King Hill, Idaho.
Klamath-Langall Valley:			
Langell Valley I. D	Chas. A. Revell	do	Bonanza, Oreg.
Klamath-Horsefly:			
Horsefly I. D	Irl Davis	President	Do.
Lower Yellowstone	Axel Persson	Project manager	Sidney, Mont.
Milk River, Chinook Div.:			
Alfalfa Valley I. D	A. L. Benton	President	Chinook, Mont.
Fort Belknap I. D	H. H. Bonebright	do	Do.
Harlem I. D	Tho. M. Everett	do	Harlem, Mont.
Paradise Valley I. D	D. E. Norton	Superintendent	Zurich, Mont.
Zurich I. D	C. A. Watkins	President	Harlem, Mont.
Minidoka, Gooding Div.:			
American Falls Reserv. Dist. No. 2.	S. T. Baer	Manager	Gooding, Idaho.
Minidoka gravity:			
Minidoka I. D	Frank A. Ballard	do	Rupert, Idaho.
Minidoka pumping:			
Burley I D	Hugb L. Crawford.	do	Burley, Idaho.
Newlands:			
Truckee-Carson I. D	W. H. Alcorn	President	Fallon, Nev.
North Platte:			
Interstate Div.-Pathfinder I.D.	T. W Parry	Manager	Mitchell, Nebr.
Ft. Laramie Div.-Gering-Ft. Laramie I. D.	W. O. Fleenor	Superintendent	Gering, Nebr.
Ft. Laramie Div.-Gering-Ft. Goshen. I. D.	Bert L. Adams	do	Torrington, Wyo
Northport Div.:			
Northport I. D	Hark Iddings	do	Bridgeport, Nebr
Okanogan:			
Okanogan I. D	Nelson D. Thorp	Manager	Okanogan, Wash.
Salt Lake Basin (Echo Res.):			
Weber River W. U. A	D. D. Harris	do	Layton, Utah.
Salt River:			
Salt River Valley W, U. A	H. J. Lawson	Gen. supt, and chief engr.	Phoenix, Ariz.
Shoshone, Garland Div.:			
Shoshone I D	J. O. Roach	Superintendent	Powell, Wyo.
Frannie Div.; Deaver I. D	Floyd Lucas	Manager	Deaver, Wyo.
Strawberry Valley:			
Strawberry W. U. A	Clyde Trevort	President	Payson, Utah.
Sun River, Fort Shaw Div.:			
Fort Shaw I. D	E. J. Gregory	Manager	Fort Shaw, Mont.
Greenfields Div.:			
Greenfields I. D	A. W. Walker	do	Fairfield, Mont.
Umatilla:			
East Div., Hermiston I D	E. D. Martin	do	Hermiston, Oreg.
West Div., West ext. I. D	A. C. Houghton	do	Irrigon, Oreg.
Uncompahgre:			
Uncompahgre Valley W.U.A.	C. B. Elliott	do	Montrose, Colo.
Yakima, Kittitas Div.:			
Kittitas Reclamation Dist	V. W. Russell	do	Ellensburg, Wash.

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THE RECLAMATION ERA

VOL. 25, NO. 2 FEBRUARY 1935

COLUMBIA BASIN PROJECT, WASH. VIEW OF WEST BANK DEVELOPMENT

President Roosevelt Enumerates Practical Principles in his Message to the 74th Congress

"The new program of emergency public employment should be governed by a number of practical principles.

"(1) All work undertaken should be useful—not just for a day or a year, but useful in the sense that it affords permanent improvement in living conditions or that it creates future new wealth for the Nation.

"(2) Compensation on emergency public projects should be in the form of security payments which should be larger than the amount now received as a relief dole, but, at the same time, not so large as to encourage the rejection of opportunities for private employment or the leaving of private employment to engage in Government work.

"(3) Projects should be undertaken on which a large percentage of direct labor can be used.

"(4) Preference should be given to those projects which will be self-liquidating in the sense that there is a reasonable expectation that the Government will get its money back at some future time.

"(5) The projects undertaken should be selected and planned so as to compete as little as possible with private enterprises. This suggests that if it were not for the necessity of giving useful work to the unemployed now on relief these projects in most instances would not now be undertaken.

"(6) The planning of projects would seek to assure work during the coming fiscal year to the individuals now on relief, or until such time as private employment is available. In order to make adjustment to increasing private employment, work should be planned with a view to tapering it off in proportion to the speed with which the emergency workers are offered positions with private employers.

"(7) Efforts should be made to locate projects where they will serve the greatest unemployment needs as shown by present relief rolls, and the broad program of the national resources board should be freely used for guidance in selection. Our ultimate objective being the enrichment of human lives, the Government has the primary duty to use its emergency expenditures as much as possible to serve those who cannot secure the advantages of private capital."

THE
RECLAMATION ERA

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Price 75 cents a year

HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25 No. 2 FEBRUARY 1935

A New Deal For Reclamation

By J. Rupert Mason, San Francisco [1]

ALTHOUGH irrigation agriculture is generally considered as something new and more or less "experimental" in this Nation, the British Society of Anthropology accepts as its fundamental doctrine that historically civilization was created as the result primarily of the invention of irrigation. The influence of irrigation on this earth's early history, not only in Babylonia and Egypt, but in India, China, the deserts of Central Asia, America, Mexico, and Peru, and the economic aspects of modern irrigation schemes in Italy, India, the Sudan, Mexico, South Africa, Chile, and Australia are all evidence that should prove powerful ammunition in meeting the allegations of paid propagandists that irrigation communities are stepchildren, or worse, and that irrigation is something the Government might better leave to "rugged individualism." In Egypt, I found inscribed on the tomb of Queen Semiramis, who lived over 4,000 years ago, "I constrained the mighty river to flow according to my will and led its waters to fertilize lands that had before been barren and without inhabitants." Ever since, irrigation dams and main canals in Egypt have been installed with money provided by the National Government, the same as our National Government furnishes the money for flood control, navigation, and harbor improvements, and without any special tax on the lands directly benefited. The Egyptian Government knows from long experience that the population and new taxable wealth, which the irrigation systems make possible, return to the Government, indirectly, many times the cost of the works, through the years. Irrigation canals built under Queen Semiramis are still delivering water to the thirsty soil in Egypt, even better than when built. But had the same works been built with funds borrowed by an irrigation district in any of our Western States, they would have had to be paid for in about 20 years after they were built by those then owning the land, and obviously it would not have been fair to saddle the entire cost on them in such a short period of years, when others for thousands of years afterward got as much benefit.

> *No other Federal division than the Bureau of Reclamation got on the job quicker, presented greater continuity of effort, employed more men in proportion to amounts spent or more nearly struck a balance in employment in Eastern industries to build the machinery and equipment of reclamation and its related activities.*
> —*Marshall N. Dana.*

ITALY'S EMPLOYMENT PROGRAM

Mussolini, Premier of Italy, referring to his "Bonifica" or 14-year national land reclamation scheme, estimated to cost over $500,000,000, recently said, "This is the kind of warfare I prefer." Under this scheme, the land resources of Italy are being "renovated" from one end of Italy to the other. Some 2,000,000 acres have already been irrigated or drained or both, and put in condition so that danger of drought or flood is reduced to a minimum, and many new cities and planned rural communities are being created. Italy is convinced that Mussolini's Bonifica offers a wise program which will afford employment and activity to thousands previously unemployed, and the best part of it is that after the irrigation and drainage works are built, the opportunity for planned rural communities and lasting activity for the people has only just commenced.

Although we have heard and read much about Federal reclamation projects in the United States, and the average eastener has very often been told in the press and magazine articles that irrigation works have been "given" the West, we know that less than 7 percent of the land irrigated in the 17 Western States today is in Federal reclamation projects. And even the land in the Federal projects has not been "given" its irrigation either, although interest is not charged on the funds invested by the Reclamation Bureau in the works. But the money that has gone into these Federal projects all came out of the West, and would otherwise more likely than not have been spent on river or harbor schemes in the Eastern States, and without any obligation of repayment.

HOMEMAKING UNDER IRRIGATION

In his first message to Congress, President Theodore Roosevelt 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. Just as the settlement of the Ohio and Mississippi Valleys brought prosperity to the Atlantic States, the increased demand for manufactured articles will stimulate industrial 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 irrigation will be consumed chiefly in upbuilding the local centers of mining and other industries, which would otherwise not come into

[1] Presented before the annual meeting of the Washington Irrigation Institute at Ellensburg, Wash., Nov. 23, 1934.

existence at all. Our people, as a whole, will profit, for successful homemaking is but another name for the upbuilding of a nation." Less than 1 year later Congress passed the Reclamation Act, under which so many splendid works have been built. Yet the irrigation districts in California alone have voted and sold their own bonds, under State supervision and control, to finance the cost of building similar reclamation works which are supplying dependable moisture today to half again as many acres as there are irrigated in all of the Federal reclamation projects in the 17 Western States combined, and all without one dollar of Federal or State credit aid or subsidy, direct or indirect. Although the achievement of irrigation districts in other Western States is perhaps less striking, many volumes could be written about their survival and progress through fair weather and foul, of how they appeared like oases in a year of great drought such as 1934, and why these districts fully deserve more understanding on the part of politicians and the press than they have usually enjoyed to date. We know that, generally speaking, the lowest cost irrigation systems are those of the irrigation districts, and that future similar works must cost much more than the present projects.

PERMANENCE OF IRRIGATION

The President of the United States has made it very clear that he intends removing millions of acres of marginal land from crop production, and supporting new public works designed to improve the productivity of the soil, reduce flood and drought hazards, and make possible the very lowest cost of production of our necessary food supply, to the end that food costs in the cities may not rise, unduly. Inasmuch as experts tell us that the crop value per irrigated acre is today two and one-half times the national average, irrigationists may well face the future with confidence that irrigation is here to stay. Indeed, one authority predicted 10 years ago that 50 years hence, the one large and dependable food supply of this Nation will be that grown on the irrigated valley lands of the States west of the Mississippi River.

RELATION OF WATER TO WESTERN DEVELOPMENT

President Harding, in his address on "Development, Reclamation, and Water Utilization" delivered at Spokane July 22, 1923, said: "Our whole view of the relation of water to western development has changed much in the last generation. Only a few years ago these waters were looked upon as potentially useful merely for irrigation and agriculture. We entered upon a great program of irrigation enterprise in that era when we had but a vague notion about the dual purpose that your water resources ought to serve. But now we know that the same water can, in most cases, be utilized both for power and irrigation. In the light of what we know now about all the aspects of this subject we may confidently look forward to a generation in which these young and vigorous Commonwealths of the West will boast as great a population as the entire Nation numbers today, capable of living for the greater part within itself, representing the widest variety of occupations and interests, and having its problems of transportation largely solved for it because it will be so nearly self-sufficient and self-contained. There will not again come a time when imperial estates will be distributed with lavish hands to enterprising gentlemen, whose only claim is that they would like to own them."

PURPOSES OF DAM CONSTRUCTION

Shortly before this Mr. Hoover, when chairman of the Colorado River Commission had said: "I am not now and never have been in favor of anything but Government construction of the irrigation, reclamation, and hydroelectric projects on the Colorado, of whatever magnitude. Agriculture must have first place over power, because agriculture must always be the chief industry of that vast region. Power requires a continuous flow of water and it might be that such flow would be in certain season wasteful to agriculture. The time will come when all the water of the Colorado will be needed for irrigation."

President Coolidge said in his message to the Congress on December 4, 1928: "On the whole, the (reclamation) service has been of such incalculable benefit in so many States that no one would advocate its abandonment."

President Franklin D. Roosevelt has proven himself a man of action, as well as a fine-sounding orator, and also a really great statesman in his creation and vigorous support of the Tennessee Valley Authority, where a new civilization and many new commonwealths are now in the making. There is little doubt the President has in mind the creation of many more similar Federal authorities to have charge of flood control, irrigation, navigation, and hydroelectric power improvements on such great rivers as the Mississippi, Missouri, Columbia, Colorado, Sacramento, St. Lawrence, Rio Grande, and others.

The old-fashioned homesteaders and log cabins carved out of the forest and wilderness through rugged individualism went the road of the horse and buggy. In their place many of us now living will witness the creation of new and carefully planned rural commonwealths, where cheap and abundant electricity generated at Government-built dams will banish much of the back-breaking drudgery that wore out so many pioneers, will afford means for low-cost warmth in winter and air-conditioning in summer, heat for cooking, and power for new industrial plants to be located among the rural centers. There will be good roads, schools, cooperative markets and a spirit of working for the common good, such as is not always in evidence in our workers today. The romantic enterprise of developing and utilizing our unrivalled natural resources has only fairly begun. In fulfilling its manifest destiny, the West must now dedicate itself to the orderly and far-sighted utilization of its most valuable natural resources, water both for irrigation and for power.

Ruling asked on Parker Dam

The United States by its Attorney General and Solicitor General filed January 9, 1935, in the Supreme Court of the United States a bill of complaint against the State of Arizona, to enjoin the State from interfering in any manner whatsoever with the construction, operation, and maintenance of Parker Dam and appurtenant works, across the Colorado River near Parker, Ariz.

Sun River Farmer Winner at Grain Show

LeRoy Kirby, of Simms, Mont., Sun River project, has brought back the international barley championship to the United States. His exhibit of barley was given first place in competition with the one at the International Hay and Grain Show recently held in Chicago. Mr. Kirby won with the "Trebl" type of barley, the same by which Canada last year wrested the championship from Montana.

Montana also carried off the reserve championship on barley, which was awarded to J. C. Hauf, of Corvallis. At the same exhibit L. Chatterton, of Geyser, Mont., showed the champion carload of feeder steers.

The final accounting for the sugar-beet crop grown in the Yakima Valley and shipped to the refinery at Bellingham, gives a total of 300 cars, or about 10,000 tons, grown on 820 acres.

Nation Benefited by Irrigation[1]

By L. H. Mitchell, Reclamation Economist

TO THE people of the West irrigation and reclamation are synonymous. Many not familiar with what irrigation means to the arid West look upon reclamation as just another plan to make unproductive land produce crops. Reclamation of vast areas has been accomplished by drainage. Land can be reclaimed by fertilization or by changing the cropping or farming methods. "Nation" is used in the subject in place of any arid State because recently there has been obtained conclusive proof that, insofar as financial benefits are concerned, a much greater percentage of the income from an irrigated farm goes into the channels of eastern commerce than is left for the economic and social well-being of the community and State.

RECENT ECONOMIC SURVEY

While visiting several Federal reclamation projects during the month of October 1934, typical farmers were contacted on four of them who could furnish detailed information relative to the disposition made of their farm income.

The selection of the typical farmers was made by the project superintendent or some member of the district board. In this selection it was necessary to pick farmers who kept records or who had reasonably good memories. A few typical renters were selected, thereby giving a fair cross-section of the situation.

When interviewing an Idaho farmer, we carried on the first part of the survey from the yard. At this point we listed the following items: Automobile, truck, hay and potato machinery, plows, harrows, wagons, and many other pieces of farm equipment; next we took inventory in the barn, where we listed harnesses, a milking machine, feed mill, small tools, hardware, etc. We then went into the house. The farmer had just returned from town where he took dairy products and eggs in exchange for groceries, consisting of breakfast food, coffee, tea, maple sirup, caro, extracts, soap, lard, matches, etc. In the house was the radio, electric washer, and other electrical appliances, heating and cooking stoves, the many items found in every kitchen, furniture, books and magazines, cosmetics, jewelry, clothing, etc., and last, but not least, the pipe with the makings. The farmer, much to my satisfaction, admitted that about the only items on his farm that did not come from the industrial sections were from the garden, stock, and poultry products, and the water for irrigation.

It was in Idaho that the idea originated which accounts for the illustration accompanying this article. This picture showing the exchange of and markets for items produced and purchased by the irrigation farmer in Idaho is typical. It is not intended to convey the idea that each spot represents a quantity of any product received or shipped by the industrial interests, but merely to explain a healthful condition of trade or exchange. The density of the spots illustrates the areas benefited by reason of the selling of manufactured articles to the Idaho irrigation projects. The principal product on some projects is sugar, on others fancy fruit, seed peas, and beans, but on nearly all projects, beef, lambs, turkeys, and dairy products are important items. In the complete processing of these farm products and the items the farmer uses, a large amount of labor is required.

On one of the projects where 10 typical farmers furnished the information, the survey showed that the average amount of money placed in the channels of circulation was more than $1,000 per farmer per year. There being 500 farmers on that project, the total average amount used in the purchase of commodities from the industrial sections of the United States amounts to more than a half million dollars annually. It may be argued that this amount is excessive when compared with the value of crops. However, upon further analyzing the situation, it was found, in taking the year 1932, that the crop report showed the total value for that year to be $601,121, and the recent survey for that year showed that approximately 75 percent was used in purchasing eastern manufactured articles and products, leaving about $150,000 for items of a local nature, such as taxes, operation and maintenance, insurance, etc.

Crop values do not represent a true picture of the amount of money received by the farmer for his crops because practically all of the hay and grain is fed to livestock and poultry, and the farmer realizes at least 20 percent more by disposing of his crops in this way. Alfalfa, for example, valued at $4.50 per ton, when sold through the channel of butterfat, returns to the farmer approximately double this amount. What is true of alfalfa is also partially true of grain crops. Therefore, if the crop reports show a return of $601,121, it is safe to assume that at least $120,000 more was realized by the farmers.

An analysis of the survey for a division of another project with 480 farmers shows that an average of approximately $1,000,000 was placed in circulation annually for articles manufactured in industrial sections. For the year 1932 the survey showed for that project $816,000, or 75 percent of the crop value, was placed in circulation for the purchase of commodities manufactured in the industrial East, and with a crop value of $1,090,000, the community had $274,000 to be used in payment of taxes, operation and maintenance charges, etc. It is fair to assume that the farmers of this division realized at least $220,000 more for their crops than the crop report indicates. In other words, nearly one-half million dollars was spent locally in 1932.

The average amount of money put into the channels of commerce annually, remote from the home territory, by the average typical farmer used in the survey, covering the period 1928 to 1934, inclusive, varied from $1,000 to $1,500. During normal times this amount will not be lowered. With the 43,000 farmers on our reclamation projects, it is safe to state that at least $43,000,000 is put into circulation annually through the industrial sections of the United States and 11,000,000 round dollars start rolling in the local territory. We should not forget the important part the townsmen on the projects play in this great economic and social activity. Sufficient information is not yet available to show how much money the project city family sends annually into the channels of commerce, but from the information gathered from a few typical townsmen on one of our projects, their expenditures are about equal to those of the typical farmer.

This survey is conclusive proof that an irrigation project is an instrument serving a social purpose rather than a subsidy or a plan for private profits by a separate class.

DEPENDENCE OF INDUSTRY UPON AGRICULTURE

It is difficult to conceive the tremendous good that comes from the development of an irrigation project. When an article is purchased by an irrigation farmer, whether a truck, farm equipment, electrical appliances, clothing, household goods, musical instruments, magazines, or other like articles, imagine the number of people engaged in the several lines of profession or labor who participate in or ride on the machine of industry that is manufacturing the article.

The industrial and agricultural industries of the Nation are closely allied. A

[1] Paper presented at Annual Meeting on Jan. 11-12, 1935, of Wyoming Reclamation Association held in Cheyenne, Wyo.

market for the items the farmer must have enables the industrialist to purchase the farmer's products, which, when consumed by the individual, develop power that makes work. Through this work more products are manufactured. In other words, the old saying "We're chasing the boy around the bush" or perpetual motion, is in the instant cases a reality.

It is sometimes alleged by those not directly benefited in the development of the West by irrigation that all of these accomplishments resultant from exploring, and not exploiting, a great natural national resource—water—could be had in the Central West and eastern portions of the United States and, therefore, why use public funds to build up the West when there is room to accomplish the same result much nearer the principal markets. It is also argued in the same breath that, in view of the fact there is no interest charge, reclamation by the United States is a subsidy. Such statements are generally by people who are either not informed of the facts or for selfish or personal motives are working for or against the production of a certain commodity or crop. Along the same line of reasoning it could have been argued that the United States should never have expanded agriculturally beyond the Thirteen Original States and, when the country expanded, the eastern edge of the Central West was the limit of agricultural expansion. But, fortunately, statesmen saw the national benefit of expansion and home-building and worked to that end. The farther west farming extended, the greater the benefits to the Nation. There were more miles of railroads and likewise more men engaged in transporting the products of the farm to the industries, and vice versa; another endless chain.

Too often the public does not appreciate that the irrigation projects constructed by the United States are self-supporting and self-liquidating. Before any construction of irrigation works is started there are repayment contracts with irrigation districts or associations. Of the $220,000,000 expended for irrigation works by the United States, $48,000,000 has already been repaid. To offset the interest-free complaint is the fact that the entire Nation is benefited by reason of irrigation projects, as has already been explained. The many people not familiar with the facts do not know that the original reclamation fund, which is a revolving fund, was derived from the sale of public lands subsequently augmented by receipts from oil royalties.

HOW IS EACH STATE BENEFITED BY FEDERAL IRRIGATION?

One of the yardsticks in answering this question is the amount of money that remains in the community from the sale of crops. For example, if the three Federal projects in Wyoming are on a par with the average, and in my opinion they are, 1,400 families pay an average of at least $400 each, or a total of $560,000, for defraying the expenses of local and State governments, for maintaining schools and churches, and for advancing society. Were it not for irrigation, Torrington, Powell, and many other towns in the State would be mere whistling crossings, on the railroad.

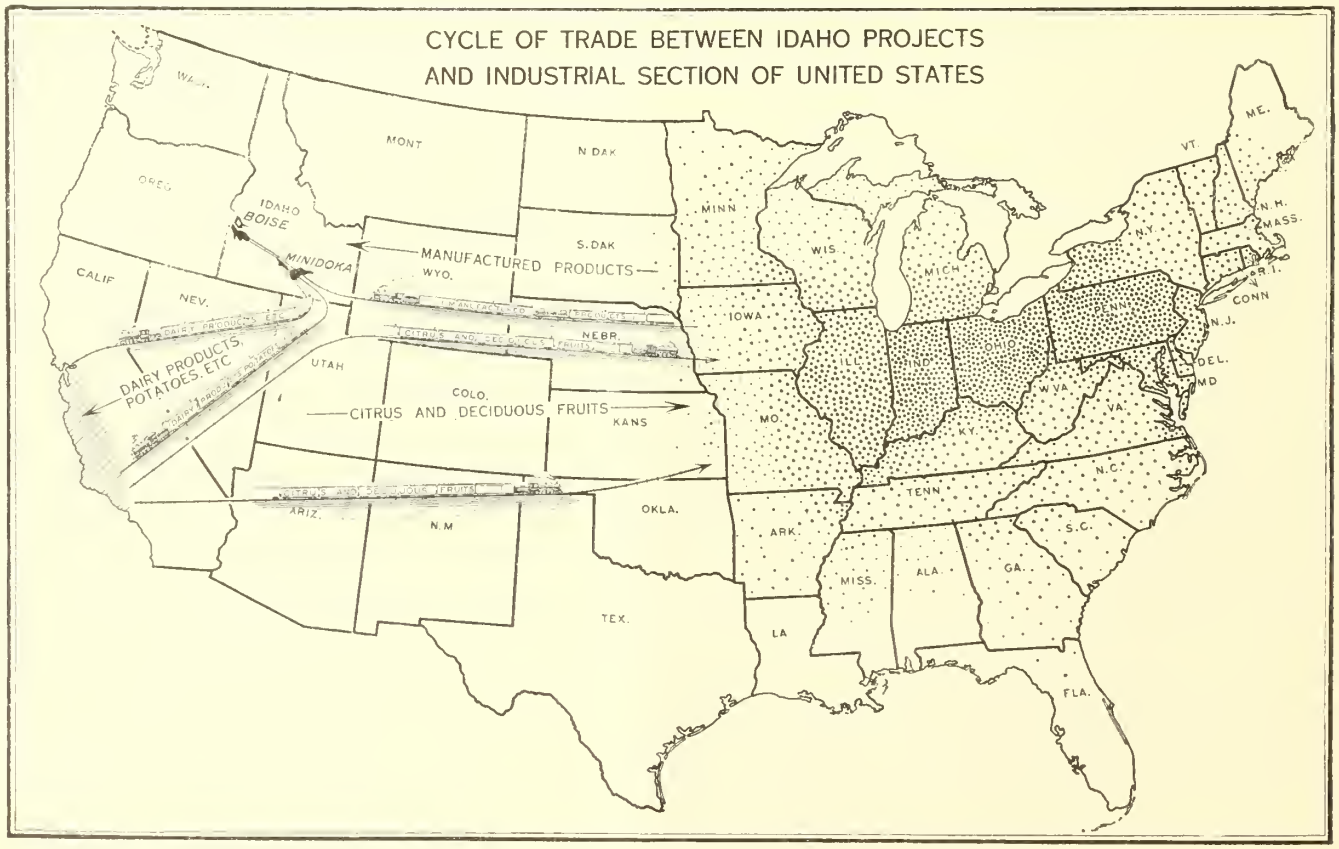
WHAT ARE THE PROSPECTS FOR IRRIGATION EXPANSION?

So long as there is water going to waste, there are possibilities of home-making, provided the cost of having the water available can be repaid by the beneficiaries as provided by law. With the completion of the various projects now under construction and those under consideration, about 50,000 additional self-supporting farmers will be established with approximately the same number of homes in the towns. It is not necessary to use much imagination or do a great deal of computing to realize what the future has in store. With the completion of those projects, and the construction of other feasible ones, new wealth will be created. There will be an enlarged exchange of services upon which the entire wealth of the Nation is founded and maintained.

PEOPLE ON SUBMARGINAL LANDS COULD BE TRANSFERRED

Nearly every State, if not all, has many families now on submarginal lands where

(Continued on p. 36)



Report on Survey of Federal Reclamation in the West

By F. E. Schmitt, Editor, Engineering News-Record, and John W. Haw, Director, Agricultural Development Department, Northern Pacific Railroad

A REPORT based on an impartial survey of Federal reclamation in the West, made by F. E. Schmitt and John W. Haw, has been submitted to Secretary of the Interior Harold L. Ickes. On the basis of inspection of typical projects and study of the conditions and problems of reclamation, the committee made the following findings:

1. Reclamation by irrigation of land in the arid and semiarid western half of the United States is shown by its results to be a sound and desirable national undertaking. It represents a constructive policy of social development.

2. Reclamation should be continued by the Federal Government as available means may permit.

3. Except for the influence of the present depressed farming conditions the operating projects are in the main excellently developed and represent strong, prosperous communities.

4. Present reclamation procedure encounters its most troublesome problems in the financial relations between the water user and the Government. The problems arise from the fact that the Reclamation Bureau, though not a banking agency, is required to carry out the banking function of collecting the installment payments on the cost of the works. The Bureau of Reclamation should be relieved of the responsibility for collection in the case of all future projects. If practicable, the revised collection system should be applied also to the operating projects.

5. In the interests of full and efficient utilization of stream waters, the best plan of development as between different regions in the basin and most efficient arrangement of the individual project, it is desirable that the selection and planning of projects be improved by establishing cooperation with States and by authorizing the Bureau of Reclamation to develop its project plans on the basis of best regional results.

6. For permanent security of irrigated agriculture, future reclamation should, if practicable, include measures that will prevent overdevelopment of land beyond the available water supply. Control of storage should remain in the hands of the Federal Government to assure equitable distribution.

7. A uniform policy to govern power developed or to be developed in connection with reclamation projects should be established by law.

RECLAMATION A FUNDAMENTAL AGENCY OF PUBLIC WELFARE

The report of the Committee on Federal Reclamation Policy said that without the spread of population through the deserts due to reclamation and the production of wealth which resulted from it, balanced growth of the Nation as a whole could not have been achieved. In broadening the base of the country's food supply, in strengthening and supporting its industry, in extending the opportunity for establishing self-supporting homes, in enlarging and building up the Nation's transportation system, reclamation has been a fundamental agency of public welfare.

In recommending that Federal reclamation should be continued as available means may permit, the committee pointed out that reclamation now is an important agency in the readjustment of agriculture and the redistribution and settlement of population. In the current season the stream of migration from marginal areas of the Great Plains in search of better and more secure living conditions has made it important that existing irrigated areas be stabilized and rehabilitated, and such additional irrigated areas be developed as may be economically feasible. In connection with this recommendation, the committee points out that reclamation agriculture has little relation to the problem of surplus agricultural production. The crops produced on the projects are in the main not those staples which are overproduced. A large part of the project crops is consumed in the West itself, and the staples produced on the projects have been absorbed by the increased consumptive requirements of the West directly attributable to irrigation development.

PAYMENT OF CONSTRUCTION COSTS SHOULD BE RESUMED

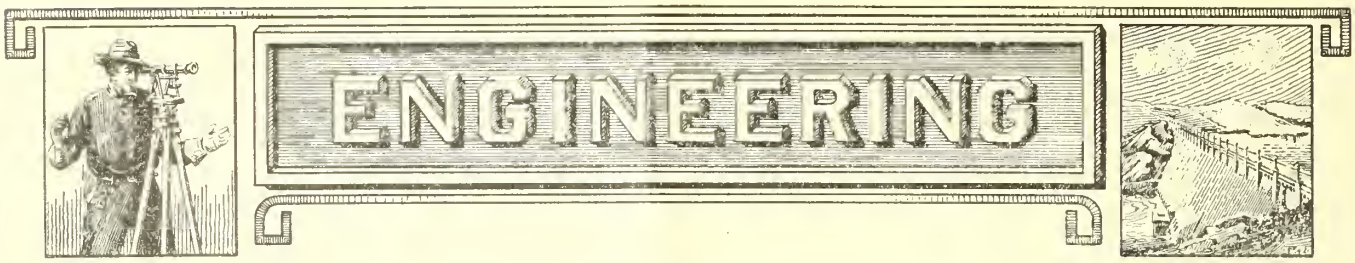
Because the reclamation projects are excellently developed and represent strong prosperous communities, the Committee on Federal Reclamation Policy believes that they have no reason for claiming preferential treatment over other agriculture, and that they should be held subject to the same requirements of solvent and self-reliant action and payment of debt obligations that apply to all farmers. The reclamation farmer is in no sense to be regarded as a ward of the Government, nor should he be allowed to claim that status. Because of improving farm income, the committee reported that most of the projects should be able to resume payment of construction costs next year, ending the moratorium which Congress voted 4 years ago. The committee believes, though, that conditions may justify exempting from resumption of payments those projects whose 1934 production suffered by reason of water shortage, even though they should be able to repay if their water supply next year is normal. The committee believes that no general moratorium should be granted.

Recommending that the Bureau of Reclamation be relieved of the responsibility for collection of payments on future projects and, if practicable, on present projects, the committee pointed out that such payments should be made on a normal bank basis. Because of the interest charge that necessarily accompanies such banking operation, the accounting that underlies the project farmers' repayment would require modification. A study by Congress of methods for making the change is desirable. A suitable plan would include (1) making the farmers' repayment obligations a debt handled through the Farm Credit Administration, and (2) fixing the sale price of the raw irrigated land at not greater than fair value, as a basis for the farmers' repayment.

RELATION OF POWER TO IRRIGATION

The question of power produced in connection with reclamation projects was referred to the committee. It reported that because of the wide diversity between projects in the relation of power to irrigation, and the necessity of placing reclamation relations on a definite basis, it is essential that a uniform policy be established by law. The committee suggested several principles which it believes commend themselves as the basis for such a policy. These include the principle that the farming enterprise and the power enterprise are independent activities and, to be sound, should each stand on its own feet; the principle that power costs should be calculated on a basis of full and correct accounting; and the principle that power rates should be determined by consideration of the general public welfare and should not be used as a means of subsidizing a limited group.

(Continued on p. 36)



Boulder Dam Spillways

By Wesley R. Nelson, Associate Engineer, Boulder Canyon Project

THE first of the major structures for the operation of Boulder Dam, power plant, and appurtenant works was recently completed when the last pours of concrete were made for the Nevada and Arizona spillways. The first work for these structures was inaugurated on the Nevada side in February 1932, and construction of the two huge basins and their inclined tunnels has generally been in progress since that time.

Original plans contemplated the building for each spillway of a free crest 700 feet in length, a long concrete-lined channel opening into an inclined tunnel connecting with an outer diversion tunnel, and a 50-foot by 50-foot Stoney gate installed at the upper end of the channel. Following a period of research, which included the building of models to the scale of 1 to 60 and 1 to 20, the design was changed to a weir with a drum-gate crest equipped with four 16-foot by 100-foot gates, a concrete-lined channel enclosing a stilling basin that was formed by a weir built across the channel at its lower end, and the spillway outlet as before through a 50-foot diameter inclined tunnel to the previously constructed outer diversion tunnel.

The redesign satisfied the requirement of the Colorado River Board that the spillways should have sufficient capacity to carry 400,000 c. f. s. of water when the reservoir was at the elevation of the crest of the dam, 1,232 feet above sea level, and that the spillways, power plant, and other outlet works should control the flow of water past the dam to a maximum of 75,000 c. f. s. at elevation 1,229, the proposed high-water surface of the reservoir. The average flow of the river for the past 30 years has been approximately 22,000 c. f. s., the maximum recorded flow through Black Canyon 200,000 c. f. s. (in 1921), and the possible maximum discharge (in 1884) indicated at approximately 300,000 c. f. s.

RESERVOIR CAPACITY

The 115-mile-long reservoir that will form back of the dam will contain 30,500,000 acre-feet of water when the lake surface is at elevation 1,229 above sea level, of which 9,500,000 acre-feet are for flood control, 5,000,000 to 8,000,000 acre-feet for silt pocket, and 12,000,000 to 15,000,000 acre-feet for active or regulation storage. It would be necessary for a 300,000 c. f. s. flood to run approximately 16 days or a 200,000 c. f. s. flood 24 days to equal the allotment for flood control. At the elevation of the premanent spillway crest, 1205.4, the reservoir will contain 27,000,000 acre-feet and 2,000,000 more at elevation 1,221.4, the top of the raised drum gates.

The reservoir will ordinarily be regulated by the power plant, canyon-wall valve houses, and plug outlet works, but water may rise to the top of the raised gate 3 years after initial reservoir storage if the annual river flow is as great as its average discharge for the past 30 years, and the amount of water passing the dam is not greater than the downstream requirements for irrigation. It is possible, however, that the spillways will never be required to operate at their capacity of 400,000 c. f. s. If this occurred, it is of interest to note that the velocity of flow as water passed into the diversion tunnels would be at the rate of 175 feet per second or 120 miles per hour, and that more than 11,000,000 horsepower in terms of falling water would be released.

As will be noted by reference to engineering drawings, the length of the Nevada spillway is more than 700 feet from the upstream end of the channel to inclined tunnel portal; the maximum depth of channel below the raised gates is 122 feet; the slopes of the channel sides are ½:1; and the channel bottom width 40 feet. The weir is a gravity dam of overflow profile, 75 feet, in maximum height, containing a clear crest of 400 feet length, and three piers 11 feet by 27 feet in section and 36 feet high, separating the four drum gates. The outlet for the spillway, consisting of the inclined tunnel leading from spillway channel to outer diversion tunnel, is approximately 600 feet long, and narrows gradually from the entrance portal dimensions, of 68 feet high and 79.5 feet wide, to a 50-foot diameter section. The largest battleship could be floated in the channel if the inclined shaft were plugged at the portal.

An interesting feature of design is the elaborate provision for structure drainage. Porous concrete, of 1 foot average thickness, was poured beneath the channel floors. 3-inch inside diameter porous concrete drain tiles were placed along the transverse construction joints of the floor and sides of the channel, and 3-inch diameter half sections were installed in the horizontal joints of the channel lining. The porous concrete tile followed the rock line as closely as possible, and the space between the tile and rock wall was filled with broken tile or porous concrete. Thus water percolating back of the channel lining will be conducted by the porous concrete and porous tile to the central drainage tunnel below the channel floor, down which it will flow to a tunnel through the downstream abutment of the spillway and thence to the arch of the spillway inclined tunnel.

Other revisions of the spillway plans included the construction of a concrete walkway along the landward side of both spillways, and the building of a steel-concrete bridge for the Black Canyon Highway across the downstream end of the Arizona spillway channel.

EXCAVATIONS

Excavations for the open cuts of the spillway channels were practically completed during 1932, removing 564,000 cubic yards of rock in a 10 months' period. Truck-mounted drilling jumbos, similar to those used in diversion tunnels, (see RECLAMATION ERA, September 1932), 20-ton trucks and 3½-cubic-yard electric shovels were the principal items of excavating equipment. Most of the drilling, however, was done by jack hammers, drilling down holes. Muck was hauled upstream from the Nevada spillway, a distance of approximately a half mile over steep and winding roads to a side canyon, and on the Arizona side was dumped in a large fill on the landward side of the spillway channel.

The inclined tunnels were excavated to 56 feet diameter by first driving a 7 foot by 14 foot top heading from the diversion tunnels upward, enlarging these pioneer bores to 14-foot slots extending to the lower walls of the inclined tunnels and breaking down the remaining side sections into the slot, working in horizontal benches from the top downward. The tunnel muck, amounting to 59,000 cubic yards on the Nevada side and 77,000 cubic yards in Arizona, was removed from the diversion tunnels by power shovels and trucks. A total working period of approximately 18 months was required to drive the tunnels.

The weir foundation and channels were drilled and grouted to depths as great as 150 feet under pressures as high as 300 pounds per square inch. Holes of 30-foot depth or less were put down with compressed-air hammers, and deeper ones with light diamond drills. The water-cement mixture of grout was mixed by a five- or seven-sack grouting machine and forced into the rock by mud pumps, the connection between pumps and hole intake being through 1½-inch steel-cased rubber hose.

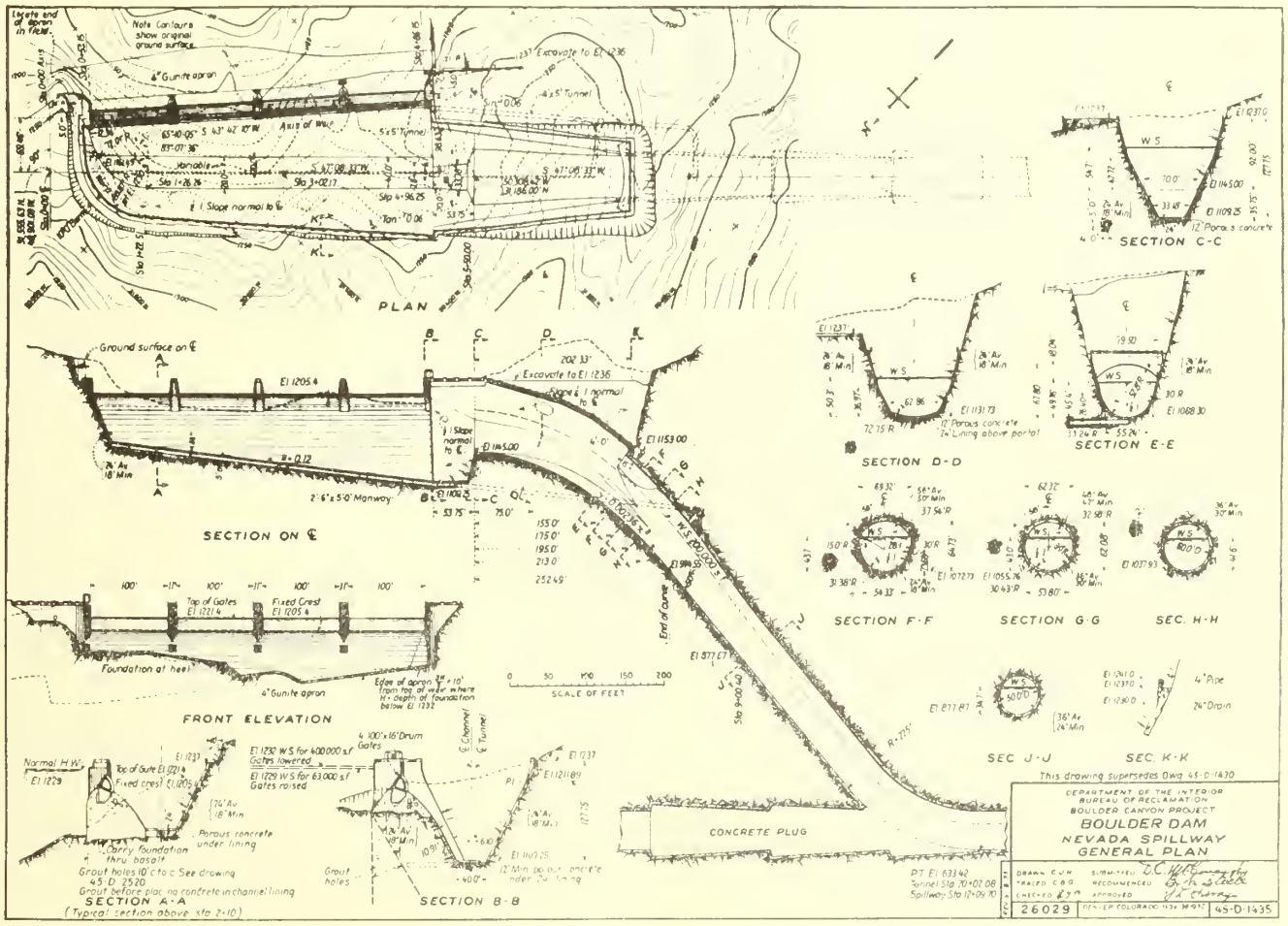
To assist in impeding percolation of water through the rock foundation of the Arizona spillway weir, a 75-foot by 30-foot section of clay blanket, 5 feet in average thickness, was placed in the ravine section on the reservoir side of the weir and protected by a 3-foot thickness of rock riprap. Similarly, an area 40 feet wide in front of the Nevada weir was covered with a 4-inch layer of gunite paving for the entire length of the weir.

CONCRETE LINING OF CHANNELS

Concrete lining of the channels was started in March 1933 on the Nevada side and in April for the Arizona spillway. Concrete was transported from the Hi-Mix plant to the spillways by truck, or truck and cableway, in 4-cubic yard agitators. Pouring was done either directly by cableway or transferred to a spout-dump bucket of 1-cubic yard capacity and conveyed to pouring site by an electric dragline equipped with an 100-foot boom. Concrete was first placed in the lower sections of the weirs. Channel lining then was poured to the inclined tunnel transition before completing the weirs, thus providing a roadbed for the dragline on the partially poured weirs.

The channel lining of 24-inch thickness was nominally reinforced and built in 14-foot by 15-foot panels, each panel being secured to the excavated channel by hooked 1⅛-inch square bars grouted into holes that were drilled into the rock a minimum of 5 feet. The lining was poured against the rock excavation in all cases except at the upstream end of the Arizona channel. Here a ravine crosses the site of the spillway, and the location of the structure in the most favorable position moved the upstream end of the channel lining on the landward side away from a solid rock backing. A series of 38 reinforced concrete buttresses, 24 inches thick at the top and battered ⅛ inch to 12 inches on the back side, was built to support the channel lining for an approximate distance of 440 feet, starting at the upstream end. A backfill of excavated material, no rock exceeding 1½ cubic feet in volume, was placed between the buttresses.

Placing a 36-inch thickness of lining in the inclined tunnel from the Nevada spillway was started on August 25, 1933, but work was suspended after a short section of lining had been poured near the diversion tunnel. Concrete was brought by trucks in 4-cubic-yard agitators to the river side of the tunnel transition. Here it was dumped into a chute that connected by a long 14-inch pipe line to a gate near the bottom of the incline. The central chute and radiating chutes ran from the gate to the pouring sites. The proces



was not altogether satisfactory and a placing method was later inaugurated using a cableway to transfer concrete agitators to the portal of the incline, from where they were lowered down the incline by double track and skip to belt conveyors which carried the concrete to position back of the forms. Concrete placed in the spillway basins amounted to approximately 120,000 cubic yards and in the inclined tunnels 32,000 cubic yards.

DRUM GATES INSTALLED

Installation of the drum gates commenced in March 1934, and all eight were practically erected by the following October. These gates are structural steel buoyant vessels that are floated in the recesses between piers in the spillway crests and are raised or lowered by respectively filling the recesses with water or emptying them. Each gate has a flat bottom and two curved sides resembling in section, when in raised position, the quadrant of a circle of 17 feet radius having a 3-foot extension projecting upward from the reservoir face. The length of a gate is 100 feet, and its height, when raised, 16 feet in elevation above the permanent crest. In a lowered position, the reservoir side of the gate provides a curved surface to complete the outline of the weir crest. The skin plates of ½-inch thickness on the reservoir face and ⅝-inch thickness on the other two sides are supported generally by a series of 39 intermediate girders of ⅜-inch web and 2 feet to 2 feet 6 inches depth at 28 inches centers. The end sections are formed of 5/16-inch buckle plates resting on a grid work of 27 inches by 10 inches by 91 pound girders and 6 inches by 50.1 pound ship channels.

Spring seals of brass and rubber are provided on the channel lips of the recesses and on both ends of the gates to prevent leakage to or from the recesses. Any leakage into the drum gates is drained by lengths of 4-inch hose connected to the bottom of the gate and leading to drainpipe embedded in the concrete structure.

The gates may be operated automatically or manually. Automatic control is actuated by a float located in a well in each of the crest piers. The well is connected by pipe to the reservoir and the float is attached by rod, sheaves, and cables to the drum gate and to a 24-inch balanced control needle valve which regulates the flow of water from the gate recess. Thus, with the control valve connections regulated to hold the crest of the gate at a desired elevation, any rise in the water surface of the reservoir will raise the float which in turn will open the control valve and allow water to drain from the recess, lowering the gate. When the reservoir surface lowers, the float will lower, closing the control valve and raising the gate, thus maintaining the reservoir water surface at a practically constant elevation.

Manual control of the gate is provided by a hand wheel operated hoist that connects to the rod attached to the float, raising or lowering the rod independently of the float and controlling the positions of the drum gate as in the automatic operations.

The gates were furnished by the Consolidated Steel Corporation, of Los Angeles, and were assembled in the field by the builder of the spillways, Six Companies, Inc. The weight of each gate is approximately 500,000 pounds.

Notes for Contractors

Caballo Dam, N. Mex.—On December 19, 1934, an allotment of $100,000 (Federal project no. 39) was made by the Public Works Administration to the Bureau of Reclamation to provide for future power development at Elephant Butte Dam by making provision for later raising the height of Caballo Dam. The Caballo low dam is to be built by the International Boundary Commission, United States and Mexico, with P. W. A. funds. The low dam will cost approximately $1,500,000 and a high dam an additional $1,000,000. The allotment of $100,000 is for foundation work which will make it possible to increase the height of the dam at a later date. With a high dam a reservoir capacity of 350,000 acre-feet will be obtained. The Elephant Butte Dam now stores water for irrigation, but if it is later decided to develop power at Elephant Butte, it will then be necessary to raise the Caballo Dam. Revenues derived from the sale of power at Elephant Butte will repay to the Government the present allotment of $100,000. Specifications and plans for the Caballo Dam are now being prepared in the Denver office.

Taylor Park Dam, Colo.—Considerable interest is being shown by contractors in Taylor Park Dam near Gunnison, Colo., bids for its construction to be opened at Gunnison on February 18. The specifications call for bids on alternative types—a concrete arch dam and an earth and rock fill structure—in order to give the Bureau comparative costs. Among the contractors looking over the work are Hinman Bros., Denver, Colo.; S. S. Magoffin Co., Ontario, Oreg.; Morrison-Knudsen Co., Boise, Idaho; The Carleton Co., Inc., New York City; Rosoff Subway Construction Co., Inc., New York City; Winston Bros. Co., Minneapolis, Minn.; Lawlor-Woodward Co., Seattle, Wash.; Edward Peterson Co., Omaha, Nebr.; Utah Construction Co., Ogden, Utah; Pioneer Construction Co., Denver, Colo.; R. S. Morrow & Son, Omaha, Nebr.; J. A. Terteling & Sons, Boise, Idaho; New Mexico Construction Co., Albuquerque, N. Mex.; Porter-De Witt Construction Co., Kirkwood, Mo.; W. E. Callahan Construction Co., St. Louis, Mo.; Fegles Construction Co., Minneapolis, Minn.; Maguire & Lawlor Construction Co., Butte, Mont.

Sealed bids (specifications no. 658–D) will be received at Denver, Colo., until 10 a. m., February 18, and will at that hour be opened, for furnishing and delivering f. o. b. cars at Almont, Colo., approximately 125,000 barrels of standard or modified portland cement or 15,000 barrels of standard portland cement in cloth sacks for the Taylor Park dam.

Frenchtown project, Montana—The Public Works Administration authorized an allotment of $180,000 to the bureau for construction of the Frenchtown irrigation project of 7,500 acres near Missoula, Mont. The project is numbered F. P. 41.

Boulder Canyon project, Arizona–Nevada—Awards of contracts under specifications no. 589, equipment for the Boulder power plant, have been made as follows: Schedule 1, 2,300-volt switching equipment, Delta Star Electric Co., Chicago, Ill., $108,430; schedule 2, 287.5-kilovolt oil circuit breakers, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $421,452; schedule 3, 287.5-kilovolt lightning arresters, General Electric Co., Pittsfield, Mass., $37,120; schedule 4 287.5-kilovolt disconnecting switches, Bowie Switch Co., San Francisco, Calif., $106,000; schedule 5, 23-kilovolt bus structure, I. T. E. Circuit Breaker Co., Philadelphia, Pa., $264,603; schedule 6, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $21,070. There were 12 bidders. The equipment will be installed by the Bureau.

Sealed bids (specifications no. 655–D) will be received at the office of the Bureau of Reclamation, Denver, Colo., until 2 p. m., February 11, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the factory shipping point or at Boulder City, Nev., one portable, high potential, test set and portable dielectric testing equipment for use in the Boulder power plant. All apparatus will be installed by the Government.

Sealed bids (specifications no. 656–D) will be received at Denver, Colo., until 2 p. m., February 14, 1935, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the factory shipping point or at Boulder City, Nev., 7 carbon-dioxide fire extinguishing systems; 3 portable carbon-dioxide fire extinguishing systems; 40 spare cylinders of carbon-dioxide and expendable material; and 28 carbon-dioxide hand fire extinguishers (15-pound capacity) to fit in cabinets having inside dimensions of 35 by 12 by 8 inches; for installation in the Boulder power plant. All apparatus will be assembled and installed by the Government.

Sealed bids (specifications no. 657–D) will be received at Denver, Colo., until 2 p. m., February 15, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the factory shipping point or at Boulder City, Nev., 4 flow meters for measuring flow of water through 115,000 horsepower hydraulic turbines; 1 flow meter for measuring the flow of water through a 55,000 horsepower hydraulic turbine; and two portable indicating manometers, water manometers, and tool cabinets for installation in the Boulder power plant. All apparatus will be installed by the Government.

Seventeen manufacturers submitted bids under specifications no. 604, for cylinder gate hoists and bulkhead gates, opening at Denver on December 27. The Consolidated Steel Corporation, Ltd., Los Angeles, Calif., with a bid of $203,500 f. o. b. Los Angeles, was low on item 1, four-cylinder gate hoists. Under item 2, 24 bulkhead gates, Bethlehem Steel Co., Bethlehem, Pa., submitted the low bid of $17,500 f. o. b. Bethlehem. Award of contracts was approved on January 9.

On January 24 bids were opened at Denver, Colo., for furnishing five 30-inch diameter sphere valves (specifications no. 610) for installation in the station service penstock at the Boulder power plant. The valves will be installed by the Bureau.

Sealed bids (specifications no. 654–D) will be received at Denver, Colo., until 2 p. m., February 6, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the factory shipping point or at Boulder City, Nev.; 3 deep well turbine-type, motor-driven, pumping units, 5,000 g. p. m. capacity each; 1 deep well turbine-type, motor-driven, pumping unit, 1,600 g. p. m. capacity and 2 portable deep well turbine-type, motor-driven, pumping units, 1,500 g. p. m.; for installation in the Boulder Dam and power plant. All apparatus will be installed by the Government.

At Denver, Colo., on January 21, bids were received for furnishing main control equipment, battery-charging sets, battery-control switchboard, 250-volt direct current distribution switchboards, 460-volt and 115-volt alternating current control equipment, and miscellaneous 2,300-volt and 16,500-volt switching equipment—all to be installed in the Boulder power plant. The specifications are no. 601.

Contracts for furnishing single and 3-phase, oil-insulated, self-cooled, outdoor type, station service power and lighting transformers (specifications no. 592) have been awarded as follows: Schedule 1, Westinghouse Electric & Manufacturing Co., Sharon, Pa., $9,740; schedules 2 and 3, Moloney Electric Co., St. Louis, Mo., $30,312.85. These awards were approved on January 9.

On December 27 the following contracts were awarded under specifications no. 595, for furnishing deep well turbine pumping units, oil-pumping units, water-jet eductors, air compressors and receivers, and water-pressure regulators for installation in the Boulder Dam and power plant: Schedule 1, deep well turbine pumping units, no award (will be readvertised); schedule 2, oil pumping units, Woodin & Little Inc., Rockford, Ill., $4,581.25; schedule 3, portable high-pressure pumping unit, Northern Pump Co., Minneapolis, Minn. $590; schedule 4, water-jet eductors, Schutte & Koerting Co., Philadelphia, Pa., $35,225; schedule 5, air compressors and receivers, Pennsylvania Pump & Compressor Co., $8,220; schedule 6, water-pressure regulators, Fisher Governor Co., Marshalltown, Iowa, $474.60. All prices are f. o. b. factory.

McClintic-Marshall Corporation, Bethlehem, Pa., received the contract for furnishing structural steel for intake tower bridges at Boulder Dam, under specifications no. 634–D, at a price of $23,150 f. o. b., Chicago, for items 1 and 2. There were 16 bidders.

Bids were received at Denver on January 28, specifications no. 647–D, for furnishing three oil purifiers, each with a capacity of 1,200 gallons per hour; one filter paper dryer; and one test tube centrifugal oil tester.

On January 28 bids were opened at Denver for furnishing under specifications no. 648–D, twelve 15-foot 2-inch by 14-foot, one 11-foot 4-inch by 14-foot, and one 17-foot 10-inch by 14-foot bulkhead gates for turbine draft tubes at the Boulder power plant.

Twenty-five manufacturers submitted bids on December 3 for furnishing machine tools for the Boulder power plant under specifications no. 641–D. English Bros. Machinery Co., Cincinnati, Ohio, was low on item 1 with a bid of $4,030. The Ohio Machine Tool Co., Kenton, Ohio, submitted a low bid of $3,374 on item 4. All bids for items 2, 3, and 5 were rejected and these items will be readvertised.

Bids will be opened at Denver, Colo., on February 4 for furnishing and delivering f. o. b. cars at factory shipping point or at Boulder City, Nev., aluminum or galvanized steel rolling or vertical folding and swing doors (specifications no. 651–D) The Government will install the doors.

On February 7 bids will be opened at Denver for furnishing control cable supports and control tunnel car (specifications no. 609) for the Boulder power plant. The schedule has two items and delivery is required in 90 days.

New equipment and materials for which the Denver office is now preparing plans and purchase specifications include the following: (Dam and appurtenant works) intake tower revolving crane; bulkhead gate lifting beam; trash rack lifting beam; walkways and stairways for upper tunnels; tunnel ventilation system; 86-inch Paradox gates and 72-inch needle valves for downstream plug outlet works; (power plant) storage batteries; water heaters and coolers and flow meters; conduit installations for control communication and station service power and light; high voltage circuits from power plant to switchyard; electrical installation in hoist house at upper end of control tunnel; oil handling system, relay house and battery room for 287 kilovolt switchyard; windows; control board for water master's room; oscillographs for checking transmission line disturbances; machine tools; transformer transfer car; turbine handling crane; draft tube bulkhead gates and gantry crane. Preliminary detail specifications are also being prepared for generators, turbines and governors for two additional large units for the power plant, to serve the metropolitan water district.

Owyhee project, Oreg.—Consolidated Steel Corporation, Ltd., Los Angeles, Calif., has been awarded a contract at its bid of $536,057 for schedules 2 and 9 (specifications 598). The work comprises furnishing and erecting 80-inch diameter plate-steel pipe for the Malheur River siphon, and 70-inch diameter plate-steel pipe for the Dead Ox siphon. Parker-Schram Co., Portland, Oreg., with a bid of $64,764.50 was the successful bidder on schedule 1 for the construction of inlet and outlet structures, Malheur River siphon, trench excavation and construction of timber bridge. Under schedule 8 for construction of the inlet and outlet structures for the Dead Ox siphon, J. A. Terteling & Sons, Boise, Idaho, was awarded the contract at a price of $6,051.

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Seven bids were received on December 4 at Ontario for construction of earthwork and structures, Coyote Gulch drain, Dead Ox Flat division, under specifications no. 639–D. The bids ranged from $8,416 to $23,576 and J. A. Terteling & Sons, Boise, Idaho, was low.

Bids were opened at Ontario on January 15, specifications no. 644–D, for the construction of earthwork and structures, North Canal laterals, Mitchell Butte division. The work is to be completed within 220 days after date of receipt of notice to proceed.

At Ontario on January 7, bids were received under specifications no. 607 for the construction of earthwork, tunnels, and structures (except siphons and wasteways) on 14 miles of the South Canal, Succor Creek division. The work is located near Adrian, Oreg., and Homedale, Idaho. Ten bids were received and the low bid was $232,991, submitted by Morrison-Knudsen Co., Boise, Idaho.

Sealed bids (specifications no. 661–D) will be received at Denver, until 2 p. m., February 18, 1935, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the factory shipping point or at Ontario, Oreg. one motor-driven, vertical-shaft, pumping unit of 5½ second-feet capacity, for the North pumping plant; and one motor-driven, vertical-shaft, pumping unit of 13 second-feet capacity for the South pumping plant for the Advancement District. All apparatus will be installed by the Government.

At Ontario, Oreg., on January 12, bids for construction of structures on Kingman laterals (specifications no. 512–O) were opened, with seven bids received. John Gardner of Klamath Falls, Oreg., submitted low bid of $6,494.

J. A. Terteling & Sons, Boise, Idaho, has been awarded the contract for construction of 25 miles of the North Canal, Mitchell Butte division (specifications no. 600) at their bid of $123,894. The principal item of work is 823,800 cubic yards of excavation, all classes. Nine bids were received ranging from the Terteling low bid of $123,894 up to $222,873.

Columbia Basin (Grand Coulee) project, Washington.—The Standard Asphalt Paving Co., Spokane, Wash., with a bid of $94,849, has been awarded a contract, under specifications no. 581, for highway, street, alley, and parking area surfacing; sidewalks; curbs and gutters; catch basins and storm sewers for the Government camp. Five bids were received at the opening at Almira on December 6.

Howard S. Wright & Co., Seattle, Wash., submitted a low bid of $42,590 for the construction of an administration building (specifications no. 603) at the Government camp and was awarded the contract on January 5. Twelve bids were received, the highest being $65,347.

Bids were opened at Almira, Wash. on January 16 (specifications no. 608) for the construction of two dormitory buildings at the Government camp.

The low bidder under specifications no. 640–D for furnishing deep-well pumping units for the Government camp, was the General Machinery Co. with a bid of $3,904.76, f. o. b. Almira, and this company was awarded the contract. Nineteen bids were received at the opening on December 6.

Bids will be opened at Almira, Wash., on February 7 for furnishing and delivering one 7½-ton motor-operated traveling crane (specifications no. 653–D) for the Government warehouse at the Grand Coulee Dam.

On January 21 at Denver bids were received under specifications no. 645–D for furnishing material for a steel warehouse at the Government camp, comprising all structural steel, siding, roofing, windows, doors, and ventilators. The building will be erected by the Government.

Eleven bids were received at Almira on January 5 under specifications no. 649–D for removal of slide on highway and construction railroad, involving 347,000 cubic yards of common excavation, 11,400 cubic yards of rock excavation, and 8,650,000 sta. cubic yards of overhaul. The low bid was $110,505, submitted by David H. Ryan, San Diego, Calif. Contract was awarded on January 14. It is required that the work be completed in 90 days.

Bids will be received at Almira, Wash., until 10 a. m., February 11, and then opened for construction of a warehouse building at the Government camp (specifications no. 659–D). The work is located about 22 miles northwest of Almira. The warehouse building will consist of three sections, one of which will be 60 by 120 feet in size, one 40 by 260 feet in size, and one 30 by 200 feet in size. The foundations of all of the sections and the walls to a height of 4 feet above the floor will be of concrete. The framework above the concrete will be of structural steel and will be covered with corrugated steel sheets or interlocking plate steel. Clear-span bents will be spaced at about 20-foot centers. The first two sections above described will be separated by a reinforced concrete wall extending to the roof. Metal sliding doors will be located in the outside walls, with metal-sash windows between and above the doors, and two all-metal sliding fire-doors will be provided in openings in the concrete wall between two of the sections. Ventilators will be located along the ridge of the roof at 40-foot centers. An office room and a toilet room with wooden partitions will be located in corners of the warehouse. All plumbing work and the electrical installation will be included in the contract. The work shall be completed within 100 calendar days from the date of receipt of notice to proceed.

Work and materials, soon to be advertised include drilling equipment, 75-ton gantry crane, garage materials, and 6-room residences.

Moon Lake project, Utah.—Bids will be received at Salt Lake City, Utah, on February 4 for construction of the Moon Lake Dam (specifications no. 605). The work is located on the West Fork of the Lake Fork of the Duchesne River, about 30 miles north of Duchesne, Utah. Plans call for a moistened and rolled embankment of clay, sand, and gravel, 90 feet high, which will be protected by a heavy rock fill on the downstream slope, and by a 3-foot layer of rock riprap on the upstream slope. The work is scheduled for completion in 600 days. The Government will purchase cement, reinforcement bars, piping, gates and hoists, structural steel, and other materials.

Hyrum project, Utah.—On January 21 bids were opened at Hyrum, Utah, under specifications no. 606 for the construction of pumping plant, structures and canal lining on the Hyrum-Mendon, Wellsville, and Hyrum Feeder canals.

New work and material purchases now contemplated include storage battery and copper oxide rectifier, with charging panel; air valves and piping for upstream gates; switches and control mechanism for slide gates; Selsyn indicators and connections; canal structures.

Parker Dam project, Arizona-California.—Bids are invited for furnishing the following equipment for buildings in the Government camp (specifications no. 652–D), bids to be opened at Denver on February 5; 10 electric ranges and 10 electric refrigerators, or 10 combination electric ranges and refrigerators; 2 electric water coolers; one 30-gallon and one 120-gallon electric storage water heaters; fourteen 3-kilowatt and twelve 4-kilowatt electric space heaters.

On January 29 bids were received at Denver, Colo., under specifications no. 650–D for construction of the air cooling and ventilating systems for the office and dormitory buildings in the Government camp.

Sun River project, Montana.—Tomlinson-Arkwright Construction Co., of Great Falls, Mont., was awarded the contract, under specifications no. 596, for constructing earthwork and structures on the Mill Coulee Canal near Ashuelot.

The company's bid was $44,847.10 and the work must be completed in 180 days.

Klamath project, Oregon-California.—Sealed bids (specifications no. 660–D) will be received at Denver, Colo., until 2 p. m., February 15, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the factory shipping point or at Klamath Falls, Oreg., two motor-driven, vertical-shaft pumping units for use in the Melhase-Ryan sump drainage pumping plant. All apparatus will be installed by the Government.

Ogden River project, Utah.—The Denver office is preparing designs and preliminary specifications for a steel siphon for the water collecting system; trashrack metal work, lifting device, rake and derrick crane; Ogden-Brigham Canal structures; Ogden Canyon pipe line.

During the year 1934 the Castberg Creamery on the Shoshone project purchased 99,010 pounds of butterfat and manufactured 120,935 pounds of butter. They also manufactured 6,845 gallons of ice cream, 2,200 pounds of cottage cheese, and 170 tons of ice.

Details of Cofferdams, Columbia Basin Project

Diversion of the Columbia River through the agency of the cofferdams to permit closure of the Grand Coulee Dam is one of the most difficult problems facing the builders of the big dam. S. H. Woodard, consulting engineer, who visited the dam site from October 10 to November 13 relative to diverting the river for foundation unwatering, has recommended the diversion be handled in three stages.

1. The first coffer on the west bank is to be built during the season of 1934–35 and will consist of cells of steel sheet piling driven into rock and filled with material from the excavation areas. It will confine the river to its present channel during 1935.

2. The second coffer on the east bank will also be built during the season of 1934–35 if the present schedule can be met, or if not, during the season of 1935–36. This coffer will still confine the river to its present channel during 1935–36.

3. The third coffer is to consist of 2 rows of cellular steel sheet piling cribs driven across the channel, 1 upstream and 1 downstream from the dam. This will divert the river during the season of 1937 through a section of the dam on the west bank left low for the purpose. Closure is to be made after the flood season of 1937.

First work on the cofferdam on the west shore began November 16, 1934, with the construction of stone-filled cribbing for breakwater 20 feet wide and to December 1, 145 feet into the stream. This will also be used as a working space to start erection of the coffer. This coffer will consist of 60 cells made of sheet piling driven into rock and 960 feet of cut-off or line piling supported by wood sheet and timber framed cribs.

The total length of the cofferdam up and downstream will be 2,930 feet.

Two barges, 30 by 75 by 7.5 feet deep and 37 by 59 by 7.5 will be used in driving the piling.

A recent shipment of 3 cars of lambs made by the Minidoka County Lamb Pool contained 658 fat lambs and 20 feeders, the lambs averaging 88 pounds each. The owners received a total of $3,467 for the animals.

Boulder City office force, Boulder Canyon Project. Left to right, back row: J. W. Dodson, F. C. Quantrell, J. O. Reeves, L. L. Maples, C. S. Lawson, R. C. Thaxton, Walter Seyfarth, F. C. Lewis, Otto Littler, J. A. McArthur, J. P. Jones, B. D. Glaba; center row: W. B. Radford, M. C. McKeever, C. C. Darden, E. H. Schoppe, R. S. Calland, S. H. Moore, C. S. Hoag, C. F. Weinkauf, W. R. Nelson, R. L. Brown, B. G. Sucher, G. H. Baird, John E. Soehrens, G. E. Chambers, R. B. Spearman; front row: Mrs. Cora Trimble, Mrs. C. J. Blake, Mrs. Hattie Petersen, Miss Marguerite B. Riswold, C. H. Tornquist, Sims Ely, John C. Page, Walker R. Young, Ralph Lowry, T. S. Martin, Earle R. Mills, Miss Martin, Mrs. Hannah Liles, Mrs. Cecile M. Crowe.

Installing Fish Screen in Pishkun Reservoir, Sun River Project

For some years past the Bureau of Fisheries has had under consideration the installing at some point in the main canal of this project of a fish screen to prevent the fish from passing down the canal to be finally carried out onto the land in the course of irrigation to perish. And now the project of installing the screen is becoming a reality.

A. W. Walker, project superintendent, states that a screen is now being installed in Pishkun Reservoir at the outlet into the main canal leading to this project. Mr. Walker says the screen is in the nature of grill work, roughly on the order of woven-wire fencing but it is made of steel bars and the meshes are wider at the top than at the bottom.

The superintendent believes the screen will operate successfully under the conditions that prevail at Pishkun, and especially that it will not become filled up with debris or silt as there is no driftwood or other debris in Pishkun Reservoir and even the grass along its shores has been grazed down very close to the ground.

In view of the length of time the installation of a screen in connection with the local canal has been under consideration, its installation just now is a matter of special interest and visitors to the reservoir next summer will make it a point to inspect it.

As already stated, the screen is being installed by the United States Bureau of Fisheries, and Mr. Walker states that the cost of the screen, installed, will be about $7,000.—*Fairfield (Mont.) Times.*

Construction of Hyrum Project, Utah

By Everett T. Giles, Associate Engineer, Bureau of Reclamation

The Hyrum project is being constructed for the purpose of supplementing the water supply of about 12,000 acres of land in the south end of Cache County, Utah. Funds for its construction, to the amount of $930,000, were allotted by the Federal Emergency Administrator of Public Works in September 1933. The principal features of the project are the Hyrum Dam and Reservoir and three comparatively small canals.

Located on the Little Bear River about 1 mile south of Hyrum, Utah, the dam will form a reservoir having a capacity of 18,000 acre-feet and a net capacity of 14,000 acre-feet; designed as an earth-fill structure it will have a maximum height of 90 feet above stream bed and a top length of slightly more than 500 feet. In connection with the construction of the earth-fill dam there will be a tunnel aggregating about 720 feet in length, a spillway with a capacity of 6,000 second-feet, and a relocated road and dike about 2,700 feet long. Bids for the construction of the dam and related structures were opened on December 13, 1933, J. A. Terteling & Sons of Boise, Idaho, presenting the low bid for $337,211. The contractor began work on March 20, 1934. Under the terms of the contract, work must be completed by August 8, 1935.

The placing of the earth embankment section of the Hyrum Dam was practically completed on December 3, since which time inclement weather has delayed construction work to a considerable extent. At the end of December work on the dam and appurtenant structures was 89.7 percent complete, as indicated by the contractor's earnings, and 56.4 percent of the time allowed had elapsed.

The canal system consists of the Hyrum-Mendon Canal, initial capacity 89 second-feet, length, 14 miles; Wellsville Canal, initial capacity 15 second-feet, length 5.4 miles; and the Hyrum Feeder Canal, initial capacity 9 second-feet, length 1.3 miles. Bids for the earthwork on these canals were opened on October 11, 1934, the low bidder being J. A. Terteling & Sons, of Boise, Idaho, who were awarded the contract for $27,316. Notice to proceed was given the contractors on November 23, 1934, and on the same day work was started on the Hyrum Feeder Canal. At the end of December the canal excavation was 20.2 percent complete and 17.5 percent of the time allowed under the contract had elapsed.

More Boulder Records

A new record for transportation of concrete was made on the day shift of December 30, 1934, at Boulder Dam, when in an 8-hour period cableway no. 7 transported 277 buckets from the canyon rim to pouring site. This was at the rate of a bucket every 1¾ minutes. The buckets are 8 cubic yard capacity, and approximately 2,100 cubic yards were transported during the shift.

In December 34,306 persons in 10,440 cars were checked through the reservation gates, a new monthly record for visitors to the dam. The total number of visitors to the project during the year 1934 was 266,436.

Survey of Federal Reclamation

(Continued from p. 29)

The committee, composed of two members, F. E. Schmitt, editor of the Engineering News Record, New York, and John W. Haw, director of agricultural development, Northern Pacific Railway, St. Paul, Minn., which was appointed September 10 by Secretary Ickes, visited operative reclamation projects at Huntley, Mont.; Yakima, Wash.; Orland, Calif.; Yuma, Calif.–Ariz.; and Strawberry Valley, Utah. It met with nine delegations representing water users' associations, conferred with numerous groups of agricultural authorities and economists of State agricultural colleges and with State officials, engineers and representatives of planning and water resources boards. The records of reclamation project construction were examined, and the views of the Governors, the State planning boards and the water authorities of all the Western States were canvassed.

Benefits of Irrigation

(Continued from p. 29)

they are barely managing to exist, and no doubt many of them are on relief. How much better it would be for these people, the State, and the Nation if they were permitted to move to those irrigation projects waiting for funds to complete the irrigation works. It is true, all of them would have to sell what they produce above the amount needed for the support of the families before any great wealth would become real. But in building a new home on irrigation, each settler creates the need for at least another family in the trading or exchanging cycle and still another in the industrial centers. This procedure takes a like number off the relief rolls or the dole.

The orange festival on the Orland project, sponsored by The Boosters Club, was such a decided success in attracting a large crowd to Orland and in advertising the citrus industry, that it has been deemed wise to make it an annual event. A "queen" contest, votes for which were given for cash payments at local stores, created a great deal of enthusiasm and resulted in a large increase in business among the merchants, several of whom reported the payment of long overdue bills in order that the votes might be received.

The Reclamation Era

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FEBRUARY 1935

Safeguards for Federal Reclamation Policy

ONE Feature of Federal reclamation planning, which acts as a safeguard, is often overlooked when dealt with by uninformed persons. It is feasibility. So much is this a part of Federal reclamation planning that in 1924 it was made a mandatory provision of law that approval of Federal reclamation projects be contingent on the furnishing of a feasibility statement as to the engineering and economic features involving a proposed development.

A feasibility statement submitted by the Commissioner of Reclamation in support of a project includes complete information as to water supply, engineering features, the cost of construction, land prices and analysis of soils together with a program of crops best adapted, markets, climatological data; in fact, every feature that goes into creating a farming community entirely dependent on irrigation farming for its support.

A project is not recommended for approval where it is known the per acre cost is so high that the type of crops to be grown cannot meet these payments to the Government when due.

During the 33 years of its operation the Federal reclamation policy has been constructively carried out, establishing a mode of living, supporting approximately 700,000 people, and creating 237 project towns. Its operation has contributed greatly to the advance of engineering knowledge and irrigation practice. Settlement and development under all the projects carried out in the past 10 years have been as rapid and as successful as could be possible under any system. There have been no failures.

REAL FACTOR IN UNEMPLOYMENT

The enlarged program of reclamation being carried out with P. W. A. funds has assisted greatly in relieving the unemployment situation all over the country. Dollars allocated to the Bureau of Reclamation have created a purchasing power that is felt in every section of the United States. Gradually it is harnessing the water of streams that would otherwise be run to waste. A map of the western third of the United States in which reclamation is being carried on, which once showed the need for additional reclamation projects, now shows one irrigation possibility after another being consummated, and there are now very few additional opportunities for the application of the Federal reclamation policy as possibilities are rapidly disappearing.

SELECTION OF SETTLERS

After putting into a proposed development all of the advanced thought and study above referred to, the Bureau then zealously goes about the serious business of locating on the lands of a project a type of person who with capital, equipment and experience has the best opportunity to make a success. Local boards of well-informed men make selections and after settlement is effected every assistance is given the newcomer to get started in making a going concern of his farm.

NEED OF CREDIT

One of the weaknesses in the present set-up is the lack of a source of credit for early development at an interest rate that agriculture can stand. This has been the subject of several bills introduced in previous Congresses, but which failed of enactment. It is generally conceded by those best informed on land settlement and rural development that this is a matter that should be handled to a conclusion. The necessity of a new settler procuring loans at high interest rates often means the difference between success and failure as the burden of overhead of meeting his payments to the Government, his local and State taxes, and the interest on borrowed money is more than he can stand.

SEASON 1935 HAS BRIGHT OUTLOOK

Reports generally from the field are to the effect that the outlook for an ample water supply for this year is good. Generally speaking, the demand for crops and the prices received were very gratifying. Several sections of the country suffering from water shortages this past year will, by the construction activities of the Bureau with P. W. A. funds, not suffer such a shortage this year. Notable is the Imperial Valley of Lower California where stored water from Boulder Dam will be delivered during the next irrigation season.

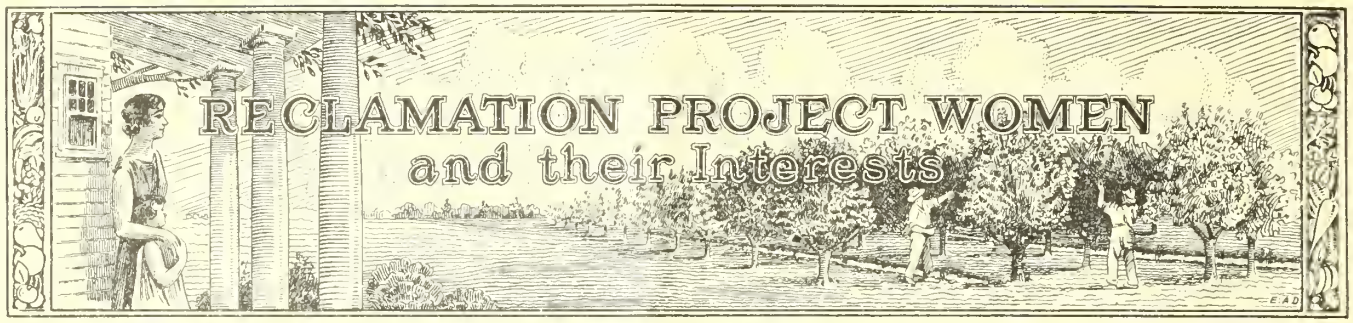
FEDERAL RECLAMATION NUCLEUS IN NATIONAL PLANNING

When planning of all natural resources is carried out on a coordinated national plan, it will be found that Federal reclamation projects already constructed or under construction will be a real foundation on which complete development of watersheds can rest.

SUBMARGINAL PROGRAM

Any plan to move farmers from submarginal lands on to land that will be self-supporting, should take into account lands which are rich as to fertility and can be farmed under irrigation. Here stabilized farming communities can spring up and with the proper planning, involving a sufficient water supply, settlement can be effected without the hazard of crop failures during the dry years. Fertile irrigated lands can be selected for the farmer, taken from submarginal lands. Here he will have less risks, fewer hazards, larger returns per acre, and greater rewards for skill in cultivation.—*M. A. Schnurr.*

4-H Dairy Calf Club early fall meeting, 1934, on Sun River project Mont.



The heading of these pages, "Project Women and Their Interests", is a direct charge to us who plan the contents to present material you will consider interesting. We do not believe that any article of project interest that may be carried in this magazine is not of interest to women, but we do realize that there are many subjects in which women are especially interested.

We plan to carry on these pages of the ERA articles concerning various agencies, in the Government and outside, whose work is of direct interest to women. Many branches are engaged in work not uniquely of concern to women, but interesting to know about, and our pages shall also be open to them. Please consider these pages as yours—they really are. Your comments and suggestions are earnestly requested, and information to be presented will be welcomed. Nothing, surely, is of more interest to a project woman than to know of the activities and achievements, through initial good management or through trial and error, of women on other projects. We hope you will send us items about your communities, schools, gardens, clubs, or other activities in which you may be interested. Address all communications to the Commissioner of Reclamation, Department of the Interior, Washington, D. C.

The Federal Government's Model Prison for Women

By Margaret C. Feast

IN THE mountains of West Virginia, at Alderson, there is a women's Federal penitentiary, known as the Federal Industrial Institution for Women. To it are sent women convicted of Federal crimes, whose sentences are not less than a year and a day. Cottages to shelter 500 women, a school, hospital, superintendent's home, administration building, buildings where certain industries are housed, and a farm—these make up this institution.

I arrived at Alderson—an employee! one October morning, and was impressed by the same features a newcomer always observes. The grounds are beautiful against the surrounding mountains. There appeared to be no guards. The women in tidy cotton uniforms of different colors seemed to work with a will, and there was an atmosphere of purpose and peace. My initial amazement changed, however, to respect. This order and peace were clearly no accident, and I wanted to know how, and why, and who.

Built in 1927 the institution has had only one superintendent, Dr. Mary B. Harris, a woman whose capacity for organization and whose human understanding are largely responsible for this venture in an intelligent solution of an age-old problem.

The keynote of the discipline, I learned, is cooperation under attentive supervision, and no idle time. Daily schedules for the inmates include work to maintain the institution, classes in subjects which will give the women a means of earning an honest living, and recreational activities designed to make real the benefits of social adaptability and cooperation. Now amplify a day's routine of discipline, industry, regular duties, training, nourishing food, and cleanliness into a schedule of not less than 11 months. Is it not likely that those who observe such a routine will acquire habits of acceptable social behavior?

These schedules are not arrived at aimlessly. Each is the result of study of the individual's case history by a classification board. Her health, education, mental attitude, the influences of her former life and the prospects for her future are considered, and a routine is worked out with a view to her rehabilitation. Review and possible reclassification occur every 3 months.

Discipline is partly maintained by a well thought out system of privileges: Extra letters home, duties which imply trust, permission to order from their own funds simple toileteries, or candies. In each cottage, which has tiny separate rooms for 30 women, there is a council—an important element in the morale and behavior of the little group.

The women may learn cooking, domestic service, sewing, power sewing. If their health indicates outdoor employment, they may learn the business of raising poultry, or may work on the farm, dairy, or garden. They may learn typing, stenography, switchboard operation, and practical nursing.

Recreation is given its proper place in the routine: Gymnasium, singing, infrequent movies, more frequent plays and entertainments, including, perhaps, a Gilbert and Sullivan piece. There is surprising and varied talent among the women. One evening a week there is assembly for choral singing and current events. There is a religious service on Sunday; and on Sunday evening in the cottages Christian Endeavor meetings are

Lower rectangle of buildings

held—short programs worked out by the women. Obviously these diversions are of the type to stimulate resourcefulness—they are active rather than passive amusements.

In the autumn a country fair is held. Barns are transformed into stands to display handicraft and cooking skill. Quite a gala day it is. Members of the staff and guests don masque clothes—quaint or ridiculous. Judges make blue, red, and yellow ribbon awards. Because competition is keen, there are consolation awards too. Scores are kept through the year, with good marks to each cottage for enterprise and attractiveness of garden plots, tidiness indoors, and discipline, and at Fair time a donated trophy cup is awarded. Strangely enough, the cup is most frequently won by one of the Negro cottages.

Make no mistake. There is no indulgence here. No smoking. Not even radios, although arrangement is planned for selected programs to be heard. There is not a woman serving a short sentence or long, under the conditions outlined, who would not eagerly exchange her relative security for "freedom." Unused to self-discipline as is the average lawbreaker, a life of regulation is worse than irksome. But this regulation is not the senseless confinement of the obsolete penal policy. It is instead a substitution of influences and occupations which may redeem an antisocial human being into a person fitted to live in a society, not perfect, but striving toward the good of the whole.

Work among these women makes one fact very clear. Their personal problems, not taken care of, form a background against which the most scientific and helpful schedule of living must fail. A woman may have a family of children now cared for by a grandmother. Word comes that the grandmother has died, or the children are ill, or the family has been put out for failure to pay rent. Even in a prison there are few women sufficiently calloused to be able, with this burden of worry, to benefit from any good influences. So a social service division has been projected by the Federal Prisons Bureau with workers in every penal institution. With a program of professional procedure, their duties are of course varied, but none is more important, perhaps, than their sympathetic understanding and effort to straighten out the problems which cause so much anguish to the individuals unable to do it for themselves.

This institution is almost too new to permit an accurate appraisal of results. The appropriation requirement for maintenance, however, all things considered, is not prohibitively more than that required for the old, congested, block-cell prisons, conducive only to idleness and mischief, and where for one thing a far larger budget is necessary for guards. Without in the least sentimentalizing, one can hardly fail to subscribe willingly to a far-seeing system that counts the value of human rehabilitation and crime prevention. The old system didn't work. This one may.

Thirty women, supervised by two matrons, live here

A formal opening of its new creamery at Ellensburg has been held by the Milk Products Co. on the Yakima project.

Auditorium. School, religious services, and assembly meetings are held here

Invitation to a Movie

To the program managers of many organizations, boards of education and the like, the films of the Bureau of Reclamation need no introduction. Wherever one of our films is shown, there are almost always requests for others, and this appreciative demand has led the Division of Public Relations of the Bureau to give thought to the matter of making the availability of the films more widely known. In the East they tell a little-understood story of pioneering, not as an imaginative movie director visions it, but as it actually is. The reality of desert converted into communities and farms, and the immensity of engineering structures in their surroundings of great natural beauty are impressed upon audiences by our films, and foster good will toward the cause of Federal reclamation. Not alone in the East, however, have the films popularity. In the West, where the story is not new, they seem to carry the charm of familiarity. There, more than in the East, the story rings true with the compelling appeal of portraits in a family album.

This is an invitation to call upon us for the use of these films. To a project audience the general films, in the first group listed below, and the construction films, "Boulder Dam" and "Storage and Diversion Dams" would perhaps be more entertaining that those which portray a project's history. With one exception they are all 35 mm, fireproof stock, and they may be borrowed at only the cost of transportation both ways, with the understanding of return in good condition.

Livestock on the Irrigation Projects
Southern Reclamation
Story of Federal Reclamation
Apple Time in Yakima
Beele Fourche Project, South Dakota
Boise Project, Idaho
Minidoka Project, Idaho
Shoshone Project, Wyoming
Yakima Project, Washington
Boulder Dam (35 mm) and (16 mm).
Storage and Diversion Dams

Reclamation Projects Financed by Public Works Allotments

By W. F. Kubach, Chief Accountant, Bureau of Reclamation

ALL construction work being performed by the Bureau of Reclamation is now included as a part of the comprehensive Public Works program adopted by the Federal Emergency Administration of Public Works. Appropriations from the Reclamation Fund for construction work on Federal Reclamation projects available for the fiscal year 1934 were withheld from expenditure and were replaced and supplemented by allotments granted to the Bureau by the Federal Emergency Administrator of Public Works from (1) the appropriation of $3,300,000,000 made pursuant to the National Industrial Recovery Act of June 16, 1933, and (2) the appropriation of $400,000,000 made available to the Public Works Administration by the appropriation act of June 19, 1934.

An allotment of $38,000,000 has been granted for continuation of construction of the Boulder Dam, power plant, and appurtenances. The expenditure of this allotment is subject to the conditions imposed by the Boulder Canyon project act of December 21, 1928, which provides among other things that the money expended shall be repaid to the United States Treasury with interest at 4 per centum per annum. An allotment of $9,000,000 has been granted for construction of the All-American Canal, a feature of the Boulder Canyon project. Expenditures for this feature of the project are repayable to the United States under the conditions imposed by the Boulder Canyon project act.

Expenditures from allotments for all other Federal reclamation projects are repayable under the provisions of the reclamation law or conditions imposed

No.	State	Project	Allotment	Construction features
2	Oregon	Deschutes	$50,000	Investigations of water supply.
3, 4	Arizona-Nevada	Boulder Canyon	38,000,000	Construction of Boulder Dam power plant and appurtenant works; purchase of machinery and equipment for Boulder power plant. Total cost, $108,800,000.
5	Oregon-Idaho	Owyhee	6,500,000	Canals and structures, North Canal system; Malheur River and other large siphons. Total project cost, $18,000,000.
6	Oregon	Vale	1,000,000	Agency Valley Dam and Reservoir (earth embankment, 480,000 cubic yards); Willow Creek Canal, 20 miles.
7	Washington	Yakima-Kittitas	60,000	Canals and laterals in Kittitas division (completed).
9	Do	Grand Coulee	15,000,000	Grand Coulee Dam and power plant, 3,350,000 cubic yards of concrete; railroad, highways, bridge, town-site buildings, streets, water supply, etc. Total cost, $63,000,000.
10	Colorado	Denver office	20,000	Office alterations (completed).
11	Wyoming	Casper-Alcova	12,000,000	Alcova diversion dam; Seminoe Dam, Reservoir, and power plant; canals and structures; transmission line and 2 substations. Total cost, $22,700,000.
12	Arizona	Yuma	120,000	Drains and drainage structures, Valley division.
13	Idaho	Boise	31,000	Drains and drainage structures, Boise Kuna district.
13a	Do	do	9,000	Drains and drainage structures, Notus district.
14	Do	Upper Snake River storage	4,000,000	Storage dam and reservoir on Upper Snake River.
15	Do	Minidoka-Gooding	30,000	Laterals and structures in Gooding division (completed).
16	Montana	Bitter Root	100,000	Reconstruction and improvement of laterals and structures in irrigation district.
17	Do	Milk River	65,000	Laterals and structures.
18	Do	Chain Lakes storage	2,000,000	Fresno storage dam and reservoir on Milk River near Havre.
19	Do	Sun River	600,000	Drains and drainage structures; laterals and structures.
20	Nevada	Truckee River storage	1,500,000	Storage dam and reservoir on Little Truckee River, Calif.
21	Do	Humboldt	2,000,000	Rye Patch Dam and Reservoir on Humboldt River.
22	New Mexico-Texas	Rio Grande	500,000	Laterals, drains, and structures in Elephant Butte district, N. Mex.
23	Oregon	Stanfield	100,000	Reconstruction of canals and structures, Stanfield district.
24	Utah	Hyrum	930,000	Hyrum Dam and Reservoir on Little Bear River (earth dam and dike, 350,000 cubic yards); Hyrum-Mendon Canal, 14 miles, and smaller canals and canal structures.
25	Do	Ogden River	3,000,000	Pine View Dam and Reservoir on Ogden River near Huntsville; South Ogden and North Ogden high-line canals and other canals and canal structures.
26	Arizona-California	All-American Canal	9,000,000	Imperial diversion dam (floating or Indian weir type, 1,700 feet long), 80 miles of main canal and 130 miles of Coachella Branch Canal; 65,000,000 cubic yards of excavation. Total cost, $27,000,000.
27	Arizona	Verde	150,000	Investigations and surveys.
28a	Arizona-California	Colorado River Indian	25,000	Investigation and survey of irrigation project in Colorado River Indian Reservation.
28b	Arizona	Gila Valley	75,000	Investigation and survey of irrigation project in Gila River Valley; diversion at Imperial Dam; power for pumping from Parker power plant.
29	Utah	Provo River	2,700,000	Deer Creek Dam and Reservoir; canals and structures; enlargement of Weber-Provo Canal; Utah Lake levees. Total cost, $9,974,000.
30	Do	Moon Lake	1,500,000	Moon Lake Dam and Reservoir.
31	Do	Sanpete	300,000	Tunnels and short feeder canals for Ephraim and Spring City divisions.
32	Colorado	Uncompahgre	2,725,000	Taylor Park Dam and Reservoir ($2,000,000); improvement of Gunnison Tunnel ($400,000); repairs to project canal system ($325,000).
33	Arizona-Nevada	Boulder Canyon	25,000	Industrial survey in Boulder Dam area (Geological Survey is cooperating in making field investigations).
34	Oregon	Umatilla River	10,000	Surveys of Umatilla River watershed to determine feasibility of storage reservoirs.
35	Colorado	San Luis Valley	900,000	Construction of drain in "closed basin."
36	Oregon	Grande Ronde	10,000	Investigation of Meadow Park Dam site on Grande Ronde River.
37	Montana	Buffalo Rapids	20,000	Engineering, agricultural, and economic studies to determine the feasibility of the Buffalo Rapids project.
38	California	Klamath project, Tule Lake division	25,000	Completion and reconstruction of dikes for flood protection.
39	New Mexico	Rio Grande project, Caballo Dam	100,000	To provide for future enlargement of dam.
40	Wyoming	Shoshone project, Willwood division	30,000	Laterals and drainage.
41	Montana	Frenchtown project	180,000	Construction of irrigation works.

by the Public Works Administration at the time of granting allotments.

Because of diminishing income to the Reclamation Fund from sales of public lands, oil royalties, and construction repayments, only a small construction program could be provided for in the annual budget. The transfer of the Bureau's construction work from annual appropriations from the Reclamation Fund has made it possible for the Bureau to proceed with a greatly enlarged construction program which has given and will continue to give employment to thousands of workers in localities in the Western States where the unemployment conditions were acute, and also made possible the placing of large orders for cement, lumber, steel equipment, and electrical and hydraulic machinery in the manufacturing centers of the Pacific and Eastern States.

The accompanying statement shows Public Works allotments granted to the Bureau.

On the Tule Lake division of the Klamath project $25,000 has been allotted for work on the dike system.

All-American Canal Construction Started

THE first canal to carry water from the Colorado River to what is now the Imperial Valley was started in 1900. This canal, built from a heading just north of the international boundary, ran south and west through Mexican territory to empty into the Alamo River. The water was carried down the river channel to irrigate a comparatively small acreage in the area then known as the "Salton Sink." Today more than half a million acres of land are watered by a canal system much more complete than the original but still running for a great many miles through Mexico.

The history of the irrigation of the Imperial Valley is one of battles against floods, drouths, disposal of silt, and maintenance of canals in foreign territory. In the spring of 1905 the river changed its course, and running through a new heading which had been excavated a few months previously, emptied into the Alamo and New Rivers to discharge into the Salton Sea. For two years the entire flow of the river poured into the sea raising the water level 73 feet and increasing the area 278,000 acres. During this period, thousands of acres of land between Volcano Lake in Lower California and the Salton Sea were flooded and the soft desert soil, built up by wind action, was carried along with the floods.

The antithesis of this period was the summer of 1934 when, owing to successive years of insufficient snow in the upper Colorado River Basin, the river reached its lowest discharge in history. Although a sand dam was built across the channel below the present Imperial heading and the entire flow of the river was diverted into the canal, insufficient water reached the Imperial Valley to keep crops alive. It is estimated that the valley suffered a crop loss of $9,000,000 during the 1934 season.

Approximately 100,000 acre-feet of silt are carried by the river and deposited into the Gulf each year. With the water so heavily burdened, it has been necessary to maintain dredges in the present canal just below its intake to remove as much silt as possible before it is allowed to reach the smaller laterals and the farm land. Although under normal conditions these dredges operate almost continuously, great quantities of silt are carried through the distribution system and deposited on the farm lands, usually forming a delta at each turnout and increasing the cost of irrigation year after year.

ALL-AMERICAN CANAL

1, Cutting through solid rock on Pilot Knob; 2, canal in the Imperial Valley being dug by teams and fresnoes as a relief measure for farmers in that vicinity; 3, a 12-cu.yd., a 6-cu.yd., and a 2-cu.yd. dragline preparing to cross the Yuma Main Canal; 4, one of the erecting yards of the Callahan Construction Company.

Celebration at Potholes, Calif., at beginning of construction of All-American Canal, Dec. 5, 1934.

With the construction of Boulder Dam nearing completion, the menace of floods and drougths is ended. The same act of Congress which provided for the construction of this dam provided for the construction of the All-American Canal, a canal built entirely within the United States, to serve the Imperial and Coachella Valleys. This canal, starting at a diversion dam about 15 miles up the Colorado River from Yuma, traverses steep, broken lands until it reaches the international boundary, and from there it turns westerly crossing about 10 miles of drifting sand dunes, continuing on to cross the Imperial Valley. The maximum canal section will be about 232 feet in width at the water surface, with a bottom width of 160 feet and a water depth of 20 feet, with an initial diversion of 15,000 cubic feet of water per second. At the Salton Drop 2,000 cubic feet of water per second will be diverted for the Yuma project, and 3,000 cubic feet of water per second at Pilot Knob for power development. Through the sand hills a cut 100 feet deep and more than 500 feet wide will be required.

Final development calls for the Coachella Branch Canal which will divert from the All-American Canal near the west edge of the sand hills and run in a northerly direction crossing the valley near Indio, Calif., approximately 130 miles of canal.

Actual construction started on August 8, 1934, when the Griffith Co., successful bidders for one schedule of canal excavation, began operations to remove about 500,000 cubic yards of rock. On December 17 the W. E. Callahan Construction Co., St. Louis, Mo., and Gunther & Shirley, Dallas, Tex., contractors for about 30 miles of canal excavation, totaling approximately 40,000,000 cubic yards, and Boyce and Igo, subcontractors, began work.

The Callahan Co. is using two 12-cubic-yard and three 6-cubic-yard Monighan draglines, one 2-cubic-yard Northwest and one 2-cubic-yard Bucyrus dragline. Boyce and Igo have one 12-cubic-yard Monighan dragline and the Griffith Co. has one 2-cubic-yard shovel.

The program under which these contractors are operating calls for the completion of this section of canal by February 1938.

Because of the shortage of water in the Imperial Valley during the past season, the Imperial Irrigation District requested a million-dollar appropriation from the Public Works Administration to construct a section of canal in the valley by force account, as a relief measure. To date about 7 miles of canal west of Calexico is under construction. This excavation is all in good material and the work done so far has been performed very creditably by men and teams.

The project was formerly launched on December 16, when a crowd estimated at 5,000 attended the celebration of its beginning which was held near Potholes, about 12 miles northeast of Yuma. Governor Merriam, of California, was the guest speaker for the occasion.

Policy Regarding Schools for Reclamation Projects

By D. S. Stuver, Reclamation Economist

DURING the year 1917, a question having arisen in regard to whether school buildings could be erected as part of a construction camp to be used by a school district for instructing the children at such camp and in the neighborhood, the Comptroller of the Treasury rendered a decision to the effect that if, in the judgment of the Department, the erection of a school building will aid in securing men necessary for construction activities, inducing them to remain longer in the service, and be in the interest of the Government, the Reclamation Act and appropriations made pursuant thereto would authorize such action.

In a number of localities where construction jobs of considerable magnitude have been undertaken by the Bureau of Reclamation, the problem of providing adequate school facilities for the children of the construction workers has been somewhat difficult to solve. The tendency has been for schools which already had been established in some localities, although adequate to care for the usual and normal demands of the community, to become overcrowded on account of the added construction population. Also in some places the construction camps and jobs are remotely situated with respect to existing schools.

The desirability and importance which attaches to the proposition that every child is entitled to and should receive the best education that can be afforded has not been questioned and experience has indicated that greater efficiency prev ils and more work of a satisfactory nature is performed on jobs where reliable men with families can be employed and where proper living conditions and educational facilities are provided and maintained.

Notwithstanding the fact that the carrying on of a construction job generally results in the stimulation and increase of business through the expenditure by the workers and the Government of considerable money in the immediate locality, it is frequently the case that workers are not property owners in the community and hence do not aid directly in the establishment and upkeep of schools, other public institutions and improvements in the same manner or to the extent by which the permanent residents and property owners contribute through taxation. For this and other reasons, some of the State and local school district authorities have found it extremely difficult during the past few years to properly finance school operations and necessary expansions thereof.

EDUCATIONAL FACILITIES AT BOULDER DAM

The construction of Boulder Dam on the Colorado River at a location where there were practically no living or other accommodations for the workmen and their families necessitated the building by the Government of an up-to-date town with houses, streets, water supply, sewerage and electrical systems and other civic improvements adequate for a population of about 5,000 during the construction period. A school, which was erected as a part of this development, is now being operated under the supervision of the

Superintendent of Schools of the State of Nevada, a school district having been formed to embrace the area.

During October 1934 the matter of making provision for schools on projects under the Bureau of Reclamation received the careful personal attention of the President and the Secretary of the Interior and resulted in the approval of a policy for the providing of school facilities on construction jobs, any expenditures made therefor to be included as a part of the cost of the particular project affected. In the establishment of this policy, however, it is not to be understood that schooling is to be provided at the expense of the Government for the overflow due to the crowding in of unemployed, and it will be necessary for the States and counties to formulate their plans for taking care of the children of settlers on the projects. These settlers are potential taxpayers and it is assumed that their residence is established with a view to permanency.

SCHOOLS TO SERVE CONSTRUCTION PROJECTS

Works upon which construction is now in progress, and where the school needs of the workers' children are under consideration, include the Grand Coulee Dam project in Washington, the All-American Canal project in Southern California, and the Agency Valley Dam on the Vale project in Oregon.

In connection with the All-American Canal project, the main canal to the Imperial Valley will be 80 miles long, and the branch to the Coachella Valley will entail a length of 130 miles. Owing to the distance involved in the construction of these canals it is obvious that the concentration of the workers at a single point would be impracticable, making it necessary to consider the establishment and operation of separate schools at a number of towns along and convenient to the canal location. The excellent school facilities in Yuma, Ariz., will no doubt be taken advantage of by the children of workers residing in proximity to that city.

A grade school building to accomodate the pupils living in the Government Engineers' Camp at the Grand Coulee Dam is now in course of construction, under a contract awarded to American Builders, Inc., of Seattle, Wash. The specifications and contract under which the Grand Coulee Dam is being constructed require the contractors to furnish, without charge therefor, school facilities for residents in the contractors' camp. The contractors have accordingly obtained authority from the State Department of Education to appoint a temporary school board whose acts will be official until such time as a permanent school district may be determined upon and formed. Meanwhile, a temporary two-room school building has been erected and two teachers, an acting principal and a second teacher, recommended by the State school authorities, have been employed. This school will be fully accredited by the State Board of Education. The two-room building will be used until the needs can be more definitely ascertained after which a permanent grade school building will be erected at Mason City, the contractors' camp, by the contractors. The temporary building meets the State requirements as to lighting, blackboards, etc., and has standard equipment, electric heating, cloak room, and toilet facilities. If, at a later date, it develops that there are enough older students to warrant the organization of a high school at Mason City, the necessary facilities therefor will be provided but, for the present, it is the plan to arrange for such students to attend some established high school with tuition to be paid by the contractors who are building the Grand Coulee Dam.

The providing of school facilities on construction jobs undertaken by the Bureau of Reclamation will henceforth be a primary consideration and will be included in future contracts for work, whenever warranted by the scope and nature of the work to be performed.

Federal Reclamation a Regulator

By L. H. Mitchell, Reclamation Economist

A governor on a locomotive regulates the supply of steam; it adjusts the speed of the machinery. Likewise the dam on a stream is a governor, as it controls the water and prevents floods. Federal reclamation is a miniature governor in the supply and demand of farm products. This fact is especially outstanding during years of drought when the average production of farm commodities for the entire Nation drops below the average.

Irrigation makes possible a sure crop every year. A good illustration of how reclamation is a regulator in the supply of farm commodities is given in the case of the lettuce crop now being harvested on the southern projects of the Bureau of Reclamation. Were it not for the crop of lettuce on the Salt River and Yuma projects, consumers of lettuce would probably be looking for substitutes. The price for this off-season crop would be out of reach of the average housewife.

On the Yuma project alone, from 3 to 4 thousand carloads of lettuce, harvested or in the process of being harvested, is a small governor. If these carloads were in one train it would cover a distance of 33 miles. Think of what this means to the railroads affected by the activity, and the employees of the transportation companies who are not alone in receiving benefits as the result of this regulator.

Not less than 2,500 laborers are required to plant, harvest, pack, and ship the lettuce crop on the Yuma project alone. The harvesting time covers a period of some 3 to 4 months. Thus Federal reclamation is a regulator in the labor situation. Why not more regulators and more insurance against the effects of the drought?

Settlement Activities on the Riverton Project

The trend toward irrigated farms is demonstrated on the Riverton project, Wyoming, as indicated by the following statistics which represent settlement activities on the project for the year 1934:

	Number
Inquirers concerning farms available	1, 270
Personal inspections of project lands	402
Farm applications received	132
Irrigable area involved (acres)	4, 966
Made homestead entry	50
Private farms sold	21
Irrigable area involved (acres)	2, 297
Farm units available on December 31, 1934	63

The number of farm applications received was 45 percent greater than in any other year. The number paying the advance water rental charge exceeded by almost two and a half times the record of any other year. The number of sales of private land was probably greater than in the previous 8 years combined.

Several pieces of property on the Orland project have changed hands and in all cases the new owners are experienced farmers having assets sufficient to insure a reasonable degree of success. It is probable that the season's citrus crop, demonstrating as it did the wonderful recovery from the effects of the freeze of the winter of 1932, will have a marked influence on the future of the project.

The Grandview Commercial Club on the Yakima project, Washington, gave a luncheon on a recent date, at which some 40 new settlers in that immediate community were guests. The settlers are from drought-stricken areas in Colorado, and the Dakotas. A like number who had settled in the Sunnyside community, 7 miles distant, had previously been entertained in the neighboring town.

Reclamation Organization Activities

R. F. Walter, chief engineer, and E. B. Debler, hydraulic engineer, Denver, Colo.; B. E. Stoutemyer, district counsel, Portland, Oreg.; E. B. Darlington, superintendent Minidoka project; and R. J. Newell, construction engineer, Owyhee project, were in Washington on January 14 for a conference regarding power and water questions on the Snake River and also matters relating to the Minidoka and Owyhee projects.

On January 25 Miss Mae A. Schnurr, assistant to the commissioner, delivered an address on Boulder Dam in the Interior Department Auditorium, before members of the Civic League of Brookmont, the Brookmont Garden Club, and affiliated clubs of Maryland. Miss Schnurr's address was illustrated with motion-picture film and lantern slides.

The following representatives from project offices have been designated, and other assignments are anticipated, to furnish material of general interest for publication in the Reclamation Era:

All-American Canal, T. A. Clark, office engineer; Boulder Canyon, Wesley R. Nelson, associate engineer, and B. D. Glaha, photographer; Owyhee, Ferd Schlapkohl, engineer; Hyrum, Everett T. Giles, associate engineer.

United States Senator C. C. Dill, of Washington, Governor Martin, and Director of Highways Murrow visited the Columbia Basin project on the occasion of the driving of the "golden spike" on the United States Construction Railroad.

George O. Sanford, chief of the Engineering Division in the Washington Office, delivered an illustrated lecture on Janurary 24 on Boulder Dam before the national organization of patent attorneys in Washington, D. C.

P. I. Taylor, engineer, in July 1934 assumed the duties of Assistant Chief of the Engineering Division, Washington office.

Francis J. Farrell, senior clerk in the Denver office, was transferred to Salt Lake City, Utah, effective December 31 last.

Senator Elbert D. Thomas of Utah; J. R. Templin, consulting engineer, New Zealand; L. W. Odell, of the Odell Construction Co., Los Angeles; Dr. W. F. Durand, consulting engineer, Stanford University; Gr. de Uff. le Dre. Ing. Albino Pasini, Prof. al R. Politecnico di Milano, Deputato al Parlamento, Milan, Italy; and Prof. William J. McCaughey, head of Department of Mineralogy, Ohio State University, Columbus, were among the recent visitors to the Boulder Canyon project.

Public Works Engineer Honored

Arthur S. Tuttle, New York State engineer for the Public Works Administration, has become president of the American Society of Civil Engineers. Selection of Mr. Tuttle to head the oldest national engineering society, comprising 15,000 members throughout the United States, is further recognition by the engineering profession of the high type of engineers employed by the Public Works Administration. As State engineer for New York Mr. Tuttle occupies one of the most important positions in the field organization of the Public Works Administration. Many other nationally known engineers have been brought together both in the field and in the Engineering Division in Washington, giving P. W. A. an engineering personnel that is outstanding.

Mr. Tuttle was born March 26, 1865, at Burlington, Conn. He was graduated in 1885 from New York University with the degrees of B. S. and C. E. From his graduation until 1901, he served in various engineering capacities on the development of the Brooklyn water supply. He then took charge of an investigation for the development of irrigation and water power in Hawaii. From 1902 until March 1933 Mr. Tuttle was connected with the Board of Estimate and Apportionment of the city of New York as assistant engineer, deputy chief engineer, chief engineer, and consulting engineer. From April 1933 to August of the same year he was a member of the New York City Emergency Work and Relief Administration. Since August 1933 he has been New York State engineer for the Federal Emergency Administration of Public Works, as well as resident project engineer for the Government on the construction of the Triborough Bridge.

P. Hoffman, of the Denver legal staff, while on a brief visit to members of his family in the Capital City, called at the Commissioner's office.

H. A. Parker, superintendent of the Shoshone project, has been placed in charge of investigations at the Buffalo Rapids project, Mont. Preliminary studies in connection with this project were started the latter part of January.

An appreciative audience of more than 300 students and guests of the Columbia Technical Institute of Washington, D. C., recently enjoyed a most interesting lecture on Boulder Dam given in the auditorium of the Interior Department by L. H. Mitchell, reclamation economist of the Bureau of Reclamation, Department of the Interior.

Mr. Mitchell's 29 years of experience in reclamation work made his lecture most interesting, as well as authentic. His talk was illustrated by four reels of fine movies and a beautiful collection of colored lantern slides.

Word has been received that Victor G. Evans, employee of the Bureau of Reclamation for many years, was killed recently at Indio, Calif. Mr. Evans was employed in various capacities by the Bureau from 1913 to 1928. His last assignment as chief clerk of the Rio Grande project terminated with his resignation on December 24, 1928. Mr. Evans had been working recently for the Metropolitan Water District of Los Angeles, Calif. He was killed when his automobile collided with a truck.

Marshall N. Dana, of the Oregon Journal, Portland, called at the Washington office on January 14. Mr. Dana was in the city on a brief visit.

R. C. E. Weber, superintendent of the Yuma project, is recovering from severe injuries sustained on January 18, when on an official trip his car collided with another machine near Blythe, Calif.

Charles H. Lillingston, chief clerk and fiscal agent on the Orland project, having been employed by the Bureau since 1909, was retired from the service on account of ill health effective April 1, 1934. Mr. Lillingston is now living at Marceline, Mo.

The peak of employment on the Boulder Canyon project occurred on July 20, when 5,251 were listed on the pay rolls of the Government and contractors.

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ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead,** Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; Miss Mary E. Gallagher, Secretary to the Commissioner; George O. Sanford, Chief, Engineering Division; Wm. F. Kubach, Chief Accountant; Charles N. McCulloch, Chief Clerk

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Eugineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies, Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. . Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal ageut	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
Carlsbad	Carlshad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen [1]	C. M. Voyen	W. J. Burke	Billings, Mont.
Columbia Basin, Grand Coulee.	Almira, Wash	F. A. Banks	do	C. B Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
Grand Valley	Grand Junction, Colo	W. J. Chiesmau	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Engineer	George B. Snow		do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent	N. G. Wheeler	C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Resident engr	H W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	J. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif			George H. Bolt		R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wentzell [1]	C. B. Wentzell	W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo	H. A. Parker	Superintendent	L. J. Windle [1]	Denver office	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Denver office	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Engineer			J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		Denver office	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Constr. engr	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo	C. B. Elliott	Engineer	do	do	do	Do.
UpperSnake RiverStorage.	Idaho Falls, Idaho	H. F. Bahmeier	Associate engr			B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz	R. C. E. Weher	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal.

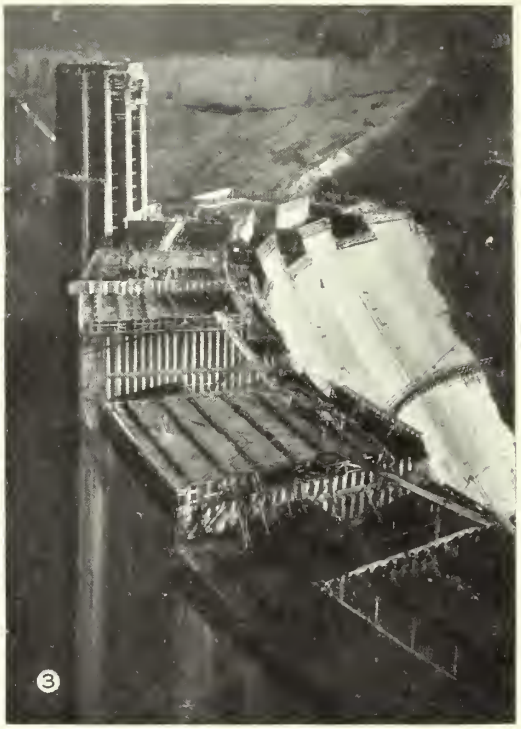
Projects or divisions of projects of Bureau of Reclamation operated by water users

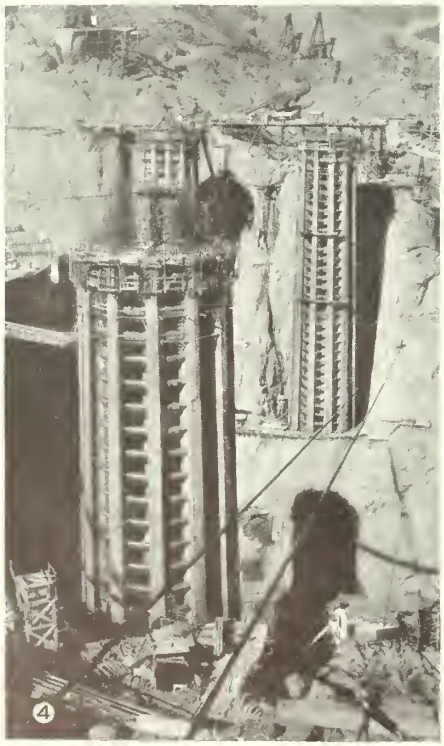
Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrig. dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	C. W. Tharp	Superintendent	C. J. McCormick	Grand Junction.
Huntley	Huntley irrigation district	Ballantine, Mont	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Irl Davis	President	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	D. E. Norton	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	F. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district.	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo	Bert L. Adams	do	Nellie Armitage	Torrington.
Northport division	Northport irrigation district	Bridgeport, Nebr	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan
Salt Lake Basin (Echo Reservoir.)	Weber River Water Users' Association.	Layton, Utah	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Gen. supt. and ch. engr	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	Superintendent	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigation district	Fairfield, Mont	A. W. Walker	do	A. W. Walker	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg	E. D. Martin	do	Euos D. Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley Water Users' Association.	Montrose, Colo	C. B. Elliott	do	Wm. W. Price	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	do	R. E. Randolph	Ellensburg.

Important investigations in progress

Project	Office	In charge of—	Title
Buffalo Rapids	Powell, Wyo	H. A. Parker	Superintendent.
Colorado River Basin, sec. 15	Denver, Colo	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes investigations	Bend. Oreg	C. C. Fisher	Engineer.
Gila Valley	Denver, Colo	P. J. Preston	Senior engineer.
Grande Ronde investigations	Stanfield, Oreg	Foster Towle	Associate engineer.
San Luis Valley	Denver, Colo	R. F. Walter	Chief engineer.
Umatilla River investigations	Stanfield, Oreg	Foster Towle	Associate engineer.
Upper Colorado River investigations			

SALLIE A. B. COE, *Editor.*





BOULDER CANYON PROJECT MAKES RAPID PROGRESS

1, Thirty-foot diameter penstock pipes awaiting transportation to damsite; 2, Boulder City, Nev., as seen from air; 3, top working of dam seen from point slightly upstream on Nevada rim. Top forms at elevation 1145. Downstream Arizona intake tower in upper left; 4, downstream Arizona intake tower with the two Nevada intake towers in background, seen from Arizona canyon rim; 5, Thirty-foot diameter penstock pipe section ready for hoisting into position beneath beader tunnel No. 3; 6, looking obliquely upstream along overflow weir of Arizona spillway. View shows piers with 16 x 100-foot drum gates in lowered position.

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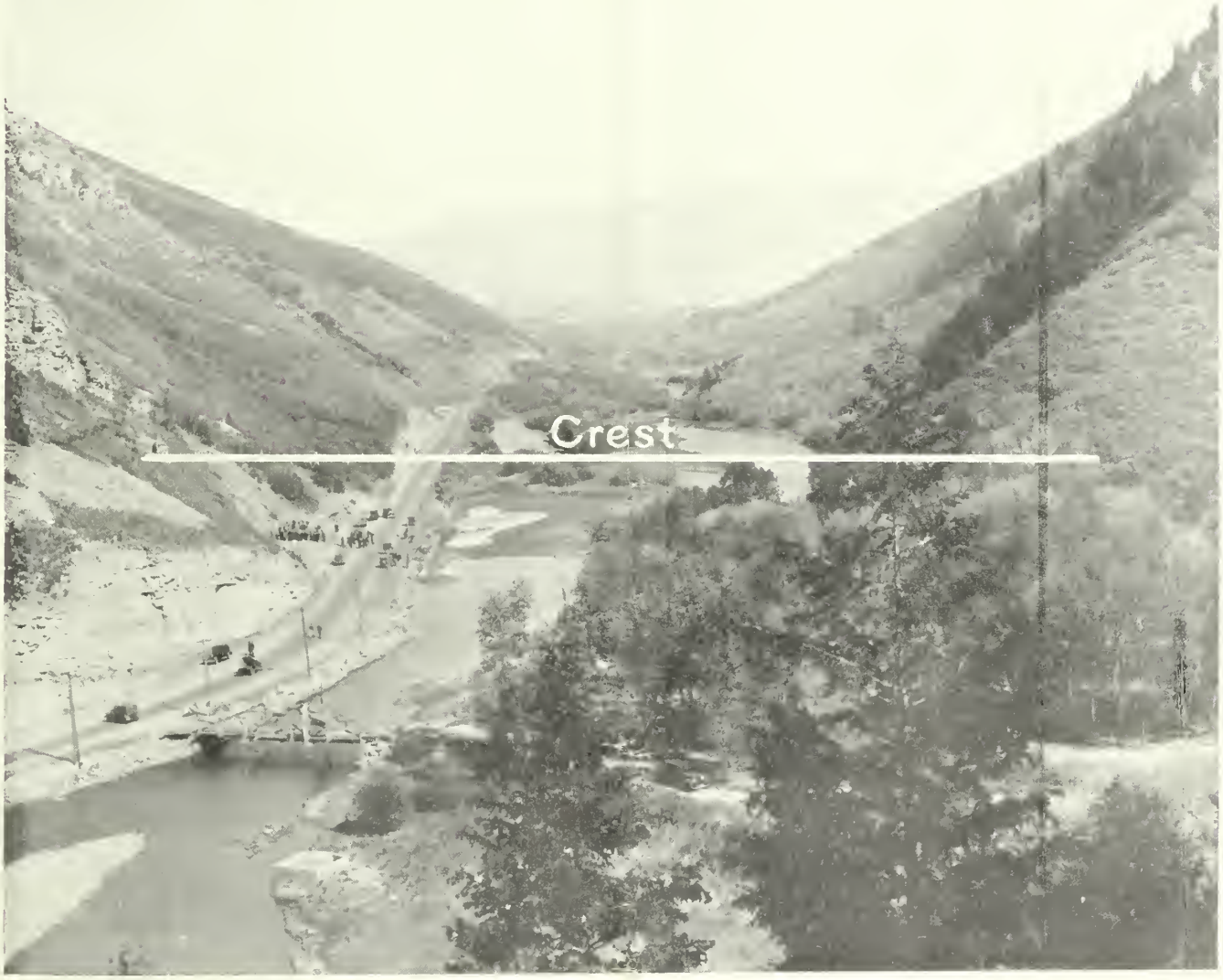

PINE VIEW DAMSITE, OGDEN RIVER PROJECT, UTAH, SHOWING CREST OF DAM

THE NATIONAL PUBLIC DOMAIN POLICY UNDER THE NEW TAYLOR GRAZING LAW

"The Nation cannot afford unduly to restrict or hamper the enterprise of the men of the West upon whose energy and initiative the whole people must depend for their beef and their mutton and the byproducts that flow from your great industry. So interested is the Federal Government in fostering and building up the livestock industry that it has been decided, as a matter of paramount national policy, that no one in the future will be permitted to destroy the range or impair its capacity to graze the herds that will become increasingly dependent upon it. Fortunately, in this instance the interest of the Nation and of the industry go hand in hand. You stockmen know that you cannot continue in business without sufficient forage for your herds and flocks. Enlightened self-interest calls for whole-hearted support by you of the policies declared by the Taylor grazing law. And on our part we want to work with you in a spirit of helpful cooperation.

"Not only self-interest, but a patriotic regard for the highest interest of the Nation will impel you, I am sure, to work hand in hand with your Government in making this epochal act the means of a major contribution to the prosperity and contentment of the whole people. I want to emphasize that the policy of the Federal Government, as expressed in this law, will be not only to protect and administer the range in the interest of your essential industry; it will be equally our policy to give to the small, independent stockman that protection which he so badly needs and which he has so sadly lacked in times past. The public range is to be devoted to the greatest good of the greatest number of those dependent upon it. Size will not count as against this dedication to the common good; political influence will be of no avail. In more ways than one, the Taylor grazing law is not merely a regulatory measure to upbuild and maintain the public range and to control its use in the interest of the stockmen of the Nation. It is a Magna Charta upon which the prosperity, well-being, and happiness of large sections of this great western country of ours will in the future depend."

Excerpts from address by Secretary of the Interior Ickes before meeting in Denver on February 12, 1935, of western officials to develop the national public domain policy under the new Taylor grazing law

THE

RECLAMATION ERA

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HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

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Reclamation as a National Policy

By Marshall N. Dana, President, National Reclamation Association [1]

THE times have brought us to a showdown on reclamation as a national policy. We are ready for it. We are ready in the deep conviction that the national administration will approve and that nature itself will validate the essential place of reclamation in the economy of the Nation and in the attainment of the great goals of security and human happiness.

During the year 1934 reclamation assumed a place in the national recovery program, of which its sponsors may well be proud. By direct authorization from the President, the Administrator and the Federal Board for Public Works, allocations exceeding $200,000,000 were used and are now being used to place reclamation on a solid and self-sustaining foundation. Nor do I hesitate to predict that administration confidence in the worth of reclamation and in the United States Bureau of Reclamation will be demonstrated by further allocations to meet well-determined needs.

Great land and water programs have occupied the energies of wide-spread organization created by direction of the President and will be submitted to the present Congress. In these programs reclamation has also the honor to take a conspicuous position, not only as an integral part of the values to be created and conserved, but as ideal demonstrations of the feasibility of the storage of water, the prevention of floods, the beneficial use of the water upon the land, the collateral development of power, the checking of soil erosion, the research and soil analysis necessary to determine fertility, and the economic desirability of land use, coupled with the general planning of community growth, industrial development, transportation extension, and market relationships that, in turn, become the human establishments of the more abundant life.

Ended by nature, the past season, was the argument to prove the essential place of reclamation. While devastating drought was world-wide and its effects were tragic, agriculture maintained by moisture artificially applied helped to meet the emergency. The mountains were seen, when other sources failed, as reservoirs of life itself. The American people had reason to paraphrase, "We will look unto the hills whence cometh our help."

RECLAMATION DOES ITS PART

No other Federal division than the Bureau of Reclamation got on the job quicker, presented greater continuity of effort, employed more men in proportion to amounts spent or more nearly struck a balance in employment in eastern industries to build the machinery and equipment of reclamation and its related activities. In reviewing the reclamation work now underway, we find the accompanying figures, as covered by the outline, effective in November 1934, from the Bureau of Reclamation.

These figures, of course, do not represent the final cost of authorized projects.

Our present concern is with very large questions. Answers must be given. Reclamation as a national policy to be continued with full Federal assistance and loyal western cooperation has been named. I submit also the desirability of further large and wise planning to chart the areas suitable for future reclamation in readiness for development as need appears. A program should be made covering the projects desirable for at least the next 25 years. These plans should not outrun demand but should anticipate. The time to begin is now. In fact, the beginning has been made. It has been made at the direction of the President of the United States. It was made by him not only when his approval rested upon the inclusion of reclamation in the Public Works program, but it was expanded by him in the great studies for utilization of land and water, affecting the productive areas of the entire country. These studies and the programs for land and water use that are in prospect will as certainly include the reclaimable areas of the United States as any others.

Some of the legislative and land use suggestions offered more than a year ago to the President, the Congress, the Secretary of the Interior, and the Commissioner of Reclamation, were as follows:

1. That the authorized reclamation program be continued, either by direct congressional appropriation in aid of meritorious projects, or by allocations from a further Public Works fund.

State	Project	Allotment
Oregon	Deschutes	$50,000
Arizona-Nevada	Boulder Canyon	38,000,000
Oregon-Idaho	Owyhee	6,500,000
Oregon	Vale	1,000,000
Washington	Yakima-Kittitas	60,000
Do	Grand Coulee	15,000,000
Colorado	Denver office	20,000
Wyoming	Casper-Alcova	12,000,000
Arizona	Yuma	120,000
Idaho	Boise-Kuna	31,000
Do	Boise-Notus	9,000
Do	Upper Snake River Storage.	4,000,000
Do	Minidoka-Gooding	30,000
Montana	Bitter Root	100,000
Do	Milk River	65,000
Do	Chain Lakes storage	2,000,000
Do	Sun River	600,000
Nevada	Newlands (Truckee storage).	1,500,000
Do	Humboldt	2,000,000
New Mexico-Texas.	Rio Grande	500,000
Oregon	Stanfield	100,000
Utah	Hyrum	930,000
Do	Ogden River	3,000,000
Arizona-California.	All-American Canal	9,000,000
Do	Colorado River Indian Reservation.	25,000
Arizona	Gila Valley	75,000
Utah	Provo River	2,700,000
Do	Moon Lake	1,500,000
Do	Sanpete	300,000
Colorado	Uncompahgre	2,725,000
Arizona-Nevada	Boulder Canyon (industrial survey).	25,000
Oregon	Umatilla River	10,000
Colorado	San Luis Valley	900,000
Oregon	Grande Ronde	10,000
Arizona-California.	Parker Dam	2,000,000
		106,885,000

2. That the test of feasibility be favorable reports submitted by the United States Bureau of Reclamation disclosing

[1] Report by Mr. Dana presented at recent meeting in Salt Lake City of National Reclamation Association.

the economic and social necessity of the project, its soundness from thorough engineering analysis, and, preferably, its noninclusion of new or raw lands unless as part of a program to retire in just proportion other areas deemed to be marginal.

3. That a Federal program for the retirement of marginal lands shall include marginal lands within reclamation projects.

4. That a policy of nonrepudiation of contractual relations shall be maintained rigidly between Federal Reclamation projects, their settlers, and the United States Government, the Bureau of Reclamation.

5. That Federal assistance, through the Reconstruction Finance Corporation, in the refinancing of projects organized under state law shall be made to include all projects that qualify under test of feasibility and necessity, that appropriations shall be made to cover, and that other nonprofit irrigation and reclamation projects be given the same time and opportunity for refinancing with Federal assistance as those organized under State law.

6. That naval petroleum reserve lands subject to drainage by other petroleum operations shall be restored to the public domain and to the jurisdiction of the Secretary of the Interior.

7. That cooperation of Federal and State agencies shall be continued and fully sustained in records of water supply necessary to effective and prudent administration of irrigation enterprises.

8. That the liberal, fair, and far-reaching program of the Congress, the President, the Administrator of Public Works, and the Commissioner of Reclamation in continuing and supporting reclamation as a national policy has the support and gratitude of the National Reclamation Association and its constituent members.

EVERY REGION IS ENTITLED TO ITS AGRICULTURE

There was also presented a general statement, "The West Must Farm." This statement set forth that every region is entitled to its agriculture as a balancing factor in other developments and as an essential in general progress. It was repeated to the United States Senate by Senator J. P. Pope, and incorporated in the Congressional Record.

In furtherance of the plan for the placing of settlers from drought-blighted districts upon available areas of Federal reclamation projects. I met Commissioner Mead at St. Louis last June, and he instituted activities looking toward a definite understanding of the areas available and the steps that should be taken.

During the President's journey eastward, after his remarks on the coast, a further opportunity was had to discuss with him the problems of western development and to offer a recommendation for the coordination in the field of Federal agencies concerned with the constructive steps of recovery. This proposal was given favorable consideration and amplified in a formal outline subsequently submitted.

Protest was entered against the destructively critical article on reclamation as published in Collier's Magazine, under the authorship of Owen P. White. Assurance was given by William Chenery, publisher of Collier's that correction of acknowledged inaccuracies would be made through publication of an article by Secretary Ickes. This appeared in the issue for December 8, 1934. As wide circulation as possible has been given the statements setting forth what we believe to be correct and just as they relate to reclamation.

AN INVENTORY OF WESTERN WATER RESOURCES

An inventory of the water resources of the West was discussed by the writer with Senator J. P. Pope, of Idaho, and subsequently presented by Senator Pope in the form of a proposal to the President of the United States. Very shortly thereafter the President ordered an inventory of the water resources of the United States, including the western area. This was made and reported, and was placed in the President's hands in connection with his general report and recommendations to Congress.

The following recommendations were presented to the recent Conference of the National Reclamation Association held in Salt Lake City, Utah:

1. The continuance and completion of the soil and water surveys;

2. The prosecution of the national progams of land and water utilization, in which reclamation shall be integrated as an essential;

3. An attitude on the employment of revenues from power plants developed incident to reclamation projects that shall represent the broad and careful judgment of those interested in western reclamation;

4. The continuance of reclamation as a national policy;

5. The additional studies and planning indicating the desirable future program for reclamation, with the allocations necessary;

6. The desirability, or otherwise, of continuing the moratorium on construction payments;

7. The organization of strong State reclamation groups where these do not exist, and the assumption of full responsibility by all reclamation groups.

I am convinced that we as members of the National Reclamation Association should adhere as strongly as before to the highest standards of honor and integrity in contractual relationships between th Federal Government and the reclamatio projects.

It should be the accepted duty of th directors elected in representation of th reclamation States to bring about Stat organizations where these are lacking an to maintain all State organizations in ful vigor and efficiency. The necessity of ac tive and responsible performance of duty on the part of directors will be even mor apparent in the future than in the past.

RECLAMATIONISTS—PAST AND PRESENT

Last year I called by name those to whom gratitude was due and to whom my appreciation as president of this association was offered for loyal support and cooperation. I again repeat that we are deeply indebted to President Roosevelt, to Secretary Ickes, to Commissioner Mead, to our western Senators and Representatives, and to the splendid engineering, legal, and construction staff that are carrying authorized projects to completion. The number of the loyal and active friends of reclamation has increased; its enemies are fewer. The support of officers and directors has been an encouragement, and without the staunch and devoted work of Kenneth Miller, secretary of the association, I would not have cared to undertake my own part of the duty. We are indebted to the generous and disinterested help given by the transcontinental railroads, and they have set a standard of cooperation worthy of emulation by others, including our own affiliated groups.

Death robbed us the past year of the treasurer of this association, A. E. Larson, of Yakima, and director for Washington in this association. Mr. Larson rendered his service so ably and efficiently and yet so joyously and congenially that the day of his death marked the passing not only of a supporter of reclamation, but a friend whom I cherished and whom I sorely miss. By appointment of the Honorable Clarence D. Martin, Governor of Washington, H. Lloyd Miller, of Sunnyside, long and zealously identified with reclamation, has succeeded Mr. Larson as director from Washington. We welcome him.

Reclamation, in the past year, has made an unexampled progress. It was progress that marked the fitness of reclamation for the recovery program and the readiness to go ahead that had been made possible by the wisdom and the engineering skill represented by the Bureau of Reclamation. But it was progress also due to the fact that at the zero hour the West organized, that it spoke with one voice and went forward as one man. We deal, still, with the emergency that created both N. R. A.'s—the National

(Continued on p. 48)

Project Water Supply Conditions

HEAVY rains and snowfalls in the West during the month of January, which made possible the early commencement of water storage in the Boulder Dam Reservoir, are accumulating in the storage lakes of other projects in the reclamation area in such amount as to assure water users of an adequate supply for this year's crops, Dr. Elwood Mead, Commissioner of Reclamation, Department of the Interior, states.

Throughout last summer's drought most of the water users in the western irrigation regions were able to secure enough water from the reservoirs for the crops. In some instances, however, the reservoir supply had run very low, and some consternation was felt for the 1935 growing season in case the precipitation again should be below normal.

Precipitation during the first month of this year, however, has provided an adequate, and in some cases abundant, storage reserve in those reservoirs which successfully had balked the drought, and has alleviated fears for those reservoirs which had been drained extremely low. The snows of the past month have materially improved conditions in the higher altitudes by adding to the snow reserves, which in turn are draining into the rivers and streams, and then into the reservoirs, and the rains, besides replenishing soil moisture, are also raising the water levels of the reservoirs.

The benefits from January precipitation are widespread, but outstanding improvements have been noted on the Newlands project, Nevada, and the Minidoka project, Idaho. At the end of December, Jackson Lake, on the Minidoka project, had a limited water supply of 85,180 acre-feet, but by the end of January had an adequate content of 114,760 acre-feet. Similarly, the American Falls Reservoir, also on the Minidoka project raised from the limited number of 250,320 acre-feet in December to 396,260 acre-feet in January. Lake Walcott, on the same project, increased from 61,720 to 64,800 acre-feet.

The Boise, Idaho, reclamation project had 4.12 inches of rain during the month of January, and at the end of the month 30 inches of snow stood on the ground. This raised the water supply in the Arrowrock Reservoir to 51,360 acre-feet, and in the Deer Flat Reservoir to 73,274 acre-feet, providing for irrigators in southwestern Idaho assurance of an adequate water supply for the next growing season. In the same State the Minidoka project reported distinct raises in its reservoir levels, with 114,760 acre-feet in Jackson Lake, 396,260 acre-feet in American Falls Reservoir, and 64,800 acre-feet in Lake Walcott.

The Klamath project, Oregon, which has three storage reservoirs, reported 356,000 acre-feet in Upper Klamath Lake; 11,340 acre-feet in Clear Lake; and 9,830 acre-feet in Gerber Reservoir. At the Owyhee Reservoir, also in Oregon, a rise of 4.93 feet in the water surface during January increased the storage waters over 13,000 acre-feet, bringing the total at the end of the month to 174,130 acre-feet. The Umatilla project also reported a sufficiency of storage water, with 17,110 acre feet in McKay Reservoir.

The Milk River, Montana, project in the belt of last year's drought, reported an adequate supply of storage water, with 23,040 acre-feet in Sherbourne Reservoir, and 18,967 acre-feet in Nelson Reservoir. From the Sun River project, in the western part of the State, figures show that the Gibson, Willow Creek, and Pishkun Reservoirs all have more than enough storage water.

Although the Rio Grande project, New Mexico and Texas, in 1934 had the second lowest inflow in its history, the other having occurred in 1902, the prospects now indicate that the 1935 supply of water will be sufficient for all needs. Five hundred seventeen thousand nine hundred and twenty-nine acre-feet of water are now stored in the Elephant Butte Reservoir. Dona Ana County, N. Mex., which is irrigated by this project, reported a cotton yield of 1.45 bales per acre, which is believed to be the largest production of any county in the United States.

Salt Lake Basin, Utah, reported 11,420 acre-feet in Echo Reservoir. The Hyrum project, Utah, also reported an adequate supply.

Western Nevada, in the vicinity of the Truckee storage project, will have sufficient water for this year's growing season. Snow stood at 7 feet on the level at Truckee in January.

The Yakima project, Washington, reported that the 723,905 acre-feet of water now stored in Tieton Reservoir is more than enough for this year.

The Orland project in California also reports an abundance with 65,600 acre-feet in the East Park and Stony Gorge Reservoirs.

Owing to extreme depletion of ground water and storage on several of the projects last year and accumulated deficiencies in precipitation since October 1, 1934, only slight improvement in run-off prospects were noted. At Belle Fourche, S. Dak.; North Platte, Wyo. and Nebr.; Strawberry Valley, Utah; Carlsbad, N. Mex.; and Salt River, Ariz., the water supply is limited. The Riverton project, Wyoming, is suffering power water short-

(Continued on p. 51)

Monument to Sugar Industry in Salt Lake City

According to an Associated Press article appearing in a recent issue of the Billings Gazette, the founding of the sugar industry in the western United States, which now turns millions of dollars annually into the pockets of farmers for sugar beets, was marked in Salt Lake City on November 17 with the dedication of a monument near the site of the first sugar factory built west of the Mississippi River.

"The monument, a 70-foot limestone shaft flanked by reflecting basins, is located in Sugarhouse, an outlying business district of the city. It was here in 1853 that Abram O. Smoot, father of former United States Senator Reed Smoot, under commission by Brigham Young, erected an adobe factory building that housed the pioneer sugar mill. The building, after having been put to numerous uses, was torn down only a few years ago. Its former site is now occupied by a retail market.

"Sugar at a dollar a pound prompted Brigham Young in 1849, 2 years after the arrival of the Mormon pioneers in the Great Salt Lake Valley, to send representatives to Europe to study manufacturing methods. They purchased machinery, shipped it by sailing vessel to New Orleans and thence up the Mississippi River. In 50 huge freight wagons, drawn by 200 oxen, it was started across the plains the following year, but became stormbound en route and spent the winter of 1853 in Wyoming. Next spring the equipment reached this settlement and was installed in the adobe factory.

"The machinery was inefficient, however, or the operators did not understand their task any too well, for the first efforts to make sugar from cane were a failure. The growing of beets was encouraged and they later were substituted, but it was not until 1891 that the first carload of white granulated sugar was made. It was declared to have been the first ever made from beets grown by irrigation.

"Sixteen sugar factories in Utah now spend upwards of $5,000,000 annually for beets grown in the State, and others in southern Idaho, Montana, Wyoming, and Colorado make a like contribution to farmers of the intermountain West.

"The monument was erected at a cost of $20,000 from donations by the city, the Latter Day Saints Church, and individuals."—*The Billings Gazette.*

Visitors to the Boulder Canyon project in January numbered 25,751, and vehicles 7,738. Of these, 769 persons and 268 cars were traveling the route from Kingman via the Black Canyon Ferry.

Owyhee Project, Oregon-Idaho

By Ferd Schlapkohl, Engineer

The Owyhee project experienced a good year in 1934. For the lands already irrigated, the water supply was ample, crop yields large, and prices reasonable. On the canal system from the Owyhee Reservoir, construction progressed rapidly, with ample funds, an average of six principal contractors, and about 600 men employed. On the new lands homeseekers crowded in from less favored sections, settlers with money to pay half down on their lands, to build houses and to drill wells. Malheur County is now a specially favored section with little unemployment, little suffering from drought, and with every house occupied in the towns.

Most crops have done better than usual. Alfalfa has yielded heavily with either four cuttings or three and a good crop of fall pasture for which there has been much demand on account of dry outside range. Corn was planted early and matured well. Green peas, baby lima beans, head lettuce, and other like crops produced splendidly. Apples were disappointing on account of multitudes of pests surviving the mild winter. Most crop prices were fair and the egg and butter fat markets especially had improved.

CONSTRUCTION ACTIVITIES

In the field of new construction the monumental Owyhee Dam stands complete, the canals and main laterals on the Mitchell Butte division are practically completed, and a good start has been made on the sublaterals.

For the Dead Ox Flat division, bids have been received for the construction of the 4-mile Malheur River siphon, for 28 miles of main canal, and for one trunk drain, thus completing the North Canal and leaving only the division laterals for later advertisement. The wide spread interest among contractors in the long siphon was gratifying and the bid prices favorable.

On the South Canal leading to the Succor Creek division, which is largely in Idaho, bids will be called at once for 14 miles of main canal within Oregon, including one mile of tunnels and several important structures. The remainder of the South Canal, which is in Idaho, will be advertised soon, leaving only laterals and drains in this last division of the project.

Work on laterals, drains, and other improvements will be kept going and the long program of construction on the Owyhee project drawn rapidly to a close.

ECONOMIC OPERATIONS

Settlement and project operation are becoming the main interests. It is planned to deliver water through the new system to about 10,000 acres next spring and to gradually extend the operation through 2 or 3 succeeding years. The demand for land, both raw and cultivated, is good. Settlement is being directed by the Vale-Owyhee Land Settlement Association with a full-time secretary, Mr. Frank Morgan, located at Nyssa, Oreg. Mr. Morgan reports that land has been sold to settlers from Canada, Oregon, Washington, Utah, Montana, the Dakotas, Nebraska, Colorado, Wyoming, Arizona, California, and Idaho. Inquiries have come from the United States, Canada, England, Hawaiian Islands, and Dutch Guiana. The usual units sold are 40's and 80's. The selling price in all instances except two has been the appraised value and the usual terms one-half down and the balance in 5 years, although several sales have been made for all cash. The selling argument is that bumper crops have been grown on the adjoining lands in this year of drought. Less than 1,000 acres remain to be sold of the lands to be irrigated in 1935.

Reclamation, A Natonal Policy

(Continued from p. 46)

Recovery Administration and the National Reclamation Association. We need not less, but greater harmony of purpose and union of effort. Reclamation belongs to the times and it is timeless. It is as ancient as the skill of man, as modern as the airplane and the radio. In it we find our homes, our fortunes, and our future. Without reclamation western progress stops.

North Platte Valley Receives $50,000 Allotment

An allotment of $50,000 for a survey to determine the availability of the water supply in connection with proposed irrigation projects in the North Platte Valley, Nebr., was announced today by Public Works Administrator Harold L. Ickes.

The allotment was made to the Bureau of Reclamation, Department of the Interior, which will make the survey.

Allotment for North Transmountain Diversion

Public Works Administrator Harold L. Ickes has announced an allotment of $150,000 for an investigation and report on the proposed northern transmountain diversion from the basin of the Colorado River to the basin of the South Platte River in Colorado. The plan to be studied contemplates diversion from tributaries of the Colorado River on the western slope of the Rocky Mountain Divide to supplement the water of the South Platte across the mountains to the east.

Preliminary investigations have disclosed the quantity of water from the Colorado River to which the State of Colorado is entitled is in excess of the amount that can be beneficially used on the western slope, while there is a shortage on the farms and in some of the towns within the irrigated area of the South Platte Valley.

The investigation provided for by this allotment is to include:

1. Engineering and geological surveys and investigations to determine the most feasible location for such transmountain diversion, together with the preparation of preliminary plans and estimates.
2. A determination of the amounts of water that can practicably be diverted without injury to western slope interests.
3. A determination of the areas to which diverted waters would be furnished and the economic value thereof.
4. A determination of the present and probable future western slope irrigation development in Colorado affected by such prospective transmountain diversion.
5. Survey and investigation of reservoir sites on the western slope of suitable location and capacity to enable replacement of waters that can physically be impounded or diverted for the eastern slope to the extent that such waters are needed for present and prospective irrigation on the western slope in Colorado.

The allotment was made to the Bureau of Reclamation, Department of the Interior.

The following paragraph from the latest report of the Carlsbad project speaks for itself:

"Building in Carlsbad has been quite active; one new store building and a few residences are being put up, together with the new post office. Considerable interest is being shown in oil prospecting to the east of the project. Work on the Red Bluff Dam is being pushed rapidly. The potash mines are working steadily. The Park Service has started laying a pipe line from Rattlesnake Springs to the Caverns to increase their domestic water supply."

ENGINEERING

Boulder Dam Nears Completion

By Wesley R. Nelson, Associate Engineer, Boulder Canyon Project

MAN'S challenge to the forces of the Colorado, as exemplified by his daring to throw the barrier of Boulder Dam across its channel, appears to have been refused, and the river is submitting quietly to the yoke of man's control. On only two occasions during the construction period have sudden floods caused inconvenience, and the peak flows of the year have never approached the expected maximum.

Now, with the dam raised to its crest height, excepting at the 8-foot middle slot, all plugs installed in diversion tunnels, with the river coursing through one of the Nevada tunnels under control of slide gates, and the building of all other features of reservoir regulation well advanced, the importunities of those concerned with the benefits to be obtained from the project are for "bigger and better" floods to fill the reservoir.

"That's an awful big hole to fill with concrete", has been the remark of more than one observer when viewing the canyon from its rim, and truly mountainous were the amounts of materials required, more than 3,000,000 cubic yards of concrete, containing more than 3,000,000 barrels of cement and nearly 6,000,000 tons of sand, gravel, and cobbles. The volume of the dam is greater than the largest pyramid in Egypt, its thickness at the base is more than the length of two ordinary city blocks, and its height from bedrock to crest nearly that of a 60-story building.

The actual placing of this immense quantity of concrete was only one of the problems, as the tremendous mass concentrated in a relatively small space, and the enormous pressure of water on the canyon walls and upstream dam face introduced questions of design that have never confronted builders of smaller structures. Boulder Dam, rising 727 feet above bedrock, having a base thickness of 650 feet and crest thickness of 45 feet, would retain the setting heat generated by the setting of the concrete for several hundred years if cooled by natural processes. During this time the changes in volume would result in the opening of undesirable and possibly dangerous cracks throughout the dam.

A solution of the problem required the dissipation of the setting heat during the time of construction, designing the structure so that the cracks formed by cooling would occur in designated positions and the filling of the cracks with a cement-water mixture of grout after cooling had been completed. The dam was built in a group of approximately 230 vertical columns of 25 to 60 feet in horizontal section, the joints between the columns being placed parallel to the axis of the dam or at right angles to it. Interlocking keys were formed between the faces of columns and on top of each 5-foot pour of concrete.

Cooling tubing of 1 inch diameter was placed at 5-foot vertical and 5-foot 9-inch horizontal distances throughout the dam, requiring approximately 580 miles of pipe. Each line of tubing ran from the supply header in the 8-foot vertical slot in the middle of the dam out to an abutment and back to the return header in the slot. Grout outlets were installed on the sides of all columns at spacings of approximately 5 feet vertically and 5 feet 9 inches horizontally. These were joined to ½-inch diameter feeders which in turn were connected to 1½-inch and 2-inch diameter headers requiring approximately 200 miles of pipe when completed.

Water at two different temperatures, termed precooling and refrigerated, was pumped through the cooling lines. The precooling water was furnished from an atmospheric tower and entered the dam at temperatures varying from 45° to 89° F. Refrigerated water was supplied by an ammonia plant and entered the dam at approximately 39° F. More than 400 electrical thermometers were installed throughout the structure for determination of temperature, and the extent of cooling was also ascertained by inserting thermometers 25 to 30 feet into the tubing after cooling water had been shut off for 24 hours. The temperature of the precooling water was increased as much as 21° and the refrigerated water 17° by its passage through the dam.

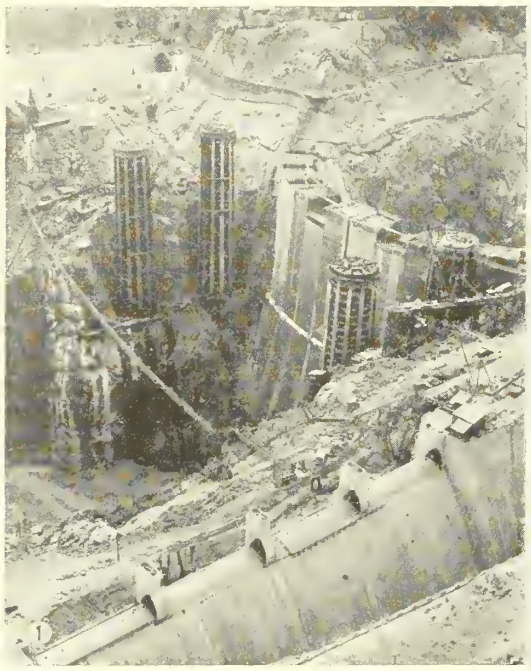
The atmospheric tower, ammonia plant, and circulating pumps were all placed on the lower cofferdam, a thousand feet downstream from the main dam structure. The refrigeration plant had a capacity on an ice producing basis of 1,000 tons in 24 hours, and the atmospheric tower supplied as much as 950 tons. About 3,500 gallons per minute of water usually passed through the cooling loops, and the rate of flow was 3 to 4 gallons per minute through each. A 50-foot lift in the dam was cooled in a period of 6 to 8 weeks, and cooling ordinarily proceeded at one time in a section of the dam 150 to 230 feet in height. Precooling water was circulated first, and after it had extracted the greatest practicable amount of heat was replaced by refrigerated water. The dam was cooled to an average temperature of 50° at the upstream face (varying from 43° at the base to 72° at the crest) and the downstream face to 71° (increasing from 63° at the base to 72° at the crest).

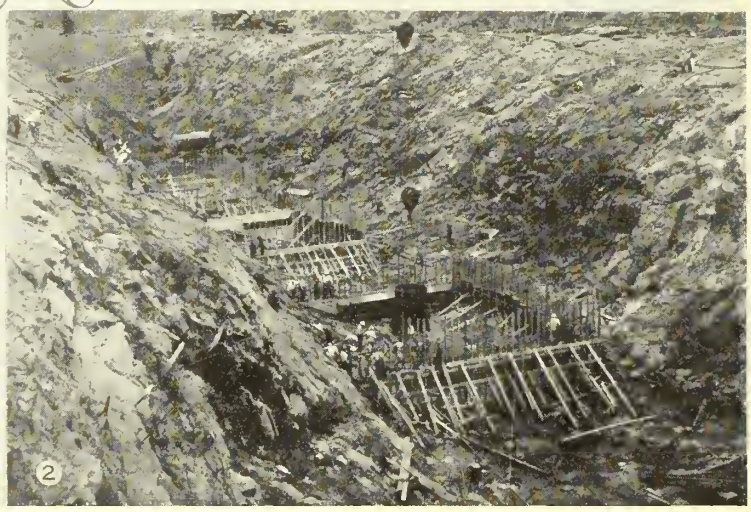
After a section of the dam, for example, from elevation 800 to 850, had been cooled to the stipulated temperature, the cooling headers were removed from the middle slot, and the slot poured to the higher elevation. The next step was the grouting of construction joints by forcing the cement-water mixture into the cracks opened up between the dam columns by the contraction due to cooling. The section thus cooled and grouted was allowed to resume the temperature of the surrounding medium, and the consequent expansion carried from column to column by the joint filling of grout placed the entire mass of concrete in compression and prevented cracking.

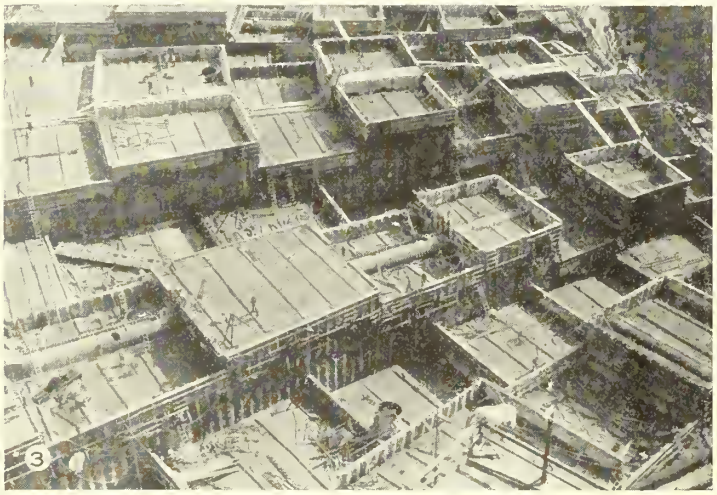
On March 1, 1935, cooling had been nearly completed to 50 feet from the dam crest, the slot was poured about 150 feet from the top, and grouting was practically finished within 225 feet of the crest. It is expected that all grouting will have been completed by June 1, 1935.

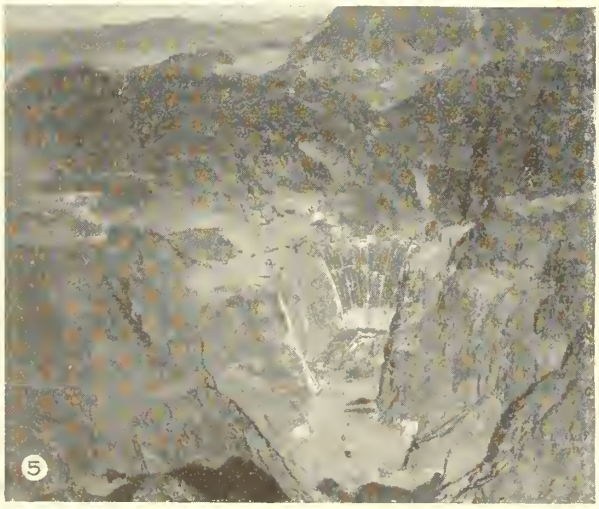
Construction record after construction record was broken as the contractor transformed Black Canyon from a narrow river channel to a dry gorge, and the dam structure and its contributing features

BOULDER CANYON PROJECT
ARIZONA-NEVADA









1, Upstream face of dam and appurtenant works seen from hill on Nevada side of Black Canyon; 2, First bucket of concrete placed in Boulder Dam proper on June 6, 1933; 3, Looking across dam structure from Nevada abutment. Top forms at an elevation 785; 4, Cleaning top concrete surface at construction joint preparatory to placing next higher lift in column; 5, Black Canyon and Boulder Dam seen from air. Top forms of dam at elevation 1165; 6 Placing the third millionth cubic yard of concrete in Boulder Dam.

rose from the canyon floor and canyon walls.

FIRST CONCRETE POURED

The 50 feet diameter tunnels for carrying the river around the dam were pushed through the canyon walls and lined with concrete in the first 2 years; the huge earth-fill cofferdams were raised in the next 5 months; and excavation for the dam was finished and the foundation rock made ready to pour the first concrete on June 6, 1933, 2 years and 2 months after operations were started in Black Canyon.

A million cubic yards of concrete were swung out over the canyon by cableways, lowered to pouring sites, and dumped in the steadily mounting pile of the dam within 6 months, and this rate of pour was maintained throughout construction. The third millionth yard was placed on December 5, 1934, and the remaining 250,000 cubic yards (excluding the middle slot, parapets, and miscellaneous features) in the succeeding 3 months, an average rate of pour of 5,400 cubic yards each 24 hours. Concrete-placing records established in this time were 3,000 cubic yards in 8 hours by 1 concrete-mixing plant (six 4-cubic-yard mixers); 10,417 cubic yards in 24 hours from 2 mixing plants (using eight 4-cubic-yard mixers); and the transporting of 277 buckets of concrete (approximately 2,100 cubic yards) by 1 cableway in an 8-hour shift.

Dam concrete was first furnished by four 4-cubic yard mixers at the low-level plant of the contractor, Six Companies Inc., located on the Nevada canyon wall 4,000 feet upstream from the dam and 75 feet above the river. Another plant of two 4-cubic yard mixers was later built on the Nevada rim approximately 600 feet downstream from the top of the Nevada abutment. The high-level plant was enlarged as concrete requirements demanded, finally containing six 4-cubic yard mixers when the low-level plant was abandoned and dismantled.

Special buckets were designed for placing the concrete, the one of 8-cubic yard capacity being of bottom-dump type, nearly 7 feet in diameter and 7 feet high. Pouring in constricted areas was accomplished by means of 4-cubic yard spout-dump buckets or 4-cubic yard agitators. Transportation of concrete to pouring sites was provided by special compartment type or flat cars hauled by electric or gasoline engines, and a group of five 25-ton cableways equipped with traveling end towers.

The 8-cubic-yard bottom-dump bucket was carried by the cableway hoist line through a direct sliding connection to the doors in the bottom of the bucket, thus providing insurance against the doors opening in transit. A latch on each side of the bucket also held the doors in closed position. The bucket was dumped by manually disengaging the latches and transferring the load from hoist lines to dump lines which were connected to the bucket rim, the weight of the concrete forcing the doors open. When the bucket released its 16-ton load of concrete, the rebound of as much as 25 feet was taken up promptly by the cableway operator. The doors were closed when transferring the load from dump line to hoist line, the latches locking automatically. All operations of the cableways were conducted by the hoist men in the head towers on the Nevada side, who received instructions by telephone for movements of the bucket from signalmen located at the loading and dumping sites.

The first pour for each 5-foot lift was a slurry of cement-sand-water grout sufficient to cover the top surface of the column. This was done to fill surface irregularities and provide better bond between the old and new concrete. Placing the 3,250,000 cubic yards of concrete in the dam required the loading, transporting, and dumping of approximately 450,000 buckets.

PERCOLATION OF WATER—PREVENTION

It is not within the province of this article to discuss the many details of construction and all of the various dam features, but even a short description would not be complete without mention of the particular attention that was given to prevention of percolation of water past the dam through the abutments and foundation.

A gallery in the dam, about 5 to 25 feet from the rock surface and containing many steps and spiral stairways, starts at the crest, follows the abutment downward to the base, crosses the base, and ascends the opposite abutment. A line of holes, at approximately 5-foot centers and as deep as 150 feet, was drilled from this passageway, and another line containing a similar spacing and depth of holes was put down immediately upstream from the upstream face of the dam. Rings of holes to depths of 150 feet were also drilled from the two inner diversion tunnels and the two upper penstock header tunnels at locations opposite the dam axis. Grout was forced into the openings at pressures as high as 1,000 pounds per square inch, the pressure being supplied by grout pumps. Holes in many cases required more than 1,000 sacks of cement to fill the connecting cracks, fissures, and crevices in the rock.

After grouting is completed, a line of 2-inch diameter holes, at approximately 10-foot centers and as deep as 100 feet, will be drilled from the gallery into the abutments and foundation along a line downstream from the line of grout holes originating at the gallery. Thus any water passing the "grout curtain" will be picked up by the drain holes, flow into the gallery, follow it downward to a drainage gallery and from there flow downstream through the dam to the tailrace of the power plant. All water accumulating below the elevation of the drainage gallery will be collected in a sump from where it will be lifted to the drainage gallery by pumping.

Any water seeping through the concrete at the upstream face of the dam will be intercepted by a line of internal drains spaced along the dam axis at 10-foot centers and consisting of vertical lines of porous concrete tile extending from the crest of the dam to the drainage gallery and to the passage below.

INSPECTION OF INTERIOR OF DAM

Inspection of the interior of the dam will be provided through the galleries previously mentioned and by six others, some of which cross the dam from abutment to abutment, and others extend up and downstream. There are also two larger passageways that lead to the powerhouse. Elevators running from the crest of the dam downward will furnish access to all galleries.

Work remaining to be completed includes the finishing of cooling and grouting operations, filling the temporary grouting galleries and the middle slot with concrete, installing elevators, finishing the powerhouse galleries, and building the crest parapets and their ornamentations. All this is expected to be completed by the summer of 1935, only 2 short years after the first concrete was placed in the dam base.

Man has again accomplished what was once so freely predicted he could not do. The question is often asked, "Who conceived and planned this great project?" and the answer must be, "No one man; it represents the accumulated knowledge gained by the engineers of the Bureau of Reclamation in 30 years of building similar structures."

Water Supply Conditions

(Continued from p. 47)

ages this winter due to the depletions of 1934 in the snow banks and glaciers. Considering January precipitation and assuming future conservation measures, it is felt that these projects will probably make considerable gain in their storage supplies within the next few months.

For reservoirs with concurrent records, the storage water on hand January 31, 1935, was 3,085,150 acre-feet as compared with 5,044,100 acre-feet which was stored in these reservoirs last January, before the drought. This is 93 percent of the storage on hand on January 31, 1932, the winter following the drought of 1931.

Notes for Contractors

Vale project, Oregon.—Specifications and plans have been completed for furnishing three 16- by 17-foot radial gates, three motor-driven double-drum radial gate hoists, two 3-foot-3-inch by 3-foot-3-inch high-pressure gates, and 42 inch diameter welded plate steel outlet pipes for the spillway and outlet works at Agency Valley Dam. The specification number is 616 and bids will be opened at Denver on March 20. All apparatus and materials will be installed by the Government.

Boulder Canyon project, Arizona-Nevada.—Under Specifications No. 643–D for furnishing insulated wire and cable for the Boulder power plant, 17 manufacturers submitted bids, which were opened at Denver on January 11. Three bidders, Graybar Electric Co., Inc., American Automatic Electric Sales Co., and the General Cable Corporation, submitted identical low bids of $84,214.72 for the seven schedules.

At the opening of bids under Specifications No. 654–D at Denver on February 6, the Victor Equipment Co., Los Angeles, Calif., was low at $10,070.62 for furnishing deep-well, turbine-type, motor-driven pumping units. This was a readvertisement of item 1 under Specifications No. 595. There were 10 bidders.

Bids were opened at Denver, Colo., on February 25, under Specifications No. 612, for furnishing and installing two 4,000-pound capacity and two 5,000-pound capacity automatic electrically operated passenger elevators, with total lifts of 117.5 and 528.33 feet, respectively, in the Boulder Dam and power plant.

Fourteen manufacturers submitted bids on February 4 for furnishing rolling, vertical folding, and swing doors (Specifications No. 651–D) for the Boulder Dam power plant and appurtenant works. The following bid $38,007 for items 1, 2, 3, and 4 (aluminum) f. o. b. Boulder City: Soule Steel Co., Cincinnati, Ohio; Cornell Iron Works, Long Island City, N. Y.; Moeschl Edwards Corrugating Co., Covington, Ky.; R. C. Mahon Co., Detroit, Mich.; J. G. Wilson Corporation, Norfolk, Va.; Kinnear Manufacturing Co., Columbus, Ohio; and George W. Johnson Manufacturing Co., Kansas City, Mo. The same companies, with the exception of the last-named bid $24,753 on items 5, 6, 7, and 8 (galvanized steel). The Kawneer Co., of Niles, Mich., is the apparent low bidder on items 9, 10, and 11 (aluminum vertical folding and swing doors) at $42,800 f. o. b. Niles.

The DeLaval Separator Co. submitted low bid of $13,050 for furnishing oil purifiers, filter-paper drier, and centrifugal oil tester for the Boulder power plant under Specifications No. 647–D, opening at Denver, January 28. There were four bidders.

The Westinghouse Electric & Manufacturing Co., Sharon, Pa., was low bidder, under Specifications 655–D, opening at Denver, February 11, for furnishing one portable high-potential test set and portable dielectric testing equipment for use in the Boulder power plant. Low bid was $9,640 and there were two bidders.

Twenty-one manufacturers bid on furnishing bulkhead gates for turbine draft tubes for the Boulder power plant under Specifications No. 648–D, opened at Denver on January 28. The Mississippi Valley Structural Steel Co., St. Louis, Mo., was low at $12,992 f. o. b. St. Louis. The bids ranged up to $25,919. Contract was awarded February 12.

Nineteen bids were received at Denver on February 7 under Specifications No. 609, for furnishing control cable supports and control tunnel car for the Boulder power plant. The low bid under item 1 (cable supports) was $23,950, f. o. b. Boulder City, submitted by the Midwest Steel & Iron Works Co., shipping from Lackawanna, N. Y., and Minnequa, Colo. The Bethlehem Steel Co. bid $470, f. o. b. Boulder City, under item 2 (car), with shipment from Johnstown, Pa.

Bids were opened at Denver on February 20, under Specifications No. 662–D, for furnishing 1 turbine gallery crane with 2 hydraulic jacking frames of 150 and 60 tons capacity, respectively; two 30-ton trolleys and 2 lifting beams for installation in the Boulder power plant.

Bids under Specifications No. 663–D were opened at Denver on February 25 for furnishing one 10-inch lathe, one 24-inch upright drill press, and one 10-inch pedestal grinder for installation in the Boulder power plant. The apparatus will be installed by the Government.

Joshua Hendy Iron Works, San Francisco, Calif., was awarded a contract on February 12 for furnishing five 30-inch sphere valves for station service penstock at the Boulder power plant (Specifications No. 610). Bids were opened in Denver on January 24, and 12 bids were received. The contract price is $18,669.26.

Specifications and plans for 86-inch Paradox gates and 72-inch needle valves for downstream plug outlet works are nearing completion in the Denver office. Materials and equipment for the power plant soon to be purchased include water heaters and coolers, gasoline-engine driven tractor, storage batteries, precision-test instruments and oscillographic equipment, 180-ton transformer transfer cars, ventilating apparatus, draft-tube gantry crane, and station service current limiting reactor.

Sun River project, Montana.—Bids were opened at Fairfield, Mont., on February 28 for the construction of earthwork and structures for open drains on the Greenfields division, Specifications No. 611. The Bureau is to purchase, for installation by the successful bidder, the following: 12,000 pounds of reinforcement bars; 1,200 linear feet of 18- to 30-inch diameter concrete pipe; and 5,200 linear feet of 15- to 30-inch corrugated metal pipe.

Plans and specifications are being prepared for additional lateral construction.

Uncompahgre project (Taylor Park Dam), Colorado.—Specifications and plans are being prepared for office and dormitory buildings, and bids for construction will soon be requested.

Eight contractors submitted bids on the construction of Taylor Park Dam (Specifications No. 594) at the opening on February 18 at Gunnison, Colo. The Utah Construction Co., Salt Lake City, Utah, Henry J. Kaiser Co., Oakland, Calif., and Morrison-Knudsen Co., Boise, Idaho, combined to submit the low bids, as follows: Schedule 1 (concrete-masonry dam), $784,742.50; schedule 2 (earth-and-rock-fill dam), $798,078.50. Five contracting firms bid on schedule 1 and seven bids were received on schedule 2.

Columbia Basin project, Washington—On March 4 bids were opened at Almira (Specifications No. 613), for the construction of a garage and fire station in the Government camp at Grand Coulee Dam. The building will be one story, and about 70 by 121 feet in size. Outside walls will be of concrete and the inside partitions of timber construction covered with portland-cement plaster over metal lath. Floor will be of concrete and the roof will be of timber construction supported on structural steel trusses. The building must be completed in 90 days after receipt of notice to proceed.

The American Bridge Co. submitted a low bid of $23,399 f. o. b. Odair, Wash., for furnishing materials for the construction of a steel warehouse at the Government camp, Grand Coulee Dam, under Specifications No. 645–D. Bids were opened at Denver on January 21, and 16 manufacturers quoted. The low bidder was awarded the contract on February 20.

Specifications No. 615 covering the construction of two 5-room and one 6-room residences in the Government camp site are ready for bidding. The opening date is March 22.

Clark & Earley, Seattle, Wash., bid $24,264.70 for constructing the warehouse building in the Government camp site (Specifications No. 659–D) at the opening

on February 11 at Almira. There were three other bids.

Bids were opened at Denver on February 26 for furnishing one 75-ton gantry crane with one 15-ton auxiliary hoist for the storage yard. The specifications are numbered 664–D.

Fifteen manufacturers submitted bids ranging from $2,596 to $6,450, at the opening on February 7 at Denver, for furnishing a 7½-ton motor-operated traveling crane (Specifications No. 653–D). The apparent low bidder is the Bedford Foundry & Machine Co., of Bedford, Ind.

In the construction of the Grand Coulee (low) dam, for which the Mason-Walsh-Atkinson-Kier contractors have a $29,000,000 contract, the Government will purchase the following materials: 5,000,000 barrels of cement; 25,000,000 pounds of steel reinforcement bars; 115,000 linear feet of metal sealing strips; 52,000 square feet of cork board; 6,232,000 pounds of gates and conduit linings; 45,000 pounds of control apparatus for gates; 1,000,000 pounds of penstock and draft-tube bulkhead gates; welded plate-steel penstock pipes, 18 feet and 4 feet 6 inches in diameter; three 21-foot 6-inch and two 60-inch hydraulically operated butterfly valves and operating mechanisms; two 375-ton and one 20-ton overhead traveling cranes, one 20-ton gantry, and two 150-ton gantry cranes; 203,000 pounds of track rails; 4,242,000 pounds of trash-rack metal work; 1,600,000 pounds of structural steel in power house; 1,200,000 pounds of metal tubing, pipe, fittings, and valves; 7,400 pounds of aluminum curbs and handrailings; 100,000 linear feet of electrical cable; 144,000 linear feet of electrical metal conduit; asphalt-saturated felt roofing, metal lath, stairways, floor plates, gratings, rolling and swinging doors, metal sash windows and operators, plumbing fixtures and hardware, and miscellaneous metal work.

Moon Lake project, Utah.—T. E. Connolly, of San Francisco, Calif., submitted the low bid of $547,221 for construction of Moon Lake Dam (Specifications No. 605) at the opening at Salt Lake City on February 4. There were five bids ranging up to $691,596. Winston Bros. Co., Minneapolis, Minn., bid $579,922 and W. W. Clyde & Co. of Springville, Utah, $585,419. The Bureau, through its Denver office, will purchase for this job 90,000 pounds of steel tunnel liner plates; 175,000 pounds of gates and other metal work; 870,000 pounds of steel reinforcement bars; 1,500 feet of drainpipes; and 740 linear feet of electrical metal conduit. The dam site is on the West Fork of Lake Fork of Duchesne River about 30 miles north of the town of Duchesne, and 80 miles northeast of Castlegate, the nearest railroad point. Six hundred days are allowed to complete the contract after receipt of notice to proceed.

Parker Dam project, Arizona-California.—Bids were opened at Denver, Colo., on February 5, for furnishing electric ranges, refrigerators, water coolers, water heaters, and space heaters (Specifications No. 652–D) for buildings in the Government camp. The apparent low bids received were as follows: Item 1, Malleable Iron Range Co., Beaver Dam, Wis., $445; items 2 and 4, Listenwalter & Gough, Inc., Detroit, Mich., $824.88; item 5, Edison General Electric Appliance Co., Chicago, Ill., $47.95 (f. o. b. Earp, Calif.); items 6, 7, 8, and 9, South Wesix Heater Co., Los Angeles, Calif., $656.84.

Six Companies, Inc., were notified on February 12 to resume operations on their $4,239,834 contract for construction of the Parker Dam and appurtenant works.

Owyhee project, Oregon.—Specifications are being prepared for construction of the South Canal to Jump Creek (Idaho) Kingman Main and K. D.–2.3 drains, and the Shepard Gulch drain. Structures on the South Canal, station 2 to station 736, in Oregon, are covered by Specifications No. 614 now being issued. Additional small lateral contracts will be let in the near future.

All-American Canal, California.—The canal from station 245 to station 1860 is now being constructed under contract. A section comprising 7 miles west of Calexico is being built by force account as a relief measure. The following plan of procedure for additional work has been prepared by the Denver office. The first work to be advertised for bids will be the section west of the sandhills, station 1860 to 3310, which should be ready for bidding immediately, as specifications are now being written. The levee section and canal from the Imperial Dam site to station 245 should be ready for advertising in April. Additional field work is necessary, and it will be a few months before construction of the Imperial Dam and desilting works will be advertised for bids. Three large box concrete siphons for carrying the canal under washes will be started this fall. The Denver office is now considering a plan for a canal location through the city of Calexico.

Upper Snake River Storage, Idaho.—In the Denver office a draft of specifications has been prepared for the construction of the Island Park Dam on North Fork of Snake River about 25 miles north of Ashton. Drawings of the dam and appurtenant works for inclusion in the specifications are in progress. Preliminary draft of specifications for the construction of a highway and telephone line around the reservoir basin has also been prepared.

Sanpete project, Utah.—Preliminary specifications have been prepared for construction of the Spring City Tunnel, which will probably be advertised at the same time as the Ephraim Tunnel (Specifications 602) is readvertised.

Klamath project, Oregon–California.—Byron Jackson Co., of San Francisco, Calif., submitted a low b d of $1,787 destination, for furnishing pumping units for the Melhasse-Ryan sump drainage plant (Specifications No. 660–D) at the opening at Denver on February 15. Eleven manufacturers submitted bids.

Progress of Investigations of P. W. A. Projects

Gila Valley, Ariz.—A report regarding an initial project for the Gila Valley, Ariz., has been completed, and further work is awaiting studies of the effect of the Boulder and Parker Dams on the channel of the Colorado River. Classification of lands in South Gila Valley is being continued.

Upper Snake River Storage, Idaho.—Investigations of reservoir sites on the North and South Forks of the Snake River are in progress. The diamond drilling at Island Park site, North Fork, has been completed and shafts, test pits, and test tunnels are being excavated to determine the character of the foundations. Surveys of section and property lines have been completed, and a survey for cross-cut canal from Henrys Fork to South Branch of Fall River Canal has been made. On the South Fork, drilling at Johnny Counts dam site is completed, drilling at the Grand Valley site has been started, and an exploration tunnel in the right abutment to a total length of 170 feet excavated.

Buffalo Rapids, Mont.—Investigation of the irrigation possibilities near Miles City and Glendive, Mont., was commenced in January. Available reports and maps are being reviewed and a survey party is in the field.

Deschutes, Oreg.—The field investigation of storage possibilities for a supplemental irrigation supply for lands along the Deschutes River has been completed. Field maps of the various dams and reservoir sites, with area and capacity curves, are being prepared together with designs and estimates for inclusion in the report, which is being written in Denver.

Grand Ronde River, Oreg.—An investigation of the Meadow Park reservoir site on Grand Ronde River is being made. A plane table survey of the topography of the Upper Grand Ronde dam site has been completed. A geological examination of the site is to be made.

(Continued on p. 54)

California allots $50,000 for Central Valley Project

An appropriation of $50,000 has been authorized by the State legislature to expedite preliminary work on the Central Valley water project. The measure passed both houses with only one dissenting vote in each. The money will be available immediately and work will be hastened on necessary surveys and reports required by the Federal Government.

Bills which have been introduced in Congress by California representatives would make the Central Valley project a Federal undertaking similar to that in the Tennessee Valley. One introduced by Henry E. Stubbs provides for expenditure of $170,000,000, and the other by Frank H. Buck provides for a Federal agency to prosecute the work. Of the total amount, $38,000,000 would be a direct Federal grant. In addition $12,000,000 would be designated as a direct grant toward construction of Kennet Dam. The $120,000-000 loan is to be amortized over a period of 40 years. Supervision of the project is to be vested in the Secretaries of War and the Interior.—*Pacific Constructor.*

Investigations, P. W. A. Projects

(Continued from p. 53)

Umatilla River, Oreg.—Test-pit explorations at Ryan Creek dam site on the Umatilla River and surveys of a canal line to serve the irrigable area under the proposed irrigation project have been completed.

Allotments.—During January an allotment of $50,000 was made for investigation of water supply in the North Platte River Valley in Nebraska, and an allotment of $150,000 for an investigation of irrigation possibilities by the construction of a transmountain diversion from the Colorado River across the Continental Divide to the South Platte River in Colorado.

The Southern Pacific Co. reports that freight shipments from Yuma for the month of January totaled more than $500,000, or approximately $325,000 more than the previous maximum for January. The increase is credited to a general gain in all commodities, including lettuce, general merchandise, cotton, cottonseed, grapefruit, and livestock.

On the Klamath project a number of sawmills have resumed operations owing to the recent increase in demand for pine lumber.

Power plants operated on Bureau of Reclamation Projects during fiscal year 1933–34

Project	Name of plant	Outgoing line voltage	Plant capacity (kilovolt-amperes)	Number of units	Head in feet	First cost of plant	Cost of operation and maintenance without depreciation	Estimated depreciation	Cost per kilowatt-hour exclusive of depreciation	Distribution of kilowatt-hours generated: Sold to consumers	Irrigation and drainage requirements	Used for other purposes	Losses	Total output (kilowatt-hours)	Gross power sales (kilowatt-hours)
Boise	Black Canyon	66,000	10,000	2	75.5–90.3	$414,317.21	$19,063.06	$11,000.00	$0.00056	[11] 29,089,191	33,864,219	563,610	(1)	60,877,590	(2)
	Boise River	22,000	1,875	3	21.4–25.3	167,905.37		2,434.00			2,605,430	34,000	(1)	2,639,430	(2)
	Grand Valley	2,300	3,750	2	73–79	210,500.00	[3] None	None						4,701,900	375,000.00
Grand Valley	Minidoka	33,000	10,000	6	[5] 51.12–47.79	1,110,190.86	39,840.80	40,476.00	.000759	16,384,069	29,054,089	4,216,513	3,148,313	[6] 52,802,984	[7] 141,608.31
Minidoka	American Falls [4]	33,000	540	1	44	76,975.00									
Newlands	Lahontan [8]	33,000 66,000 2,300	1,875	3	110–20	141,886.01	9,699.51	4,260.00	Not known	2,084,880	582,196	342,284	(9)	3,009,360	9,260.16
North Platte	Guernsey	33,000	6,000	2	70–90	454,244.27	11,995.13	16,070.00	.001059	16,143,807	69,760	189,172	1,417,440	[6] 17,956,340	[16] 232,571.13
	Lingle	33,000	1,750	4	106	184,791.74		[10] 15,927.16	.002409			136,161		94,970	None
Rio Grande	Elephant Butte	2,300	150	1	18–180	8,440.50	1,814.95	None	.019	None	None	94,970	Unknown		
Riverton	Pilot Butte	33,000 2,300	2,000	2	100	259,520.00	13,566.10	7,800.00	.01284	701,109	None	255,651	99,970	1,056,730	19,102.08
Salt River	Roosevelt	110,000	19,250	7	70–240	1,372,193.73	28,920.17	68,609.70	.0005161					56,040,000	
	Horse Mesa	110,000	33,300	3	265	982,756.47	23,157.38	49,137.82	.0002354					98,360,000	
	Stewart Mountain	46,000	13,000	1	35–114	344,070.32	8,791.15	17,203.51	.0003739					23,510,000	
	Mormon Flat	110,000	8,750	1	40–150	472,011.68	10,595.41	23,600.58	.0002329					45,487,000	
	Cross Cut	11,000 40,000	5,250	6	111	663,920.33	15,145.44	33,196.02	.001852					8,178,000	
	South Consolidated	40,000	2,000	2	34	176,202.81	7,232.00	8,810.14	.002129					3,397,200	
	Arizona Falls	11,000	1,060	2	19	115,566.47	6,181.94	5,778.32	.005078					1,217,475	
	Chandler	11,000	600	1	40	177,410.37	6,195.04	8,870.52	.007342					843,730	
Shoshone	Shoshone	33,000	7,000	3	220	880,375.56	20,463.27	28,787.40	.00393	152,333,863	46,168,757	157,476	38,380,376	[5] 237,040,472	1,975,692.49
Strawberry Valley	Spanish Fork	11,000	1,000	2	123.5	135,827.82	15,067.13	4,074.27	.0023	4,601,970	None	97,980	510,017	[6] 5,209,967	60,894.89
Yakima—Kennewick	Prosser	66,000	3,000	1	40	404,843.88	9,000.00	9,000.00	.00041	[6] 3,631,302	None	55,401	265,389	3,438,630	46,357.88
Yakima—Sunnyside	Rocky Ford [14]	6,600	187	1	73	23,000.00	1,504.06	1,056.40	.0022	[13] 21,673,003	None	35,209	299,248	22,007,460	40,285.61
Yuma	Siphon Drop	33,000	2,000	2	[5] 13.49–9.81	364,886.00	12,805.00	13,248.00	.00154	None	685,400	None		685,400	None
										[15] 7,144,843	670,580	74,156	426,093	[5] 8,315,672	64,416.84

[1] Included in preceding figures.
[2] Not reported.
[3] Contractor operates and maintains plant at own expense and distributes all power generated.
[4] American Falls (west side) plant operated only in case of emergency; not operated since 1927. Island plant dismantled, first cost included.
[5] Maximum to average.
[6] Includes purchased power.
[7] The figures for distribution include 373,984 kilowatt-hours from Idaho Power Co. and 2,398,504 kilowatt-hours (under used for other purposes) to same company under exchange agreement. Revenue to United States from exchange of power $1,350.57 included under gross power sales.
[8] Plant operated by Sierra Pacific Power Co. under lease assigned by Canyon Power Co.
[9] None to district.
[10] Includes $5,601.28 of replacement.
[11] Includes 28,206,212 kilowatt-hours to Idaho Power Co. for transmission.
[12] Includes $7,275.54 for purchased power.
[13] Includes 4,810,000 kilowatt-hours of winter power in payment to Pacific Power & Light Co. for transmission of power to irrigation districts.
[14] Operated by Grandview Irrigation District under Government supervision.
[15] Includes 1,258,500 kilowatt-hours to Yuma auxiliary irrigation.
[16] Includes $2,042.90 for rentals.

The Reclamation Era

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Special reduced rates are given individual water-user owners or water-users organizations for mass subscriptions on Federal irrigation projects.

MARCH 1935

Power

In the early days of the operation of the Federal reclamation policy, following the approval of the act by President Roosevelt on June 17, 1902, the development of hydroelectric power in connection with reclamation projects was thought of as an aid in lowering the cost of construction. As a matter of fact, power plants were built only when power could be advantageously used in construction or when it was foreseen that power would be needed to pump water to high lands.

OPPORTUNITIES FOR LOW-COST CONSTRUCTION LIMITED

It was only logical that irrigation projects with the lower costs would be developed first, and with the completion of projects involving opportunities for low-cost construction we naturally were confronted with the problem of developing projects where all the factors involved resulted in per acre costs that presented another question to the Bureau and that is, would the type of agriculture proposed for a particular project meet the cost of this more expensive development? It was then that the subject of cheap power entered the picture.

With the supplying of cheap power for pumping, and enjoyment by the settlers of this privilege, it was only natural that there was set up a power consciousness and the demands for development of hydroelectric power in connection with new projects were constant and insistent. Where a power plant was constructed for the development of hydroelectric power to be used for construction or pumping to high lands, the cost of the plants was included in the total construction cost of the project which the water users obligated themselves to repay under their contracts with the Government.

SUBSIDIZING IRRIGATION WITH POWER INCOME

The inauguration of a policy of building power plants larger, to permit of the sale of power, subsidized reclamation, as profits were applied to repayment of the cost of irrigation works. This raised the question as to who was entitled to the net profits. A number of projects like the Strawberry Valley, Minidoka, Newlands, and North Platte, are enjoying power revenues as an income and in effect this subsidy relieves the water users of the payment of a very substantial part of their annual construction and operation payments.

UNIFORM POLICY REQUIRED

A uniform policy with respect to development and disposal of hydroelectric power on Federal reclamation projects should be established by legislation. There are now 23 plants in operation on 13 Federal reclamation projects, with an installed capacity of 58 units and a total output of 419,836,905 kilowatt-hours.

Power plants which are built with Government funds should be the property of the Federal Government. Where plants are built as adjuncts to irrigation development, it is believed power profits should be applied as follows: First, to the repayment of the construction cost of the power system; second, to aid in repayment of the construction cost of the dam or other structures which creates or makes possible the power development; third to be covered into the reclamation revolving fund to be used as other income to the fund in the construction of additional works.

PRESIDENT'S POWER POLICY COMMITTEE

The subject of power has become such a live one that the President has created, in the Public Works Administration, a Power Policy Committee, the personnel of which is as follows: Harold L. Ickes, Secretary of the Interior, chairman; Morris L. Cooke, chairman Mississippi Valley Committee, vice chairman; Robert E. Healy, member Federal Securities Commission; David E. Lilienthal, trustee Tennessee Valley Authority; Frank R. McNinch, chairman Federal Power Commission; Gen. Edward M. Markham, Chief of Engineers, United States Army; Dr. Elwood Mead, Commissioner of Reclamation; and T. W. Norcross, chief engineer, Forestry Division.

For the past 7 months they have been studying the whole subject of power and what the Government's position relative thereto should be. Its report is in course of preparation and should be available for submission to the President shortly.

RECLAMATION POWER BILLS PENDING IN THIS CONGRESS

A bill has been introduced in this session of Congress designed to declare a policy with respect to the distribution of power revenues on Federal reclamation projects, and for other purposes.

Senator Adams introduced S. 1924 on February 18, 1935, which was referred to the Committee on Irrigation and Reclamation the same day. It has not as yet been reported out of committee.

Bills designed to bring about a declaration of policy last Congress and which failed of enactment were S. 3375, also by Senator Adams of Colorado; and H. R. 9124 by Congressman Chavez of New Mexico.—*M. A. Schnurr.*

(Date)_____

COMMISSIONER,
Bureau of Reclamation,
Washington, D. C.

SIR: I am enclosing my check [1] (or money order) for 75 cents to pay for a year's subscription to The Reclamation Era.

Very truly yours,

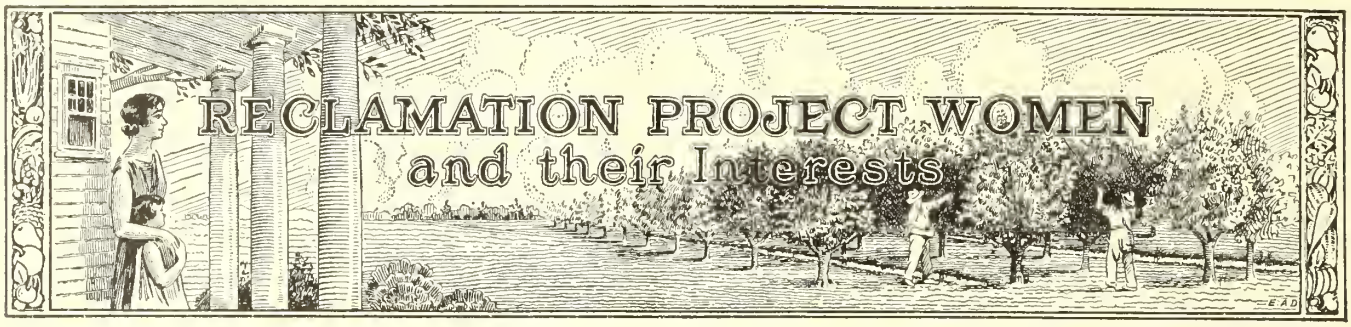
(Name)_____

(Address)_____

_____

NOTE.—30 cents postal charges should be added for foreign subscriptions.

[1] Do not send stamps.



If You Want Books

By Beatrice Sawyer Rossell, Editor, Bulletin of the American Library Association

"NEXT to rural free delivery of mail, I think the State library is the best thing we have, if we know how to use it," a woman in an isolated community recently wrote the State librarian at Salem, Oreg.

Two-thirds of the Federal reclamation projects now planned or under construction are in States where people in isolated areas can obtain book service from a State library extension ageney.

STATE LIBRARY SERVICE

In Oregon, to take a State where such service is available, 50 books for adults and children may be borrowed for 6 months by a group of people if one person will agree to act as custodian and the group—or one of its members—will pay transportation. Round-trip charges would be less than $1.50 to any borrower within the State.

If a young person who ean not go to college and is not working wants to use some of his free time to follow some course of reading, he can write to the State library and have a reading course prepared on almost any subject in which he is interested. During the past two years approximately 2,000 persons have followed such reading courses in Oregon, their subjects ranging from bee culture to music appreciation. Some of the subjects most often asked for were psychology, interior decoration, and home nursing. Books on child training were also in demand. A borrower is asked to pay transportation charges on the books but the preparation of the eourse costs him absolutely nothing.

> Perhaps your project is located in a State whose State Library offers the excellent service to rural communities outlined in Miss Rossell's article. If not, your community may have solved its problem of securing books to read, in a manner that would be interesting and suggestive to others. If so, please tell us the details. Address your communication to The Commissioner, Bureau of Reclamation. If the problem has not been solved, by all means write to Miss Rossell who will see that at least your letter gets to those authorities who are earnestly considering a solution.

Not only is study of an individual promoted by the Oregon State Library, but small schools can increase the opportunities offered their students by securing what are known as "Little Libraries"—collections of 15 or 25 books planned for schoolroom use and loaned for a six-weeks period. During the past two years more than 71,000 books were obtained by Oregon schools for boys' and girls' reading in this way.

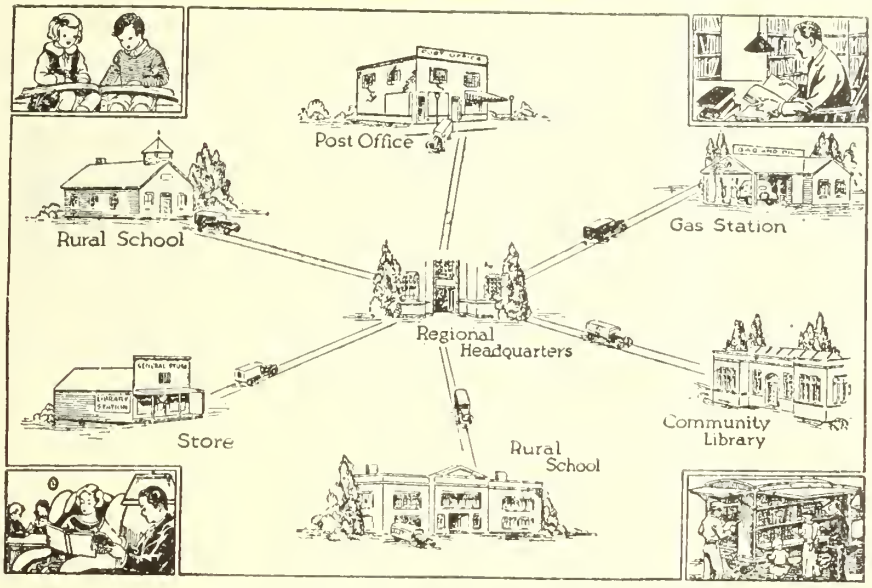
Not everyone who borrows books from a State library extension agency such as that in Oregon has to be a student. Perhaps a reader wants a book of plays or games; again she may want a book on quilting or flower gardens. Poetry or biography, travel or nature study—all are covered in a good State library collection and any resident of the State may borrow one or more books for the cost of postage only.

A person who borrows books by mail is of course handicapped by not knowing what books a library has. To offset this difficulty the Oregon State library publishes book lists in the Oregon Journal and other publications and also issues mimeographed lists on such subjects as Fifty Best Books in American Literature, 1833–1933, Recent Books for Young Women, Some Recent Biographies, and Plays for Community Groups. Copies of these mimeographed lists are gladly sent on request to anyone in the State.

Books by mail.

AMERICAN LIBRARY ASSOCIATION SERVICE

The American Library Association, 520 North Michigan Avenue, Chicago, publishes both book lists and lists of reading courses which may suggest books to be requested from a State library, a nearby county or local public library. Lasting Satisfactions lists about 70 reading-with-a-purpose courses, the list being sent to anyone free on request. Gifts for Children's Bookshelves may be obtained for 5 eents in stamps; Recent Children's



Books for 3 cents in stamps; the Parents' Bookshelf for 5 cents in stamps; and Graded Bookmarks, listing books for the first to ninth grades, for 1 cent apiece.

Unfortunately, not every State has a good library extension agency which offers service such as that given in Oregon. In more than one State, as readers of this article probably know, book service is almost impossible to obtain. A few families connected with Federal projects—notably those at Bonneville Dam, Oreg., and Norris Dam, in Tennessee—are not concerned with book service offered by the State, as at Bonneville the Multnomah County library furnishes books and at Norris the Tennessee Valley Authority has opened a library. But the majority of families are numbered among those 43 million people in the United States who have no local public library service available.

Is the American Library Association doing anything to secure libraries for these millions of people without them, someone is probably wondering. It is the major problem upon which the association is now at work.

A temporary proposal they are making is the initiation of library service with the aid of a State or local library, and workers secured through a relief agency. In one Illinois county, such service has been successfully launched with books provided by the State library extension agency, an automobile supplied by the county authorities and workers furnished by the relief commission. Such a project can be sponsored elsewhere by a public library, department of education, or any other qualified department or agency.

Books borrowed from a library may be supplemented by gifts of books and magazines solicited from people in the local community. One Mississippi county brary organized with relief workers who began their work without a single book, now owns more than 3,000 volumes and has loaned thousands of good magazines until they have been literally read to pieces.

Thousands of people throughout the country are securing some form of library service with the assistance of relief workers, and readers of The Reclamation Era may want to attempt a library project if they have no other means of getting books. The American Library Association, however, is giving most of its attention to a more permanent solution of the library problem.

A year ago an American Library Association library planning committee was appointed to work with National and State planning boards for far-reaching improvements in library service. Since then, at the request of the American Library Association, 42 States and the District of Columbia have appointed library planning committees or their equivalents to work on the same problem.

Basic needs as the A. L. A. sees them, if reading needs of people in isolated communities are to be satisfactorily met, are a strong State library extension agency in each State and a State-wide system of regional libraries. In Arkansas, Illinois, Tennessee, and West Virginia funds are now being asked from State legislatures to provide for improved State service. State library leaders cooperating with the A. L. A. are seeking by this means to provide book service for several million people now without it.

PROPOSED REGIONAL LIBRARIES

How a regional library such as the A. L. A. is proposing would operate is shown

(Continued on p. 65)

How Regional Book Service Would Operate

Every large area has some natural center where people go to do their trading. Here would be located a book collection, in charge of trained librarians, which would offer good, but at the same time economical, service to all the people of the area. For the convenience of people remote from this center, service would be given by book automobile and book collections in such places as stores, post offices, gas stations, and rural schools.

A library on wheels.

Accomplishments and Finances of Emergency Conservation Work Camps

By John S. Martin, Accounting Division, Bureau of Reclamation

IN THE January issue of RECLAMATION ERA, Dr. H. T. Cory told of the establishment of the nine Emergency Conservation Work camps allotted to the Bureau of Reclamation. In this writing an attempt will be made to tell something of the work so far accomplished and of the outlay in money involved.

Three of the nine camps, Camp BR–8 at Elephant Butte Dam and Camps BR–9 and DBR–10 at Guernsey Lake, Wyo., are being operated by the National Park Service. This arrangement was made because the work planned for these camps is almost entirely recreational development and the Guernsey Lake area is a State Park. The work programs of these camps are being carried on efficiently by the National Park Service under the general direction of the superintendent of the Rio Grande and North Platte projects. The six remaining camps are operated by the Bureau of Reclamation, the superintendent or resident engineer of the Reclamation project upon which the camp is located being the responsible officer in immediate charge of each camp.

IMPORTANT WORK ACCOMPLISHED

The six camps operated by the Bureau began work in August 1934, and on January 31, 1935, had, in addition to minor items, completed satisfactorily an impressive total of important work, all of immediate benefit and much of it insuring future benefits of great value.

Camp DBR–1 at Minatare, Nebr., on the North Platte project, on a work program including grading truck trails, concrete lining of laterals, repairs to structures, improvement of grounds at Lake Minatare, etc., had built 2.7 miles of road, cleared and graded 15 acres of public camp ground including the moving of 5,435 cubic yards of earth in fine grading, built 33 public camp ground facilities of various kinds, built 2,333 linear yards of ditch, placed concrete lining in 7,212 square yards of laterals, run 58,883 feet of survey lines, and moved 6,871 cubic yards of earth and 361 cubic yards of rock in maintenance work. The money value of the completed work accomplished by this camp, at a very conservative estimate would approximate $40,000.

Camp DBR–2 at Orman Dam on the Belle Fourche project, with a varied program including 20 or more different items of work all having important public value, had built 3.5 miles of road, installed 3,100 feet of pipe and a 6,000-gallon storage tank for a public water system, built 1,042 yards of new ditch, repaired 15 miles of telephone line, had done maintenance work on 308,000 linear yards of canals and laterals and placed 128 cubic yards of new concrete in repairs to the masonry work of the dam. A conservative estimate of the value of the work done by this camp would be in the neighborhood of $35,000.

Camp DBR–3 at Carlsbad, N. Mex., with three major jobs on its program, of which the most important are raising the core wall of Avalon Dam, clearing and cleaning canals and laterals, and the extension and protection of the east embankment at Lake McMillan, had built 20 miles of truck trail, placed 25,880 yards of earthfill and 4,266 cubic yards of heavy rock riprap paving, had done maintenance work on 147,000 linear yards of canals and ditches, moved 450 yards of earth and 90 cubic yards of rock, and placed 30 cubic yards of new concrete and 10 cubic yards of masonry.

The value of the work done by this camp cannot be adequately expressed in dollars and cents because of the potential future value of the improvements to Avalon Dam and McMillan Lake embankment. Leaving this indefinite value out of the calculation, the work done by this camp can be valued at not less than $40,000.

Camp DBR–4 is located at Ysleta, Tex., near the city of El Paso, on the Rio Grande project. The work program for this camp is varied, including the coring of canal banks with concrete for the protection of the canal itself and the lands lying below, largely within the city of El Paso, where value of buildings and improvements is high and a serious canal break would cause extensive damage. Other items of work are rodent control, improvement of operating roads on canal banks, clearing and cleaning canals and drains, and assisting in the construction of a project garage and other buildings.

Work began on August 20, and at last report January 31, 37 miles of road had been repaired, 13,700 acres had been treated in rodent control, 122,600 square yards of canal bank cored, 82 miles of survey lines run, 1 building completed and 5 partially completed. The work on buildings consisted mostly in making thousands of adobe bricks. The work accomplished by this camp is estimated to have a value of $52,000.

Camp DBR–5 located on Currant Creek, near Heber City, Utah, had for its most important job the construction of a 5-mile feeder canal, which will bring a valuable addition to the water supply for the Moon Lake project. This camp operated only from August 9 to October 18, when it was moved to Bridgeland, Utah, and designated as Camp DBR–11. In that time, a little more than 2 months, the camp forces had built 5 miles of telephone line, run 4 miles of survey, line and grade, cleared timber from 7,231 linear yards of canal location, and had finished excavation amounting to 6,000 cubic yards of earth and 40 cubic yards of rock. The value of this work can be placed at not less than $21,000.

Camp DBR–6 on the Sanpete project, Utah, near Ephraim, also engaged in building feeder canals, and operating from August 13 to October 18, had built 2 miles of truck trail with 5 bridges, cleared timber from 5.5 miles of canal location, ex-

cavated 15,900 cubic yards of earth and 4,200 cubic yards of rock, and built masonry dams with cubic contents of 160 cubic yards. The value of this work can be placed at not less than $15,000.

Camp DBR–11 manned by the personnel of the former Camp DBR–5 is located on the Moon Lake project at Bridgeport, Utah. Work began on October 19. By January 31 the camp forces had built 1 mile of telephone line, constructed 8 small buildings, cleared 7,600 yards of canal location, and moved 53,440 cubic yards of earth and 96 cubic yards of rock. The value of this work has been placed at $14,000.

Camp DBR–12, formerly DBR–6, located at Huntsville, Utah, on the Ogden River project, began work October 23. The two major items of work are demolishing an old wood-stave pipe line of 6-foot diameter 4½ miles long preparatory to replacement, and clearing the Pine View reservoir site. On January 31, 6,810 feet of the pipe line job had been completed and 110 acres of the reservoir site cleared of timber. The work accomplished is estimated to be worth $17,000.

In order to arrive at an estimate of the total values obtained by the money expended the value of equipment on hand should be added to the estimated value of completed work. Doing this we have the following acquired values:

Total estimated value of completed work		$234, 000
Purchase price of equipment per inventory of Nov. 30, 1934	$94, 966	
Less loss and depreciation, 30 percent	28, 490	
		66, 476
Total		300, 476

When the camps were first authorized 8 trucks were purchased for each of the 6 camps, and shortly thereafter a number of tractors were bought. These purchases soon ran into money and the allowance of $4,000 per month per camp, including all equipment, was cut into quite heavily, so that the average monthly allotment per camp for camp operations had to be scaled down to approximately $2,500. However, by careful economy and with the cooperation of the irrigation districts, counties, and individuals interested, in supplying needed materials and services, the work has gone on successfully. Field and Bureau administrative problems have been met with but little trouble or delay and the rather complex relations with other departments brought into orderly arrangement and agreement so that any expansion of the E. C. W. program for the Bureau of Reclamation may be expected to proceed in an efficient manner.

The following is a brief statement of financial transactions attending E. C. W. operations for the 6 camps actually operated by the Bureau for the period August 1, 1934, to January 31, 1935:

EMERGENCY CONSERVATION FUND FINANCIAL STATEMENT

JAN. 31, 1935

Allotments received from Finance Authority		$212, 150
Allotments issued:		
To camps for operations	$82, 500	
Denver—Equipment for camps	113, 000	
Washington office—Administrative	1, 000	
		196, 500
Balance not yet allotted		15, 650

	Allotments received	Less accounts payable and audited vouchers	Balance unencumbered
Camp DBR-1	14, 000	10, 035. 57	3, 964. 43
Camp DBR-2	14, 400	14, 059. 80	340. 20
Camp DBR-3	14, 150	11, 665. 21	2, 484. 79
Camp DBR-4	15, 600	15, 114. 63	485. 37
Camp DBR-5*	5, 000	4, 570. 07	429. 93
Camp DBR-6*	5, 000	4, 523. 29	476. 71
Camp DBR-11	8, 350	8, 355. 07	*5. 07
Camp DBR-12	6, 000	4, 027. 62	1, 972. 38
Sub-total—Camps	82, 500	72, 351. 26	10, 148. 74
Denver—Equipment	113, 000	105, 158. 31	7, 841. 69
Administrative	1, 000	51. 03	948. 97
Total	196, 500	177, 560. 60	18, 939. 40

Allotments made to camps for February operations were substantially increased as it appears that funds available will permit somewhat increased expenditures until March 31, when current appropriations expire. No comment can be made regarding funds for continuance of the work as legislation for the purpose, at the date this is written, has not been passed.

Project superintendents have expressed approval of the E. C. W. operations on the projects under their charge, commenting on the value of the work performed, not only as regards immediate benefits to the citizens of the several communities but to the general public and the country at large. The health and general spirit of the enrollees at the camps are reported as excellent, and the interest of the men in the educational programs and facilities as being keen. It would seem that the effort and money expended in this work is well spent and it may be hoped that an expanded E. C. W. program will provide a number of additional camps for other projects where work of great value may be done.

Carload shipments received at Boulder City during the month of January included the following:

	Cars
Bulk cement	505
Pipe and fittings	2
Structural steel and machinery	26
Skelp	39
Sack cement	2
Miscellaneous	6
Total shipment	580

On the Vale project, Oregon, one resale of 80 acres of land was recently made. During the past year 40 new settlers purchased 2,033 irrigable acres on the Harper, Little Valley, Bully Creek West Bench, and Bully Creek East Bench units. Approximately 1,000 acres were sold on the Willow Creek unit.

Looking downstream from Boulder Dam while full river flow is checked by closing gate valves in diversion tunnel No. 1.

Preparing for the Destitute

By L. H. Mitchell, Reclamation Economist, Public Relation Division, Bureau of Reclamation

EIGHTEEN years ago the word most mentioned and thought of was "preparedness." The United States was then preparing to do its share in making the world safe for democracy.

Today that important word, while not forgotten, is rarely used. Instead, we hear such words or phrases as "doles", "aid to the unemployed", "back-to-the-land", "inflation", "deflation", "cut Government expenses", "cut salaries", "lower taxes", "domestic allotment plan", "overproduction", "under consumption", "rugged individualism", etc. There are many arguments for and against any of these as playing an important part in the present depression, or as a cure for it.

Although the United States is not at war with any foreign foe, there is probably as much suffering now among the unemployed and their children as was experienced by our people directly and indirectly affected by the conditions which prevailed during the World War. If preparing for a conflict on a battlefield is imperative, surely we should now be preparing for the army of destitute. The purpose of this article is to suggest means for the relief of the jobless army and those located on submarginal land who would like to move to a farm or small tract where everyday simple subsistence may be produced, where they may become self-supporting and live in keeping with the American standard.

PEOPLE LAND HUNGRY

The Bureau of Reclamation, in the Washington office alone each year, answers thousands of letters from people in all walks of life interested in the land settlement activities of the Government. The field offices, of course, handle a much greater number of similar inquiries. This is a barometer that indicates how the people are thinking. Some of these letters relate circumstances that are pathetic; a few of them tell of financial reverses and specific losses with "investment" concerns; and many of them are stories of unemployment for 2, 3, or more years. Most of the inquiries are from people of more or less farming experience. During the past year there have been hundreds of inquiries from farmers on submarginal land. Their daily work on these low-producing farms was from sun-up to sun-down, yet they have nothing to show for it and want another chance. There must be considerable truth in the saying "once a farmer always a farmer."

The Bureau of Reclamation, a Federal organization engaged in providing homes, has its field of activity in the arid West where a special type of farming must be followed. It has, however, during its more than 3 decades of activities, demonstrated the fact that the Federal Government may participate in business as a practicable undertaking and conduct that business with honesty and integrity. As a result of the expenditures made under the direction of this Bureau, more than 43,000 farm homes have been established and these farms, together with the population in the towns that have grown up on the projects, support a population of nearly 700,000 people. The question naturally arises, where would these people be had no Federal reclamation projects been constructed. That question cannot be answered, definitely and satisfactorily, but it is more than likely that a considerable percentage of reclamation farmers would be located in the humid section of the country, producing crops of which there is considerable surplus and that the economic conditions would be aggravated rather than benefited as they have been by the creation of these fertile areas in the western third of the United States.

WESTERN STATES LARGE CONSUMERS OF EASTERN COMMODITIES

New wealth is created on the projects each year and it is quickly distributed through the usual channels of trade throughout the entire United States. A survey conducted by the writer in October 1934 showed that at least 75 percent of the farmers' income was spent for the purchase of commodities produced in the industrial sections of the United States. Taking the average annual production of crops grown on Federal reclamation projects at $60,000,000, which includes years of low value, it is safe to conclude that $45,000,000 is sent annually into the industrial market.

President Roosevelt in his message to Congress in December 1901, stated:

"The policy of the National Government should be to aid irrigation in the several States and Territories in such manner as will enable the people in the local communities to help themselves and as will stimulate needed reforms in the State laws and regulations governing irrigation. 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 industrial 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 irrigation will be consumed chiefly in upbuilding local centers of mining and other industries, which would otherwise not come into existence at all. Our people as a whole will profit, for successful homemaking is but another name for the upbuilding of a nation."

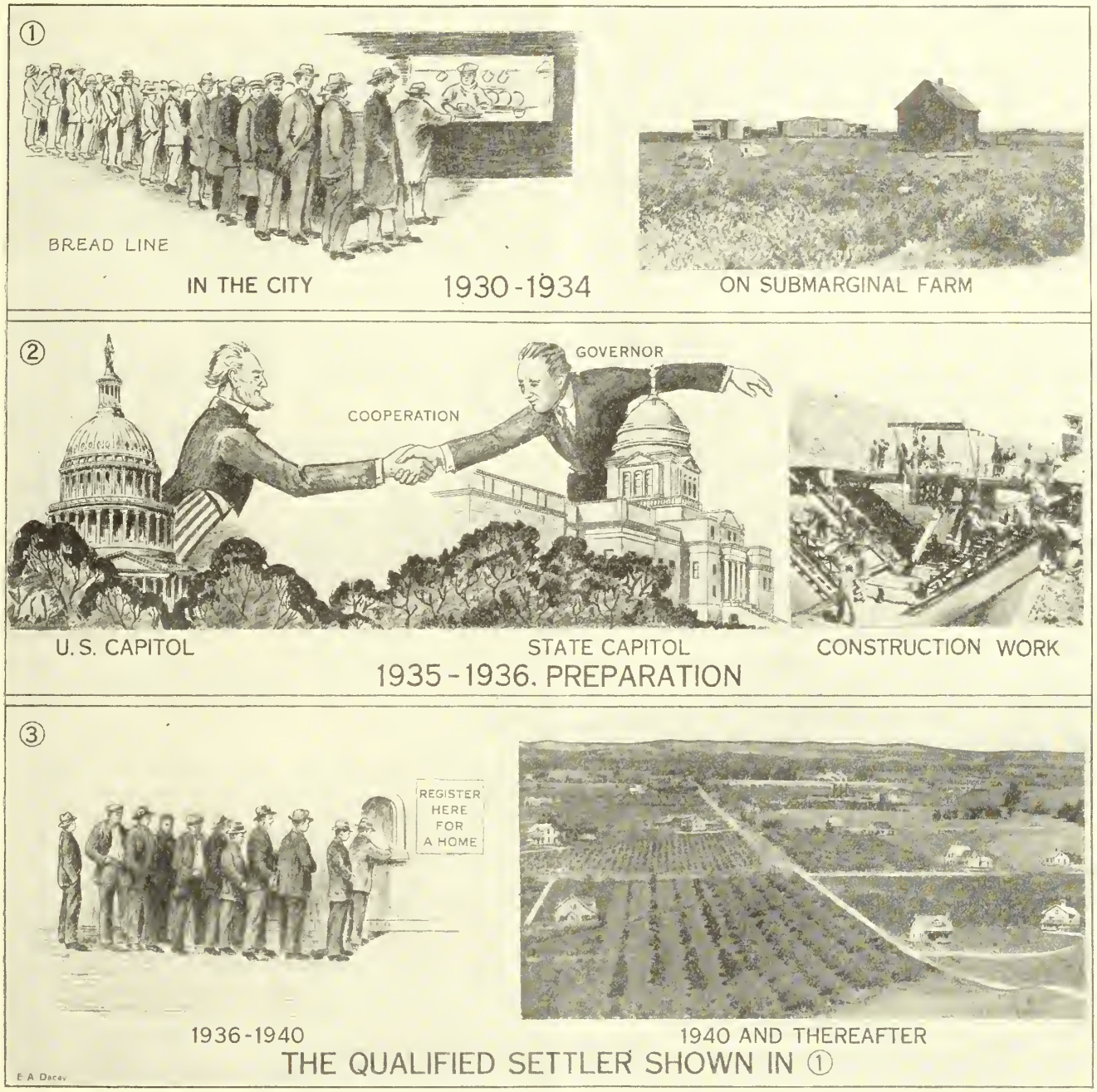
The number of unemployed, the amount expended by the United States and charitable institutions for relief, and the acreage of submarginal land can only be estimated. Conditions or circumstances change so rapidly that by the time a comprehensive survey can be completed for any of the above features the results cannot be accurate, but it is generally admitted that the figure for any of these items is appalling. It is a foregone conclusion that the number of unemployed should be permanently reduced, and those on submarginal land who are not submarginal farmers [1] should be permitted to become self-supporting by moving to land that is capable of growing crops. The sooner both of these national problems are solved the easier and less expensive the task.

There was a time when, for any reason, a farm would not produce, the operator could move to a new place with rich virgin soil. This was in the days of free land by homesteading. If one made a mistake in selecting a place he did not have to live with that mistake. He could move. Today people on submarginal lands are no better off than those with nothing to do living in towns. In fact, if and when one on submarginal land changes from a dole to a self-supporting farmer at least one other person in towns can be assured work.

The Bureau of Reclamation, which at a cost of $220,000,000 has constructed irrigation works that have made it possible for nearly 700,000 people to become self-supporting, may be used for a measuring stick. In any computations it should be remembered that the settlers benefited have already paid back $48,000,000.

In preparing for those deserving people, the unemployed with farming experience and the farmers on submarginal lands, the natural questions asked are: "Where can they go to be self-supporting?"

[1] A submarginal farmer is defined as one who has not been successful even when climatic conditions were favorable and prices for farm products were generally satisfactory.



"What acreage of productive land is available?" "Where is it located?" and "How much is needed?" Since the World War the total acreage in crop has not materially changed. There has been an increase in wheat acreage and a few other crops where improved and more efficient farm machinery has encouraged large acreage farming. The increase, however, has been largely in the Great Plains (not the irrigated areas). To offset this increase there has been a decrease in crop acreage in nearly every State east of the one-hundredth meridian. There was scarcely any change in the north central Western States, excepting eastern North Dakota, eastern Kansas, and all of Missouri. The northern portion of the New England States and parts of the South Atlantic States changed very little during this same period. The total abandoned acreage is estimated to be not less than 5,000,000 acres, and it could possibly be double that amount. Should the country experience another drouth in the next few years this abandoned acreage could treble.

In any program of preparing for the destitute who have a knowledge of farming by actual experience, great care should be exercised in selecting only localities where the precipitation is sufficient to produce crops, or where irrigation can be practiced. In either case the topography must be favorable and the fertility of the soil not depleted.

In many, if not all of the States, large areas are delinquent in State and county taxes. In a few localities there are farms, once owned by mortgage companies, on which the taxes are overdue and the period of redemption has expired. The counties affected by this, if not already in possession, can, by following the law, acquire ownership of a considerable acreage of idle land or at least lands that are not paying taxes. In some localities the counties have already become large landowners. Without bringing into cultivation new lands or submarginal lands and without increasing the surplus of such crops as wheat, corn, cotton, tobacco, and others, a large number of the unemployed can, and it is believed should be permitted to obtain the major portion of their livelihood from these lands. This can be brought about as follows: The county

could furnish the land, and whenever possible to do so, the county should also do the financing. If a county is financially unable to do the work necessary to place either a small or large tract of land in shape to house and provide for its deserving unemployed who are farm-minded, then the State could help. If, however, the State is financially embarrassed, and wishes Federal aid, it would seem that the necessary finances might be worked out on a plan whereby the State could supply the land. The title to this real estate should be in the States cooperating and free of all encumbrances. The Federal Government, should, where the States are unable to do the financing, furnish the necessary money for loaning to qualified unemployed and deserving farmers on submarginal lands. The entire plan could be worked out on a cooperative basis, the money loaned by the United States to be secured by a first mortgage and paid back with a small rate of interest.

The farmer should be required to pay taxes on his equity in order that schools could be maintained.

Then there are undeveloped irrigable projects in the arid West where, when completed, at least 50,000 farm families could be self-sustaining.

In addition to the self-supporting homes which follow the completion of irrigation works, home-building opportunities can be located elsewhere in the United States. In the oldest settled States of the Union people are living on land where, because of poor soil conditions, they have been unable to make both ends meet. In many cases the low producing qualities of the soil is not the fault of the present occupant. The topography favorable for erosion, the fertility which had taken centuries to accumulate, has disappeared. Much of this condition is the byproduct of civilization. Through many generations the farmer has, whether innocently or as an exploiter, slowly permitted the best part of the soil to wash and blow away.

The area required for each farm would depend on the location, the type of farming to be followed, and the individual. It has been repeatedly demonstrated that the failure of a large number of farmers has been due to the fact that they are farming too large an acreage instead of trying to make a small acreage produce maximum returns at a minimum cost. It is not unusual for one farming a few acres, or even an acre, to have a little cash balance at the end of the year. This is not always the case with the big landowner, whose large cash outlay for labor and equipment is not always reflected in corresponding returns. Ten million acres may be sufficient to provide a livehood for 1,000,000 of the unemployed. The cost of equipping such an undertaking, provided the land is furnished by the States or counties, is difficult to estimate. However it is believed that an average of $1,500 for each qualified applicant, not only would work wonders, but it might be the turning of the tide, and it certainly would not be a dole.

FARMS ONLY FOR FARM-MINDED

It is frequently a waste of money to provide a home for one on a farm who has not the background of a farmer nor a sincere desire to become one. The family must also have the proper attitude. One who does not know on which side of a cow to sit when milking or how to harness a horse is generally helpless and hopeless on a farm. The following story has its value. A hitch-hiker stopped at a farm house for a handout just as one of the boys had completed a hard day's work of cultivating sugar beets. The hitch-hiker was a mechanic by trade and had never seen a horse collar before. He offered to do something to pay for his meal. The tired farmer boy gladly agreed to give the hitch-hiker a supper if he would unharness and take care of the horses. This was a contract that was enjoyed by both parties until the next morning when the boy went to harness the horses and found to his surprise that the hitch-hiker in removing the harness from the horses had taken it apart piece by piece. It took the boy 2 hours to put the crossword puzzle together.

All applicants for farms should qualify as to physical ability, industry, character, and farming experience.

It is evident that Ex-Governor William Tudor Gardiner, of Maine, knew what he was taking about when he said:

"Certainly the depression has taught us that overconcentration of population in the big cities is a dangerous thing. Surely our whole society will be better ordered when many of those now in the cities are spread out in our rural regions. I believe all that. I believe, in fact, that an intelligent back-to-the-land movement is very much needed, and that it will come. But a haphazard dumping of untrained, unadaptable people on the soil would be a grave mistake. It takes more than good intentions to make a go of farming.

"I have seen a good many farms, but I never saw one that was equipped with a self-starter, either in the State of Maine or anywhere else. To make a farm go—any farm—you have to prime it with sufficient capital to meet the needs of modern farming, crank it up with good hard work, and keep it throttled up with intelligence and understanding. Otherwise it will soon stall, leave you stranded on some bleak stretch of the economic highway and clog up the road so that more able farmers will have a hard time making headway."

Any and all moneys used in this preparatory work for the unemployed should, like the reclamation fund, be returned by those benefited. A dole is injurious both to the receiver and the giver. Those moving out of the ranks of the unemployed to prospective homes should be encouraged to help work out their own problems. There never has been and probably never will be a substitute for individual efficiency.

In some States large areas are cultivated by a few. Would it not be better for all if the same acreage could be cultivated by many? That is, it should be divided into small tracts where the occupant could have a chance to be a home owner. While greater efficiency and more intensive farming resulting from subdivision of large farms increases gross production, there is an even greater increase in consumption by substitution of man and animal power for large machines. Surplus production would be decreased, especially of such crops as wheat, corn, rice and cotton, and consumption increased, something that admittedly is needed.

EDUCATIONAL FACILITIES OF MAJOR IMPORTANCE

Next in importance to supplying the body with proper food and clothing is the education of the children. In any preparation movement, school facilities are of major importance. The possibility of overproduction of crops and the increased expense of providing educational conveniences for the children resulting from moving back to the farm, give the already overtaxed farmer much concern. Overproduction, provided lands now already in cultivation are used, should not occur. State aid should help in solving the problem of educating the children during the pioneer period, where additional schools are needed.

Those seeking relief by earning their living from the soil should be encouraged and not scorned.

Those who trek "back to the land" will, if they are wise, give the subject their best thought, and be sure that rural life is what they are looking for. There is no reason to believe that the man or woman who is willing to work, and who will use head as well as hands, can not make a living, and get ahead, on the farm.

The farm is too often considered a place where one can go as a last resort to make a living. That is what gives many the idea that a farm is the dumping ground of all who have made a failure at some other occupation. This is an erroneous conception. From time immemorial the

(Continued on p. 66)

Reclamation as a Federal Investment

F. D. Helm, Treasurer Uncompahgre Valley Water Users' Association, Montrose, Colorado

THE Government is investing its funds for the moral, intellectual, and physical development of the Nation through its expenditures of public money in schools, roads, irrigation works, social experimentation, and countless other activities. Those expenditures, which result in the permanent development of the country, creating lasting national wealth, building communities that are able to produce in taxes for future generations, making for a stronger nation numerically and financially, are national investments in the future.

PIONEERS BUILT NEW EMPIRE

A few decades ago our forefathers, with a vision of future possibilities for an empire in the West, saw an opportunity to invest Federal funds and Federal influence in the few scattered settlements of this vast and almost unknown region, peopled almost exclusively by wild animals and wilder red men. As a result of this vision pioneers under the protection of the Stars and Stripes forced their way through hostile lands, endured privations of desert and plain, suffered unspeakable hardships, and at times lived in constant fear of massacre from unfriendly Indians. This vision of national investment in the future has built a new empire, and has carved from a wilderness a new civilization rivaling the one established at Plymouth Rock. The Pacific Slope States are now developing much faster than the Nation as a whole. The population growth of this area between the census period of 1910 and 1920 was 30 percent as compared with the national growth of 14.9 percent. During the 10-year census period from 1920 to 1930 these States increased their population 40.8 percent while for the United States as a whole the increase in population for the same period was only 16.1 percent.

In view of the past performance and of the more equitable climatic conditions, it is reasonable to believe that the rate of growth in this region will be on an accelerated basis provided the large quantity of staple food requirement of its people can be obtained from a production reasonably near at hand, which source must come from the development of the arid West through Federal investment in reclamation. If this production is not made possible within reasonable reach of the fast developing West, the stream of migration is going to be diverted to Canada and other parts of the country that capitalize their less natural opportunities and advantages. The required production must logically come from the gradual development of the irrigated section of the arid West. To destroy or hinder the irrigation development of this region would divert the current of shifting population from the West much the same as soil exhaustion in the New England States, which would result in higher food prices, higher labor costs, and the gradual transfer of the bulk of the textile industry from industrial New England to the rural South. As irrigated agriculture is the central point from which all forms of agricultural and industrial activity of the arid West must revolve, any expenditure for irrigation development must be classed as a national investment in the future of our Nation.

The natural resources of this section of the country were originally composed largely of mineral wealth. As the gold, silver, copper, oil, coal, timber, and other natural resources of this region are gradually consumed, it becomes highly important to the States and the Nation that the new resources be developed to take their place or these States will soon go into decay and finally become a liability to the rest of the Nation.

UNEMPLOYMENT RELIEVED

The gradual development of irrigated communities has provided employment and a living for thousands who might otherwise be on relief. On reclamation projects alone there are nearly 3,000,000 persons who will, through irrigation, be able to maintain themselves. They may not be making a profit during this depression period in agriculture, their purchasing power may have been greatly reduced, and they may have been forced to forego the purchase of many luxuries, but they have jobs and places to sleep and something to eat.

If it were not for these irrigation projects, where would these people be today? Perhaps in some manufacturing center—out of work and living on relief or possibly farming in the humid section on marginal farms in the already overcrowded farming region or helping to build up the agricultural surplus by farming a tract of land that should be taken out of production and given a chance to build up its fertility for future generations.

NATION STRENGTHENED IN WAR BY COMPACTNESS

The development of the arid West through irrigation projects is an invaluable strengthening of the Nation in case of war. Any nation can be better equipped to defend itself if it is a solid compact Nation of united communities than if it is widely separated by vast spaces of desert and semidesert regions. It is better able to furnish man power, to produce provisions and munitions of war, to furnish finances and to meet all of the emergencies of war.

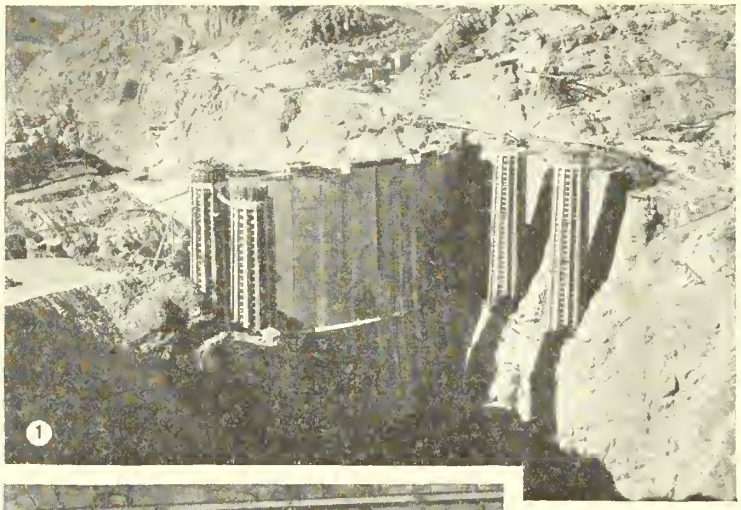
RECLAMATION, A SUCCESSFUL INVESTMENT

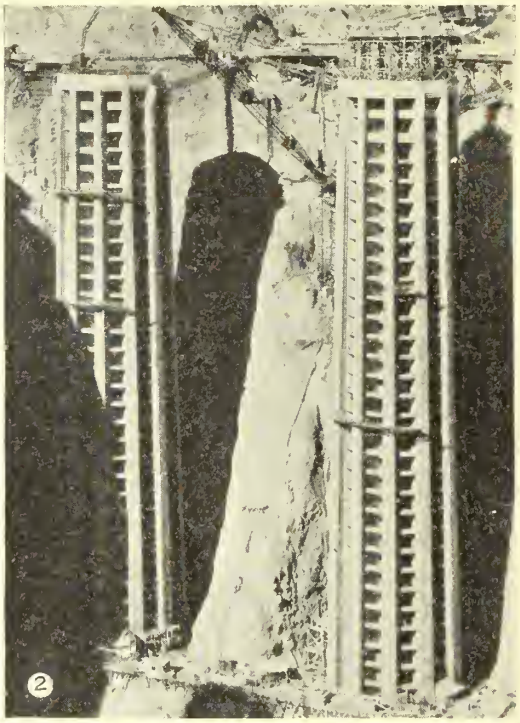
As an investment, Federal reclamation stands as a solid example of a successful government investment. Government investments often go sour. Not so with Federal reclamation if it is considered in the broad sense. If the cost had been ten times as much and not a dollar returned it would still stand as the greatest investment from a strictly financial point of view that the Government has ever made. It is creating a vast market for manufactured goods which has created employment for countless thousands. England has spent billions to develop foreign trade as an outlet for her manufactured goods. By the expenditure of a comparatively small sum on Federal reclamation, there has been created an immense perpetual market for manufactured goods that is far more valuable to this Nation as a whole than the construction cost even if not a cent were returned to the Federal Government. One project, Yakima, during 1926 spent $9,950,000 on automobiles only; another project paid more than $800,000 for freight in 1 year, which gives but a faint picture of the flow of manufactured goods into these projects with the resultant benefit to the manufacturing districts.

RECLAMATION CREATES PERPETUAL FEDERAL REVENUE

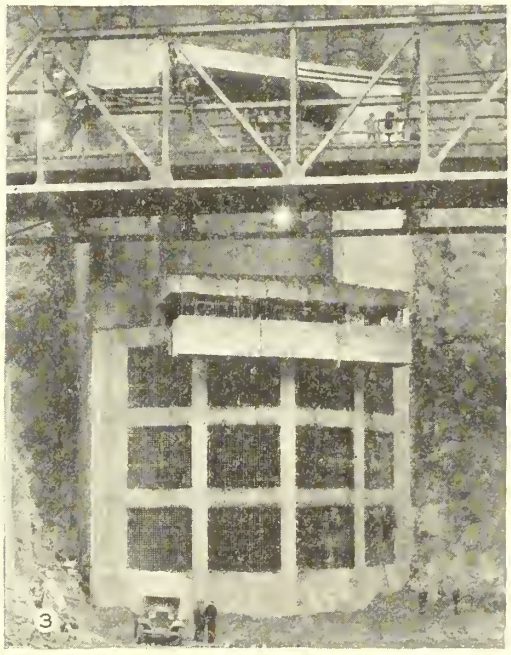
These projects have created a perpetual revenue for the Federal Government through their tax-producing ability. It is claimed that the annual incoming taxes alone collected by the Federal Government from reclamation projects prior to the depression amounted to approximately 5 percent of the entire construction cost of the projects. This is in addition to the large amount of indirect tax which has gone in a steady flow to the Federal Treasury. Federal reclamation has taken worthless deserts peopled only by jackrabbits and prairie dogs and transformed them into an empire with an assessed valuation of nearly one billion dollars,

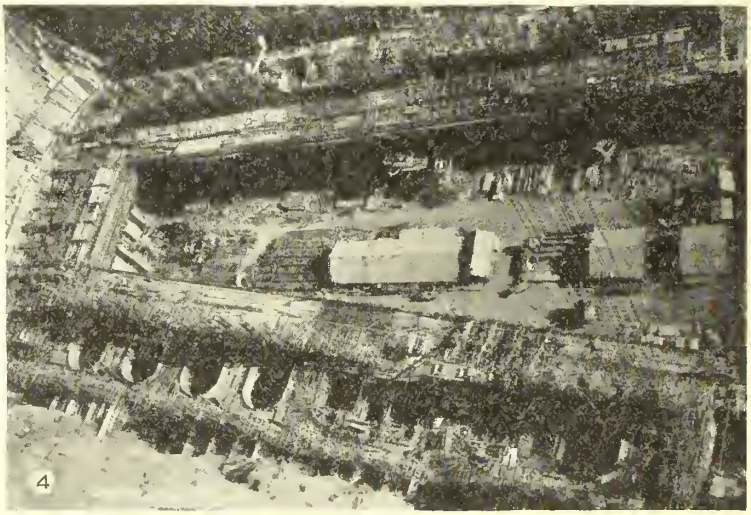
(Continued on p. 66)

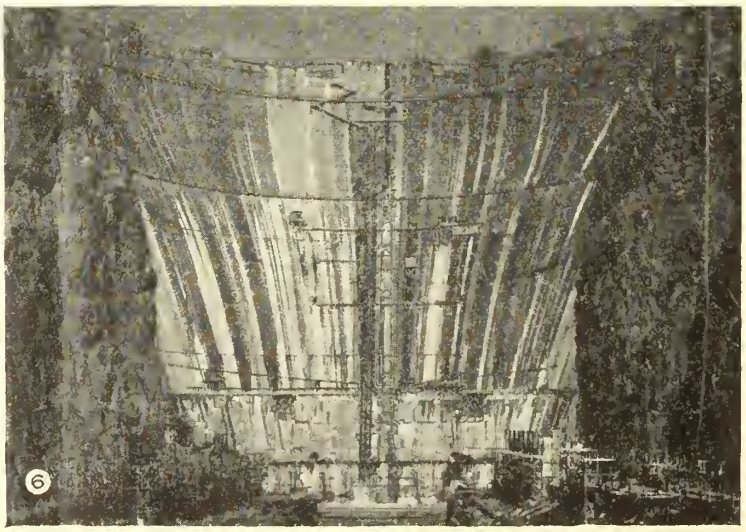




BOULDER CANYON PROJECT







1, Boulder Dam and appurtenant works as seen from nigh point on Arizona rim of Black Canyon, Top forms at elevation 1232; 2, Telephoto view of Nevada intake towers seen from Arizona rim of Black Canyon; 3, Start of reservoir regulation. Trash rack at inlet to diversion tunnel No. 1; 4, Power plant construction seen from control tower of 150-ton capacity cableway. View looks downward; 5, Start of reservoir regulation. Flow passing through diversion tunnel No. 4 in background and through dike into diversion tunnel No. 1 in foreground; 6, Downstream face of dam. Top forms at elevation 1232.

Control of Curly-Top Beets and the White Fly

CURLY-TOP of sugar beets was first recognized as a disease of major importance in 1899, in California. Since that time, frequent and often very destructive outbreaks have occurred in practically all sugar-beet areas west of the Rocky Mountains except in a few districts in the fog belt along the Pacific coast. It has not occurred in serious amounts east of the Continental Divide.

In regions where it occurs as epidemic, curly-top is most destructive of all beet diseases. In several of the important agricultural districts west of the Rocky Mountains this disease is the principal factor limiting the beet crop. Curly-top is a virus disease. The causal virus is transmitted by the beet-leaf hopper, *Eutettix Tenellus* (Baker). The geographical distribution of the disease is, therefore, the same as that of the insect vector. Investigators have emphasized direct financial losses due to curly-top. Some have placed the direct loss at upward of $30,000,000 since the disease first made its appearance.

When it was shown that the beet-leaf hopper is probably the sole natural agency of transmission of the curly-top virus, the control of the insect was suggested as a means of preventing or mitigating curly-top damage. Extended entomological research has been conducted in the effort to effect control of the insect. Attacks on the leaf hoppers with insecticides and mechanical means have in the past been conducted mainly in sugar-beet fields without practical results.

HISTORY OF BEET-LEAF HOPPER

The beet-leaf hopper is single brooded and begins to deposit its tiny white eggs in the stems and midribs of the beet leaves from about the end of June, the time doubtless varying somewhat with the locality and local climatic conditions, until the end of August. Probably the majority of the eggs are deposited by the middle of July. The nymphs begin to appear about the second week in July, and some have made their appearance in considerable number as late as the end of August. This pest is an exceedingly active insect; its favorite mode of locomotion is by hops with lightning-like rapidity. The range of its leap seems to be about 18 inches. The adult while on beets uses its wings but little. In common with several closely related species, it is a true sucking insect; it is provided with powerful head parts and a stout bill. The bill when not in use is tucked snugly against the under side of the body.

NATURE OF INJURY TO PLANT

The symptoms of injury by this leaf hopper are to be found upon all parts of the plant. The first to appear is usually an inward curling of the inner leaves. This is associated with a distortion and enlargement of the veins of the leaf. In severe cases the veins are covered with nipple-like protuberances. As the disease advances the whole plant becomes affected. The leaves become badly crumpled, the stunted roots develop an abnormally large number of fibrous rootlets from the root stem, and the root itself becomes darkened, especially where the rings of fibrovascular bundles show in cross sections. The crown of the beet will often be covered with a sweet gummy substance which exudes from the beets.

METHOD OF CONTROL

The method of controlling the disease through breeding a resistant variety of beets was first recognized and breeding began with Townsend in California in 1902. His efforts were handicapped because the relationship of the beet-leaf hopper to the disease had not then been demonstrated, and therefore no way of insuring exposure of the plants to the disease was known. In one trial, however, in 1907, he reports evidence of an appreciable degree of resistance in the progeny of plants selected for resistance, as compared with 25 other varieties.

In 1918 breeding was begun in earnest by the United States Department of Agriculture in an effort to develop a beet that would resist the disease, and has continued until the present time. The result has been the development of a strain highly resistant to curly-top, producing a tonnage comparable with any of the old type seeds. This strain is known as "U. S. No. 1." The scattered fields throughout Utah and Idaho planted with this seed this year thoroughly demonstrate its ability to withstand the ravages of the disease. Further careful selection has developed an offshoot of U. S. No. 1 which is even more resistant than its parent, and is known as Accession No. 23.

Cooperating with the United States Department of Agriculture, the Utah-Idaho Sugar Co. produced in the St. George, Utah, area in 1934 sufficient U. S. No. 1 seed to supply all their growers in white fly areas for the 1935 planting. As further developments are made in the breeding of resistant strains the Utah-Idaho Sugar Co. will put them into production to supply their growers.

Results obtained this year from plantings of the U. S. No. 1 variety in widely scattered areas convince us that the white fly problem has been solved, and that no grower need fear this pest longer regardless of the mildness of the winter or the severity of the outbreak.—*The Farm Messenger.*

If You Want Books

(Continued from p. 57)

in an accompanying cut. Almost every large area has some town which serves as its trading center. Here a regional library would have its headquarters, from which books would be sent by automobile to rural schools, post offices, gas stations, and other gathering places where people could borrow them easily and without charge. Such regional service is now being successfully operated in British Columbia, where service was begun as an experiment 5 years ago and is now being carried on with local tax support.

The success of a regional library bill will depend in the main on local initiative and support, in the opinion of library leaders, but State and even Federal aid will probably be needed if people in poor and sparsely settled States are to have reasonably satisfactory service.

HOW YOU CAN HELP

If readers of this article are interested in library service, why not write to the author and tell her what they and their families want and what reading they now have in the way of books, magazines, and newspapers? She cannot promise to help or even to answer the letter if letters are too numerous, but she can promise to see that letters showing a real need of books reach authorities concerned with this problem of library service for isolated families. Needed books, it should be noted, cannot be made immediately forthcoming, but if enough people express a desire for library service it will unquestionably hasten the day when such service will be provided.

In a study of 5 Wyoming counties, made by Wyoming's delegates to the National Reclamation Association conference held recently at Salt Lake City it was found that the 3 irrigated counties included were wealthier than the 2 dry-farming counties. Nonirrigated counties pay 9 to 15 cents an acre county and State taxes, while irrigated land counties pay 23 to 72 cents.—*Wyoming Stockman-Farmer.*

Revised Plan for Casper-Alcova Project

SECRETARY of the Interior Harold L. Ickes has approved a revised program for construction by the Reclamation Bureau of the Casper-Alcova project in Wyoming. Under the new plans the irrigation development which would have cost $23,701,235 will cost $20,004,254, a net reduction of $3,696,981. A P. W. A. allotment of $12,000,000 has been made to start construction of the project. The conclusions and recommendations embodied in the new plan recommended by Dr. Elwood Mead, Commissioner of Reclamation, and approved by Secretary Ickes, follow:

1. The Seminoe reservoir power development is financially sound. Profits from the sale of power will not only repay the Seminoe development but will help pay for the irrigation project. The storage in Seminoe reservoir is needed to extend irrigation in Wyoming, and to develop the unused but valuable mineral wealth.

2. Before construction is resumed certain water-right difficulties should be cleared up. Through misunderstandings the water rights to be issued by the State of Wyoming for portions of the Federal North Platte project are incomplete. This is a menace to the water supply of irrigators. It is recommended that further letting of contracts for any works be deferred until proper official action is taken by Wyoming authorities looking to the completion of water rights for the Casper-Alcova project with a priority of 1934 and the Gering-Fort Laramie project with a priority of 1904.

It is also recommended that upon the execution of a repayment contract by the irrigation district under the revised program above stated, construction work be resumed.

Under the revised program the first unit of the project will consist of 35,000 acres which the engineers agree can be adequately irrigated with waters obtained from the Seminoe Reservoir. The proposal now is to construct the main canal only far enough to irrigate 35,000 acres but of a size so that the entire area of 66,000 acres can eventually be irrigated if it is found that sufficient water is available as claimed by some engineers and by the State authorities.

It is in the center of an important grazing area where there is an imperative need for winter feed for range livestock. Because of this, alfalfa will be the principal crop. This irrigated area therefore will increase the use and value of a large area of grazing land. It is assumed that construction payments on this area, as large as those now being made on other similar areas in the arid region, can be made. On this basis a yearly average construction payment of $2 an acre has been fixed. This makes the average total minimum construction charge $80 an acre, with operation and maintenance to be paid in addition.

Dr. Mead declared that the feasibility of the Casper-Alcova project depends on the construction of the Seminoe Reservoir and power plant. He added that the cost of the irrigation works in excess of $80 an acre must be paid from the profits on power. In this connection he said:

"A reservoir with a capacity of 1,040,000 acre-feet to conserve and hold flood water and water passing down the stream in nonirrigation months is a part of the plan. The Pathfinder Reservoir, constructed 25 years ago and lying immediately downstream from Seminoe, enables Seminoe outflow to be used in producing power, as needed, to an amount equivalent to 16,000 kilowatts continuous power, or 140 million kilowatt-hours per year. Exhaustive inquiries show that there is an existing market for this power in Casper, Cheyenne, Rawlins, Laramie, Medicine Bow, and Parco. These are among the principal towns in the State. Power rates in all these communities are generally high as most of the power is fuel-produced in small plants. The Bureau now operates 2 hydro-power plants on the North Platte River near Torrington with a large part of the output sold directly to 11 towns and 2 industrial plants on the North Platte project. Power is sold to 3 public utilities serving Casper and towns for 200 miles downstream into Nebraska, and there are demands from other towns which cannot be supplied. Seminoe power will be marketed throughout southeastern Wyoming. More communities will secure power directly from the Government and others will benefit from lower rates."

Preparing for the Destitute

(Continued from p. 62)

home owners on the soil have been the backbone of nations.

Xenophon, 300 years B. C., stated:

"Agriculture is an art which will enrich those who diligently practice it, provided they understand it; but if they do not understand it, it matters not how hard they may labor at it, it leaves them in poverty."

Cato, about 50 years B. C., said:

"It is from the tillers of the soil that spring the best citizens, the staunchest soldiers; and theirs are the enduring rewards which are most grateful and least envied. Such as devote themselves to that pursuit are least of all men given to evil counsels."

Practically all of the leaders in this country "admit" that they were reared on a farm.

The American Legion and the various women's clubs on the Sun River project continue in a healthy condition.

A Federal Investment

(Continued from p. 63)

creating from these barren wastes one of the principal assets of the States in which they are located thus increasing the financial stability of both State and Nation.

It is creating a potential wealth that is revolving year after year. The valuation of the crops produced each year on reclamation projects is now nearly equal to the construction cost of the completed projects.

No other investment of the Federal Government has brought the Nation a larger, more solid, and economical return. No other investment of a like amount has done as much to build homes, strengthen the country, create taxable property, and to furnish an outlet for manufactured goods.

It is an undeniable fact that the results of Federal reclamation activities fully justify the expenditures of Federal funds as well as reclamation funds for the development of irrigation in the arid West on a pure investment basis even if there were no hope or thought of any return of the money expended for construction from the landowners on the projects.

The Klamath project, Oregon-California, shipped 800 cars of potatoes during the month of January, the heaviest of record, bringing shipments to the close of that month to about 3,250 cars. To the same date the project had shipped 5,000 tons, or 219 cars, of alfalfa hay to the drought area and an additional 3,000 tons were contracted for shipment.

$36,000 Allotted to Klamath Project

In accordance with the provisions of the National Industrial Recovery Act of 1933, an allotment of $36,000 has been made to the Interior Department, Bureau of Reclamation, to complete a portion of an incomplete drainage system on the Klamath Irrigation Project, Oreg.

Board of governors and officers, Salt River Valley Water Users' Association, 1935.

Profitable Irrigation

Some farmers in the drought regions who were able to improve their irrigation systems during the past summer reaped handsome profits. The Bureau of Plant Industry reports the experience of a fruit grower who irrigated 827 eight-year-old peach trees in an orchard at Springdale, Ark. He applied approximately 1,000,000 gallons of water during the drought at a cost of $240 and marketed about 3,000 bushels of peaches from the trees. The fruit was of so much better size and quality than the peaches from unirrigated trees that his price was about 50 cents a bushel more than his neighbors were able to get.

Thus the $240 expenditure for water was responsible for a $1,500 increase in income, for quality, not taking into account the increase in the number of bushels he harvested as the result of irrigation.

Sun River Marks Improvement in Crop Yields and Values

The average yield per acre of cereals on the Sun River project, Mont., in 1934 was 63 percent higher than that for the preceding year. The acreage of wheat was 10.6 percent under the total cropped area for the year 1933, and the total value of all cereal crops, which include corn, wheat, oats, and barley, was 106.4 percent greater than for the preceding year. These increased vaules are attributable to better marketing conditions and higher yields, the higher yields having been made possible by better farming practices.

Crop returns from many of the projects indicate that 1934 was a profitable season for the irrigator with adequate water. There is no doubt that early conservation and careful use contributed to the season's success. Outstanding among the reports are the Belle Fourche, where crop values very nearly equaled those of the 1929 high, and the cotton yield of Dona Ana County, Rio Grande project, of 1.45 bales per acre, which is believed to be a high figure for the whole United States.

RECENT PUBLICATIONS OF INTEREST

Department of Commerce, Bureau of Foreign and Domestic Commerce: Statistical Abstract of the United States, 1934, 56th an. edition. On sale by Superintendent of Documents, Government Printing Office, cloth bound copies $1.50 each.

Department of Agriculture, Bureau of Agricultural Engineering: Technical Bulletin No. 439, October 1934, "Policies Governing the Ownership of Return Waters from Irrigation", by Wells A. Hutchins, Irrigation Economist. On sale by Superintendent of Documents, Government Printing Office, price 5 cents per copy.

Department of Agriculture, Circular No. 331: Walnut Blight and Its Control in the Pacific Northwest, by Paul W. Miller, Associate Pathologist, Division of Vegetable Crops and Diseases, Bureau of Plant Industry. On sale by Superintendent of Documents, Government Printing Office, price 5 cents per copy.

The World Today—Encyclopaedia Britannica, February 1935, pp. 18–20 (illus.): Destruction of Land Value by Erosion, by Dr. Elwood Mead, Commissioner, Bureau of Reclamation, Department of the Interior.

An allotment of $30,000 from P. W. A. funds has been announced for drainage work on the Willwood division of the Shoshone project, Wyoming.

A home on Main Division, Klamath project, Oregon-California

Reclamation Organization Activities and Related Matters

On February 12, Hon. Harold L. Ickes, Secretary of the Interior, delivered an address on the National Public Domain Policy and the New Taylor Grazing Law before a meeting in Denver of western officials from Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.

Dr. Elwood Mead, Commissioner of Reclamation, gave an illustrated lecture on March 1 before the Engineer School at Fort Humphreys, Virginia, his subject being "Boulder Dam." On March 19 Dr. Mead will address the Providence Engineering Society at Providence, Rhode Island, on the same subject.

George O. Sanford, chief of the engineering division of the Washington office, left the city for the West on January 29 for the purpose of conferring with the Governors of Montana, Idaho, Wyoming, and other State officials on a construction program covering further reclamation development in the Northwest. Mr. Sanford returned to Washington on February 9 by way of Denver.

Walker R. Young, construction engineer on the Boulder Canyon project, delivered an address on February 23 before the American Farm Bureau Federation, held in Los Angeles on February 25–27. Mr. Young's subject was "The Boulder Canyon Project and Its Mission in Reclamation."

Olaf Laurgaard, construction engineer on the Parker Dam project, has been transferred to the position of engineer in the Denver office.

Mills E. Bungar has been transferred from the Gila Valley investigations to the Denver office, effective January 1.

P. I. Taylor, assistant chief, engineering division, Washington office, on February 25 delivered an illustrated lecture on Power Development on Federal Reclamation Projects at the Public Ownership League conference, which was held in Washington February 21–25.

N. G. Wheeler, chief clerk of the Klamath project, is reported ill and still confined to the University of California Hospital.

O. G. F. Markhus, of Washington, was appointed by the Secretary of the Interior to the position of assistant engineer on the Columbia Basin project, effective January 23, 1935.

Local Representatives Assigned to Furnish Material for Publication in Reclamation Era

Supplementing the list recorded in the February issue of the ERA of persons designated to furnish articles and local news items to be carried in the ERA the following additional projects have made assignments as indicated:

Denver office, Sumner P. Wing, engineer.

Yuma, R. C. E. Weber, superintendent, and W. A. Boettcher, office engineer.

Parker Dam, R. R. Nichols, junior engineer.

Minidoka, E. B. Darlington, superintendent.

North Platte, J. A. Keimig, assistant engineer.

Vale, Henry L. Lumpee, junior clerk.

Belle Fourche, F. C. Youngblutt, superintendent.

Ogden River, G. C. Imrie, office engineer.

Yakima, M. D. Scroggs, irrigation manager, Sunnyside division, and D. E. Ball, superintendent of irrigation, Tieton division.

Columbia Basin, O. G. F. Markhus, assistant engineer.

The Colorado River consulting board, consisting of Dr. D. C. Henny, Dr. W. F. Durand, Dr. C. P. Berkey, and Louis C. Hill, met recently with J. L. Savage, chief designing engineer; B. W. Steele, senior engineer (dams); H. R. McBirney, senior engineer; and C. P. Vetter, at Yuma, Ariz., to discuss problems pertaining to future construction on the All-American Canal.

Employees of the Government and contractors on the Boulder Canyon project on January 31, as shown by the pay rolls, totaled 4,153. Of this number, 3,867 were charged to the several contractors, and 286 to the Bureau of Reclamation.

Fred W. Hazelwood, district engineer for the Department of Public Works of California, paid a recent visit to the Klamath Falls project office to discuss matters pertaining to the construction of the proposed highway across the Tule Lake division.

Francis J. Farrell was transferred from the Denver office to Salt Lake City, where he assumed the duties of chief clerk on January 1.

Rio Grande Compact Continued

At a meeting in Santa Fe, N. Mex., on January 28, of the Rio Grande Compact Commission, following an adjourned meeting in the same city on December 10 and 11, 1934, the following official representatives of the Federal Government and the States of Colorado, New Mexico, and Texas were present:

United States: S. O. Harper, representative of the President; E. B. Debler, engineering advisor; H. J. S. Devries, legal advisor.

Colorado: M. C. Hinderlider, commissioner; S. P. Howell, legal advisor; George M. Corlett, legal advisor; Ralph Carr, legal advisor; R. J. Tipton, engineering advisor.

New Mexico: Thomas M. McClure, commissioner; Frank H. Patton, legal advisor; E. K. Neumann, legal advisor; Edwin Mecham, legal advisor; John Bliss, engineering advisor; C. H. Howell, engineering advisor.

Texas: Major Richard F. Burgess, acting commissioner.

At the conclusion of the meeting it was agreed by the members of the commission that recommendation be made to the Governors of the respective interested States to extend the life of the present Rio Grande compact to June 1, 1937. A motion was also carried that the meeting of the commission adjourn to March 18, 1935, to again convene at Santa Fe, for the purpose of continuing the negotiations for a permanent compact.

Construction of the earth-fill Agency Valley Dam, at Beulah, Oreg., by the Hinman Bros. Construction Co., for the Vale project, is approximately one-half completed. The dam will be 89 feet high, have a length at the crest of 1,700 feet, and will impound 60,000 acre-feet of water. From 80 to 180 men have been employed since April 1934 on its construction. Completion is scheduled for early in 1936. It is a P. W. A. project.

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Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead,** Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; Miss Mary E. Gallagher, Secretary to the Commissioner; George O. Sanford, Chief, Engineering Division; Wm. F. Kubach, Chief Accountant; Charles N. McCulloch, Chief Clerk

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H. Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Dehler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
Carlsbad	Carlsbad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen [1]	C. M. Voyen	W. J. Burke	Billings, Mont.
Columbia Basin, Grand Coulee.	Almira, Wash	F. A. Banks	do	C. B. Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
Grand Valley	Grand Junction, Colo	W. J. Chiesman	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Engineer	George B. Snow		do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent	N. G. Wheeler	C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Resident engr	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif	Ralph Lowry	do	George H. Bolt		R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wentzell [1]	C. B. Wentzell	W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo		Superintendent	L. J. Windle [1]	Denver office	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Denver office	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Engineer			J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		Denver office	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Constr. engr	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah
Repairs to canals	Montrose, Colo	C. B. Elliott	Engineer	do	do	do	Do.
Upper Snake River Storage [3]	Idaho Falls, Idaho	H. A. Parker	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

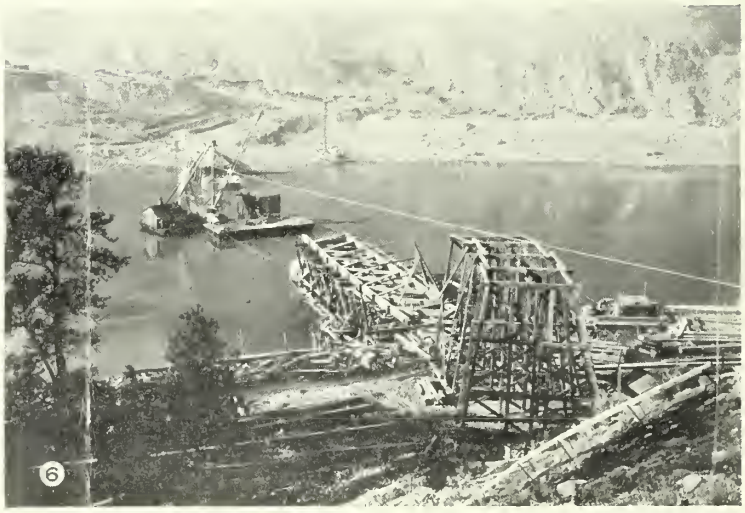
Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrig. dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	C. W. Tharp	Superintendent	C. J. McCormick	Grand Junction.
Huntley	Huntley irrigation district	Ballautine, Mont.	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Irl Davis	President	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont.	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	D. E. Norton	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	F. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district.	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo.	Bert L. Adams	do	Nellie Armitage	Torrington.
Northport division	Northport irrigation district	Bridgeport, Nebr	Mark Iddings	do	Mabel J. Thompson.	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash.	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
Salt Lake Basin (Echo Reservoir.)	Weber River Water Users' Association.	Layton, Utah	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Gen. supt and ch. engr	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	Superintendent	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont.	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigation district	Fairfield, Mont.	A. W. Walker	do	A. W. Walker	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg.	E. D. Martin	do	Enos D Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley Water Users' Association.	Montrose, Colo	C. B. Elliott	do	Wm. W. Price	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	do	R. E. Rudolph	Ellensburg.

Important investigations in progress

Project	Office	In charge of—	Title
Buffalo Rapids	Powell, Wyo		Superintendent.
Colorado River Basin, sec. 15	Denver, Colo	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes investigations	do	C. C. Fisher	Engineer.
Gila Valley	do	P. J. Preston	Senior engineer.
Grande Ronde investigations	do	Foster Towle	Associate engineer.
San Luis Valley	do	R. F. Walter	Chief engineer.
Umatilla River investigations	do	Foster Towle	Associate engineer.
Upper Colorado River investigations			
Upper Snake River storage	Idaho Falls, Idaho	H. A. Parker	Constr. engr.

SALLIE A. B. COE, *Editor.*



COLUMBIA BASIN PROJECT

WASHINGTON

1, Upstream section of west cofferdam from east bank, showing fog condition throughout January; 2, Portion of wash excavation area. View from west hills; 3, view upstream of west cofferdam area; 4, Development from east hills; 5, contractor's footbridge, elevation 960, looking west; 6, Contractor's railroad bridge from east bank.

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THE RECLAMATION ERA

VOL. 25, NO. 4 APRIL 1935

A TYPICAL MODERN TOWN HOME ON THE SHOSHONE PROJECT, WYOMING

GOVERNMENT OF THE UNITED STATES

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BUREAU OF THE BUDGET

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Grand Coulee Contractors Build Mason City

By O. G. F. Markhus, Assistant Engineer, Bureau of Reclamation

MASON CITY is the contractor's camp at the Grand Coulee Dam of the Columbia Basin project on the Columbia River, in approximately north central Washington, about 85 miles west of Spokane, although it is not of as permanent type of construction as the Government camp, now nearing completion, directly across the river, it does not give one the impression of a "camp", but rather that of a substantial and modern city of comfortable homes for the 3,000 employed in the building of the immense dam and powerhouse. The city derives its name from the Silas Mason Co., Inc., of New York City, which concern, together with the Walsh Construction Co. of Davenport, Iowa, and the Atkinson-Kier Co., of San Francisco and San Diego, has the $29,000,000 contract for building the dam and powerhouse—known locally as the MWAK Company. This company claims an investment of practically $1,000,000 in Mason City.

It is located on a gently sloping bench on the east side of the river, with its main and central avenue in line with the new State Highway bridge, some 3,000 feet below (north of) the dam. Along this 80-foot street is located the public service station and garage, two automobile sales agencies, recreation hall, bus depot, general store, theater, town hall, bank, postoffice, hotel, and laundry. It circles the "civic center", Mead Park, with its 150-foot flag pole and flower beds, and continues on to the steep hillside east of town. The homes of men with families are on the north side of this main artery, and on the south side the bunkhouses for other workers and foremen, the "bachelor town" of one-room cottages, girls' dormitory, hospital, administration building, camp office, mess hall, headquarters of the National Re-employment Service, storage yards, and, along the river, the machine shops and main warehouses. The other streets are 50 and 35 feet in width, all uniformly graded for drainage to the river. Roadways will be surfaced this spring with a 6-inch layer of gravel, covered with a top of 1½ inches of bitumen compound. A total of 14 miles of water and sewage mains reach every point, with fire hydrants at all street intersections. Streets will be sprinkled during the dry season.

WATER SUPPLY

Water is pumped from the Columbia about a mile above the dam, and above all drainage from nearby towns. Two centrifugal pumps direct-connected to electric motors, and one stand-by pump operated by gas engine, with a total pumping capacity of 1,500 gallons per minute, elevate the water to three large water tanks with a capacity of 350,000 gallons, located on the hillside at a height to give from 60 to 110 pounds' pressure. The water is chlorinated at the pumps and is systematically tested for potability. Sewage is treated in an Imhoff tank, with the effluent discharging below low-water stage some 4,000 feet below the dam. Provision for fire protection includes a modern fire-alarm system with call boxes at each street intersection, and call recording instrument at the central fire station, where an automatic siren is installed on the town-hall roof; and a hose truck with booster pump and a company of drilled volunteer fire fighters. Street lighting is from 300-watt lamps at each street intersection. Reasonable rules for the general welfare and safety of the camp are rigidly enforced by company inspectors and serious infractions of law and order are brought to the attention of the justice of the peace by the State highway patrol, two of its officers having been assigned for duty in Mason City by Governor Martin.

CITY WITHOUT CHIMNEYS

Mason City has several unique features, and undoubtedly the most outstanding—certainly the one of greatest popular interest—is that here is a city of 3,000 people entirely without chimneys and smoke. Except for the larger, or main floor areas in the recreation hall, general store, and the mess-hall, the entire city is electrically heated. Results covering the 4-month period ending with February are said to be entirely satisfactory. The rate charged consumers is 3 mills per kilowatt-hour, and it is said that the average cost for electricity for heating, cooking, hot water, and lighting, for the cold month of January, in a 4-room house, was $8. Continuous tests are being conducted by the engineering experiment station of the Washington State College on various types of heaters, kinds of building material and insulation, and other important conditions, the construction company having set aside 16 houses for this purpose. One of the insulating materials is a diatomaceous earth mined at Libby, Mont., and shipped to Spokane where it is roasted and becomes the commercial article, "Unifil". It weighs 6 pounds per cubic foot and is said to equal cork in insulating qualities. This same earth is also marketed as "Zonolite". It is expected that the results obtained from these tests will be available in considerable detail shortly after the close of the heating season, and it is proposed to include these data in an article on electric heating at Mason City in an early issue of the Era.

EMPLOYEES' HOMES

Bids covering dam and powerhouse construction were opened June 18, 1934, and the Mason-Walsh-Atkinson-Kier Co. was awarded the contract shortly thereafter. Approval of the 5 million dollar bond was delayed, however, so that official notice to proceed with the work was not received until September 25. This unexpected loss of time made it necessary for the contractor to immediately speed up activities preliminary to actual operations in rock and dirt, with camp facilities as first and foremost. A decided saving in time was

accomplished by contracting with a woodworking concern in Spokane for sectional, or ready-cut buildings. These were designed so that the largest sections measured 28 by 14 feet and were delivered by truck to the dam site, a distance of 100 miles. Window sash, doors, and all cabinet work was fitted at the mill, and all hardware attached. Six men assembled from 6 to 10 of the 3- and 4-room houses in an 8-hour day, and the erection of the 350 ready-cut buildings was completed, including plumbing, wiring, insulation, and all fixtures, within a period of 3 months.

The floors of all houses are of double construction with insulating paper between, and set on concrete footings. Walls are made up of shiplap on two-by-fours, insulating paper, and drop siding. The roofs have an overhang of 2 feet and are covered with shiplap, composition roofing ,and a metal hip. All inside walls and ceilings are finished with thick insulating wall-board.

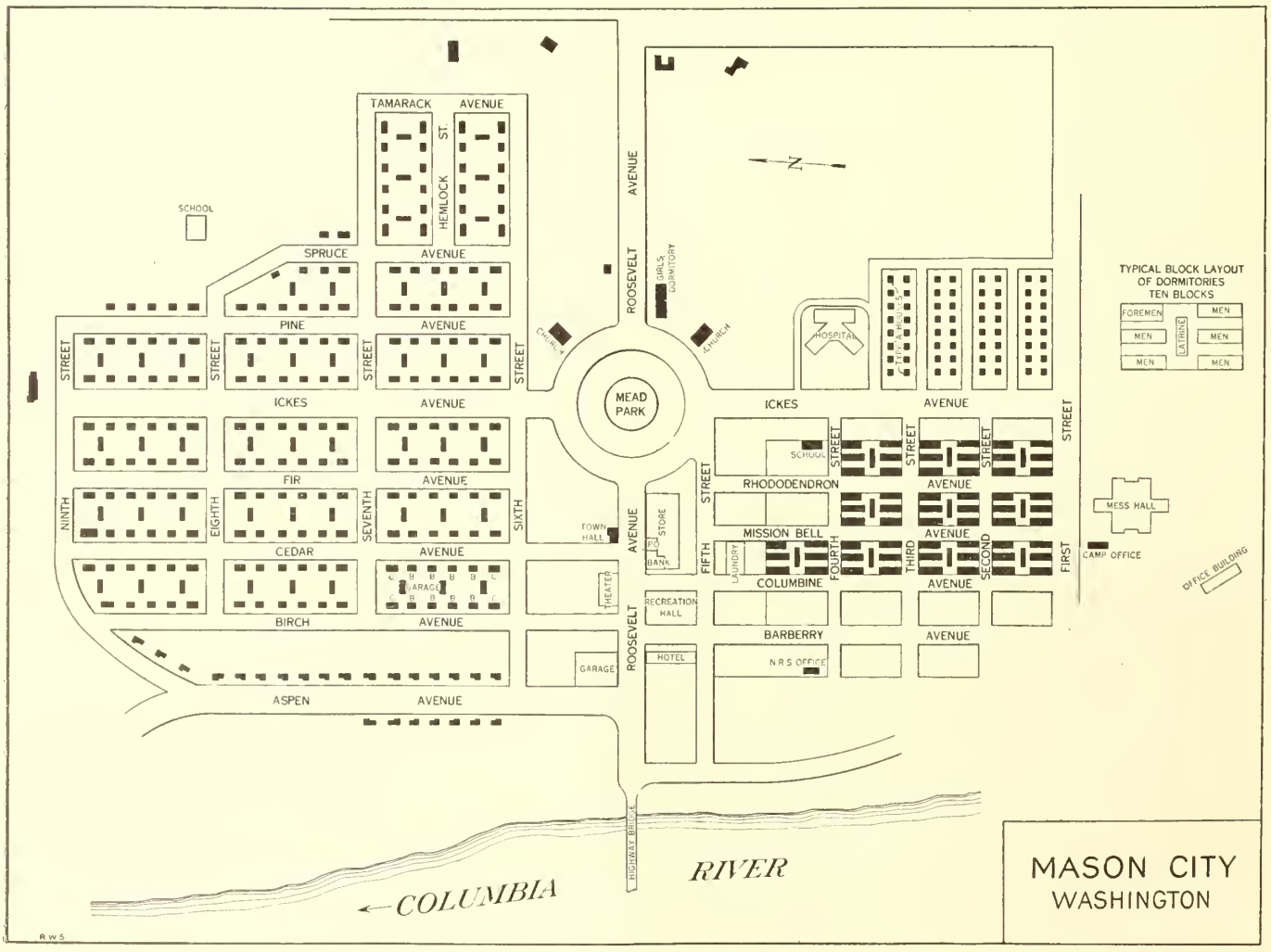
The type "A" house consists of a combination living and bedroom; kitchen with sink and cupboards; bathroom with tub, toilet, and lavatory; and a wardrobe closet. There are 64 of these 1-room cottages.

The type "B" house plan includes a 15½ by 12-foot living room, a 12- by 11-foot bedroom, large closet with window, bathroom with shower, toilet, lavatory, and medicine cabinet; kitchen and dinette, including sink, double drainboards, cabinets and a dining table for four, and a screened rear porch with laundry trays. There are 127 residences of this size.

The floor plan of the 88 type C house is substantially the same as for the B except that there has been added another bedroom and a linen closet.

The electric heating equipment in each house includes a 2.5 kilowatt hot-water heater (30-gallon tank), an 8.67 kilowatt range and air heaters totaling, respectively, 3, 13.5, and 16 kilowatts for the A, B, and C types of houses. There are 8 type B houses, 4 type C, and 3 four-car garages to each city block. Located on the outskirts of the camp are 11 residences for executives and officials, also of the ready-cut type, with 5 to 7 rooms. The 1-room houses are built in a solid square, with 35-foot streets, on the south side of Roosevelt Avenue directly east of the men's dormitories, or "bunkhouses.' There are 50 men's dormitories, each with 12 rooms, 10 by 11 feet and 8-foot ceiling, equipped with 2 beds, 2 clothes lockers, and 2 desks with chairs. There are 5 of these to the block, which includes also a foremen's dormitory and a latrine. Bunkhouse equipment includes fire extinguishers. The foremen's house has 8 single 10- by 10-foot rooms with lavatory and clothes locker, arranged 4 on each side of a central hallway, a linen closet, 2 toilets, 2 laundry trays, and a recreation room. Each latrine contains a 500-gallon hot-water tank with 28 kilowatt heater, 12 showers, 10 toilets, 4 double wash-up sinks, and 3 two-compartment laundry trays. Thirteen kilowatts is used for heating. All of the ready-cut buildings are painted white and look neat and substantial.

Plans are now being formulated for an appropriate scheme of landscaping, notwithstanding the fact that the life of the camp will probably be only the length of time required for the construction of the project—either the low dam or the high dam. Planting will include shade trees and shrubs indigenous to soil and climate, quick-bearing fruit trees, flower beds, and lawns, with special attention to Mead Park, the area in front of the hospital and the approach to the highway bridge. Prizes will be given for best cared-for



lawns. Plans are under way for tennis courts, children's playground and wading pool, an arena for wrestling and boxing matches, and a baseball field, with bleacher seats, where intramural teams from both sides of the river will form the Grand Coulee Twilight League and contest for the season's prize cup. A major team representing Mason City will play exhibition games on Sundays with teams from the Idaho-Washington State League, of which it will be a member, and such noted traveling exhibition teams as the "House of David" and any others that may visit the Pacific Northwest. It is only natural that a great interest is taken in the popular sport of the country, but especially so here when it is known that Mr. T. J. Walsh, president of the MWAK Co., caught behind the bat for the Chicago Cubs during the days of Three-Finger Mordecai Brown, and is sponsoring this major outdoor sport. The airport north of the townsite was built with P. W. A. funds by the State of Washington.

PUBLIC BUILDINGS

Recreation hall.—This building, facing Roosevelt Avenue, is 100 feet wide and 135 feet long, with a high arched ceiling. It is the social gathering place, or "clubhouse", of the workers, where entertainment may be had at pool and billiard tables, the ever popular game of pinochle, or the social glass of beer, seated on a stool in front of the 60-foot copper-covered bar. This building also houses a restaurant and coffee shop, the bus depot, tobacco and news stand, shoe repair shop, and a 6-chair barbershop. A portion of the structure is partitioned off as an assembly room, serving primarily as headquarters for the American Legion, but is also the meeting place for other lodges, the volunteer fire department, "safety first" classes, etc.

General store.—This is an all-inclusive mercantile establishment where all possible requirements of employees and their families may be purchased and at what appear to be fair prices. The building is 100 feet by 220 feet, and has a floor space of 38,000 square feet. There are sections devoted to dry goods and notions, women's ready-to-wear, complete men's furnishings, groceries and fruit, meats, drugs, tobacco, news and periodicals, jewelry, watch repairing, candies, soda and

Temporary kitchen in B and C houses.

ice cream, furniture, hardware, china and glassware, electrical appliances and supplies, and a hair-dressing and beauty parlor. The post office and the bank are located in this building. The bank is a branch of the Spokane and Eastern Trust Co. of Spokane, and conducts a general banking business, including a savings department.

Theater.—A comfortable picture showhouse, seating 450, with good acoustic properties, the most improved type of projectors and screen, fireproof projection room, employs two experienced operators. Admission is 25 cents for adults and 10 cents for children. This auditorium is used for occasional religious services, pending erection of churches.

Hotel.—This hostelry contains 40 rooms that may be had as single or double rooms, with or without bath, or in suites. Beds have high-grade mattresses and all-wool blankets from western woolen mills. Each room contains a writing desk and an attached lavatory with medicine cabinet. The hotel is already completely filled, and consideration is being given to the construction of 40 or 50 additional rooms and a dining room.

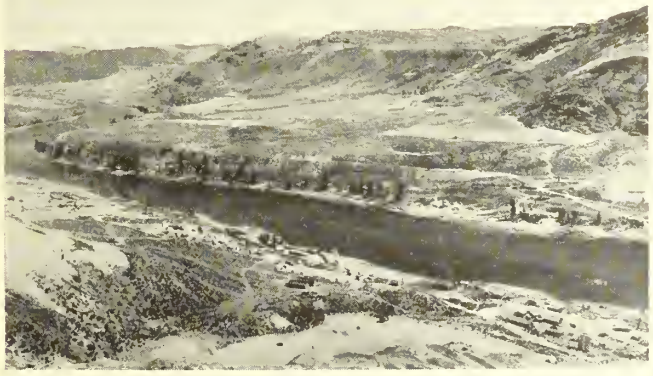
Schoolhouse.—A grade school, with an average attendance of 80, in charge of three teachers, is temporarily housed in one of the foremen's dormitories that was converted into a three-room schoolhouse. Plans are now being completed for a suitable school building to be located in the open space between Mead Park and the girls' dormitory. The school is conducted in accordance with State and county regulations. Pupils of high-school age attend classes at Grand Coulee, the company furnishing transportation and tuition. There is a total of eight high-school students in Mason City at present.

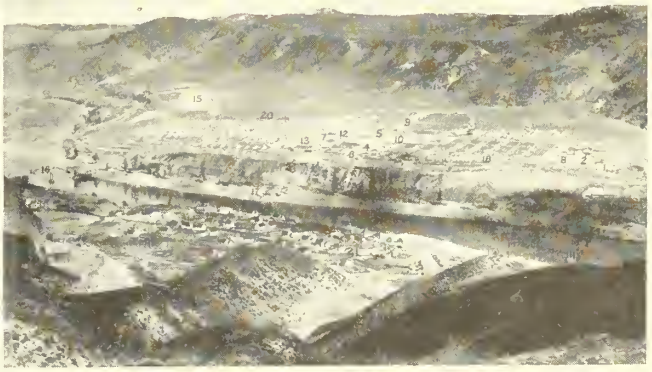
Laundry.—This is another institution that is a credit to Mason City. It has modern machinery for handling general laundry work and dry cleaning, and a tailor repair shop. The equipment includes a 150-horsepower boiler. There are 20 employees at present.

Town hall.—This serves as headquarters for the fire department and State highway patrolmen. The fire alarm siren is located on top of the building.

Girls' dormitory.—This is the home of some 30 girls employed as stenographers and clerks. It is supervised by a matron and includes a lounging room, dining room and kitchen, laundry, and all home comforts.

N. R. S. Building.—This is the headquarters of Capt. C. C. Berry, director of





Columbia Basin project, Washington—Left: Mason City before construction; right: Mason City—contractors' camp: 1, Administration building; 2, mess hall; 3, hospital; 4, recreation hall; 5, general store; 6, hotel; 7, theater; 8, camp office; 9, girls' dormitory; 10, laundry; 11, National Reemployment Service; 12, town hall; 13, public garage; 14, water tanks; 15, airport; 16, railroad bridge; 17, east pier highway bridge; 18, men's dormitories; 19, type A houses; 20, types B and C houses; 21, Government camp.

Mason City—Girls' dormitory.

labor employment under the Public Works Administration, and his force. Applicants for employment are examined for physical defects or for fitness of class of work.

Churches.—Plans are under way for the early erection of 2 churches; 1 Catholic, and 1 Protestant. They will be located on the east side of Mead Circle and will be financed from private donations of labor, material, and money.

MESS HALL AND KITCHEN

The mess hall is built in the shape of a cross, the kitchen and refrigerator occupying the full length center section and dining rooms on either side, with a seating capacity of 1,344. The tables which are uniform in size and are covered with hard-pressed wall board, seat 10 persons each. The men are seated in the order of arrival, regardless of rank, thus filling up the tables in orderly sequence. A total of 90 waiters, cooks, and helpers are employed at the present time.

Shift periods have fixed meal hours so that breakfast is served from 6 to 9; dinner from 12 to 2; supper from 5 to 7:30; night lunch from 11 to 1; and early breakfast from 3 to 5, but necessary meals are served at any time during the day. Lunches, or "nose bags", are put up in paper sacks for men on distant work, with coffee served free from stations at convenient points.

Kitchen equipment is of the most modern type, all electrically heated, and includes a bake-oven of 240 loaves per hour, an 80-quart mixer, two 3-section cookers that can handle 1,000 pounds of potatoes every 20 minutes, centrifugal potato peelers, steam kettles with a capacity of 180 quarts, a battery of pancake griddles capable of turning out 60 cakes every 2 minutes, and other equipment such as fry kettles, trunnion-type steam kettles, coffee urns, dough mixing machines, meat grinders, and ice-cream machinery with a capacity of 10 gallons every 15 minutes. The ice cream is put up in 3-ounce covered paper cups for sale at restaurants and soda counters, and served as one of the desserts three times a week. The present output is 100 gallons a day, or some 4,000 individual servings. The cold-storage room for ice cream is kept at a constant temperature of 10° below zero. Cold storage space for meats includes 40 quarters of beef and 3 tons of smoked meats. Another of the ice boxes has proportional space for butter and eggs. There is ample space in storage rooms for sufficient food (except fresh eggs) to serve a crew under peak conditions for a period of 25 days. The operation of the mess hall is under the direction of the camp superintendent and his able chef, both having had wide experience in western construction camps.

HOSPITAL

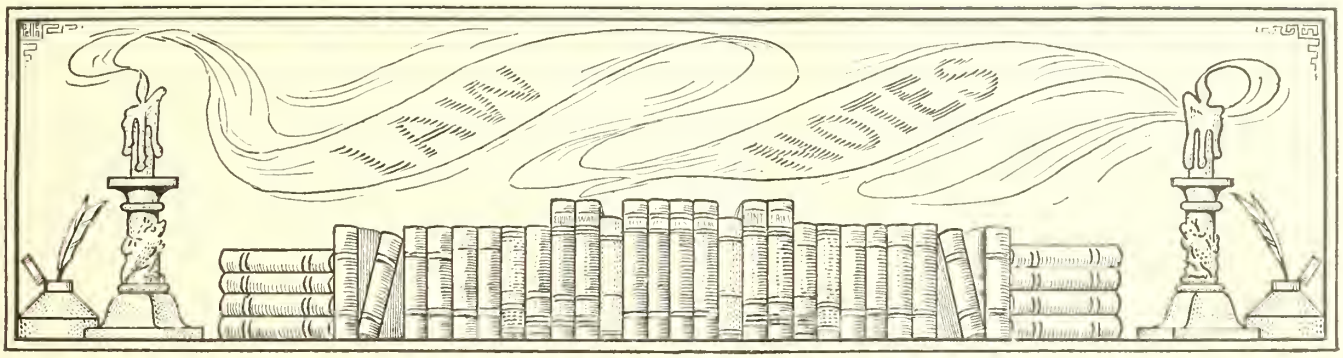
It is apparent to the visitor looking over Mason City that facilities for the comfort and welfare of employees were kept in mind when the camp was planned, but nowhere is this more noticeable than in the provisions for the care and rebuilding of the injured and sick. Grand Coulee is quite isolated in case of serious accident or sickness, as the nearest hospital is 100 miles distant, and an institution such as this creates a feeling of security to those in need of help—and also to the officials of the company. While primarily intended for MWAK Co. employees, its facilities have been offered to the Government men and their families, as well, and on the same basis.

The building is in the shape of the letter K, two stories high, and has ample room for 56 beds. It includes all departments of a modern hospital, with a present staff of three doctors for handling surgery cases and physical therapy for the after-care of those injured, with ample general and surgical service, completely stocked pharmacy, including such diagnostic aids as a well-equipped clinical laboratory with heavy-duty X-ray machine—primarily for early detection of pulmonary defects—in charge of an accredited technician. There are two major operating rooms, a smaller surgery for minor cases, also a maternity department. The affairs of the institution are directly under Col. M. J. Whitson, vice president, who originally planned that Mason City should have a grade A hospital. A section of the ground floor is devoted to dental work, reached by a separate outside entrance, and in charge of two experienced dentists. The equipment here is also complete and modern and includes an X-ray machine and dark-room.

The hospital kitchen is under the direction of a graduate dietician. The

(Continued on p. 84)

Mason City—Temporary schoolhouse on opening day.



Riparian Rights in Oregon

IN *California-Oregon Power Company* v. *Beaver Portland Cement Company*, 73 Fed. (2nd) 555, the Circuit Court of Appeals of the Ninth Circuit had under consideration the law of riparian rights in the State of Oregon. The case is particularly interesting for its discussion of *Hough* v. *Porter*, 51 Or., 318, 95 Pac., 732, in which the State court was considered as having rendered the riparian right doctrine, with minor exceptions, inapplicable in Oregon. Extracts from the decision follow:

"MACK, *Circuit Judge*.

"Plaintiff is the owner of land on the east side of the Rogue River, a meandering nonnavigable stream in Oregon, directly opposite land on the west side, the legal title to which is in defendant city of Gold Hill; defendant cement company has possession of the city's land under an executory contract of purchase. Ownership in each case extends to the thread of the stream. Pursuant to its plan to build a dam and power plant on the west side of the river, cement company exploded charges of dynamite in reefs in the river bed but entirely west of the thread of the stream, for the purpose of permitting a freer flow of water down the west side of the river and of securing an available supply of broken rock for the construction of the dam. Plaintiff, claiming that the prosecution of these operations would divert the water from its land on the east side of the river and interfere with its rights as a riparian owner on the stream, sought an injunction to prevent defendants, carrying on further blasting operations, removing the blasted rock from the bed of the stream, and doing anything else that would change the bed of the stream or lessen the flow of water over plaintiff's side of the river bed. The injunction as prayed for was denied but, to insure that some water would continue to flow down the plaintiff's side of the stream, defendants were enjoined from reducing the surface elevation of the water at the contemplated point of diversion below 1,070.056 feet above sea level. From this decree, plaintiff alone appeals.

"Plaintiff's principal contentions are that by the rule of the common law a riparian owner on a nonnavigable stream has a vested right to the natural flow of the stream not substantially diminished or diverted from its natural course; that this rule of 'continuous flow' was part of the law of Oregon when plaintiff's lands were acquired by its predecessors from the Government in 1885; and that the vested property right thus created is protected as against changes in the Oregon law by the Federal Constitution. Defendants deny that the common law rule created vested claims of continuous flow; they base their own claims on adjudicated rights and permits under the Oregon Water Code of 1909 (Laws Or. 1909, p. 319). * * *

* * * "In *Hough* v. *Porter*, 51 Or. 318, 95 P. 732, 98 P. 1083, 102 P. 728 (1909), the court thoroughly considered the effect on Oregon water law of the Federal Desert Land Act of March 3, 1877, 19 Stat. 377, 43 U. S. C. § 321 (43 U. S. C. A. § 321). That act contained provision that '* * * all surplus water over and above such actual appropriation and use, together with the water of all lakes, rivers, and other sources of water supply upon the public lands and not navigable shall remain and be held free for the appropriation and use of the public for irrigation, mining, and manufacturing purposes subject to existing rights.' This provision was interpreted as a permanent reservation and dedication to the public, with the result that 'all lands settled upon after the date of the latter act were accepted with the implied understanding that (except as hereinafter stated) the first to appropriate and use the water for the purposes specified in the act should have the superior right thereto.' 51 Or. at page 399, 98 P. at page 1095. The exception later stated was that appropriators would not be permitted so far to deplete the flow as to deprive a riparian owner of water essential for his domestic needs. 51 Or. at page 404, 98 P. at page 1097. So long as this right of domestic use was not infringed, the riparian owner whose lands had been settled after the act could not object to an appropriation of water which diminished the flow of the stream.

"The Oregon Water Code, adopted in 1909 after the decision in *Hough* v. *Porter*, does not specify what consideration, if any, is to be accorded in the determination of water rights to a riparian owner merely because of such ownership. Section 1 provides: 'Subject to existing rights, all waters within the State may be appropriated for beneficial use, as herein provided, and not otherwise; but nothing herein contained shall be so construed as to take away or impair the vested right of any person, firm, corporation, or association to any water.' Or. Code Ann. 1930, § 47–402. Section 70 of the Water Code, in explanation of vested rights, provides: '2. Actual application of water to beneficial use prior to the passage of this act by or under authority of any riparian proprietor, or by or under authority of his or its predecessors in interest, shall be deemed to create in such riparian proprietor a vested right to the extent of the actual application to beneficial use.' Id. § 47–403. * * *

* * * "The Desert Land Act was passed for the purpose of facilitating the settlement of the public domain arid land by permitting title to be acquired thereto by one who declared his intention of reclaiming it and who completed the reclamation within the prescribed period. The right to the use of water by one so conducting it upon desert land is limited to the 'amount of water actually appropriated, and necessarily used for the purpose of irrigation and reclamation'; then follows the provision relied on in *Hough* v. *Porter* that 'all surplus water * * * together with the water of all lakes, rivers and other sources of water supply upon the public lands * * * shall remain

and be held free for the appropriation and use of the public. * * *' Of this provision, the court in *Hough* v. *Porter*, said: 'This reservation of water rights for the benefit of the public was clearly not essential to any of the other provisions of the act. The previous statement contained sufficient to define and protect the rights of those selecting lands under the Desert Land Act; but the added proviso, or something of similar import, was essential to the establishment of a clear and uniform rule upon the subject as regards all appropriations thereafter to be made from streams or other bodies of water upon the public lands and to which such might be riparian. The words "shall remain and be held free for the appropriation and use of the public for irrigation", etc., are clearly words of reservation and dedication, and obviously so intended.' 51 Or. at page 386, 98 P. at page 1091.

"This reservation and dedication, it was concluded, had the effect of permanently severing from the lands then owned by the Government and subsequently granted by it, the right which the riparian owner might otherwise have, to object to an appropriation of water not already put to a beneficial use.

"Both the reasoning and the result of *Hough* v. *Porter* have been unqualifiedly adopted by the Supreme Court of South Dakota in *Cook* v. *Evans*, 45 S. D. 31, 185 N. W. 262 (1921), and *Haaser* v. *Englebreeht*, 45 S. D. 143, 186 N. W. 572 (1922); and the grounds of the decision were termed 'plausible' in *Boquillas Land & Cattle Co.* v. *Curtis*, 213 U. S. 339, 344, 29 S. Ct. 493, 53 L. Ed. 822 (1909), a case from the Supreme Court of Arizona (11 Ariz. 128, 89 P. 504) in which the question was raised but not decided. * * *

* * * "The legislative history of the Desert Land Act as found in Cong. Rec., 44th Cong., 2d Session, vol. 5, pt. 3, pp. 1961, 1964–1974, 2225, comports better with the narrow interpretation accorded it by Washington and California than with the broad interpretation of *Hough* v. *Porter*. By the act of 1866, Congress had already provided that rights to the use of water upon public lands, acquired by appropriation and recognized by 'the local customs, laws, and the decision of courts', should be maintained and protected. R. S., § 2339, 43 U. S. C., § 661 (43 U. S. C. A. § 661). By the act of 1870, it was further provided that all patents granted or pre-emption of homesteads allowed should be subject to any vested and accrued water rights acquired under or recognized by the act of 1866, R. S., § 2340, 43 U. S. C., § 661 (43 U. S. C. A., § 661). Of this legislation, a distinguished writer says:

" 'The act of 1866 gave the formal sanction of the United States to the prevailing theory of a grant to the holders of existing rights upon public land, which indeed was its primary object; for the statute had in view chiefly appropriations already made rather than future ones, and the protection of existing rights on public land against the United States itself (by the act of 1866) and against its later riparian patentees (by the enactment of 1870 was the primary object. * * *)

" 'It further provided the same method for acquiring water rights on public land in the future; a vindication of the existing system for the future as well as for the past; * * *.

" 'But as we proceed we must remember that it was wholly public land law, involving solely rights in the unoccupied public domain. * * *' 1 Wiel, Water Rights in the Western States (3d Ed. 1911) 116.

"The Desert Land Act, as originally reported to the Senate by the Committee on Public Lands, did not contain the provision limiting the right to the use of water, by one acquiring under the act, to the amount needed for reclamation and reserving all surplus water and other waters on the public domain to the use of the public. Indeed, the committee expressed the belief that no further legislation was necessary to regulate the use of water for purposes of irrigation. The provision now in question originated as an amendment offered on the floor of the Senate for the avowed purpose of preventing one who should acquire his lands under the act, from securing a monopoly over more water than was reasonably required for his own tract; it was modified in the course of debate to avoid the suggested possibility of conflicting with the act of 1866. Nevertheless, the act of 1877, literally interpreted, goes further than the previous legislation, in that it reserves to the public the right of appropriating water on all public lands regardless of whether or not such a right is recognized by 'local customs, laws, and the decisions of courts.' But neither the language nor the history of the act, fairly interpreted, supports the holding in *Hough* v. *Porter* that appropriations made after the Government had parted with its title to the land outrank the riparian rights which State law would otherwise attach to Government grants other than those under the Desert Land Act itself.

"Furthermore, the interpretation of the Desert Land Act in *Hough* v. *Porter* is inconsistent with the general doctrine that each State 'may determine for itself whether the common-law rule in respect to riparian rights or that doctrine which obtains in the arid regions of the West of the appropriation of waters for the purposes of irrigation shall control. Congress cannot enforce either rule upon any State.' *State of Kansas* v. *Colorado*, 206 U. S. 46, 94, 27 S. Ct. 655, 666, 51 L. Ed. 956 (1907). See, too, *United States* v. *Rio Grande Dam & Irr. Co.*, 174 U. S. 690, 702, 19 S. Ct. 770, 43 L. Ed. 1136 (1899); *United States* v. *Central Stockholders' Corporation of Vallejo*, 52 F. (2d) 322, 329 (C. C. A. 9, 1931); 2 Kinney, Water Rights (2d Ed. 1902), § 817.

"Whether or not the riparian rights of owners of land acquired from the Government under the Desert Land Act itself are affected by the act we need not consider, since there is no suggestion that plaintiff's lands were so acquired. We conclude that the Desert Act of 1877 did not require the State of Oregon to abandon the rule of 'continuous flow' as to all riparian lands in that State settled on and patented after its enactment."

The case then holds that the plaintiff's riparian rights were modified by the Oregon Code of 1909, and the decree of the lower court, which was in favor of the defendant cement company, was affirmed.

State Bill of Interest to Montana Water Users

A bill has been passed by the Montana State Senate, by unanimous vote of that body, that is of vital interest to Montana water users on Government reclamation projects. It was introduced by Senator T. O. Larson, of Teton County, Mont., and provides that persons on Government reclamation projects shall be permitted to pay their water assessments separately from their State and county taxes. However, the law has still to pass the Montana lower house before it can become a State statute.

Quoting from the Fairfield (Mont.) Times of February 14, 1935:

"The measure impresses one as altogether logical. There is no reason why an irrigation district shall be made a collection agency for county and State taxes. It is concerned only with the money due it and when this is tendered it should be accepted and the district be allowed to deliver water to the payor. If the measure becomes law it will also prove a means of relief to hard-pressed farmers who are unable to pay all their taxes but who can manage to pay their water assessments and who can then proceed with their farming, knowing that water for irrigation will be delivered to them when required."

The Boulder City postmaster reports that postal savings in the local office are now at a high point of $542,000, and that the average monthly mail order business amounts to approximately $90,000.

The Boulder Canyon Project and Its Mission in the Development of the Colorado River Basin[1]

By Walker R. Young, Construction Engineer, Bureau of Reclamation, Boulder Canyon Project

THE results to be expected from the construction of the Boulder Canyon project are as follows:

1. Will help alleviate the serious economic situation brought about by the general depressed conditions throughout the country.
2. Will provide flood control.
3. Will provide an adequate water supply for irrigation and domestic use.
4. Will provide silt control.
5. Will improve navigation on the river below and above Black Canyon.
6. Will create a new recreational area.
7. Will permit the generation of power, the returns from the sale of which will repay the entire cost of the project.

On July 30, 1930, President Hoover signed the deficiency act, carrying an appropriation of $10,660,000 for initiating construction of the project. Four days later Order No. 436 was signed by the Secretary of the Interior directing the Commissioner of the Bureau of Reclamation to commence construction on Boulder Dam and the Bureau actually put men to work at the dam site on that day.

Although not so intended in the original setup, this project became the first to aid in the problem of unemployment during the years of depression. Work was going ahead on the drawings and designs in the Bureau's Denver office when word was received from President Hoover to start construction as soon as possible in order to aid in alleviation of the unemployment conditions.

The design and drafting forces concentrated on the task of getting out the specifications for building the dam, power plant, and appurtenant works, and by working night and day were able to advertise for bids 6 months ahead of the date originally scheduled.

FIRST ACTIVITY AT BOULDER DAM

The first construction work was started in Black Canyon in April 1931 and as the job progressed more and more men were hired, the new community of Boulder City was established, and materials and supplies started pouring into the project over the newly built highways and railroads.

The number of men at work on construction increased to a maximum of 5,250; Boulder City grew to a population of more than 6,000, the third largest town in Nevada, and Las Vegas doubled its population. The project monthly pay rolls grew to a maximum of $743,000, and millions of dollars started flowing through the channels of trade, bringing in foodstuffs, steel, machinery, cement, and other construction supplies and equipment.

BENEFITS TO NATION, STATES, AND INDIVIDUALS

From the beginning up to the present time the average number of men employed has been approximately 4,000. Statistical data indicate that for each 10 men engaged in construction 18 are employed supplying materials. Thus, an average of approximately 11,200 men were at work on the project and elsewhere. Multiplying this figure by the average family in the United States of 4.1 persons it is found that approximately 46,000 persons have been fed, clothed, and housed the past 4 years through the project expenditures. Locally the Government and contractors' pay roll during this time has been nearly $600,000 per month, and the total payments for labor and materials made by the Government have amounted to more than $82,000,000. A recent summary of materials arriving by rail in Boulder City presents the following facts of interest. The total carloadings amounted to 27,034, which, if placed in one train would extend from Los Angeles nearly to Boulder City. These cars came from every State in the Union. Listed among the carloadings are: 16,127 of cement (14,000 from California, for which the southern California cement companies were paid $6,186,000), 2,142 of steel products, 664 of machinery, 2,348 of gasoline and oil products, 2,852 of lumber, and 435 of foodstuffs.

Payment to the Union Pacific Railroad, according to Government and contractors' figures, has amounted to $8,671,000. No record is available of shipments by highway, but we know these are considerable, particularly of fruits and other perishables.

But great as these benefits have been from the economic standpoint, they are small in comparison with the benefits that are accruing and will accrue because of the construction of the dam and power plant. At present we have the building of the power-transmission lines, the Parker Dam, the aqueduct, and the All-American Canal, none of which would have been physically or economically practical without the construction at Black Canyon. Later we will witness the erection of factories and plants, the establishment of homes and thriving communities, and all the activity that will accompany the continued development of our southwestern empire.

FUNCTIONS OF RESERVOIR

With a reservoir of 30,500,000 acre-feet capacity, the project will control not only the lesser floods which may occur during any month of the year, but also the great run-off occurring in the spring and summer months. In the past the rate of river discharge has varied from a few thousand to more than 300,000 cubic feet per second. In planning the project the upper 72 feet of the reservoir, having a capacity of 9,500,000 acre-feet of water, was reserved for flood-control purposes, and this capacity is not to be encroached upon for the storage of water except as required to control the discharge below the dam to an amount that can safely be carried through the lower valleys without the expenditure of excessive amounts of money for protective works.

In the lower delta country protective levees have been constructed to the extent of 150 miles, and 75 of these have been destroyed by the river. In 1905 the river breached the levees and discharged un-

[1] Excerpts from paper presented at the meeting of the California Farm Bureau Federation, held in Los Angeles, Feb. 25–27, 1935.

controlled through Imperial Valley and into Salton Sea for a period of 18 months. This breach was finally closed at a cost of about $2,000,000. This takes no account of large property losses suffered by the inhabitants of the district. In the absence of flood-control facilities the cost of maintenance of levees alone has been approximately $500,000 a year, and even with this large expenditure the menace is not eliminated. The people live in constant fear that the river may again get out of control. With Boulder Canyon Reservoir functioning, the volume of the ordinary large floods passing the dam site will be reduced to 30,000 and the extreme flood from 300,000 to about 75,000 second-feet. With this control established, residents of the valleys need no longer fear the ravages of the river, provided, of course, they do not, through their feeling of security, fail to maintain the channels and levees to carry even the greatly reduced discharges.

WATER FOR IRRIGATION AND DOMESTIC USE

The third effect of the project will be to provide an adequate water supply for irrigation and domestic use. Under present conditions the average river discharge past Boulder Dam site is approximately 16,000,000 acre-feet annually, with a new low record last year of 4,372,200 acre-feet. It is estimated that with Boulder Canyon Reservoir functioning there will be water for 2,100,000 acres of irrigable lands lying below the dam site, including about 200,000 acres in Mexico. At present there are 660,000 acres under cultivation. Of this acreage, 450,000 lie in Imperial and Coachella Valleys which can be expanded to about 1,000,000 acres upon completion of the Boulder Canyon project. Without the project, further expansion of irrigation is infeasible since the natural flow of the river is already overtaxed during the peak of the irrigation season, and in a year similar to that just passed there are serious shortages of water for irrigation. One of the provisions of the Boulder Canyon Project Act is that no charge may be made by the Government for water or for the use, storage, or delivery of water for irrigation or potable purposes in Imperial and Coachella Valleys and undoubtedly the water users in these valleys must view the lake now forming back of Boulder Dam with considerable satisfaction.

COLORADO RIVER AQUEDUCT

Those having interests in the Metropolitan Water District of Southern California must also look upon the project with some degree of satisfaction for it provides relief from a condition that made hazardous the further development of this area. Additional local sources of water available are not considered adequate and it has been decided by those responsible for the study of the question, that it is necessary to bring in a large supply of water from some outside source. The Colorado River is the logical source and is the only adequate source of suitable water that can be reached with reasonable cost. The plan adopted and now being executed, is to carry 1,500 second-feet of water drawn from storage in Boulder Canyon Reservoir to the Pacific coast through an aqueduct 240 miles in length originating on the Colorado River near the town of Parker, Ariz., and terminating in reservoirs near Riverside, Calif. From this point, deliveries of water will be made through a distribution system to the various cities of the district.

This development is to be by and at the expense of 13 municipalities in the vicinity of Los Angeles that have joined in the formation of the Metropolitan Water District of Southern California. The area of the district is 2,421 square miles—half the area of the State of Connecticut—with a present population of 2,660,000 and an assessed valuation of 3½ billion dollars.

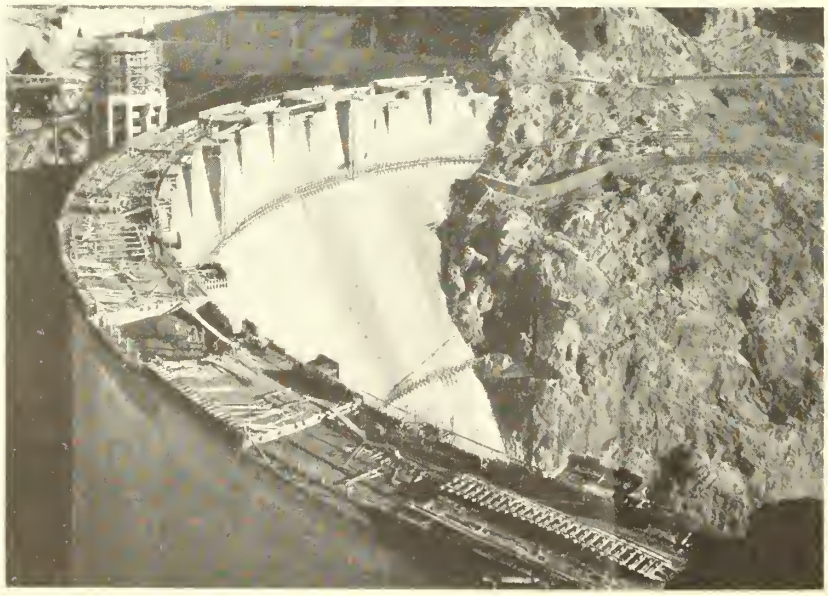
Although the Government is not building the aqueduct, it is so closely related to the Boulder Canyon project as to become an important element in the general plan for the development of the Colorado River. Water will be purchased from the Federal Government by the district at 25 cents per acre-foot and pumped over the intervening mountains by the district with electric power generated at Boulder Dam. It is estimated that the annual revenue to the Government from this operation will be $250,000.

PROJECT TO PROVIDE SILT CONTROL

The fourth effect of the project will be to provide silt control. The amount of silt carried to the delta annually by the Colorado River has been variously estimated at 88,000 to 137,000 acre-feet. If it may be assumed that the average is 100,000 acre-feet and if this is expressed in terms of weight, we have the astounding figure of 175,000,000 tons transported to the delta each year. In other words, the river when carrying the average flow of about 22,000 cubic feet per second transports its load of sand and silt past a given point at the rate of 330 tons per minute. This silt causes no end of trouble and expense to those who attempt to transport Colorado River water through canals and other irrigation works. Not only does the silt obstruct the diversion works, canals and laterals, but the continuous use of silt-laden water in irrigation results in the gradual building up of the ground elevation, especially near points of distribution, with a deposit of material of questionable value.

Under present conditions, the annual cost of fighting silt in the lower valley is said to exceed $1,000,000. In the future, this silt will be trapped to a very large extent, if not entirely, in reservoirs, and it is expected that after a few years the river below Boulder Dam will have established itself in a stabilized channel and that the silt problem in the lower valleys will have been greatly alleviated.

The question most often heard regarding the project is, "How soon will the reservoir fill with silt?" the enquirer usually overlooking the fact that one of the purposes of the reservoir is to store silt to the benefit of lower basin irrigators. Any answer to the question must, of course, be a mere guess. If the annual silt content of the river may be assumed as 100,000 acre-feet as indicated by many measure-



Boulder Canyon project, Arizona-Nevada—Top workings at crest of Boulder Dam.

ments, and the capacity of the reservoir 30,500,000 acre-feet, the answer would be 300 years providing present conditions of upstream development remain unchanged. However, in the normal development of the upper basin, additional reservoirs will be built with resulting changes in river regime. If reservoirs are created on the main river above Boulder Canyon Reservoir, they will catch the silt that otherwise would be deposited in this reservoir. It is useless to attempt to look too far into the future in this respect. The best estimate which it has been possible for the Bureau of Reclamation to make indicates a deposition of silt in Boulder Canyon Reservoir of about 3,000,000 acre-feet at the end of the first 50 years of operation.

PROJECT TO IMPROVE NAVIGATION

The fifth effect of the project will be to improve navigation on the river between Boulder dam site and Imperial dam site, the point of diversion for the All-American Canal. Technically, the Colorado is a navigable stream, but under present conditions of unregulated flow, navigation is impractical. The discharge at Boulder dam site varies ordinarily from a minimum of about 3,000 to a maximum of 150,000 second-feet. In August 1934 the minimum dropped to 1,780 second-feet and in 1884 the flow is estimated to have been 300,000 to 350,000 second-feet. The river bottom is of a shifting character and at low discharges the channels change from day to day, making navigation out of the question except for very small boats. Likewise, the river is not navigable at flood stages because of the high velocities of the river discharge. With the river regulated, the flow below Boulder Dam will vary ordinarily from 12,000 to 20,000 second-feet, the rate of discharge through the power plant depending upon the elevation of the water surface in the reservoir and upon power requirements. With the river regulated the maximum flow to be expected immediately below Boulder Dam will be, as previously stated, about 30,000 second-feet, which will be sufficient to control the usual seasonal flood. This may reach 75,000 second-feet once in about 100 years. Under conditions of regulated discharge, it is not unreasonable to believe that the river will be used for commercial purposes, particularly by passenger-carrying vessels and by freight carriers in transporting farm products from some of the valleys to railroad crossings and materials and supplies on the return trip. Safe, dependable water transportation would, no doubt, also prove advantageous to those engaged in prospecting and in the operation of mines along the river.

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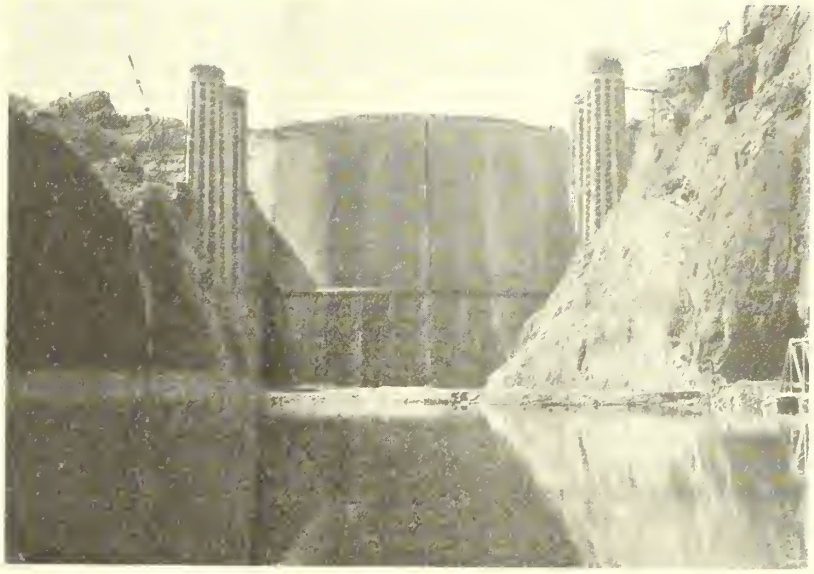


Boulder Canyon project, Arizona-Nevada—Reservoir starts to fill.

NEW RECREATIONAL AREA TO BE CREATED

The sixth result of the project will be to create a new recreational area an easy day's drive from several important cities such as Reno, Nev.; Salt Lake City, Utah; and Phoenix, Ariz., as well as from the large center of population in Southern California. The lake to be formed back of Boulder Dam will be unique in that it will be a beautifully clear and sparkling body of deep water in the midst of mountainous desert scenery, in places occupying narrow box canyons such as Black, Boulder, Iceberg, and the lower end of Grand Canyon. In the latter case, the river makes its exit from the canyon at Pierces Ferry, above which point the striped canyon walls, cut by numerous vertically walled side canyons, extend upward in towering fashion to the rim, a mile overhead. The side canyons above Pierces Ferry and the many small bays below will afford an enviable opportunity for those fortunate enough to possess time and facilities to loiter in a district having particular interest for nature lovers with its high coloring, peculiar geological formations, and traces of an early civilization, and, if they like, to dangle their fishing lines in the emerald green water, for it is planned to stock the lake with various kinds of fish. It is also predicted that the river below Boulder Dam will develop into one of the finest trout streams in this part of the country if properly stocked. This may seem a far-fetched idea to those who have known the "Silvery Colorado." However, in the future, water flowing in the river and over the rapids below the damsite will not be the warm, muddy water of days gone by. In contrast, it will be cold, clear water drawn from the lower elevations of the deep reservoir. Already the water fowl are taking advantage of the sanctuary created by Presidential proclamation and soon the observation of their habits and life will become an interesting pastime.

The climate, while not attractive during the hot summer months, is ideal during the remainder of the year for those enjoying out-of-door life and the winter months in particular are delightful. With its scenic beauties, campsites along the shore line, and opportunities for fishing and boating, the Boulder Canyon Reservoir should be a real asset to the Southwest. It should become an attractive tourist center. Visitors are coming to the project in increasing numbers. In 1932 there were 92,000; in 1933, 133,000; and in 1934, 265,000. It is possible that they have been attracted by the construction activities, but it is quite probable that the completed structures and the lake will continue to be of interest to those who enjoy the "big out-of-doors."

POWER REVENUES TO REPAY COST OF PROJECT

The seventh result of the project will be the generation of power at a location near a large power market. While the generation of power is only incidental to the principal purposes of the project, it is the "Goose that lays the golden egg", for it is the returns from power that will repay the cost of the project.

By passing water drawn from the reservoir to supply domestic and irrigation requirements through hydraulic turbines actuating generators, the potential energy stored up in the reservoir can be converted into electricity in large amount. For the reason that the primary functions

of the reservoir are to control floods and to store water during periods of high discharge to be released during period of low flood, the power plant will operate under a varying head. The maximum head available will be 590 feet, the minimum 420 feet, and the average about 530 feet.

ELECTRICAL ENERGY TO BE SOLD BY CONTRACTORS

The Federal Government will not sell electrical energy. According to the provisions of the Boulder Canyon Project Act, the Secretary of the Interior has contracted for the sale of falling water at rates which will repay the entire cost of the project with interest at 4 percent, within a period of 50 years. These rates converted into mills per kilowatt-hour are: 1.63 mills for firm power and 0.50 mill for secondary power, both measured at the Boulder Canyon switchyard. These rates are adjustable at the end of 15 years from the date of the contracts and every 10 years thereafter as required to meet changing economic conditions.

The contractors for power are required to construct their own transmission lines. The city of Los Angeles and the Southern California Edison Co. will build lines to the power market in southern California and the Metropolitan Water District of Southern California will build a line to Parker Dam site where electric power will be utilized to pump the district's water through the aqueduct over the mountains to Los Angeles and other municipalities. Other transmission lines will probably be constructed later into areas in Nevada, Arizona, and California, as required to furnish electric power for mining and other purposes.

Conceived many years ago and involving matters of life and death to many communities, the Boulder Canyon project is nearing completion as a self-liquidating investment of the Federal Government at a time when conditions demand constructive effort to prevent demoralization. Boulder Dam is receiving its last concrete and the danger of floods and droughts are forever removed from the southwestern empire. The years to come are expected to multiply the blessings to mankind from the subjugation of the Colorado River.

Notes for Contractors

Boulder Canyon project, Arizona-Nevada.—Low bidders under Specifications No. 601, for furnishing main control equipment, battery charging sets, switchboards, 460-volt and 115-volt control equipment, and miscellaneous switching equipment for the Boulder power plant, were as follows: Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., schedule no. 1, $208,261; schedule no. 2, $7,900; schedule no. 4, $126,947, all f. o. b. East Pittsburgh; Graybar Electric Co., Denver, Colo., schedule no. 3, $21,720.70 f. o. b. Boulder City; Wolfe & Mann, Baltimore, Md., schedule no. 5, $10,291 f. o. b. Boulder City.

Bids were opened at Denver on March 20 (Specifications No. 666-D) for furnishing one electric water heater, with tank and motor-driven circulating pump, two 30-gallon and one 120-gallon electric storage water heaters, and seven 3 g. p. h. and four 6.5 g. p. h. electric water coolers. Delivery in 60 days is required.

Four bids were received under Specifications No. 656-D for furnishing 7 carbon-dioxide fire extinguishing systems, 3 portable carbon-dioxide fire extinguishing systems, 40 spare cylinders of carbon-dioxide and expendable material, and 28 carbon-dioxide hand fire extinguishers of 15-pound capacity for protection of machinery and equipment in the Boulder power plant. The bids were as follows: American-La France and Foamite Industries, Inc., $23,457.18, f. o. b. Boulder City; C-O-Two Fire Equipment Co., $24,740.68, f. o. b. Boulder City; National Foam System, Inc., $19,403.67, 2 percent discount, f. o. b. Philadelphia; Walter Kidde & Co., Inc., $24,740.68, alternate bids $23,465.68 and $23,457.18, all f. o. b. Boulder City.

Three manufacturers submitted bids on February 25 for furnishing and installing in Boulder Dam four automatic electrically operated elevators with operating machinery control equipment, etc. (Specifications No. 612). The Otis Elevator Co., San Francisco, Calif., was the low bidder—$95,577 shipment Government bill of lading, and $101,934 shipment commercial bill of lading. Other bidders were the Westinghouse Electric Elevator Co., and the Haughton Elevator & Machine Co. Award of contract was approved by the Secretary on March 14.

On March 13 the De Laval Separator Co., Chicago, Ill., was awarded a contract for furnishing oil purifiers, filter paper drier, and centrifugal oil tester for the Boulder power plant (Specifications No. 647-D) at a price of $13,050, f. o. b. Poughkeepsie, N. Y., and Pittsfield, Mass.

Bids were opened at Denver on March 25 (Specifications No. 668-D) for furnishing two 120-cell and one 60-cell storage batteries, with accessories, for the Boulder power plant.

Two bids were received on Feburary 20 at Denver for furnishing turbine gallery crane, jacking frames, trolleys, and lifting beams for the Boulder power plant (Specifications No. 662-D). The Alliance Machine Co. of Alliance, Ohio, was low with a bid of $16,975, f. o. b. Alliance. The Harnischfeger Sales Corporation bid $18,630 f. o. b. Milwaukee.

Bids under Specifications No. 654-D covering deep-well turbine pumping units were received at Denver on February 6. These pumping units were originally advertised under schedule 1 of Specifications No. 595, but award was not made under the original advertisement on account of code violation. The low bid was submitted by the Fairbanks-Morse Co. under an alternate bid based on furnishing propeller-type pumping units under item 3. As the specifications called for centrifugal-type units the Fairbanks-Morse bid was not considered. The low bid conforming to the specifications was that of the Victor Equipment Co., Los Angeles, Calif., who propose to furnish Kimball-Krogh pumping units.

On February 15 bids were opened at Denver under Specifications No. 657-D for furnishing flow meters for measuring the flow of water through turbines at the Boulder power plant. These specifications were a readvertisement of Specifications No. 623-D, all bids under which were rejected. The proposal now submitted by the Bristol Co. was the low bid under item 1 and second low under item 2, but they did not meet the requirements of the specifications. Morey & Jones, Ltd., was second low bidder under item 1 and low under item 2, but these bids also did not meet the requirements. The Bailey Meter Co., third low bidder under item 1, and the Simplex Valve & Meter Co., third low bidder under item 2, bid in conformity with the specifications.

The Westinghouse Electric & Manufacturing Co. and the General Electric Co. were the only bidders on furnishing high-potential test set and dielectric testing equipment for the power plant (Specifications No. 655-D), opening February 11. The Westinghouse bid of $9,640 for both items 1 and 2, shipment from Sharon, Pa., was low.

Under Specifications No. 651-D for furnishing rolling, vertical folding, and swing doors for the Boulder Dam and power plant, the following firms submitted identical bids of $38,007 for items 1, 2, 3, and 4 (aluminum) and $24,753 for items 5, 6, 7, and 8 (galvanized steel) both f. o. b. Boulder City; Soule Steel Co., Cincinnati, Ohio; Cornell Iron Works, Long Island City, N. Y.; Moeschl Edwards Corrugating Co., Covington,

Ky.; The R. C. Mahon Co., Detroit, Mich.; The J. G. Wilson Corporation, Norfolk, Va.; The Kinnear Manufacturing Co., Columbus, Ohio; Geo. W. Johnson Mfg. Co., Kansas City, Mo.

Low bidders for furnishing lathe, drill press, and grinder for the Boulder power plant, under Specifications No. 663–D, as disclosed by the opening on February 25, were the following: Item no. 1, Hendrie & Bolthoff Mfg. & Supply Co.; item no. 2, Urquhart Service; item no. 3, Hissey Wolfe Machine Co. The low bid under item 2 submitted by the Kemp Machine Co. and the second low bid submitted by Hendrie & Bolthoff Mfg. & Supply Co. did not meet the requirements of the specifications.

Specifications No. 620 for furnishing twelve 86-inch Paradox emergency gates are ready for advertising for bids. The opening date is April 12.

On March 28 bids were opened at Denver for furnishing and delivering one used Diesel-engine-powered towboat for service on the Boulder reservoir (Specifications No. 670–D).

Bids will be opened at Denver on April 12 for furnishing four 4-motor, cage-operated, overhead traveling cranes for installation in the intake towers at Boulder Dam (Specifications No. 617). The cranes will be installed by the Government.

Bids under Specifications No. 672–D were opened at Denver on April 15 for furnishing and delivering f.o.b. cars at shipping point or Boulder City, Nev., at the option of the bidder, two gages for indicating the water levels in the forebay and tailrace and one gage for indicating and recording water levels in the river at the gaging station for installation in the Boulder power plant. All apparatus will be installed by the Government.

Materials and equipment for which plans and specifications are now being prepared at Denver include 72-inch needle valves, transformer transfer car; station service oil circuit breaker reactors, generator protective lightning arresters and capacitators, and 138 kilovolt lightning arresters; control board for water master's room, power plant piping, draft tube gantry crane, and oil storage tanks.

On March 6 the Secretary approved awards of contracts, under Specifications No. 609, for furnishing control cable supports and car to the following: Item 1, Midwest Steel & Iron Works Co., Minnequa, Colo., $23,950; item 2, Bethlehem Steel Co., Johnstown, Pa., $470. There were 19 bidders.

Bids under Specifications No. 643–D for furnishing insulated wire and cable for the power plant are being passed on by the code authority and Comptroller General before giving consideration to award of contract. Graybar Electric Co., Inc., General Cable Corporation, and American Automatic Electric Sales Co. had submitted identical bids of $84,214.72.

Owyhee project, Oregon-Idaho.—On March 11 bids were opened at Ontario, under Specifications No. 665–D, for the construction of structures on the Advancement Lateral, station 0 to station 281, and the Advancement wasteway. The work is to be completed within 60 days after receipt of notice to proceed. The Government will purchase and furnish the contractor for installation 20,000 pounds of steel reinforcement bars, 290 linear feet of 15- to 36-inch lock-joint concrete pipe, gates and gate hoists.

Bids under Specifications No. 614 for the construction of structures on the South Canal, station 0 to station 736, were opened at Ontario, Oreg., on March 28. The work is located near Adrian, Oreg., and Homedale, Idaho. The contractor must complete the work within 320 days. Purchases by the Denver office for this contract will include 590,000 pounds of steel reinforcement bars, drainpipe, gates, and miscellaneous metal work.

At Ontario on February 28 three bids were received under Specifications No. 513–0 for earthwork on the advancement lateral and wasteway, as follows: J. A. Terteling & Sons, Boise, Idaho, $5,364; Barnard-Curtis Co., Minneapolis, Minn., $6,138; Morrison-Knudsen Co., Boise, Idaho, $8,601. A contract has been awarded to the low bidder.

Three contractors bid on construction of advancement lateral structures (Specifications No. 665–D). At Ontario on March 1 the following bids were received: Dan Teters, Nyssa, Oreg., $6,835.50; J. A. Terteling & Sons, Boise, Idaho, $7,547.50; Morrison-Knudsen Co., Boise, Idaho, $8,293.60.

Specifications No. 619 for construction of the South Canal from the Idaho State line to Jump Creek are ready for advertising for bids.

Bids were opened at Ontario, Oreg., on March 28, for construction of earthwork and structures for the Kingman main drain and Kingman drain 2.23 (Specifications No. 669–D).

Sun River project, Montana.—Eight contractors submitted bids on February 28 at Fairfield, for constructing drains and drainage structures in the Greenfields division, as covered by Specifications No. 611. The three low bids were as follows: T. G. Rowland, Salt Lake City, Utah, $50,420; Tomlinson-Arkwright Co., Great Falls, Mont., $53,640. Bids ranged up to $72,780. The Government will purchase for this work steel reinforcement bars, concrete pipe, and corrugated metal pipe. The contract was awarded to the low bidder on March 19.

Moon Lake project, Utah.—The Secretary has approved award of contract to T. E. Connolly, San Francisco, Calif., for construction of Moon Lake Dam at the bid price of $547,221 (Specifications No. 605).

Uncompahgre project, Colorado.—The Utah Construction Co., Ogden, Utah; W. A. Bechtel Co., San Francisco, Calif.; Henry J. Kaiser Co., Inc., San Francisco, Calif.; and Morrison-Knudsen Co., Salt Lake City, Utah, combined to submit low bids for construction of Taylor Park Dam, at the opening on February 18 at Gunnison, Colo. These contractors bid $784,742.50 on the concrete masonry dam, and $798,078.50 on the earth and rock-fill structure. There were 5 bids received on schedule no. 1 (concrete) and 7 bids on schedule no. 2 (earth and rock-fill). W. S. Broderick, Hinman Bros. Construction Co., Floyd Shofner, and J. N. Gordon, all of Denver, Colo., combined to offer the second low bid of $974,682 on the concrete dam. The second low bidder on the earth and rock fill dam was J. A. Terteling & Sons, Boise, Idaho, who bid $819,517.50. Considering the cost of cement, the earth and rock-fill dam is the cheaper of the two.

Materials to be purchased by the Bureau in connection with this contract include 8,125 linear feet of 4-inch to 24-inch sewer pipe; 437,000 pounds of steel reinforcement bars, 23,000 pounds of trash-rack metal work, high-pressure slide gates and metal conduit linings, control apparatus for slide gates, outlet pipes, needle valves, metal walkway and stairways, structural steel, and electrical metal conduit.

Columbia Basin project, Washington.—At Almira on March 22 bids were opened for construction of one 7-room and four 5-room residences at the Government camp at Grand Coulee Dam (Specifications No. 615). The contractor must complete the houses within 120 days after receipt of notice to proceed.

Bids were opened at Denver on March 21, under Specifications No. 667–D, for furnishing thirty-five 30-gallon and one 120-gallon electric water storage heaters for the Government camp buildings.

Clark and Earley, Seattle, Wash., were awarded a contract on March 15 for construction of a warehouse building (Specifications No. 659–D) at the Government camp, the price being $24,264.70.

At the opening of bids at Almira on March 4 for construction of garage and fire station (Specifications No. 613) two bids were received. Clark and Earley, Seattle, Wash., were low at $28,138. The Lidral Construction Co. of Seattle bid $30,303.

Eleven cement companies submitted bids on furnishing 10,000 barrels of Portland cement in cloth sacks, under Invitation No. 38,067-B-1, at the opening at Denver on February 21. The bidders were the following: Santa Cruz Portland Cement Co., Portland, Oreg.; Pacific Portland Cement Co., Redwood Harbor, Calif.; Monolith Portland Cement Co., Monolith, Calif.; Northwestern Portland Cement Co., Grotto, Wash.; Superior Portland Cement Co., Concrete or Seattle, Wash.; Lehigh Portland Cement Co., Metaline Falls, Wash.; Spokane Portland Cement Co., Irvin, Wash.; Calaveras Cement Co., Kentucky House, Calif.; Olympic Portland Cement Co., Bellingham, Wash.; Henry Cowell Lime and Cement Co., Cowell, Calif.; Yosemite Portland Cement Co., Merced, Calif. All companies bid $3.17 per barrel, f. o. b. Odair, Wash., or $2.67 net with sack allowance and cash discount. The net mill prices vary from $1.08 to $1.94.

Seven bids ranging from $23,281 to $40,462 f. o. b. factory shipping points, for furnishing a 75-ton gantry crane, under Specifications No. 664-D, were received at Denver on February 26. The low bidder was the Lakeside Bridge & Steel Co., of Milwaukee, Wis., to whom contract was awarded on March 18.

Parker Dam project, Arizona-California.—The Denver office has awarded contracts to successful bidders under Specifications No. 652-D for supplying electric ranges, refrigerators, water coolers and heaters as follows: Item 1, Graybar Electric Co., Los Angeles, Calif., $431.25; items 2, 4, and 6, Listenwalter & Gough Inc., Los Angeles, Calif., $914.52; item 5, Edison General Electric Appliance Co. Inc., Chicago, Ill., $47.95; items 7, 8, and 9, The South Wesix Heater Co., Los Angeles, Calif.

Vale project, Oregon.—Bids were opened at Denver, Colo., under Specifications No. 616, for furnishing three 18-foot by 17-foot radial gates; three motor-driven, double-drum, radial gate hoists, two 3-foot 3-inch by 3-foot 3-inch high-pressure gates; and two 42 inch diameter welded plate-steel outlet pipes; for installation in the spillway and outlet works.

Ogden River project, Utah.—Specifications No. 618 covering construction of the Ogden-Brigham and Ogden Canyon tunnels are ready for advertising for bids.

Specifications are being prepared at Denver for a wood stave pipe line, siphons, flumes, and other canal structures. Designs for a 17-foot by 17-foot radial gate and a crane for handling trash racks and rakes at Pine View Dam are being prepared.

Hyrum project, Utah.—The Denver office is preparing plans and specifications for canal structures. Specifications for storage battery and charger are ready for advertising.

Humboldt project, Nevada.—The Rye Patch Dam is to be raised 10 feet in height over the original plans. The contractor for the dam construction, J. A. Terteling & Sons, Boise, Idaho, started work in February. The Bureau will purchase for installation by the contractor trash-rack metal work; high-pressure slide gates, control apparatus, and conduit linings; outlet pipes, radial rates; metal stairways, ladders and walkway; sump pump; and electrical metal conduit.

All-American Canal, Ariz.-Calif.—The Denver office is now working on plans and specifications for the following construction jobs: Imperial Diversion Dam and desilting works; Picacho, Unnamed and Four-twenty-four Wash siphons. A 20-mile section of canal west of the sand hills, station 1860 to station 3091+75, is ready for advertising and the specifications are numbered 621.

Casper-Alcova project, Wyoming.—Three cement companies submitted bids on March 1 under invitation 22153-A for furnishing 10,000 barrels of portland cement in cloth sacks. The Colorado Portland Cement Co., Boettcher, Colo., bid $2 per barrel, f. o. b. mill, and the Monolith Portland Midwest Co., Laramie, Wyo., $2.76 per barrel, f. o. b. Casper. Both of these bids give the same delivered cost to the Government. The South Dakota Portland Cement Co., Rapid City, S. Dak., bid $2, f. o. b. Rapid City and $2.78 f. o. b. Casper.

Progress of Investigations of P. W. A. Projects

Silt survey, Colorado River, Ariz.-Calif.—Plans for making surveys and borings along the Colorado River between Parker and Imperial Dam sites have been made to determine the effect of desilted water released from Boulder Canyon Reservoir. It is planned to make 19 cross sections of the river at 5-mile intervals between the 2 dam sites, and to establish permanent bench marks at the several points on the river. A reconnaissance has been made and a line of levels run from the Parker Dam site.

Colorado River Basin, Ariz., Calif., and Utah.—Land classification was continued in the Mohave Valley. A total of 49 square miles were covered by control surveys during the month, and 36 square miles of lands were classified. A survey was also made of 1,000 acres near Chemehuevi and along Bill Williams River. In Utah land classification and irrigable area maps are being prepared for the Castle Peak, Ouray, Blue Bench, and Duchesne Valleys.

Grand Lake-Big Thompson diversion, Colorado.—An allotment of $150,000 was made available in February for the investigation of a transmountain diversion from the Colorado River watershed near Grand Lake to the South Platte River watershed near Fort Collins, and available data and reports are being reviewed and plans made for field work during the coming field season.

Upper Snake River Storage, Idaho.—In spite of deep snows and cold weather, investigations were continued of the reservoir and dam sites on the North and South Forks of the Snake River. At the Island Park dam site on the North Fork, test drifts were excavated to the sound rhyolite rock and percolation tests were made to determine the rate of seepage. Maps were prepared of the Island Park Reservoir and the lands to be irrigated. Two small reservoir sites on the Teton River were investigated, and a survey was made of a small reservoir near Tetonia, Idaho. Preparation of the plans and drawings were in progress in the Denver office for the specifications of the Island Park Dam, and data were compiled for the Grassy Lakes, Lake of the Woods, and Cascade Creek reservoir sites. On the South Fork drilling was continued at the Grand Valley dam site to a depth of 120 feet and plans were formulated for continuing of river gaging on the Snake River during 1935 to ascertain losses and gains between the Grand Valley dam site and Heise. Office studies were made of the result of explorations at the Johnny Counts dam site and hydraulic studies were made in preparation for design and estimate for a dam, and a geological report was in preparation.

Buffalo Rapids project, Montana.—A field inspection of the project has been made and plans outlined for surveys which were commenced in the vicinity of Miles City and Fallon. Alternate canal lines were surveyed for supplying project lands by diversion from the Yellowstone River.

Deschutes project, Oregon.—The work of assembling data in the Denver office was continued for making preliminary designs and estimates for dams at Wickiup, Crane Prairie, Crescent Creek, Black Rock, Big Marsh, Devils Lake, and Benham Falls. Area and capacity tables were prepared of the reservoir sites.

Grand Ronde project, Oregon.—A reconnaissance was made of the Lower Grand Ronde reservoir site and a planetable survey made of the lower dam site. Drilling at the Upper Grande Ronde site was continued, and a geological examination

(Continued on p. 84)

High Lights of Owyhee Dam Construction

By C. A. Betts, Engineer, Bureau of Reclamation [1]

THE Owyhee Dam is now storing water from the 11,000 square miles of the Owyhee River watershed in southeastern Oregon, southwestern Idaho, and northeastern Nevada. The structure serves the dual purpose of storage and diversion for the 123,000 acres of the Owyhee (Federal) irrigation project, 52,000 acres of which have in the past been under prohibitively expensive pumping. Eighty-five feet below high water level and about one-half mile upstream from the dam, a 16-foot 7-inch horseshoe-type tunnel, 3½ miles long, forms the initial link of the gravity water supply to the distribution system. Above this diversion the reservoir, that extends 52 miles up the tortuous Owyhee River canyon, impounds 715,000 acre-feet of live storage. Below this is 405,000 acre-feet of dead storage. To provide as much reserve as possible for gravity use the dam has been constructed 405 feet above bedrock, and 530 feet above lowest concrete in the foundation cut-off. The 30-foot roadway along the crest is 1,000 feet in length. Pending completion of Boulder Dam the Owhyee has the distinction of being the highest in the world.

The use of this dam during construction as a laboratory for Boulder Dam experiments, the unprecedented economies effected in placing the 540,000 cubic yards of concrete, the novel ring-gate spillway, the three-quarters of a mile of galleries in the dam and the use for the first time of an elevator to connect these, all lend interest to the project.

HISTORICAL FACTS

A large dam on the Owyhee River had been under consideration since 1902, when the newly organized Reclamation Service investigated this and other semi-arid areas of the West where water attains high values. Early reconnaissance favored a small diversion dam near the mouth of the Owyhee Canyon and a storage reservoir about 80 miles upstream. The Hole-in-the-Ground site now occupied by the Owyhee Dam was selected in 1909 by Arnold & Co., who planned a canal down the west side of the river. Thereafter numerous reports were made culminating in that of Bond and Newell in 1921, which, with the accompanying reservoir surveys, served as a basis for the preparation of designs in the Denver office.

PRELIMINARY WORK

Following authorization of the project by Congress on May 10, 1926, preliminary work was begun. A topographic survey of the dam site was followed by diamond drilling. Inclined holes, supplementing the four rows of vertical holes, disclosed the fact that, like most dam sites on rock, this site had its fault. When the fault zone was subsequently excavated its extent verified the drill records within 2 feet. Comparison of five alternative designs led to the selection of the arch-gravity type of mass concrete dam as the most suitable for the location. The radius of the upstream face at the top is 500 feet, with about three-fourths of the water load carried to the abutments by arch action and one-fourth carried to the base by cantilever action. Base width is about 250 feet.

Meanwhile, a contract was let for a construction railroad to the dam site from Dunaway, Oreg., 24½ miles away, on the Oregon Short Line Railroad, where superior sand and gravel were found in quantities sufficient for the requirements of the entire project. Hauling over this line was begun in 1929. Its cost of $650,000, as well as operating charges, was absorbed in the total cost of the dam, which was $6,000,000.

Power for construction purposes was brought to the site via Tunnel Canyon over a 66,000-volt transmission line from Dunaway, where the Idaho Power Co. lines delivered energy from the Government plant at Black Canyon Dam. A telephone line paralleled the power line from a point near Adrian, Oreg.

CONSTRUCTION BEGUN

Construction of the dam was begun in July 1928 by the General Construction Co., of Seattle, Wash., the same firm that had the contract for the railroad. While a camp was being prepared for about 300 men and some 30 families in the canyon below the dam site, the initial excavation for the dam was begun by scaling loose rock from the cliffs between the upper and lower cofferdam sites.

Simultaneously, excavation of the 22.6-foot-diameter circular diversion tunnel, 1,000 feet in length, to carry the river around the dam site, was undertaken. A center heading, 5 by 8 feet, was driven from each end, the enlargement being accomplished by the ring-drilling method. Only 3 pounds of dynamite per cubic yard was used and overbreak was less than 4 percent, although the resulting trimming cost proved excessive.

FOUNDATIONS

The uncovering of bedrock, 40 feet below the river level, required removal by draglines of 19,000 yards of talus from the foot of the trimmed canyon walls, in addition to 170,000 cubic yards of earth and rock excavation.

Muck was loaded into 35 cubic yard gondola cars and delivered over trestles to the cofferdams or dumped along the canyon below the site, the fill thus made increasing the yard space available for plant buildings and screening plant.

The upstream cofferdam was carried 85 feet above the river to allow sufficient head to force a flow of 18,000 second-feet through the diversion tunnel. A tight diaphragm of Wakefield piling was carried up from bedrock through the center of the rockfill which had a 3 to 1 slope on the upstream side and 2 to 1 on the downstream side.

The lower cofferdam consisted of steel sheet piling driven to bedrock and cut off 10 feet above low water with muck fill on both sides. Protection from the action of water from the diversion tunnel outlet was provided by a row of piling placed in a training wall past the fill.

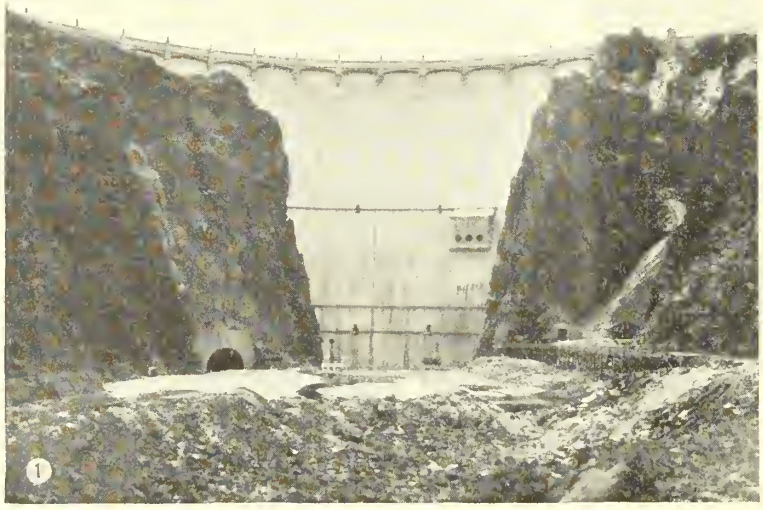
Dewatering of the foundations was accomplished by two electrically operated deep-well pumps suspended from cables stretched across the canyon so that the pumps could be lowered to follow the water level. The combined capacity of these 75-horsepower pumps was 5,000 gallons per minute.

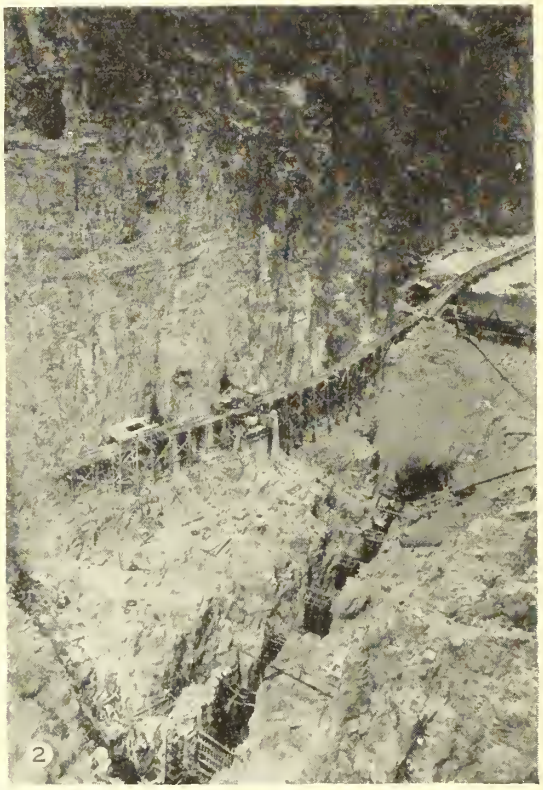
CABLEWAY

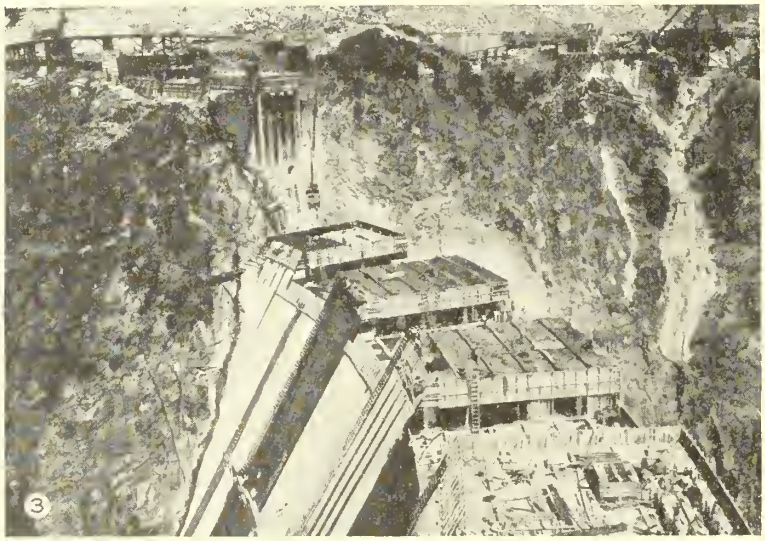
Handling of these pumps, as well as other heavy equipment, was facilitated by the 25-ton remote control, electric cableway spanning the canyon for the prime purpose of placing the 540,000 cubic yards of concrete in the dam. A movable head tower, 1,300 feet from the stationary tail tower, traveled at the rate of 200 feet per minute over a 550-foot arc on five rails, permitting the 8-yard bucket to reach all parts of the dam. Traveling at the rate of 250 feet per minute across the canyon, raised at the same rate and lowered at a rate of 1,200 feet per minute, the bucket was directed from an operator's house suspended over the dam in sight of all work. Remote control of the 400-horsepower hoisting motor, the 75-horsepower tower-moving motor, the air brakes, and other machinery in the head tower was regulated by the electromagnetic switches. It was necessary for a man to ride the bucket to open and close the two semicircular drop gates in the bottom. As a result of this system of placing concrete the dam site was free from the maze of chutes and guy cables so often used.

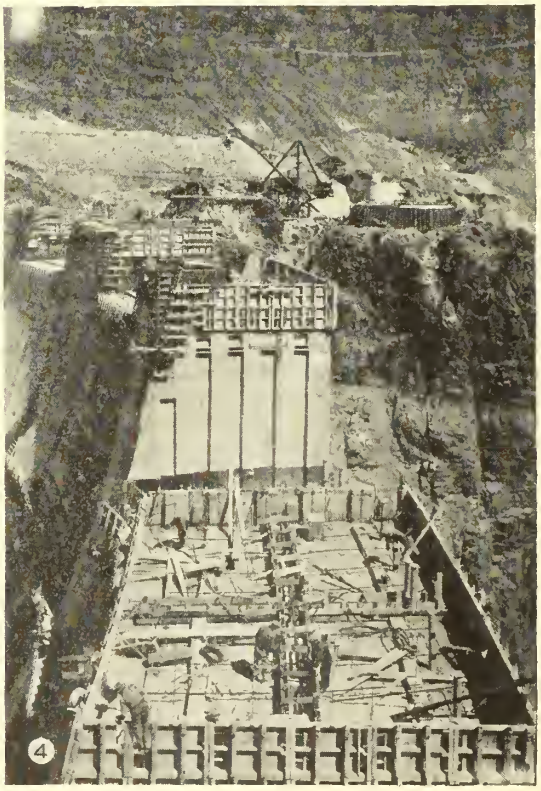
A local intrusion of hard, crystalline rhyolite forms the abutments and founda-

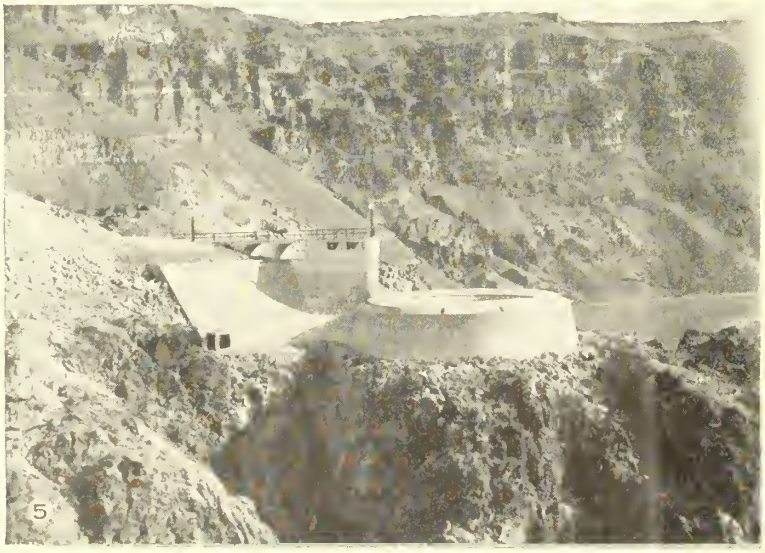
[1] Mr. Betts was employed as engineer on the Owyhee project during the construction of the Owyhee Dam.











OWYHEE PROJECT
OREGON-IDAHO

1, Downstream face of Owyhee Dam, showing spillway tunnel outlet portal; 2, Foundation rock, showing fault zone with forms for shafts prior to concreting; also upstream cut-off trench and power outlet tunnel in left abutment; 3, Placing concrete with 8-cubic yard cableway bucket in panel No. 11, while forms are being raised on panel 5 and cleanup gang works on panel 7; 4 Invar volume meter, cooling water pipe, and other experimental apparatus installed in panel 3; 5, Ring Gate spillway structure and filling reservoir from dam.

tion of the dam, and extends 200 feet below the river level to where pitchstone agglomerate, formed by the rapid cooling of this flow, rests upon the softer tuff that is characteristic of the canyon above and below the site. Following the center line of the river and extending down through the rhyolite to the undisturbed tuff was a fault, 15 to 30 feet in width, filled with nested boulders, cobbles, and alluvium. After sinking a cut-off shaft in this material it was decided to excavate all of the fault zone beneath the dam, a distance of about 250 feet up and down stream. Removal of the fault-zone material was begun by dragline as soon as the bedrock was stripped and was carried down about 50 feet into the fault. To save costly timbering below this depth the fault was then filled with concrete, leaving five 12- by 12-foot shafts through which excavation of the remaining 115 feet of the fault could be carried on (photo 2). The procedure was to first carry the shaft down into the tuff about 10 feet, then remove the loose material and fill in with concrete until the entire fault was filled. Subsequently the adjoining rock was grouted, some sections having to wait until a sufficient depth of the dam was poured above to confine the grout.

CONCRETING OPERATIONS

By September 23, 1930, the drilling of grout holes in the excavated upstream cut-off trench had been carried far enough up the sides of the canyon so that the placing of mass concrete for the main part of the dam upon the solid rock foundation was begun. Nothwithstanding the fact that there remained more than 350 feet of concrete dam with appurtenances to be placed above this elevation, the contract, based on cost, was 40 percent complete on this date. It was 50 percent complete when the concrete reached the river level.

Pit-run aggregates for the concrete were loaded at the Dunaway pits by dragline and transported to the screening plant at the dam in trains of about 22 bottom-dump cars. There it was washed and separated into sand passing ¼-inch square openings; three sizes of coarse aggregates, ¼ to ¾ inch, ¾ to 1½ inches, 1½ to 2¾ inches; and cobbles 2¾ to 8 inches. There was practically no waste.

Materials were conveyed from stock piles to the batching bins by endless belts and proportioned by weight into the twin, 4-yard mixers which had a capacity of 1,100 cubic yards per 8-hour shift. From the mixing plant the concrete was transported in a shuttle train of twin, 4-yard, center-dump cars hauled by a gas dinky to the cableway bucket loading dock one-third mile away. The 8-yard bucket could in turn deliver its load of concrete to the most remote part of the structure in 1½ minutes; making such a delivery once every 4 minutes.

Concrete having a slump of about 3 inches at the mixers and 2 inches, when deposited, was spaded into position by boot-clad crews of eight men each. Four-foot lifts starting at the downstream face were poured about every 72 hours, no more than 28 feet of depth being permitted in 30 days (photo 3). Horizontal keys about a foot square were formed across the 50-foot panels at 10-foot intervals to resist leakage along the construction joint. Panel forms for the upstream and downstream faces as well as for the contraction joint keys were of metal-faced wood. Power-driven, rotary wire brooms, air and water jets were used in the clean-up of the concrete surface prior to making a new pour. Concrete control was rigorously maintained resulting in an average compressive strength of 3,300 pounds per square inch in 28 days for the mass concrete which contained 1 barrel of cement per cubic yard with a mix by weight of 1:2.7:6.45. In reinforced concrete, where the proportions were 1:1.75:4, the strength averaged 4,600 pounds per square inch.

The temperature rise in the mass concrete caused by chemical action reached 63° F. in the interior where there was little radiation. Records of 125 electrical resistance thermometers embedded at strategic points in the dam disclosed that external temperature changes had little effect 15 feet or more in from the surface and that 2 years were required for the internal temperature to return from 120° to mean annual 52°. Grouting of the contraction joints was not done until the thermometers indicated that the structure had cooled, which was in the spring of 1934.

As the dam grew in size, gates, conduits, galleries, and electrical fittings were placed. Three 4- by 5-foot sluice gates in tandem, with steel-lined outlet conduits through the dam, were installed 20 feet above tail-water level. One hundred feet above these gates three 48-inch irrigation outlets have differential needle valves at the discharge ends and sluice gates at the inlets. Another hundred feet up two 5- by 6-foot power penstocks were carried through the dam and 50 feet into the left abutment whence they can be extended to a power house if ever needed.

Connecting these valves with entrances at the top and base of the dam are 4,200 linear feet of galleries and shafts, including a 270-foot shaft with an automatic electric elevator of 9,000 pounds capacity.

Into the gutters along the galleries 3½-inch drains from the foundations deliver any water that finds its way under the structure and might otherwise exert uplift pressure. Gutter outlets lead to the downstream face. Altogether 20 miles of piping, as well as 3 miles of electrical conduits, are embedded in the dam.

Experimental apparatus installed in the dam to ascertain the heat in the mass concrete and the resulting internal stresses or movements included 125 electrical resistance thermometers, strain meters, volumetric change meters, invar crack meters, and resistance micrometers. Test loops of 1-inch pipe were buried in selected sections of the dam and cold water pumped through them (photo 4). The temperature of the water increased 20° while passing through this cooling system and that of the surrounding concrete fell correspondingly. Results obtained here aided the planning of Boulder Dam and design in general.

RING-GATE SPILLWAY

The spillway consists of a unique steel ring-gate 60 feet in diameter, 15 feet high, with a vertical travel of 12 feet located at the top of the vertical shaft 300 feet deep entering the diversion tunnel, about 700 feet from its outlet. The hollow steel gate floats with its crest 2 feet above the reservoir surface until it reaches its upper limit (photo 5). Water can then rise and pour over the crest into the shaft up to a normal capacity of 30,000 second-feet (or extreme capacity of 40,000 second-feet with water to top of dam). As the water rises above the top of the spillway the ring-gate can be lowered enough to maintain a desired water level by the automatic opening of waste gates in the float chamber.

TUNNEL PLUG

Plugging of the inlet end of the diversion tunnel was one of the final operations. A wooden gate 16 inches thick was dropped in the slot at the intake end by burning through the cable that held it. The river was by-passed through the sluice gates. The concrete plug was then poured for a distance of 60 feet upstream from the spillway shaft. Annular recesses left in the rock walls served to anchor the plug. An 8-inch pipe through the concrete relieved hydrostatic pressure at the upstream end until the work was completed and grouting could be done.

Grouting of the diversion and spillway tunnel and of the dam under pressures up to 200 pounds per square inch entailed the drilling of 3½ miles of grout holes and required more than 4 carloads of cement.

COMPLETION

The dam was dedicated on July 17, 1932, shortly after the final pours of concrete were made. The contract was concluded in November about 3 months ahead of schedule, adding another inexhaustible resource to the wealth-producing Northwest.

Deformation of Earth's Surface Due to Weight of Boulder Reservoir

To most English speaking people, indeed to most of the peoples of the earth, such expressions as "eternal as the hills" or "as solid as a rock" mean what they say. Such expressions convey one's ultimate thought as to things firm and substantial. On the other hand, the interest of the geophysicist, structural geologist, and engineer is not in the rock's permanence and immobility but rather in its impermanence as it is broken down by climatic influences and in its movements as it continually adjusts itself to the various loads imposed. On a knowledge of these factors do the permanence and safety of the more monumental of man's work depend. It is true that for most structures their life and size are such that the popular view of the earth as rigid and eternal may be accepted. But in the case of the Boulder Dam the loads involved are such that the rigidity and permanence of the rock cannot be taken for granted without investigation.

The study, at present being reviewed, is one of several dealing with possible rock deformations caused by the building of Boulder Dam. It concerns only the possible general settlement of the land under and surrounding the Boulder Reservoir due to the huge weight of the new lake which will be formed, a weight of 41,500,000,000 tons. While the bending of the earth's crust under the weight of the dam and reservoir proves to have little bearing on the security of the dam as the bending over the length of the dam will be so slight that it will be difficult or impossible to measure, it is computed that the maximum settlement of the territory over a large area will be appreciable. This fact is of great interest to the geophysicists in connection with their study of isostasy.

Among geophysicists it is tolerably well established that the granitic continental shields, which popularly may be understood to mean the surface of the earth as we know it, floats upon a heavier lower material which is probably in a plastic state. The condition is much like a woven raft of logs floating in a lake. If a heavy weight be placed on a portion of such a raft it partially submerges. Similarly it is thought that the weight of mountains partially submerges the bottom of the granitic shield in the plastic material underlying the crust. If, therefore, a new weight of appreciable magnitude be placed on the earth at any point, according to the theory of isostasy the crust will give until the submergence restores equilibrium.

It is evident that ordinarily no weight added by man to the earth's surface is great enough to give measurable settlement since it is probable that the crust is 12 to 75 miles thick so that most weights are insignificant compared with that of the crust itself. Therefore, the truth of the theory has had to depend on indirect evidence. Now for the first time possibly direct evidence may be obtained. Careful benchmarks will be established by the Coast and Geodetic Survey over the area which is expected to settle. After Boulder Reservoir is filled new levels will be run and the results compared with previous calculations.

According to the engineers, three types of settlement may take place—first, elastic settlement due to compression in the earth's crust which will probably take place in 2 or 3 years; secondly, settlement in accord with the theory of isostasy, the time required being unknown; and third, settlement due to plastic flow in the crust. Maximum elastic settlement is estimated to be 0.6 foot over an area of 12 square miles; the isostatic compensation may be 2.0 feet over an area of 150 square miles.

To the ordinary person these computations may seem to have little practical value except for the immediate problem investigated. However, it is only through greater knowledge of all physical phenomena within our reach that advance in civilization is possible. Who knows but that the results of these measurements may not lead to a better prediction of the cause of earthquakes or to a clearer understanding of structural geology which will directly benefit mankind?

Mason City, Washington

(Continued from p. 72)

building is completely air-conditioned with automatic control of temperature and humidity. A separate building adjacent to the hospital will house contagious cases. The MWAK Co. claims an investment of $100,000 in the hospital.

OFFICERS AND OFFICIALS

The administration building, a two-story structure, is the executive headquarters of the Mason-Walsh-Atkinson-Kier Co. and contains the offices of its several officials and engineers, the general manager, general superintendent, drafting, purchasing, accounting, and legal departments, telephone and telegraph offices, and headquarters for field engineers and inspectors.

The officers of the company are: Silas Mason, chairman of the board; T. J. Walsh, president; G. F. Atkinson, vice president; Col. M. J. Whitson, vice president; E. L. Kier, secretary; J. J. Walsh, assistant secretary; and W. A. Hanger, treasurer. The department heads are as follows: Francis Donaldson, chief engineer; C. D. Riddle, job engineer; H. L. Meyer, general manager; George H. Atkinson, assistant general m anager; M. H. Sloeum, general superintendent; Ray Dycus, fiscal agent; Thomas Mallotte, job attorney; Juan Hargrove, architect; F. L. Ellithorp, men's dormitory superintendent; Wm. Arndt, chef.

In order to simplify operations of commercial establishments, the Coulee Trading Co. was organized, with W. E. Kier as president, to conduct the business of the general store, the laundry, and the theater; the Mason City Co., with E. L. Kier, who designed and supervised the building of the city, president, in charge of the recreation hall, service station, public garage, and hotel; and the Washington Hospital Association, a nonprofit corporation, with eight trustees, to conduct the affairs of the hospital.

Livestock is in good condition on the Sun River project. A sale of 89 Hereford bulls at Great Falls brought an average of $260 per head. The high bull sold for $775, and the top 25 bulls brought an average of $430. The average price of $260 for the 89 head compares with an average price of $172.45 paid for the top 50 animals at each of the four preceding annual sales.

Investigations of PWA Projects

(Continued from p. 80)

of the various dam sites made and a drilling program outlined.

Umatilla River flood control.—Mapping was completed of the irrigable areas in the vicinity of Pendleton, Oreg., covered by four alternate canal lines and a report of the investigations is in course of preparation.

Employing project farmers only, at wages of 50 cents per hour, 40-hour week, the Vale project, Oregon, has completed the construction of 1,000 feet of concrete lining on the main canal. An average of 38 men, working under the direction of a Reclamation foreman, constructed the lining in slightly less than 45 working days. The structure carries water for 28,000 acres around a steep and rocky side of the Malheur River canyon, obviating the danger of a costly canal break at that point during the irrigating season. It has a bottom width of 9 feet and a vertical height of 8.5 feet. The thickness of the concrete is 4 inches.

The Reclamation Era

Issued monthly by the Bureau of Reclamation, Department of the Interior.

Subscription 75 cents a year, to other than water users, payable in advance by check or postal money order drawn in favor of the Bureau of Reclamation.

Special reduced rates are given individual water-user owners or water-users organizations for mass subscriptions on Federal irrigation projects.

April 1935

Conservation of Water

One not familiar with the purpose of, and the principles involved in, irrigation cannot be blamed for wondering why it is necessary to conserve water. When irrigators waste water, sometimes unconsciously on projects where during the past few years there has been a shortage, a serious situation exists that should be corrected.

WHY CONSERVE WATER

One of the greatest resources of the entire Nation is water. However, to obtain maximum benefits it must be under control. On the other hand, a surplus amount of water, not only in floods, but in excessive irrigation, generally has damaging results. The overindulgence of any exercises or labors or of foods and drinks is injurious to some of the organs of the body. Similarly, an excessive application of irrigation water has damaging effects either to the crop or to the soil or both.

Many irrigation projects during the recent dry seasons have been forced to conserve the water available, yet in such cases many individuals, through lack of knowledge in the economical application of water, have used wasteful methods. While irrigation and drainage generally go hand in hand, much of the seepage troubles could have been avoided had more attention been given to the best system of applying water. On some of the oldest reclamation projects in the United States one can still observe a waste of water resulting from too long runs.

As in many economic problems confronting the people today, it is easy for one to criticize the actions and business methods of others, but to put into practice a better system is often an impractical, if not an impossible, thing to do. However, it is safe to assume an irrigation farmer is not unlike those in other walks of life in that he can get into a rut. On some of the oldest irrigated valleys of the West one can observe the practice of the same primitive systems of irrigation that were in vogue 5 decades ago.

HOW TO SAVE WATER

This important subject is divided into the following subdivisions:

1. *Have the land leveled*, so that water can be applied equally to all portions of the tract having the same or similar soil conditions. Where a field is not properly prepared for irrigation, the crops on the high and low areas cannot receive the same amount of water. This results in insufficient application of water to some portions of the field and an over-irrigation of other portions, which sometimes destroys the crops.

2. *Use the proper method of irrigation*, an item which is too often overlooked. Before field ditches are laid out, a study should be made of the soil and topography. Irrigation by flooding is frequently practiced when the corrugation system would save both water and erosion. Short runs, while resulting in a slight increase in labor cost, mean more efficient use of water. While the length of runs depends upon the character and condition of the soil and the slope of the land, it can be safely stated that much more water is used than would be necessary if the cross ditches were closer together. If smaller amounts of water were applied to the rows there would, in most cases, be a saving of both water and valuable soil.

3. *Control the water.*—This requires the use of permanent checks and temporary dams (generally canvas) and small inexpensive turnouts, important items often overlooked. The material in some ditches is easily eroded. Obviously, some open outlets become enlarged and consequently the quantity of the water increases. This starts soil movement and the loss of some of its most valuable fertility.

4. *Cultivate more and irrigate less.*—This is a good motto to follow. The opposite is what actually takes place with a few and often unsuccessful farmers. A good surface mulch prevents evaporation. Cultivation is a weed eradicator while irrigation makes thrifty weeds as well as crops.

5. *Have clean ditches.*—These not only save water by cutting down seepage losses but also help in reducing transpiration losses of the grasses and weeds growing on the ditch bank. Considerable time is also saved in distributing water when there are no obstructions. Furthermore, seeds from weeds in field ditches are easily spread over the cultivated area.

Dr. Elwood Mead, Commissioner of Reclamation, whose study of present inadequate methods in general practice has convinced him of the need for better irrigation farming and the conservation of water, has concluded that the best method of correcting these mistakes is to have men in the field who by training and experience are qualified to work with the project superintendents in teaching the settlers how to get the most out of irrigation. He has for some time advocated that aid and direction in settlement and better farming were needed on nearly every project, especially the new ones. To that end he has obtained a small appropriation to carry on this important work.—*L. H. Mitchell.*

In 1934, 40 new settlers purchased 2,033 irrigable acres on three units of the Vale project, Oregon. Approximately 1,000 acres were sold on the fourth unit, which has not yet received water.

(Date)_____

COMMISSIONER,
Bureau of Reclamation,
Washington, D. C.

SIR: I am enclosing my check [1] (or money order) for 75 cents to pay for a year's subscription to The Reclamation Era.

Very truly yours,

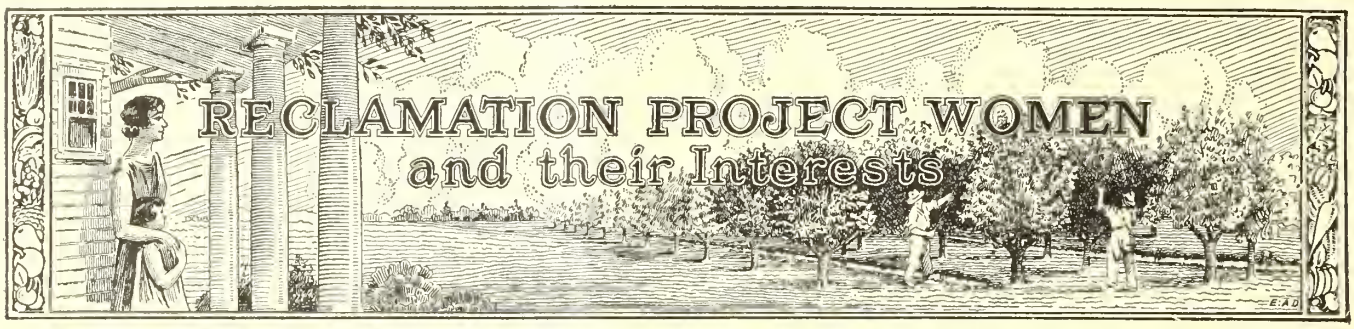
(Name)_____

(Address)_____

_____

NOTE.—30 cents postal charges should be added for foreign subscriptions.

[1] Do not send stamps.



Home Demonstration Work

A Service for Rural Homemakers

By Grace E. Frysinger, Senior Home Economist, Extension Service, United States Department of Agriculture

FOR many centuries science had only an indirect acquaintance with the homes of the world, but about a half century ago home economics became a recognized science. Since that time, in ever-increasing degree, helpful service has been rendered to the home maker with her complex responsibilities as wife, mother, housekeeper, guide in family life, and citizen.

Today help in practically every phase of homemaking is available to rural homemakers through the assistance of the home demonstration agent, a home-economics-trained woman, who represents the State colleges of agriculture and the United States Department of Agriculture within a county in a Nationwide service to rural communities.

Each homemaker is confronted with the problem of feeding and clothing the family and of keeping it in good health, and she desires to do so efficiently, to make the home comfortable and attractive, and to have social satisfactions for the family and for those within the community in which she lives.

In times such as the present, when the cash income of farm people is so low that each homemaker is faced with the problem of "stretching the dollar" to the maximum, this aid is of special value.

HEALTH IS WEALTH

Keeping the family in good health is always a basic responsibility of the homemaker, and the home demonstration agent aids her in promoting positive health through suggesting preventive measures such as desirable habits of personal hygiene, basic sanitary needs of the home, and how to care efficiently for unavoidable illness or accident in the home. In several States home demonstration groups have adopted the slogan "Eliminate the common cold", and campaigns have been held to arouse widespread participation in the plan. Sanitary drinking water and sanitary toilets have been emphasized in many places. In one county, as a result of the effort of rural women aided by the home demonstration agent, every rural-school well was scientifically tested for the purity of the water. Many communities throughout the United States have arranged for group treatment at low cost for immunization and vaccination. In many States, farm women and girls are having annual health examinations as a constructive health measure.

Clean-up campaigns have been held in many counties, and control methods for household pests have been taught to rural women as an economic as well as a health measure.

THREE MEALS A DAY MADE EASY

Those "three meals a day" have challenged the patience and resourcefulness of women throughout the centuries; but modern knowledge of foods, their composition and values, has served to simplify the problem and to contribute to good health.

Home demonstration agents teach farm women what foods are needed to keep each member of the family in good health, the kind and variety to grow, how to cook them to retain food values and flavor, what foods to combine for a balanced diet, and how to store and preserve the needed kinds and amounts for the nonproductive months. "Live at home" has been the slogan adopted by many thousands of farm women. As a result, pantries filled with vegetables, fruits and fruit juices, meat, soup mixtures, and conserves for the nonproductive period and a wholesome variety of food during the growing months have assured good nutrition.

On many a farm in the United States the garden produce has saved cash expenditure for food of from $150 to $250. One farm woman reported growing 35 varieties of vegetables, and another that her garden, which cost $10, provided $40 worth of fresh vegetables for use during the summer, in addition to produce which she marketed for $100. The vegetables from the latter garden stored for winter were valued at $40, and $20 worth were given away. Under the guidance of home demonstration agents home canning of meat has been widely practiced within the past 2 years as an economy measure when the price of livestock was so low. Over 50,000,000 quarts of food were reported canned by women in home demonstration groups during 1933.

THE MAGIC WARDROBE

Clothing the family is a perennial problem of every homemaker, and home demonstration agents have seemed almost like magicians as they have advised rural women regarding the washing of wool and silk fabrics; the steaming of velvets; the transforming of father's old trousers and an old jacket of mother's into an attractive, modish dress that makes mother the pride of the family; the making of Aunt Lou's old wool dress into a smartly tailored coat for Willie; the reblocking of father's battered and soiled old fedora so that it appears to be brand new; the dyeing of mother's last year's dress and remodeling it for daughter into an ensemble that is worthy of Fifth Avenue; and the making of tiny tot's self-help garments which combine attractiveness and educational value. Dressing the family becomingly and attractively at low cost has done much to keep up the morale of rural women.

Home demonstration agents have held meetings where instruction regarding "disguising last year's clothes", "clothing clinics", "be your own tailor", "know your fabrics", and "home dyeing" have attracted wide-spread interest. The making of tailored coats, the use of sewing machines for tailored finishes, and the "clinics for sick sewing machines"

have rendered much help in solving the clothing problem of rural families.

TAKING THE DRUDGERY OUT OF ROUTINE TASKS

Housekeeping has many routine tasks, and the home demonstration agent helps the homemaker to reduce them to the minimum and to learn to perform them so as to require the least possible time and energy. The correct height of kitchen tables, sinks, and washtubs; arrangement of equipment to save steps; effective grouping of small equipment; and the purchase or home construction of a few labor-saving devices have made the difference between an interesting task and plain drudgery. One woman reported reducing the mileage required for daily tasks within the home from 9 to 3 miles.

With the lowering of cash income from farm products, many duties formerly relegated to the factory have been revived in the home. Home demonstration agents have taught rural women how to make many household supplies, including soap, floor wax, and furniture polish; how to relacquer oil stoves, to refinish linoleum, to make and use fillers for cracks in the floor, until such time as a rise in farm income makes it possible to purchase such goods and services. "Indoor jobs for rainy days" was a project planned by rural home-makers in Minnesota to utilize the assistance of their husbands and sons in making the home more comfortable. As a result, repair of sagging doorsteps, added shelves, replaced doorknobs, filled cracks, and many other conveniences suggested by the home demonstration agent were added, as were certain home-made, labor-saving devices, such as "kitchen chariots" (scrub buckets on casters), built-in cupboards, and service wagons.

A well-lighted, step-saving kitchen saves time and energy.

NOTE.—The second half of Miss Frysinger's article outlines still other services offered by the home demonstration agent, and explains how this assistance is made available to every rural homemaker. It will be carried on these pages in the May issue.

Announcing

Three new motion picture films:
Vale Project (1 reel)
Owyhee Project (1 reel)
Great Salt Lake Basin (2 reels).
This is 35 millimeter stock, suitable for showing on standard projectors.

Instruction in home dry cleaning and dyeing is a boon to many farm women.

The Boulder Dam Film in Syracuse

A letter recently received from Mr. Austin P. Saunders, manager safety division, Syracuse Chamber of Commerce, New York reads:

"The Boulder Dam film loaned to us through the courtesy of your Bureau was shown before the first meeting of our Tenth Annual Industrial Safety Course and the 2,000 industrial employees who attended this meeting were intensely interested in the picture.

"We inaugurated an essay contest at this showing for the purpose of concentrating the attention and interest of the audience—three small cash prizes being offered. Just previous to the showing of the picture, the chairman presented some interesting facts gleaned from the questions and answers memorandum sent to us with the picture. We have received quite a good response and feel quite gratified that our contest has worked out so well."

Photographs on Display

The following announcement has been issued by the Public Works Administration:

"An unusual exhibit of approximately 100 photographs, depicting the P. W. A. program throughout the country, has been set up in the main lobby and corridor of the Interior Building by the P. W. A. press section. This exhibit gives a more comprehensive pictorial representation of the program than has heretofore been available, and your inspection of the exhibit is solicited."

Organization Activities and Project Visitors

Miss Mae A. Schnurr, Assistant to the Commissioner of Reclamation, delivered an illustrated address on Boulder Dam at the regular weekly luncheon on April 15 of the officers and employees of the Hercules Powder Co., of Wilmington, Del.

George O. Sanford, chief of the engineering division of the Bureau of Reclamation, delivered an illustrated address in the auditorium of the new Commerce Building on March 28 before the examiners of the Patent Office, Department of Commerce, his subject being Boulder Dam.

Mr. Sanford also spoke on the same subject before the Engineers' Club of Trenton, N. J. on April 18 and the Engineering Society of Western Massachusetts at Springfield on April 26.

Charles Voetsch

Charles Voetsch, engineer, employed in the Denver office of the Bureau of Reclamation, died February 7, 1935, after a brief illness. He was 57 years old and is survived by two minor children.

Born and educated in Germany, he came to the United States in 1904. Before entering the Government service he was engaged principally in the design and construction of hydraulic turbines and power plants with several of the leading manufacturing and power companies in various capacities as designer, hydroelectric engineer, and chief engineer.

From 1927 to 1929 Mr. Voetsch was employed as hydroelectric engineer and senior hydroelectric engineer in the Chattanooga and Nashville offices of the United States Engineer Department on the Tennessee and Cumberland River surveys. In November 1929 he was transferred as senior electrical engineer (hydraulic) to the Panama Canal on the Madden Dam project. When in 1931 the final design of this dam and power plant was taken over by the Bureau of Reclamation, Mr. Voetsch was transferred to Denver, assisting the engineers of the Bureau in the preparation of the designs.

During his service with the Bureau of Reclamation, Mr. Voetsch utilized his wide experience in the field of water-power development by valuable contributions to the design of such major plants as the Boulder, Norris, Wheeler, and Grand Coulee projects. He made many friends in the Bureau and contributed generously by translations of foreign research articles and by use of his personal engineering data which he had accumulated with so much industry during his career.

E. B. Debler, hydraulic engineer, Denver office, was recently appointed a member of the committee to consider the proposed San Luis Valley drainage project in Colorado.

I. A. Winter, engineer, and D. C. Seeley, assistant engineer, of the Denver office, spent several days at Knoxville, Tenn., where they discussed the Wheeler turbines. Their presence was at the request of the Tennessee Valley Authority.

James B. Hays, Denver office engineer, spent a month in the field in the supervision of the grouting of contraction joints at Boulder Dam and the grouting of foundations at Owyhee Dam.

S. K. Warrick, of Scottsbluff, and John Jirdon, of Morrill, North Platte project, attended a recent conference in Washington of the Agricultural Adjustment Administration and another with the packing firms in Chicago to provide for an orderly shipment of lambs to market.

Recent visitors to the North Platte project included the following: H. W. Bashore, construction engineer of the Casper-Alcova project; Bert Adams, of the Goshen irrigation district; W O. Fleenor and E. Newton, of the Gering-Fort Laramie irrigation district; and W. C. McCarty and Guy Sixberry, mayor and city engineer, respectively, of Morrill, Nebr.

C. A. Lyman, accountant, is on the Humboldt project, where he is installing a system of accounting.

N. G. Wheeler, chief clerk of the Klamath project, who was confined to the University of California Hospital for 2 months, has returned to Klamath Falls and to his official duties.

H. V. Clotts, assistant director of irrigation, United States Indian Service, with headquarters at Los Angeles, and N. W. Irsfeld, project engineer, conferred with the superintendent relative to the water supply for the Wapato division, Yakima project.

Recent Publications of Interest

University of California, College of Agriculture: Bulletin 586, November 1934, "Fire Blight of Pears and Related Plants," by H. Earl Thomas and P. A. Ark.

U. S. Department of the Interior: Report on Federal Reclamation to the Secretary of the Interior, by John W. Haw and F. E. Schmitt, December 1, 1934. Single copies may be obtained upon application to Commissioner, Bureau of Reclamation, Department of the Interior, Washington, D. C.

U. S. Department of the Interior, Bureau of Reclamation in collaboration with the Geological Survey and the Bureau of Mines: Mineral Resources and Possible Industrial Development in the Region Surrounding Boulder Dam, November 1934. Single copies upon request of the Commissioner, Bureau of Reclamation, Department of the Interior, Washington, D. C.

U. S. Department of Agriculture, Office of Information, Division of Publications: Technical Bulletins Nos. 401–425, with contents.

U. S. Department of Agriculture: Technical Bulletin No. 458, December 1934, Historical Characters of Flax Roots in Relation to Resistance to Wilt and Root Rot, by Lytton W. Boyle, assistant pathologist, Bureau of Plant Industry. Sale by Superintendent of Documents, Government Printing Office, Washington, D. C., price 5 cents.

U. S. Department of Agriculture: Farmers' Bulletin No. 938, April 1918, revised February 1935, Apple Bitter Rot and Its Control, by John W. Roberts, senior pathologist, and Leslie Pierce, principal scientific aid, Bureau of Plant Industry. Sale by Superintendent of Documents, Government Printing Office, Washington, D. C., price 5 cents.

U. S. Department of Agriculture: Circular No. 63, June 1939, revised December 1934, Conservation of Wastes from the Small-scale Slaughter of Meat Animals, by G. P. Walton, associate biochemist, and R. F. Gardiner, assistant chemist, Bureau of Chemistry and Soils. Sale by Superintendent of Documents, Government Printing Office, Washington, D. C., price 5 cents.

U. S. Department of Agriculture: Circular No. 341, February 1935, The Rusts of Cereal Crops, by H. B. Humphrey, principal pathologist, Bureau of Plant Industry; E. C. Stakman, agent, Bureau of Entomology and Plant Quarantine; E. B. Mains, formerly agent, C. O. Johnston, associate pathologist, H. C. Murphy, assistant pathologist, and Wayne M. Bever, junior pathologist, Bureau of Plant Industry. Sale by Superintendent of Documents, Government Printing Office, Washington, D. C., price 5 cents.

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Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
Carlsbad	Carlsbad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen	C. M. Voyen	W. J. Burke	Billings, Mont.
Columbia Basin, Grand Coulee.	Coulee Dam, Wash	F. A. Banks	do	C. B. Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
Grand Valley	Grand Junction, Colo	W. J. Chiesman	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Engineer	George B. Snow		do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent	N. G. Whecler	C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mout.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Resident engr	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif	Ralph Lowry	do	George H. Bolt		R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wenzel [1]	C. B. Wenzel	W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo	L. J. Windle [1]	Superintendent	L. J. Windle [1]	Denver office	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Denver office	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Engineer			J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		Denver office	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Constr. engr	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo	C. B. Elliott	Engineer	do	do	do	Do.
Upper Snake River Storage [3]	Ashton, Idaho	H. A. Parker	Constr. engr	Emmauuel V. Hillius		B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

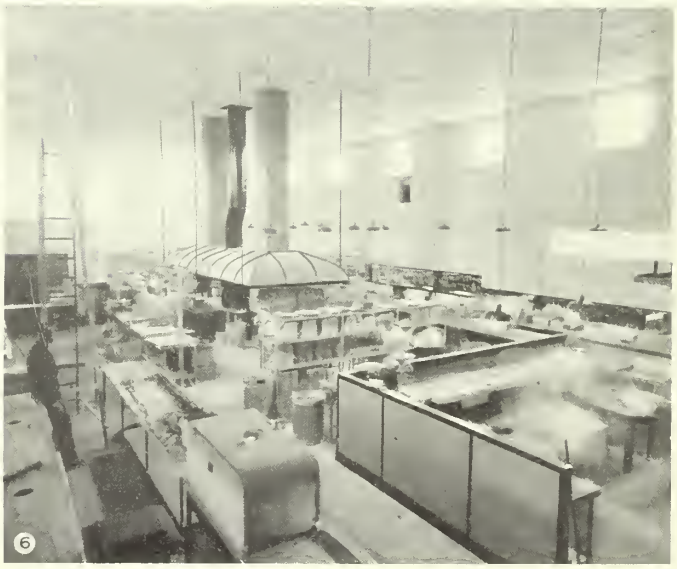
Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrig. dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	C. W. Tharp	Superintendent	C. J. McCormick	Grand Junction
Huntley	Huntley irrigation district	Ballantine, Mont.	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Irl Davis	President	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	D. E. Norton	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	F. Schroeder	Mitchell.
Fort Laramie division	Geriug-Fort Laramie irrigation district.	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo.	Bert L. Adams	do	Nellie Armitage	Torrington.
Northport division	Northport irrigation district	Bridgeport, Nebr	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash.	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
Salt Lake Basin (Echo Reservoir.)	Weber River Water Users' Association.	Layton, Utah	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Gen. supt and ch. engr	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	Superintendent	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw
Greenfields division	Greenfields irrigation district	Fairfield, Mont	A. W. Walker	do	A. W. Walker	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg.	E. D. Martin	do	Enos D Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley Water Users' Association.	Montrose, Colo	C. B. Elliott	do	Wm. W. Price	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	do	R. E. Rudolph	Ellensburg.

Important investigations in progress

Project	Office	In charge of—	Title
Buffalo Rapids	Powell, Wyo		Superintendent.
Colorado River Basin, sec. 15	Denver, Colo	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes	do	C. C. Fisher	Engineer.
Gila Valley	do	P. J. Preston	Senior engineer.
Grande Ronde	do	Foster Towle	Associate engineer.
San Luis Valley	do	R. F. Walter	Chief engineer.
Umatilla River	do	Foster Towle	Associate engineer.
Grand Lake-Big Thompson Transmountain	Grand Lake, Colo	P. J. Preston	Senior engineer.
Platte Valley			
Upper Snake River Storage	Idaho Falls, Idaho	H. F. Bahmeier	Associate engineer.

SALLIE A. B. COE, *Editor.*



Columbia Basin project, Washington—1, Administration building; 2, hospital; 3, types "B" and "C" houses; 4, mess hall; 5, one of the dining rooms; 6, part of kitchen and mess hall.

THE RECLAMATION ERA

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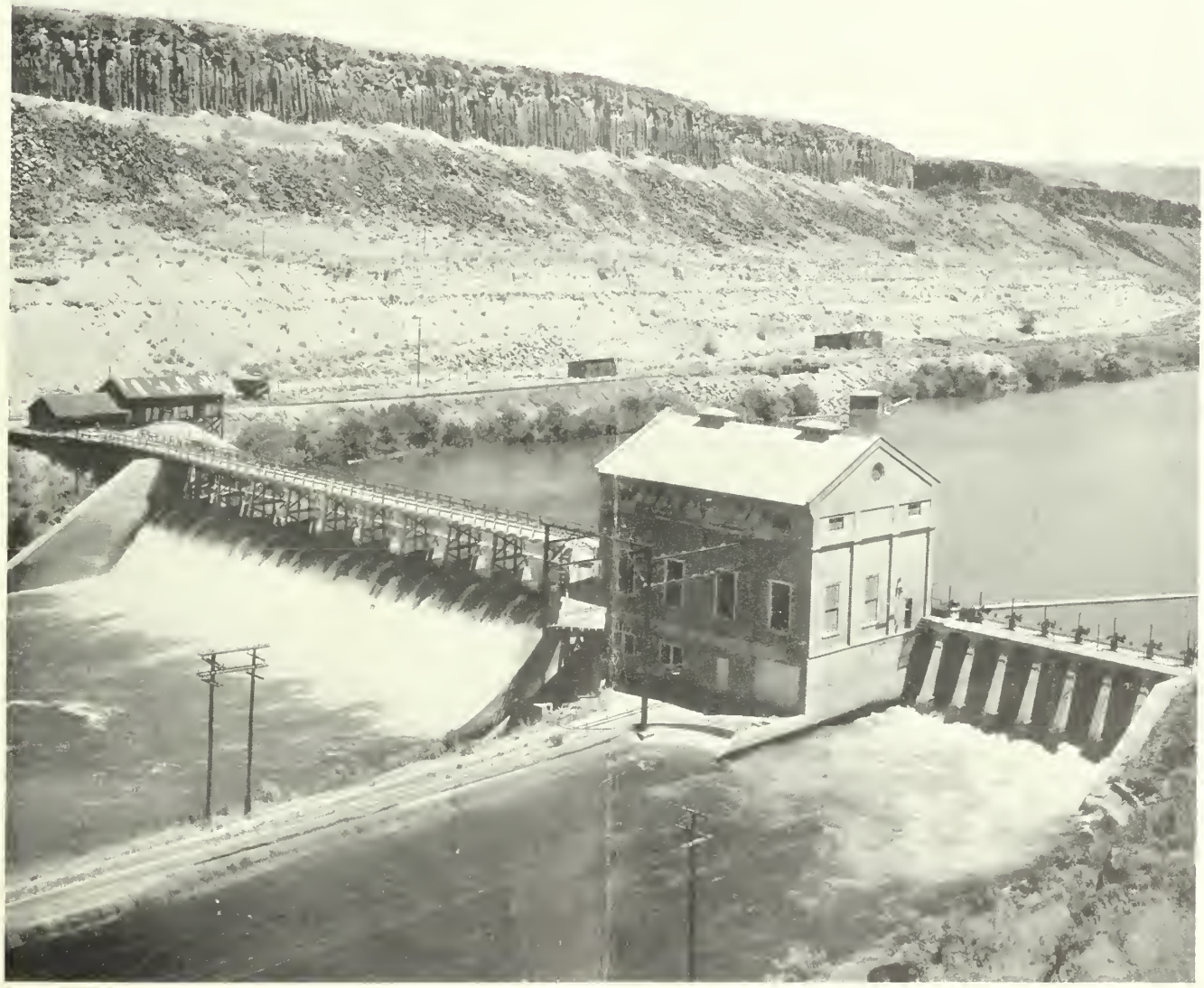

BOISE RIVER DIVERSION DAM, BOISE PROJECT, IDAHO

Public Works Administrator Ickes Invites Inspection of New Projects

Public Works Administrator Harold L. Ickes invites the Nation to inspect the 18,000 PWA projects now under construction or completed. Inaugurating a "go-see-for-yourself" program Administrator Ickes suggested that motorists and the traveling public this summer include in their itineraries the gigantic engineering jobs undertaken on the PWA program, as well as the less spectacular projects close to any community. He believes such visits are necessary in order fully to appreciate the significance of the far-flung PWA construction program. The Administrator says:

"I believe the country should see these projects—should visit them, inspect them, and understand them. I could do little better than call attention to the invitation of President Roosevelt to do this very thing, when in his address Sunday night (April 29) he said of the new works program: 'I therefore hope you will watch the work in every corner of this Nation.'"

Gigantic dams, the largest in the world; tremendous bridges; networks of highways; ship construction; river dams and channel work; slum clearance and low-rent housing projects never before attempted; the conversion of wasting land into arable, useful soil over millions of acres; the erection of the first Indian capitol in the United States—these are among the myriad activities on the PWA program in its drive to provide employment by creating useful public works.

Administrator Ickes continues:

"For nearly 2 years now the Public Works Administration has been engaged on a great construction program in every part of the Nation. Some of the jobs undertaken have been without parallel in the world's history from the engineering standpoint. The public has read about these projects and has heard about them. May I suggest now that our people go and inspect them, to see how their money has been put to work, how useful public works have been added to the capital wealth of the Nation, in order that employment might be fostered.

"The PWA program has been carefully developed to make it useful and to see that funds employed were well invested in good projects. Now the country will be able to take stock of what has been accomplished. I am glad to say to the American citizen—go see for yourself."

Many of the larger PWA projects are without equal in sightseeing features. Among these are Grand Coulee Dam in Washington State, the largest dam in the world; Boulder Dam, Nevada, highest dam ever built; Fort Peck Dam in eastern Montana on the Missouri River, the greatest earth-fill dam ever put under construction; the Navajo soil erosion project covering 16,000,000 acres of land in New Mexico, Arizona, and Utah, a project undertaken by the Soil Erosion Service with PWA funds; the Minneapolis-St. Louis series of dams on the Mississippi River; the conversion of squalid slum areas into bright, parklike low-rent housing developments in Atlanta, Cleveland, Indianapolis, and many other cities, and similar projects.

THE
RECLAMATION ERA

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HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 5 MAY 1935

Relation of Irrigated Agriculture to the Economic Well-being of the Nation

Mr. Val Kuska, colonization agent of the Burlington Railroad, makes the following very pertinent statements concerning the relation of irrigated agriculture to the economic well-being of the community and the Nation in general:

I am convinced that development of irrigated lands not only adds stability to the owner and the immediate locality, but also has a direct and favorable bearing upon all other communities, just as development of foreign markets means increased employment and revenue for our factories and farms. Surely everyone would consider it folly to curtail our exports, yet there are many who would check our own expanding markets by limiting reclamation development, a development which creates a local buying power and constitutes a consuming market for commodities produced elsewhere which, in turn, involve employment of labor, utilization of natural resources, and the subsequent development of other localities. Then they, in the endless chain of production and consumption, exert a similar influence by creating a market to supply their needs. Thus does the growth of a single community have a far-reaching effect on the rest of the world.

Furthermore, crops produced upon western irrigation projects are supplemental to, rather than competitive with, crops grown upon agricultural lands of other sections. Also, irrigated sections are surrounded by less favorable crop-producing areas so they constitute a source of feed supply for the livestock generally produced on the cheaper, neighboring lands—a market that would not exist if it could not be supplied locally.

Alfalfa hay is the most important irrigated crop according to acreage and value, being 484,044 acres or 30 percent of the total cropped area on Federal projects, but less than 4 percent of the United States alfalfa acreage in 1933.

Wheat ranks fifth among reclamation crops, being 132,831 acres or 8 percent of the total cropped area but only three-tenths of 1 percent of United States wheat acreage. As in the case of cotton, the bulk of project wheat is the hard spring variety not produced elsewhere in the United States in quantities sufficient to meet the demand of mills. Without this production on the Northwest reclamation projects, we would be compelled to import more from Canada than we now do.

RECLAMATION PROJECTS ARE CONSUMERS OF SURPLUS CROPS

Furthermore, such quantities of wheat as may be produced and shipped from reclamation projects are more than offset by flour and other grain products shipped in to the project. For example, railroad station reports at Scottsbluff, the principal town on the North Platte Project, reveal that 23 carloads of wheat were forwarded in 1910, but 29 carloads of flour were received. In 1930—after almost 20 years of irrigation development—10 cars of wheat were forwarded and 80 carloads of flour and meal received.

Unquestionably, other communities profit through processing and handling of flour and grain products sent to these irrigated areas. In even greater degree because of the larger volume, producers and manufacturers of other commodities throughout the United States benefit because Scottsbluff, for instance, is a market for their wares. In fact, the great amount by which the freight receipts exceed shipments forwarded from that station would indicate that the advantage lay with those who supply Scottsbluff demands, rather than vice versa.

Making comparisons on a larger scale, I found these very startling facts in a reclamation report of the North Platte Project for 1928: 442 cars of corn valued at $486,200 were received on the project during the year, in spite of the fact that some corn is produced on the irrigated lands as well as on some of the dry-farm areas tributary to the project. The fact that 442 cars of corn were brought to the project would convince me that the intensive development in this particular territory has helped create a consumer market for part of the corn produced in other surplus-corn producing sections of the country.

Another commodity which reflects far-reaching benefits is the 495 carloads of automobiles shipped to the project in 1928. In addition to the employment provided thousands of factory workers, we must consider the miners of coal, iron, and other metals used in the construction of automobiles, those who supply the forest products, the cloth and other materials incidental to the industry. All of these workmen are consumers and create a market for agricultural products raised partly in the immediate vicinity of their homes and partly in other localities. It is the latter portion of their consumption which shows the interdependence of the various sections of our country—and I might say, the world—on each other.

The question may be raised as to the effect irrigation and power development has on the coal business. I have checked railroad-station reports for coal receipts at Scottsbluff, Nebr., and find the trend has been as follows:

COAL RECEIVED AT SCOTTSBLUFF

Year	*Number Cars*	*Remarks*
1900	42	Before irrigation of any magnitude was practiced; includes coal supplied to Gering, at that time an inland town.
1910	234	Irrigation really began; sugar factory at Scottsbluff completed, the first of seven in the North Platte Valley; still supplying Gering with coal.
1919	1,651	Scottsbluff consumption only; Union Pacific had built line on the south side, serving Gering.

Year	Number Cars	Remarks
1920	2,098	
1924	1,448	
1925	1,610	
1929	1,804	
1930	1,358	Natural gas came into Scottsbluff.
1932	1,061	
1933	862	

COAL INDUSTRY NOT AFFECTED BY POWER DEVELOPMENT

These figures plainly show that irrigation development has been an important factor in increasing shipments of coal to that area, as in 1933 receipts were 820 carloads more than in 1900, in spite of the fact that power development at Gering and Lingle in connection with the North Platte Reclamation Project and natural gas were competitive to coal consumption. Nor does the 1933 figure include coal moving into Gering, as was the case in 1900.

Data obtained from Bureau of Agricultural Economics (U. S. D. A.) and Reclamation Bureau reports show that in 1933 the total acreage of crops harvested in the United States was 327,324,230, of which 1,589,770 acres or forty-eight one-hundredths of 1 percent were in crop on Federal reclamation projects. If the land cropped without irrigation on these projects and the land receiving supplemental water under Warren Act contracts is included, the total is 2 797,815 acres or eight-tenths of 1 percent of the United States total.

Considering all irrigated land (both reclamation and private), the last agricultural census shows that irrigated crops represented 4 percent of the total acreage utilized to produce crops in the United States in 1929, and 11.1 percent of the total value. The average per-acre value of crops was $61.50 compared with $22.32 for all other crops harvested in the United States.

The principal crops on Federal reclamation projects, their rank and comparison with United States totals are shown as follows:

1933

Rank on reclamation projects	Crops	Acreage on reclamation projects	Percent total under reclamation projects	Percent total under U. S.	U. S. total acreage	U. S. total value	Average yield reclamation project	Average yield in U. S.
1	Alfalfa	484,044	30	3.7	12,775,000		3.04 tons	1.9 tons.
2	Pasture	426,618	27					
3	Cotton	147,507	9	.48	30,144,000	$617,716,000	0.9 bale	209.4 pounds.
4	Other forage	146,119	9					
5	All wheat	132,831	8	.3	47,493,000	527,413,000	24.9 bushels	11.1 bushels.
6	Sugar beets	110,006	7	11.2	984,000	58,988,000	12.2 tons	11.3 tons.
7	Corn	70,540	+4	.06	102,239,000	2,330,237,000	28 bushels	22.8 bushels.
8	Barley	64,993	4	.6	10,052,000	156,104,000	30.9 bushels	15.1 bushels.
9	Potatoes	58,204	−4	1.8	3,184,000	317,143,000	206 bushels	99.6 bushels
10	Truck crops	57,349	−4					
11	Other hay	56,689	+3					
12	Oats	54,017	+3	.14	36,541,000	219,520,000	37.4 bushels	19.8 bushels.
13	Beans	23,813	+1	1.4	1,671,000	33,226,000	18 bushels	735 pounds.
14	Alfalfa seed	25,199	+1	6.5	382,300	4,890,000	3.2 bushels	2.41 bushels.
15	Apples	25,017	+1			97,949,000	186 bushels	
16	Corn fodder	22,707	+1				3.5 tons	
17	Clover hay	12,675	.7				1.3 tons	
18	Citrus fruit	9,112	.5			80,230,000		
19	Clover seed	7,787	.5	.7	1,006,000	8,212,000	4.5 tons	1.4 tons.
20	Pears	7,477	.4			10,252,000	163 bushels	
21	Peaches	3,612	.2			32,618,000	20 bushels	
22	Onions	2,267	.1	2.8	78,250	12,611,000	309 bushels	266 bushels.
23	Prunes	2,224	.1			15,580,000	6,030 pounds	
24	Rye	1,177	−.1	.05	2,352,000	11,737,000	8 bushels	8 bushels.
25	Sweetpotatoes	1,176	−.1	.02	761,000	37,851,000	95 bushels	85.5 bushels.
26	Miscellaneous crops	5,606	.3					

The "Lost City" of Nevada—A Few Facts

By M. R. Harrington, Assistant Park Naturalist, Boulder Dam Camp S. P. 1, Overton, Nev.

IN 1924 two brothers, Messrs. John and Fay Perkins, both residents of the Moapa Valley in southern Nevada, reported to Col. J. G. Scrugham, at that time Governor of the State, that they had seen fragments of painted pottery and traces of some kind of ruined buildings among the sand dunes on the east side of the Muddy River, just above St. Thomas. I was exploring a cave near Lovelock, Nev., at the time, and the Governor invited me to be one of a party which he proposed to bring down to St. Thomas in person to investigate the Perkins' report.

We found the house ruins and pottery to be scattered along the valley for about 5 miles, and I was able to identify the pottery as of Pueblo Indian origin, produced at an early stage of their development. The ruins gave the impression of being the work of a people just learning the art of house-building.

The find was especially interesting to archeologists, because it had previously been believed that ancient Pueblo remains did not exist west of the Colorado River; while the press was interested because of the unprecedented large size and apparent antiquity of the old settlement. Because an early explorer of the region had reported extensive ruins which had afterward been lost sight of, these newly discovered ones became popularly known as the "Lost City", although we had named them officially "Pueblo Grande de Nevada."

RUINS EXPLORED 1924–26

The Museum of the American Indian, Heye Foundation, in New York, with which I was connected at the time, engaged me to explore these ruins, and I was occupied nearly 2 years (1924–26) in excavating part of them. The museum bore almost the entire expense of this work, the State contributing the use of a motor truck and, part of the time, the services of 1 or 2 men.

The relics obtained during this exploration were sent, for the most part, to the Museum of the American Indian which had financed the project, but an excellent collection was afterward donated to the State of Nevada where it was exhibited for a while in the State building at Reno.

In 1929 I returned to explore another ruin, not directly connected with the Lost City, north of Overton, for the Southwest Museum, of Los Angeles, with which I had become associated. This collection went to the Southwest Museum.

In the fall of 1933 an Emergency Conservation Work project was inaugurated through the efforts of Colonel Scrugham, now Congressman from Nevada, to rescue what remained in the Lost City in the way of relics and information before the area should be flooded by the waters impounded by Boulder Dam. My services were borrowed from the museum by the State Park Division of National Park Service to take charge of the work, and 2 skilled foremen and about 32 C. C. C. enrollees were provided to handle the excavations. This work continued until April 1934 and was started again the following November. It is proposed to complete it during the next few months.

The larger portion of the specimens obtained will be deposited in a permanent museum now being built near Overton, Nev., above the waterline of the future lake. Some are now on exhibition in a temporary museum at the Lost City, which is visited by many tourists.

It was at first believed that the Lost City dated from the first centuries of the Christian era, and indeed, some structures seem to date from about that time, but the greater part of the occupation seems to have been from about 500 A. D. to 800 A. D.; about which time the settlement seems to have been abandoned, although some families may have lingered in the valley quite a while after this.

HOUSES OF PECULIAR CONSTRUCTION

The houses of the "city" were built of adobe, or alternate courses of adobe and stone, and were only one story. In size they ranged from 1 to 95 rooms, with an average of 6 to 8 rooms. When a number of rooms were built, these were grouped about a courtyard or patio. Many rooms were very small and used only for storage; the larger living rooms were provided with small circular fireplaces, but no chimneys. The roofs were built of poles covered with arrowbrush, rushes, and adobe; floors were of adobe or stone; some walls were neatly plastered.

The ancient people depended for their living mostly on agriculture, raising considerable quantities of corn, also beans and squashes, cotton and probably tobacco. They also ate wild seeds (like mesquite beans) and hunted rabbits, deer, and mountain sheep. Their fields were probably irrigated with ditches fed from the Muddy River, a small but permanent stream.

Their most highly developed art of which the products have survived was pottery making. A large number of food bowls, cooking pots, water jars, and canteens were made of pottery, also a few pitchers and seed jars. Of these the food bowls in particular were often tastefully decorated with painted designs in black on a white or a red ground. Occasionally the canteens, pitchers, and seed jars were also decorated, and often vessels of any type were given a corrugated surface by way of decoration. In 1924–26 we found a few fragments of baskets and woven cotton textiles which show these arts to have been also well developed.

Being ignorant of metal, the Lost City people used stone for making implements, from knives to grinding mills. The bow and arrow was the favorite weapon, although some war clubs of deer or elk antlers have been found. The ar ow was pointed with flint. No domestic animal except the dog was known, although there is evidence that small wild animals were sometimes tamed as pets. For playing games there were dice made of bone, and counters and marbles of stone; while quantities of little dolls, toy dishes and the like were made of clay. Smoking pipes were made straight, like cigar holders, of stone or clay.

ORNAMENTS AND POTTERY

For ornament there were mineral paints, red, yellow, green, black, and white, and a variety of beads and pendants made of shell and of turquoise and other stones, the shells being obtained by trade from the Pacific coast.

The finest pottery and ornaments are usually found in the graves of the people, occasionally encountered while excavating among the ruins. Evidently they believed in burying many of the belongings with the dead. The skeletons are usually so far gone in decay as to be barely traceable, but occasionally a well-preserved skeleton is found. They indicate a race somewhat below our average height with sturdy frame and, as a rule, good teeth. No regular burial ground has been found as yet.

These facts, and many more, we have established during our study of the Lost City ruins. We have learned that another people lived in the valley before the city was built, and that another tribe, the Paiutes, took possession of the country when the city was abandoned, and these last are still to be found in the vicinity. We hope, before the work is completed, to have worked out a fairly complete history of southern Nevada before the coming of the whites. At least we will have assembled a collection, which, displayed at the Overton Museum, will interest and instruct the visitor, be he tourist or native.

War on Crows, Owyhee Project, Oregon–Idaho

War was recently declared on crows when members of the Malheur Fish and Game League and the Payette County Rod and Gun Club bombed a rookery on an island in Snake River 3 miles below Ontario, Oreg.

In recent years crows have increased to an alarming extent. Flocks in flight will extend from 3 to 4 miles. Immense damage to crops and young poultry, as well as to bird life, has been done by the crows and has finally caused a declaration of war. Dynamite cartridges consisting of a stick of dynamite and a pound of shot encased in a tin cylinder were used in bombing. Forty of these cartridges were wired in the willows used by the crows as roosts and were fired at once by a battery.

By actual count, 1,500 dead crows were found in the immediate vicinity and it is estimated that double this number were destroyed. Dead crows were found as far as a mile away.

On the Tule Lake division of the Klamath project two lessees have started work on a turkey brooder house, which, with the equipment, will cost approximately $12,000. These lessees plan on raising 20,000 turkeys during the coming season.

Dead Crows, Owyhee Project, Oregon-Idaho

The Reclamation Era

Issued monthly by the Bureau of Reclamation, Department of the Interior.

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Special reduced rates are given individual water-user owners or water-users organizations for mass subscriptions on Federal irrigation projects.

APRIL 1935

Emergency Conservation Work under Reclamation Bureau

The participation by the Bureau of Reclamation in Emergency Conservation Work began during the third period—April 1 to October 1, 1934. Eleven camps were established on reclamation projects, 2 of which were "regular" camps and 9 were "drought relief" camps. Owing to their being located at a high altitude, where operations during the winter were impracticable, work was suspended at two of the camps, in Utah, during October 1934.

Nine E. C. W. camps, employing the services of approximately 200 Civilian Conservation Corps enrollees per camp, were in active operation on reclamation projects at the end of the fourth enrollment period on March 31, 1935.

EXPANSION OF E. C. W. PROGRAM

In preparation for the passage by the Congress of new legislation to authorize the continuation and expansion of Emergency Conservation Work after March 31, 1935, investigations were carried on by the various Government departments to determine where further work of a highly beneficial nature could be accomplished.

Representatives of the participating departments held frequent conferences for the working out of a coordinated plan to provide for the allocation and establishment of E. C. W. camps and for the enrollment, movement, and employment of Civilian Conservation Corps men.

The Emergency Relief Appropriation Act of 1935 (Pub. Res. No. 11, 74th Cong.), familiarly known as the "Work Relief Act", making appropriations for relief purposes, passed Congress and was approved by the President on April 8, 1935. Out of a total of $4,880,000,000 appropriated under this act, $600,000,000 was earmarked for the Civilian Conservation Corps, such money to be used in the discretion and under the direction of the President and to be available until June 30, 1937.

In addition to the camps which are under the work supervision of the Bureau of Reclamation, activities at numerous camps throughout the United States will be under the work supervision of the Army, the Forest Service, the Soil Erosion Service, National Park Service and its State Park Division, Division of Grazing, the General Land Office, Bureau of Biological Survey, Bureau of Animal Industry, and the Bureau of Plant Industry. The total number of C. C. C. enrollees employed in all of the camps under the various agencies of the Government will eventually approximate 600,000 men, resulting in 1,276 new camps being established and a material increase over the maximum of about 350,000 employed up to April 1, 1935.

As heretofore, the selection of the Civilian Conservation Corps will be supervised and directed by the United States Department of Labor and, where war veterans are employed, by the United States Veterans' Administration. The enrollment, movement of C. C. C. companies, construction, maintenance, and supervision of camps, and the clothing, feeding, and care of all enrolled men will be attended to by the Army. After camps are established and manned, the work programs, covering a wide variety of projects of considerable magnitude in many cases, will be conducted under the supervision of the various participating technical agencies above mentioned.

PROPOSED BUREAU OF RECLAMATION, E. C. W. CAMPS

Including the camps which already have been established and were in operation on April 1, 1935, a tentative allocation of 46 E. C. W. camps has been made to the Bureau of Reclamation. Although some changes in plans may become necessary, contingent upon the approval of work programs and other conditions which must be met, these 46 camps are expected to be assigned to irrigation projects in 14 States in the West and Southwest.

It is anticipated that when all of the camps are approved and in operation approximately 10,000 men will be employed on E. C. W. work directed by the Bureau.

Before a camp is definitely established, its site must be inspected and approved by the Army, and work programs for each and every camp must receive the approval of the Director, Emergency Conservation Work.

CHARACTER OF WORK TO BE DONE

In general, the work which will be done by the E. C. W. and C. C. C. forces under the work supervision of the Bureau of Reclamation will be typical of the activities which are incidental to irrigation projects in the arid West.

Some of the more important work features included in the program being contemplated, all of which are designed to be of immediate benefit, particularly by way of providing unemployment relief, and which should result in future benefits of incalculable value, are mentioned as follows:

General cleaning and maintenance of irrigation distribution and drainage systems, including repair and installation of structures. Also removal of trees and vegetation from ditches and rights of way;

Concrete lining of canals and laterals;

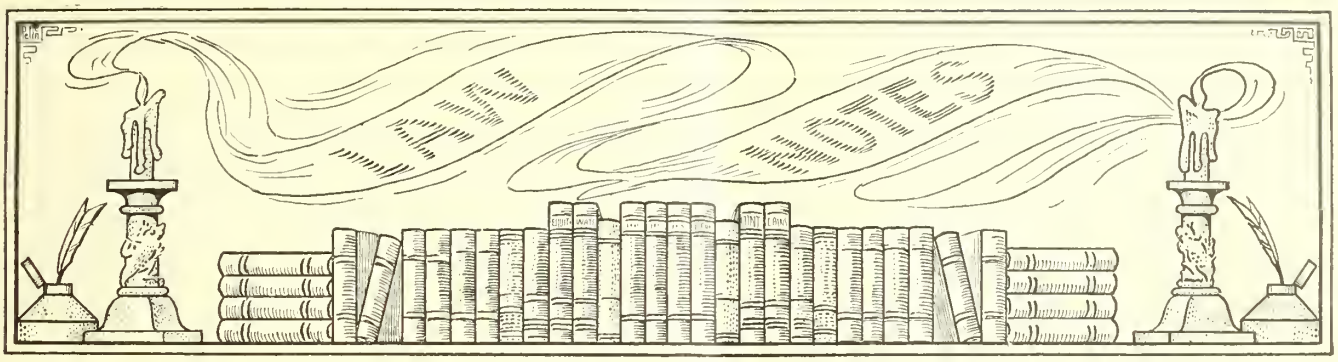
Construction of levees and embankments;

Construction of canals and laterals, including structures;

Clearing timber from reservoir sites and farm lands;

Clearing and improvement of river channels for protection against flood damages;

(Continued on p. 98)



Sunnyside Cases Dismissed

By S. Rothbard, Counsel, Bureau of Reclamation

THE Supreme Court of the District of Columbia has granted a motion, filed on behalf of the Secterary of the Interior, to dismiss the suits instituted by certain water users in the Sunnyside unit of the Yakima project, State of Washington, to restrain and enjoin the Secretary from carrying into effect an order and ruling limiting the amount of water deliverable to the water users.

These proceedings were the outgrowth of disputes between the United States and the water users as to the amount of water deliverable to them under their contracts with the Government.

The motion to dismiss was based on three grounds:

(1) The court is without jurisdiction to entertain this suit because it is in substance and effect against the United States which is not a party and which has not consented to be sued, or waived its immunity from suit.

(2) Plaintiffs have a complete and adequate remedy at law.

(3) The amended bill of complaint lacks equity because the relief prayed for therein would necessarily involve continued and detailed supervision by the court for a long and indefinite period of the performance of contract duties that require the exercise of personal judgment and technical skill.

It was contended on behalf of the Secretary that inasmuch as the United States is a party to the contracts upon which the water rights are based and the interests of the United States being therefore directly involved, the United States is the real party in interest and any relief granted would operate against the United States. It was also contended that the suits indirectly sought specific performance of the contracts. In the leading case of *Wells* v. *Roper* (246 U. S. 335, 338), a suit in equity was brought in the Supreme Court of the District of Columbia for an injunction to restrain the First Assistant Postmaster General from annulling a contract made between the plaintiff and the Postmaster General, acting for the United States. The court sustained a motion to dismiss the bill and the decision of the lower court was affirmed by the Court of Appeals of the District of Columbia, 44 App. D. C. 276, 286. The court, among other things, held:

"The form of the suit for injunction is a negative specific performance, which would compel the United States to accept the performance of a contract, and thereby affect their interest. * * *"

In affirming the dismissal of the bill, the Supreme Court of the United States based its decision solely upon the ground that the lower courts properly held the suit to be essentially and substantially a suit against the United States and, therefore, beyond the jurisdiction of the court.

The same question was involved in the more recent case of *Shoshone Irrigation District* v. *Ickes* (70 Fed. (2d) 771, 773), in which the district filed a petition for a writ of mandamus against the Secretary of the Interior, in the Supreme Court of the District of Columbia, to compel the Secretary to make a statement annually in writing of the net profits received by the United States from the operation of the Shoshone power plant, and to determine and state the portion of such net profits to which the plaintiff district was entitled and to credit the same annually to the district to be applied on its construction charge due the United States.

The Court of Appeals, in affirming the judgment of the lower court dismissing the petition, held:

"The suit here is in the nature of an action to compel the specific performance of a contract between plaintiff company and the United States. Such a suit is one against the United States, and one in which the courts are without jurisdiction, unless specially accorded jurisdiction by authority of Congress, which has not been done in this case. It is elementary that, where the purpose of a suit is in effect to enforce the specific performance of a contract, this cannot be accomplished by indirect actions, either against Federal officers or by mandamus."

It was further contended that the plaintiffs have a full, adequate, and complete remedy at law for the alleged breach of contract which they seek to enjoin, and that this remedy is available to them under the Tucker Act. The law on this point is well settled. One of the leading cases is *Hurley* v. *Kincaid* (285 U. S. 95, 104), in which the court held:

"An allegedly illegal taking of the plaintiff's property by the Secretary of War could not be enjoined by an equity court because the plaintiff had an adequate remedy under the Tucker Act in an action at law."

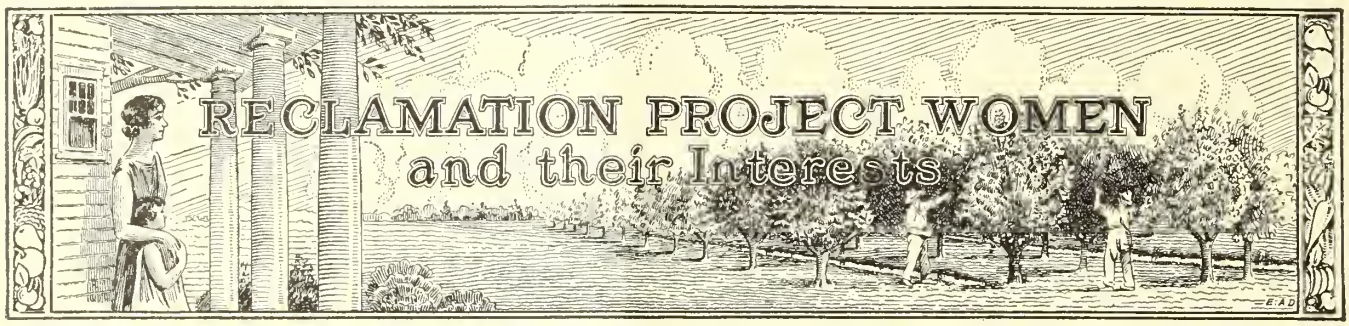
Furthermore, it is a fundamental and well settled principle of equity that specific performance will not be decreed when the contract duties involved call for a long continued and detailed supervision by the court, and involve the exercise of skill, personal labor, and cultivated judgment.

In *Arizona Edison Co.* v. *Southern Sierras Power Co.* (17 Fed. (2d) 739, 740), the court held:

"It is a settled principle that a court of equity will ordinarily decree specific performance only when it can dispose of the matter in controversy by a decree capable of present performance. It will not decree a party to perform a continuous duty extending over a series of years, but will leave the aggrieved party to his remedies at law."

The court accordingly sustained the Secretary's motion to dismiss filed in the *Sunnyside cases.*

On the Rio Grande project more bona fide changes in ownership this spring have occurred than for several years, and at prices materially higher than those recorded for several years.



Home Demonstration Work

A Service for Rural Homemakers

By Grace E. Frysinger, Senior Home Economist, Extension Service, U. S. Department of Agriculture

(Continued from April issue)

BEAUTY WITHOUT EXPENSE

Home demonstration work has helped to beautify the rural home at little or no cost. In tens of thousands of farm homes a veritable transformation has occurred. From attics, barns, cellars, and back porches, chairs and tables long since discarded have been resurrected; under the supervision of the home demonstration agent, layers of paint and varnish have been removed to reveal beautiful grain of mahogany, rosewood, and cherry, or even of satinwood. At almost no expense, the original loveliness has been restored. Sometimes it has been necessary to reupholster, to recane, or to remodel pieces of furniture, and these skills, too, have been taught by the home demonstration agent.

Other phases of home-furnishing assistance given by the home demonstration agent have been furniture arrangement, wall and floor finishes, picture selection, making of hooked and braided rugs, and curtain and drapery selection and construction.

HOME GROUNDS ARE MADE LOVELY

Home demonstration agents help women to beautify home grounds as well as the home, and in thousands of rural communities well-landscaped lawns with attractive foundation planting about the homes, and artistic border arrangement have replaced drab, uninteresting surroundings. Lily pools, rock gardens, and out-door living rooms have become places of pleasure for a restful hour after a busy day for all members of the farm family and also have served as a delight to the passer-by.

The source of these added shrubs, trees, and flowers is usually the nearby woods to which a "trek" on foot or by wagon is planned by the group. Sometimes a "county-wide exchange" is arranged, at which time all interested persons bring such contributions as they desire to barter. Out of one such exchange have grown "friendship gardens", in which the flowers or plants are named for the donors. This experience has been the initial factor in developing new and warmly valued friendships.

Attention Parents

"The Iowa Child Welfare Research Station publishes a series of bulletins called Child Welfare Pamphlets in an attempt to give parents and other interested persons recent scientific findings in a popular and readable form." So reads an announcement, which goes on to list the 45 pamphlets of the Child Welfare series. Unfortunately space does not permit full listing here. The following titles are representative: Health Protection of the Preschool Child; Education of the Preschool Child; How the Child's Mind Grows; Discipline; Educating the Handicapped; The Exceptional Child; The Quest for Emotional Honesty; What Money Means to the Child; The Modern Child and Religion; The Importance of Failure. And there are 35 others.

The pamphlets are 5 cents each, and may be obtained by addressing: The Iowa Child Welfare Research Station, State University of Iowa, Iowa City, Iowa. A complete list may also be secured.

ADDING A BIT TO THE CASH INCOME

The vegetable garden, the poultry, the dairy are not forgotten by the home demonstration agent, who is interested in helping farm women with them, not only because they are means to good nutrition, but, if necessary, supplementary sources of cash income for the farm family. The agent teaches farm women to know and to maintain standards, to use accepted procedures, and, if for sale, to so prepare and package products as to win and maintain a sustained patronage. Cooperative marketing of home crafts and farm-home produce also has been guided by home demonstration agents. Such varied articles as cut flowers, Easter lilies, Christmas wreaths, honeysuckle baskets, gourd bowls, beeswax, hooked rugs, tooled leather, poultry, butter, cottage cheese, baked and canned goods, etc., have been sold by rural homemakers at roadside stands, curb markets, and by parcel post, as well as at regularly established markets owned and operated by farm women. Annually about 50,000 rural homemakers are members of home-demonstration marketing groups.

GOOD TIMES ARE FOSTERED BY HOME DEMONSTRATION WORK

Home demonstration work brings rural women social satisfaction, for it not only stimulates group meetings for study of homemaking, but it promotes good times in the rural home and community as a normal need of every human being and helps to counteract the nervous fatigue and tension caused by financial troubles.

Beginning in a small way, this interest has grown in volume and scope until today county-wide recreation days, rural choruses, picture and music appreciation contests, orchestras, plays and pageants, trips to centers of interest, development of reading circles, and the building of community centers in large numbers of rural communities are the outgrowth of home demonstration work. Rural women have discovered abilities and creative capacities heretofore unsuspected.

HOW HOME DEMONSTRATION WORK FUNCTIONS

Assistance from the home demonstration staff is available in some degree to all homemakers who desire it. The most

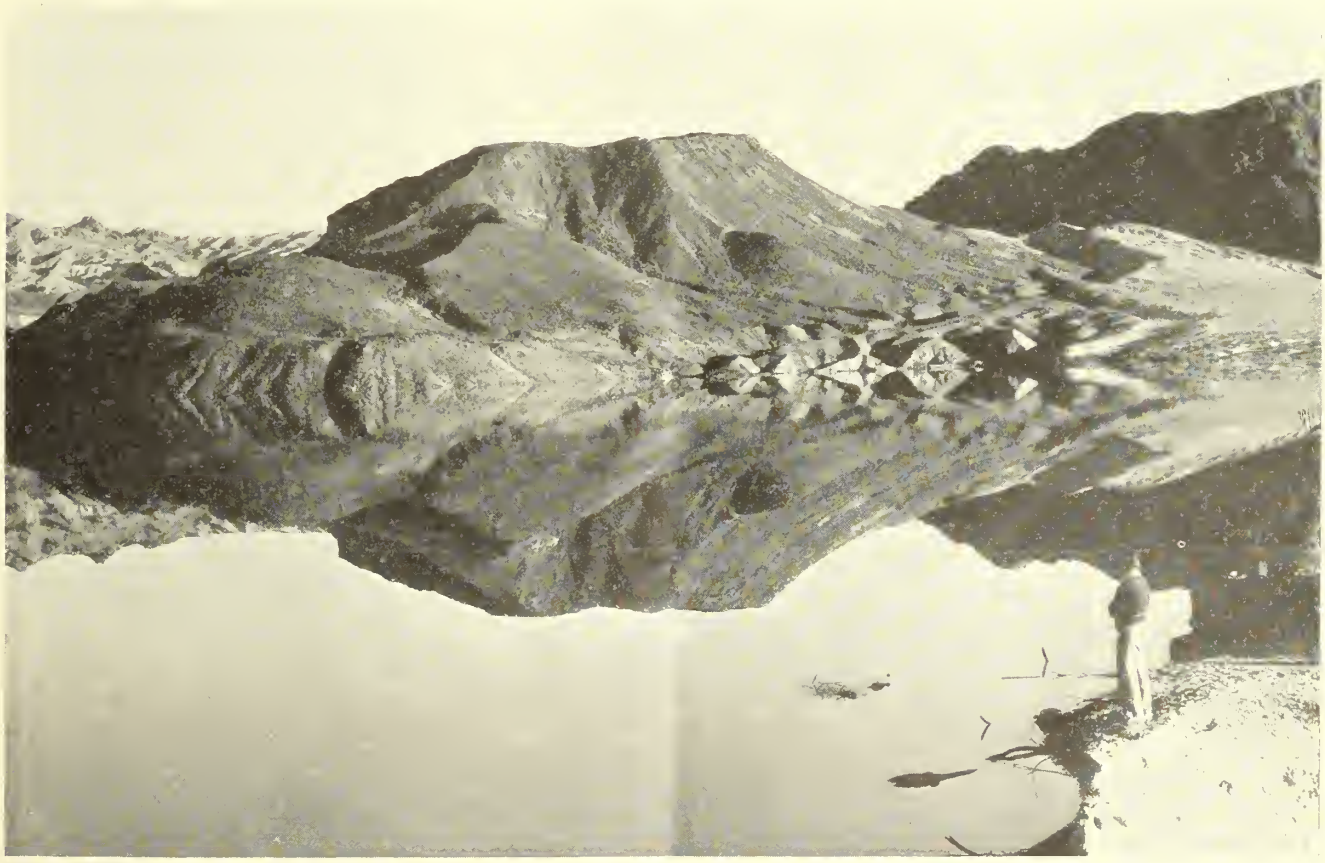
effective assistance is obtainable in those counties where a full-time county home demonstration agent is employed who, in addition to group instruction, gives assistance through personal consultation, correspondence, news articles, exhibits, radio talks, and otherwise.

The county home demonstration agent is employed cooperatively by the county, State, and Federal Governments. The amount of money required from the county is used to cover such items as office space, automobile expenses, supplies used in connection with teaching work and stenographic service. In nearly 1,200 counties home demonstration agents are now employed.

In counties not yet employing county home demonstration agents, homemakers desiring assistance may obtain limited aid by writing to the State home demonstration leader, at the State college of agriculture, who will arrange for such assistance as is possible.

One of the most outstanding values of home demonstration work is the development of capable, unselfish leadership among rural women, which had found wide-spread expression in constructive community and civic service. At present nearly a million rural women are members of home-demonstration groups. In more than 1,200 counties home demonstration agents are helping rural homemakers to achieve and maintain desirable social and economic conditions in the rural homes of the United States. Through this service constructive thinking and far-sighted and unselfish rural leadership are being developed, and rural homes are maintaining desirable standards, even when cash incomes are at a low ebb.

Farm home and garden on a reclamation project.



After admiring this photograph of the Arizona hills mirrored in the lake forming above Boulder Dam, don't fail to turn it sidewise (either direction) and observe the countenances, austere and gruesome, that peer at you. Dr. William F. Durand, of Stanford University, Consulting Engineer of the Bureau, called these faces to our attention.

Lettuce, a Prosperity Crop on the Yuma Proect

By W. A. Boettcher, Office Engineer, Yuma, Arizona

The Yuma Valley and adjoining districts are in the midst of harvesting a record lettuce crop which has brought smiles to growers throughout the districts. For the first time in several years the farmers are receiving satisfactory returns for their work. There are several reasons why the Yuma lettuce grower is in an advantageous position this season. First, the erratic Colorado River acted up again last year, but instead of over-flowing its banks and creating havoc, it changed its usual habits by nearly going dry. This caused a big decrease in lettuce plantings in the Imperial Valley, normally one of the largest lettuce producing sections in the Nation. In addition, other lettuce-growing districts have been harassed by blight and unfavorable weather conditions that have made lettuce-growing there unprofitable.

INCREASED PAY ROLLS

Thousands of persons have been given employment for a period of at least 3 months in harvesting this year's lettuce crop. Field workers, employed in cutting lettuce and packing it in boxes ready for hauling to the sheds, are paid by the day; truckers are paid by the crate for hauling to the sheds, and trimmers and packers are paid by the day. Box-makers are paid by the crate, as are also the men engaged in loading the crates on the railroad cars. The weekly pay roll this winter has been reported as high as $54,800.

The farmer is paid an average of $15 per acre cash rental for his land, and in addition is participating in the profits in most cases. There are also many individual growers who have sold their matured crops in the field. One prominent Yuma Valley woman sold her lettuce early in the season for $175 per acre, reserving 19 acres of younger lettuce for later sale; this is an exceptional case, but an example of what a profitable deal lettuce growing has been this season. Other growers have received lesser amounts of $100 to $125 per acre for their crops in the field.

MOUNTAINS OF ICE

Thousands of tons of ice are used in preparing the lettuce before it can be sent on its way to eastern markets. Nine tons are used for each car. During January of this year 1,072 carloads of lettuce were shipped by rail and an equivalent of 89 carloads were shipped by truck from the Yuma project. Heavy shipments continued throughout the months of February and March as the spring lettuce crop matured.

The cost of producing lettuce disburses cash in many directions. There are the land rentals, then purchases of fertilizer, wages of workers to cultivate and thin the crop, and charges for irrigation water. After the crop is matured there are employed cutters, packers, and truckers in the field, and fleets of trucks are required to haul the lettuce from the fields to the packing sheds, where other workers trim, pack, and place it in refrigerator cars.

Indirectly the pay roll goes on into many channels. Mechanics are required to keep the trucks in proper running condition; gasoline and oils are needed to operate them; additional men are needed at the ice plants to produce the necessary refrigeration medium for shipping the product to distant markets; men are required to pack the cars with ice; and additional railroad men are needed as fast locomotives haul the long trains of cars to the markets.

The operating expenses incurred by the vegetable-growing industry at Yuma during an average year, involving the movement of about 1,700 cars of produce (for the most part lettuce), are shown by statistics to represent local expenditures, exclusive of taxes, amounting to approximately $650,000. The component items of this amount are labor, including salaries and wages, trucking costs, ice, rentals, fuel, power, lights, and repair. Expenditures in channels outside of the local community aggregate about $750,000, consisting of freight, purchases of shook, nails, paper and labels for crates, as well as fertilizer and seed. The total of $1,400,000 is representative of operating expenses of the vegetable industry during a normal year and will be considerably exceeded this year.

Altogether an immense amount of ready cash is required, a large part of which eventually finds its way into the cash registers of local merchants and various businesses. The hotel men benefit from the large number of lettuce buyers, who remain in the community during the packing season. Rooming houses and tourist courts are filled with workers. Restaurants benefit by increased business. Vacant houses are rented and groceries and clothing are purchased. When the gods of fortune smile on a winter lettuce season, there is profitable business for everyone. Good fortune was with the Yuma project this season and a feeling of confidence prevails in the community.

Economic Conditions on Riverton Project

The report at the close of 1934 shows continued and improved progress in settlement and development of the Riverton project, Wyoming. There was no construction work, and none has been authorized for 1935. No unusual maintenance work was done. Weather conditions were generally favorable. The rainfall was light, but there was plenty of irrigation water.

Water was again delivered at a minimum advance charge of 50 cents per acre. For 1935 the rate has been increased to 60 cents per acre with excess water at 50 cents per acre-foot. One hundred and fifteen water users irrigated 7,532 acres and produced on 6,968 acres crops valued at $110,196. Crop yields per acre were about the same as in the past 2 or 3 years. Crop value per acre was $15.81, the highest since settlement on the project began, reflecting the better prices received for farm produce.

Literature was distributed to about 1,300 people. Four hundred and two prospective settlers were shown over the project, 132 applications for homesteads were received, and 71 selected homesteads and paid the advance water rental charge. About 20 sales of privately owned land were made, the land sold being for the most part that with the lowest price. About 60 homesteads remain open to entry. It now seems likely that at least 175 settlers will be farming in 1935.

The Wyoming Department of Commerce and Industry has actively assisted in settling the project. The Wyoming Highway Department completed the secondary highway into Paradise Valley in the spring and constructed a similar graveled highway 7 miles long to connect Pavillion with the main highway. This main highway was oiled from Riverton to the diversion dam. Road work done by Fremont County in the eastern part of the project was of material assistance.

In spite of the unusually low flow of Wind River, this project is one of the few places in the West where unlimited water was available throughout 1934.

During the month of February 66 carloads of packed grapefruit were shipped from the Yuma project, Arizona, to Pacific Coast and western markets, and the equivalent of 43 carloads of packed and loose fruit were shipped by truck to the Pacific Coast. All local fruit packed at the Association shed is marketed in a seasonal pool through the California Fruit Grower's Exchange.

Administration of Four Billion Dollar Works Relief Appropriation

IN THE administration of the four billion dollar works relief bill, the President has announced the organization of three major agencies and their administrators as follows:

Division of Applications and Information, Frank C. Walker, of Montana.

Works Allotment Division, Harold L. Ickes, of Illinois.

Works Progress Division, Harry L. Hopkins, of New York.

The President has announced that by far the greater part of the administration of the actual work to be undertaken would be under the 40 or 50 existing Government agencies which now and for many years have been conducting similar work. A careful study of the several hundred different types of work shows that it will be necessary to set up only 3 new agencies, 1 in charge of grade crossings, 1 in charge of rural electrification, and 1 to consolidate various kinds of work relating to rural resettlement.

DIVISION OF APPLICATIONS AND INFORMATION

The Division of Applications and Information will act as a clearing house with the general objective of providing for the public and for officials of the Federal, State, and local governmental agencies, as well as for civic organizations, a central place for their general convenience. Here will be received all suggested plans for the useful expenditure of work relief funds, no matter what the source of these suggestions may be.

In this Division these plans will be carefully sorted and checked and where engineering or other study is necessary such study will be obtained from the regular Government departments best qualified for the work. A preliminary comparison of the usefulness of all of these plans will be made by the Division and the plans themselves will then be segregated to conform with the relief areas which in turn will be based on the number of unemployed persons within a proper geographical area.

As fast as these plans are cleared through this Division they will be submitted to a Works Allotment Board, the details of which will be announced in a few days. It is worth noting that a very large number of projects already have been studied and reported on by the various governmental agencies during the past 6 months. These projects are ready for delivery to this new division for clearance.

The other principal function of this new division will be to act as an information service on the disposition of projects which have been submitted and, in the case of projects which have been approved and on which work has been begun, as the source of information on the progress of work on such projects.

WORKS ALLOTMENT DIVISION

The Works Allotment Division will receive the lists of projects sent to it from the Division of Applications and Information after the various projects have been studied and reported on by the agencies under which they fall. The Works Allotment Division will, therefore, receive projects large and small in final shape. In other words, the estimates of cost will have been checked, the length of time necessary for completion will have been passed on, the number of persons from the relief rolls who can be employed in each vicinity or, to put it another way, the percentage of direct labor will have been certified, the proportion of self-liquidating projects to the whole number will have been studied and the economic justification determined. With all this information in its possession the Works Allotment Division will be able to recommend the projects to the President by districts, for his approval.

In order that all points of view in making the allotment recommendation may be obtained, the Works Allotment Division will meet in round-table conference at least once a week for the next few months and will be composed of a large number of persons. The following, subject to later additions, will constitute its membership:

The Secretary of the Interior.

The Secretary of Agriculture.

The Secretary of Labor.

The Director of the National Emergency Council.

The Director of the Progress Division.

The Director of Procurement.

The Director of the Bureau of the Budget.

The Chief of Engineers, United States Army.

The Commissioner of Reclamation.

The Director of Soil Erosion.

The Chief of the Forest Service.

The Director of Emergency Conservation Work.

The Chief of the Bureau of Public Roads.

The Director of Rural Resettlement.

The Director of Rural Electrification.

The Chief of the Division of Grade Crossing Elimination.

The Director of Relief.

The Chief of the Urban Housing Division.

A representative of the Business Advisory Council.

A representative of organized labor.

A representative of farm organizations.

A representative of the American Bankers Association.

A representative of the Mayors Conference.

The Vice Chairman of the National Resources Board.

The Secretary of the Interior will act as Chairman of this Works Allotment Division.

Under the law, the actual allocation of amounts to be expended under the Work Relief bill must be made by the President. The President will, therefore, receive the recommendations from the Works Allotment Division before allocations are made by him. After such allocations have been made they will be transmitted to the many Government agencies already referred to, which will be charged with the prosecution of the work.

WORKS PROGRESS DIVISION

Before allotments are made accurate information must be available in regard to the actual number of employables whose names are on existing relief rolls. As the Works Relief program is intended to take care primarily of these people the projects must be allocated in proportion to the numbers within a given work area. The Works Progress Division will be in charge of these figures and will keep the other divisions informed at all times.

Next, after allotments have been made, it will be the duty of the Progress Division to see that the actual persons to be employed on the separate projects will come from those whose names are on the relief rolls.

It also will be necessary to determine the amounts of security payments in different areas of the country.

Finally, the Progress Division will be charged with keeping in touch at all times with all projects and reporting on the progress made. The agents of the division in the field, where there are not sufficient adequate projects in any work relief area, will explore possibilities for additional work and make recommendations thereon.

The general work of the Works Progress Division also will include recommendations designed to keep the actual work of the great majority on projects located as close to the homes of the workers as possible.

An unusual number of properties on the Rio Grande project changed hands during the month of February. A great number of these changes were made to people who had come in from other parts of New Mexico and Texas. One place in the El Paso Valley sold for $150 an acre.

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Engineering Investigations During March 1935

Silt surveys, Colorado River.—Investigations are in progress to determine the effect of desilted water released from the Boulder Canyon Reservoir on the river channel below. Cross section surveys of the Colorado River at 5-mile intervals between the Parker and Imperial dam sites are in progress, and five cross sections were surveyed and permanent monuments set at each cross section on both sides of the river.

Northern Transmountain diversion.—Investigations of a transmountain diversion from the Colorado River watershed near Grand Lake to the South Platte watershed near Fort Collins, Colo., are in progress. An office is being established at Grand Lake, surveying parties organized, an enlarged topographic map of the area is being compiled, and preparations are being made for locating the triangulation system in the field.

Upper Snake River storage.—Investigation of feasible reservoir sites on the upper Snake River in the State of Idaho are being continued in spite of deep snows and winds. On the North Fork excavation of test drift was completed at the outlet end of diversion tunnel site at Island Park dam site, and specifications for the Island Park Dam are in preparation. Maps of the dam and reservoir sites at Teton Creek and Spring Creek were completed and preparations are being made for exploration of foundation for Upper Teton Reservoir site. On the South Fork, diamond drilling was continued at the Grand Valley dam site, and a shaft excavated to a depth of 54 feet at the right abutment. A report of geological investigations of the Johnny Counts dam site was completed; a similar report is in progress for the Grand Valley dam site and preliminary designs and estimates have been commenced for dams at these two sites.

Buffalo Rapids project, Montana.—Irrigation possibilities in the vicinity of Miles City and Glendive are in progress. Canal lines have been surveyed along both sides of the Yellowstone River. A review of available soil surveys for determining irrigable areas is in progress, and a general map is being prepared of the areas and canal lines. Preparations are being made for excavating test pits at the diversion dam site.

North Platte Valley.—The engineer in charge of these investigations is assembling data at Lincoln, Nebr., preparatory to the field investigations.

Deschutes project, Oregon.—Investigations of storage possibilities for supplemental irrigation supply of lands along the Deschutes River are being continued, including the preparation of a report, water-supply studies for the various reservoir sites, and preparation of preliminary designs and estimates for the various reservoir sites under consideration.

Grande Ronde project, Oregon.—A report of the results of field investigations is in preparation, and a geologic report of the dam sites along the Grande Ronde River has been prepared. Drilling is being carried on on a three-shift basis at a number of dam sites, and plans and estimates of relocating the railroad around the various reservoir sites are in preparation.

Umatilla River flood control.—Investigations are being continued and field data of the irrigable areas under the various canal lines with cost estimates of the canals were being compiled, and water-supply studies made and hydraulic data secured for making estimates for designs for a dam at the Ryan Creek site.

Colorado River Basin surveys.—Classification of lands in Mohave Valley, Ariz., was completed, 18½ square miles having been classified, and classification maps completed. Land classification and irrigable area surveys were commenced above the present Grand Valley High Line Canal in the vicinity of Grand Junction, Colo., and an irrigable area survey of Plateau Valley commenced. Classification surveys were also in progress of lands along the Colorado River in southern Nevada, and 15½ square miles were surveyed. Work was continued on the preparation of irrigable area maps of the San Juan River Basin in Colorado and New Mexico.

Emergency Conservation Work

(Continued from p. 92)

Repair and improvement of dams and construction of dams for small storage reservoirs to supplement irrigation water supplies;

Construction and improvement of operating and community roads;

Erosion control around reservoirs to prevent silting and depletion of storage capacities;

Repair and replacement of pipe lines and conduits;

Repair and reconstruction of rural electrical and telephone systems;

Planting and care of trees for wind breaks;

Landscaping and improvements for camp grounds and development of recreational areas around reservoirs;

Rodent control for protection of canals and farm property;

Control of noxious weeds.—*D. S. Stuver.*

Panorama of west bank developi

Making England Safe from Floods

P. Malcolm Stewart, commissioner for the special areas in England and Wales, has announced that he is cooperating with the Ministry of Agriculture respecting England's 1,755,000 water-logged acres, and that the ministry will shortly issue a letter to local authorities offering substantial financial assistance for land drainage.

The fact is that 4,362,000 acres of land in England and Wales, that is to say, one-seventh of the land used for agricultural purposes, is dependent upon its fertility for arterial drainage. When the last royal commission reported upon land drainage in 1927 almost half that area needed immediate attention. Since then the situation has, by the nature of things, become more serious. The big rivers have become more silted up so that the water from the tributary channels cannot get clear. There are parts of the River Dee where the river bed is above the level of the land on either side of its banks. The area of water-logged land, has therefore, decreased.

The royal commission of 1927 scheduled 101 catchment basins for which catchment area authorities were suggested by the Ministry of Agriculture, and it marked 60 of these as urgent priority cases. Among these are the Thames, with a catchment area of 3,812 square miles; the Severn, 3,222 square miles; the Trent, 4,052 square miles; the Yorkshire Ouse, 4,133 square miles; the Great Ouse, 3,194 square miles.

It has been estimated that the total cost of making England safe from floods would be 30,000,000 pounds ($150,000,000), spread over 10 years, and most of the money would be spent on wages.—*Daily Telegraph, London.*

"Gardens of Eden

"The Irak Government is about to spend some $5,000,000 raising a dam across the Tigris to irrigate a desert where the Garden of Eden is supposed once to have been located. The paradise where the legendary Adam and Eve delved, spun, and begat the human race has been a sandy waste for more than 3,000 years. Now water will turn it green again, this time with date palms, wheat, maize, and cotton.

"Making useful Edens is not a new industry to our own enterprising country. Since passage of the Reclamation Act in 1902 the Government has covered with verdure nearly 20,000,000 acres of once barren wilderness. It has made possible 44,000 fertile farms and 214 cities and towns on its 27 Federal reclamation projects, wherein dwell 700,000 sons of Adam and daughters of Eve. Their toil has created $1,000,000,000 worth of taxable property. They buy $120,000,000 worth of goods in the American markets.

"While these little oases cover only 1 percent of the Nation's cropped region and their output is a negligible and largely noncompetitive mite, their part in the national economy is important. They form what Reclamation Commissioner Mead calls "seeds of civilization" in an otherwise unpeopled no man's land. To the West they are indispensable.

"While we have been creating Edens from the deserts, we also have been destroying natural Edens. Many of America's wastes are man-made—ruins of once magnificent forests and prairie pastures.

"The work of the Administration in sound reclamation projects and in checking deforestation and soil erosion is vital to the country's future, if not to its very survival. Nations before have destroyed their own Edens. Through folly and greed we can destroy ours."—*The Washington News.*

San Diego Exposition to Open May 29, 1935

The Bureau of Reclamation is cooperating with the other Bureaus of the Department in furnishing available pictorial and circular material for display at the California Pacific International Exposition to open in San Diego, Calif., on May 29, 1935. Scenes of construction work and other phases of operations on the Federal irrigation projects will feature the pictorial exhibit of the Bureau of Reclamation.

George C. Dickens, administrative assistant of the National Resources Board, has been placed in charge of the Interior Department exhibit.

Boating on Boulder Lake

Pending the establishment of a definite policy regarding the operation of boats in the lake at Boulder Dam, the Department of the Interior has issued temporary revocable permits to applicants who by reason of their prior operation are deemed best fitted to handle the boat traffic at the present time. Specifications are being prepared and bids will be called for within a short time for the permanent operation of boats on the lake.

Applicants for permits to operate boats on the lake for private purposes are being referred to Walker R. Young, Construction Engineer, Boulder City, Nev.

bia Basin Project, Washington

Boulder Canyon Project Transportation

By Wesley R. Nelson, Associate Engineer, Boulder Canyon Project

THE region around Boulder Dam is to a great extent undeveloped, and the problem of transportation in times past has generally been one of getting through the country rather than into it. Many of the interesting events in the history of southwestern Utah, southern Nevada, and the adjoining lands of Death Valley, and the Colorado River Desert in California are connected with the attempts of frontiersmen to find the least hazardous route from the foothills of the Rockies across the dry wastes to the eastern slope of the Sierras.

The fort of Old Las Vegas and the surrounding meadows that gave the post its name offered protection from the unfriendly Piutes and a respite to the traveler and his oxen before venturing to cross the 200 miles of desert to the coastal range. Seeking some other route across this forbidding country, several attempted the navigation of the Colorado River, but the many swift rapids and the everchanging flow of the river discouraged even the most courageous of voyagers. One group of wayfarers turned west from Las Vegas, instead of southwest, and the tragic conclusion of this journey was perpetuated in the naming of Death Valley. But completion of the last link in the transcontinental railroad, which took place near Ogden, Utah, in 1869, and the later construction of a line from Salt Lake to Los Angeles by the Los Angeles & Salt Lake Railroad (Union Pacific system), solved the problem of travel to the west coast, and also provided ready access to arid lands that were gradually being transformed from bleak deserts to farms and thriving communities.

Consequently, at the time the site at Black Canyon was selected as the most feasible location for Boulder Dam, the main line of the Los Angeles & Salt Lake Railroad passed through Las Vegas, Nev., only 30 miles west of the canyon. Furthermore, the route for the first 23 miles to the site of Boulder City lay generally across a broad plain and along low foothills, although the remaining 7 miles to the rim of Black Canyon were in a much more rugged country.

RAILROAD CONSTRUCTION

An agreement between the Bureau of Reclamation and the Los Angeles & Salt Lake Railroad was entered into in August 1930, wherein the railroad company would construct 22.71 miles of single-track standard-gage line from its main tracks near Las Vegas to a delivery yard at Summit (now Boulder City) and the Government would continue the line from Summit to the dam site. Provisions were also made for an interchange yard at Summit, which would accommodate 350 cars at one time. Construction of the Los Angeles & Salt Lake section was completed in February 1931 by contractor, Merritt, Chapman & Scott of San Pedro, Calif., and the Government's 10.2 miles of line was finished 7 months later by the Lewis Construction Co., of Los Angeles. Later in 1931, Six Companies Inc., contractor for building the dam, power plant, and appurtenant works, made connection with the Government line at a point 6 miles from Boulder City, and laid 20 miles of tracks to all its principal plants and construction features, including a line to the bottom of Black Canyon at the dam site and another across the river to the sand and gravel deposit, 9 miles upstream from the dam site. When all tracks were laid, the project was served exclusively by 52 miles of line.

Features of note along the railroad are the 5 tunnels on the Government line, totaling 1,390 feet in length, and 2 tunnels on the Six Companies, Inc., extension, each approximately 1,000 feet long; the 800-foot pile-trestle bridge crossing the Colorado River to the sand and gravel deposits; the retention of a 3 percent maximum grade with the load, although the difference in elevation between Boulder City and the end of the Government railroad is 1,100 feet; and the switchback at the lower end of the Government railway where a curve of appropriate radius would require excessive excavation.

CARLOAD SHIPMENTS

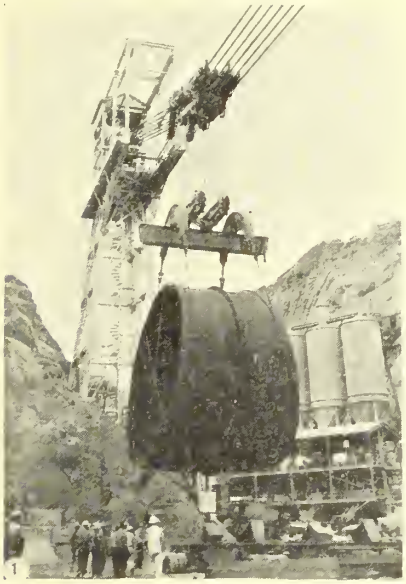
The first train passed over the Los Angeles & Salt Lake lines on February 5, 1931, and by the end of that year 2,566 cars of freight had been hauled to Boulder City. As project construction progressed, the demands for materials increased, and car shipments rose to 4,194 in 1932, 6,843 in 1933, and to a peak of 12,789 in 1934. Most of these in the latter years were of bulk cement—15,274 cars, with as many as 35 in 1 day. Other materials received in large quantities from March 1931 to January 1935, inclusive, were 557 cars of plate steel, 776 of reinforcing steel, 809 of structural steel, 664 of machinery, 372 of pipe and conduit, 2,852 of lumber, and 205 of explosives.

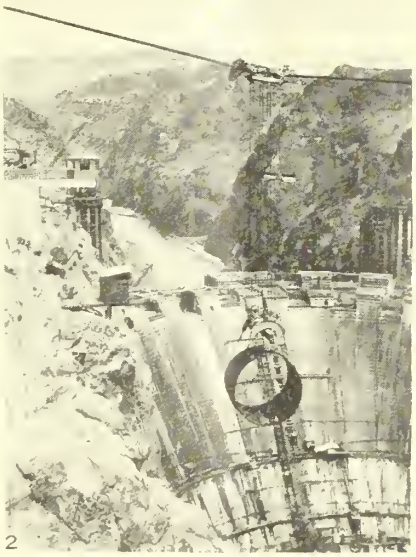
All States in the Union send supplies to form a part of the completed works, the requirements ranging from tin cups and friction tape to steel gates weighing 3 million pounds apiece and generators which with accessories will weigh 2,300,000 pounds each. Forty cars were used to transport each of these gates, and specially built low-center cars of 75-ton capacity will be required for generator parts and transformers.

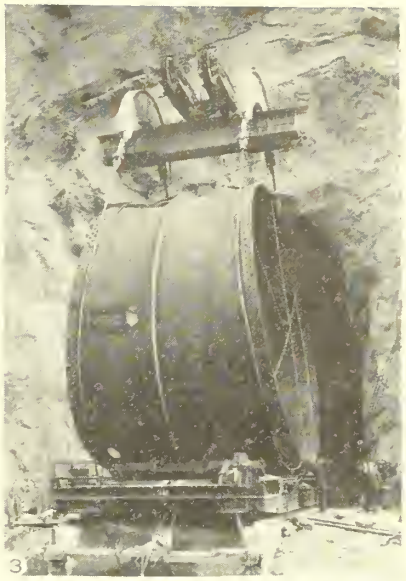
OPERATION BY CONTRACTOR

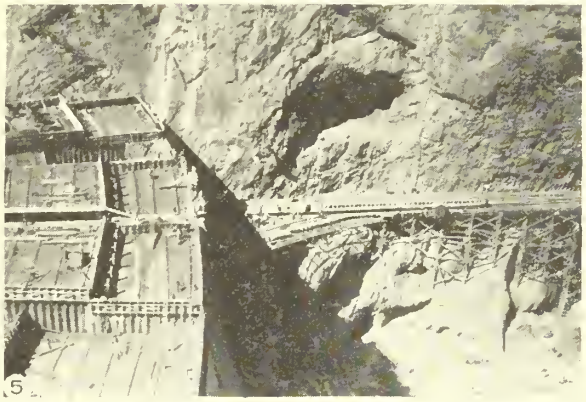
The contractor, Six Companies, Inc., operated the Government railroad and its own lines on the project. It established a singularly complete railroad system, with shops and dispatching offices, and provided adequate rolling stock which included fourteen 90- to 106-ton locomotives and 114 dump cars, as well as 14 electric and gasoline engines for short hauls. The movement of sand and gravel from the Arizona pit to the screening plant and from there to storage piles or mixing plants was one of the major duties of the system. As many as 8,423 sixty-ton cars were hauled in 1 month from pit to plant, and a total of 139,952 cars from the pit while it was operated.

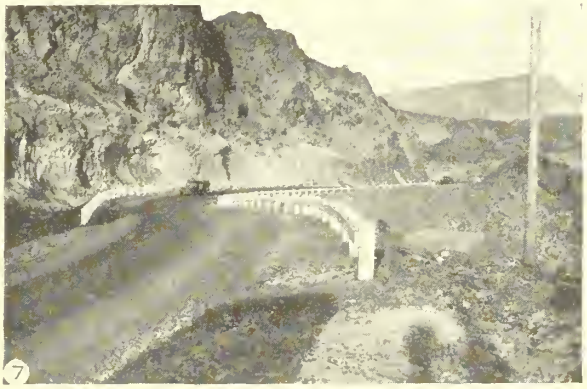
Throughout 1934 the contractor was pushing the dam construction to the maximum extent permitted by the contract specifications and was pouring a quarter of a million cubic yards or more of concrete each month. During this time as many as 300 cars of materials were placed in the dam every 24 hours.

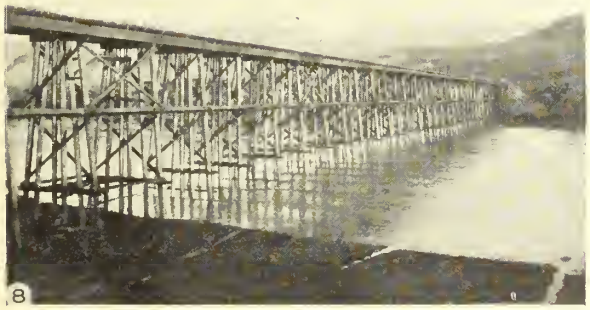












BOULDER CANYON PROJECT

ARIZONA-NEVADA

1 and 2, Handling 30-foot pipe with Government cableway; 3, 30-foot pipe on erection car at construction adit entrance; 4, hauling pipe on 200-ton trailer; 5, U. P. streamlined train visits dam on March 9, 1934; 6, a 150-passenger transport; 7, section of highway between Boulder City and dam; 8, pile trestle bridge to Arizona deposit.

Totaling the number of cars of materials that will be used in the permanent works and those for construction, it is found that if arranged in a single train, the engine would be entering Boulder City as the caboose left Kansas City, Mo. Included in this freight for Government construction would be 52,000,000 pounds of reinforcing steel, 21,700,000 pounds of gates and valves, 88,000,000 pounds of plate steel for outlet pipes, 7,000,000 pounds (approximately 1,000 miles) of pipe and conduit, 14,500,000 pounds of structural steel and 5,000,000 barrels of cement. According to records of the Government and contractors, the gross revenue of the Union Pacific system for freight hauled to the project had already amounted to $8,671,000 at the end of 1934.

TRANSPORTATION OF OUTLET PIPES

But even the standardized railroads with all their equipment could not transport the large pipe sections that form the supply lines from the reservoir to the pipes that feed the turbines and outlet valves. More than 4,600 linear feet of these headers are 30 feet in diameter and some sections 24 feet in length, weigh 187 tons, equal to the weight of two of the Mikado steam locomotives that pull freight into Boulder City. A fabrication plant was therefore built by the contractor, the Babcock & Wilcox Co., at a location approximately 1½ miles from the dam site, where flat steel plates are shaped and welded into pipe sections. The thickness of some plates is $2\frac{13}{16}$ inches, and 2 of these, approximately 12 by 32 feet in size, constitute a load for 1 railroad car. Six of these plates form a 24-foot length of 30-foot diameter pipe.

All fabricated sections 20 feet in diameter or over are transported from plant to canyon rim on a huge trailer of 200-tons capacity, pulled and controlled by two caterpillar tractors, one at the front, the other in the rear of the trailer. Sections less than 20 feet in diameter are hauled by rail. The pipe sections are lowered from rim to portals of construction adits, that lead to header tunnels, by the Government's giantlike cableway [1] that spans the canyon, downstream from the dam and power house.

There are no regular passenger runs to Boulder Dam by rail, although the Union Pacific's stream-lined train carried officials of the Government and railroad company to the upstream face of the dam on March 9, 1934, and specials, carrying excursionists, arrive in Boulder City almost weekly. The largest of these groups consisted of 10 trainloads of Shriners from California and Utah, who held a ceremonial on the upper cofferdam the night of October 20, 1934.

No estimates have been made of the freight that has been brought into the project by highway, but the amount undoubtedly is in thousands of tons, principally of foodstuffs for Boulder City.

Six Companies, Inc., has used as many as 150 trucks at one time in the removal of excavated material from the canyon workings, the building of cofferdams, and the transporting of men and supplies from Boulder City to the canyon. Some of the trucks will haul 16 cubic yards of rock, others are of 50-ton capacity for conveying reinforcing steel, while the passenger transports will carry from 50 to 150 men each.

CONSUMPTION OF MATERIALS

From the beginning of operations to February 1, 1935, the combustion engines of Six Companies, Inc., had consumed 4,643,504 gallons of gasoline, and the company's payments for truck and auto tires had exceeded $280,000. Relative to the consumption of materials in construction by this contractor, the following tabulation of some of the supplies and equipment used will be of interest: Canvas water bags, 32,664; safety belts, 5,240; hard hats, 13,046; rubber boots, 21,144 pairs; paint brushes, 19,384; lumber crayon, 34,992; tin cups, 9,720; dish pans, 3,048; dynamite, 8,551,300 pounds; exploders, 1,139,500; fuse, 173 miles; flashlights, 7,360; compressed-air hose, 34 miles; radiator hose, 1 mile; chalk line, 148 miles; nails, 18,111 kegs; fish poles, 96; life preservers, 30; manila rope, 495 miles; wire rope, 363 miles; burlap sacks, 335,000; shovels, 13,356; drill steel, 1,516,376 pounds; electric tape, 50,250 rolls; telephones, 386; wheelbarrows, 168; police whistles, 588; power shovels and draglines, $508,000; autos and trucks, $1,016,000; structural steel, pipe, wire rope, $1,938,000; compressor equipment, $501,000; electric motors and transformers, $293,000; concrete equipment, $265,000; railroad equipment, $539,000.

PROJECT VISITORS

Most of the visitors to the project travel in automobiles over the smooth oil-surface highways that lead from north and south into Las Vegas, thence 23 miles southeast to Boulder City and 7 miles farther east to Lookout Point on the Black Canyon rim. Another highway is under construction by the Bureau of Public Roads and the State of Arizona, from Kingman, Arizona, through Chloride and to Boulder Dam a distance of about 80 miles. This road will be completed by the summer of 1935, but at the present time as many as 700 visitors a month brave the corduroy and sharp turns of the dirt road, to enter the project from the Arizona side, crossing the lake back of the dam by ferry.

The interest displayed in construction has far surpassed all expectations. More than 266,000 visitors were given passes to the project in 1934, 15,033 passed through the reservation gates on the 3-day week-end of November 9–11, 1934, and 39,884 in the following month of February.

It was assumed that as construction neared its close the interest would wane, but present indications point to a greater number of visitors in 1935 than ever before.

[1] A description of the Government cableway and those of Six Companies Inc., can be found in the May 1933 issue of the RECLAMATION ERA.

Rio Grande Rectification Work

On August 28, 1934, an agreement was entered into between the Secretary of State and the Secretary of the Interior providing that the Bureau of Reclamation perform certain work for the restoration of irrigation works affected by the rectification of the channel of the Rio Grande. Funds for this work will be transferred by the Department of State to the Department of the Interior from an allotment made available to the State Department under the National Industrial Recovery Act of June 16, 1933. The State Department has transferred to the Bureau of Reclamation $100,000 and the work is now in progress.

Supplemental agreement dated January 17, 1935, between the two Departments, provides for the preparation of designs, plans, and specifications in connection with the construction of the Caballo Dam. A transfer of $20,000 has been made available and the work is now in progress under the direction of the chief engineer.

An allotment of $100,000 of Public Works money has been made available to the Bureau of Reclamation for the purpose of later enlarging the Caballo Dam. By agreement of March 2, 1935, between the two Departments, this allotment of $100,000 has been transferred to the State Department.

Four 287.5-kilovolt oil circuit breakers for the Boulder power plant are now being manufactured in the East Pittsburgh plant of the Westinghouse Electric & Manufacturing Co. Each breaker weighs 300,000 pounds and is 27 feet high. Their purpose is to protect the station from faults that may occur on the transmission line from Boulder Dam to Los Angeles.

Notes for Contractors

Boulder Canyon project, Arizona-Nevada.—The successful bidders under Specifications No. 601 for furnishing control equipment for the Boulder power plant are as follows: Schedule 1, main control equipment, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $208,261, f. o. b. East Pittsburgh; schedule 2, clock supply equipment, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $7,900, f. o. b. East Pittsburgh; schedule 3, battery charging sets, battery control switchboard, and 250-volt direct-current switchboards, Graybar Electric Co., Denver, Colo., $21,720.70, f. o. b., Cleveland, Ohio, and Los Angeles, Calif.; schedule 4, 460-volt and 115-volt alternating-current control equipment (under advisement); schedule 5, miscellaneous 2,300-volt and 16-500-volt switching equipment, Wolfe & Mann Mfg. Co., Baltimore, Md., $10,291, f. o. b. Baltimore. Thirteen manufacturers submitted bids on this equipment. Awards of contracts have not yet been made.

The Gould Storage Battery Corporation, Depew, N. Y., offered a low bid of $7,251, discount 1 percent, for furnishing two 120-cell and one 60-cell storage batteries for the Boulder power plant (Specifications No. 668-D) at the Denver opening on March 25. Other bids were as follows: Electric Storage Battery Co., Philadelphia, Pa., $8,550.57; U. S. L. Battery Corporation, Niagara Falls, N. Y., $8,400, discount 2 percent. These bids are now being given consideration as to award.

Bids were opened at Denver on April 27 (Specifications No. 674-D) for furnishing 104 luminaries for the illumination of the main roadway over Boulder Dam, and 34 luminaries for the roadways connecting dam and intake towers.

Bids under Specifications No. 673-D for furnishing one 180-ton transformer transfer car were opened at Denver on April 18. Five bids were received as follows: Consolidated Steel Corporation, Los Angeles, Calif., $5,050; Morgan Engineering Co., Alliance, Ohio, $5,560; Atlas Car & Mfg. Co., Cleveland, Ohio, $4,542; Judson-Pacific Co., San Francisco, Calif., $5,214; Geo. P. Nichols & Co., Inc., Chicago, Ill., $6,550. All bids were f. o. b. factory.

Six companies bid on furnishing water heaters and coolers for the power plant, under Specifications No. 666-D, bids opened at Denver on March 20. Contracts have been awarded as follows: Item 1, electric water heater and tank, Grinnell Co. of the Pacific, Los Angeles, Calif., $653.40 f. o. b. Boulder City; item 2, two 30-gallon water heaters, Grinnell Co. of the Pacific, $105.93, f. o. b. Boulder City; item 3, one 120-gallon water heater, Grinnell Co. of the Pacific, $112.36, f. o. b. Boulder City; item 4, seven electric water coolers, Day & Night Water Heater Co., Los Angeles, Calif., $735, f. o. b. Los Angeles; item 5, four electric water coolers, Day & Night Water Heater Co., $460, f. o. b. Los Angeles.

Bids received on January 11 under Specifications No. 643-D for furnishing insulated wire and cable for the power plant were referred to the Comptroller General's Office, on the protest of one of the bidders. He has decided that the "Thermax" bids of $84,214.72, submitted by the General Cable Corporation, Graybar Electric Co., Inc., and the American Automatic Electric Sales Co., were alternate bids, and not permissible. Accordingly the Secretary on April 16 approved rejection of all bids and readvertising.

On May 2 bids were received at Denver (Specifications No. 675-D) for furnishing and delivering one hydraulic control board for installation in the watermaster's control room in the power plant, and position transmitters for needle valve position indicators on needle valve control stands in the lower tunnel plug operating chambers in Boulder Dam. The apparatus will be installed by the Government.

Two bids were received at Denver on March 28, under Specifications No. 670-D, for furnishing a second-hand towboat for use on the Boulder Canyon Reservoir. The Tregoning Boat Co. of Seattle, Wash., offered to build a new boat to meet specifications for $16,000 or $18,000 with steel hull. P. B. Hackley Equipment Co., of San Francisco submitted an informal bid of $13,000 for a used boat, but larger than that called for in the specifications. These bids have been rejected and new bids will be invited.

The Denver office on April 1 awarded contracts under Specifications No. 657-D as follows: Item no. 1, four flow meters for 115,000 horsepower turbines, Bailey Meter Co., Cleveland, Ohio, $2,794; item no. 2, one flow meter for 55,000 horsepower turbine, Simplex Valve and Meter Co., Philadelphia, Pa., $3,170. Low bids of the Bristol Co., Waterbury, Conn. and Morey & Jones, Ltd., Los Angeles, Calif., for items 1 and 2 respectively, did not meet the requirements of the specifications.

Successful bidders for furnishing lathe, drill press, and grinder for the power plant (Specifications No. 663-D) were the following: Item no. 1, 10-inch lathe, Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo., $474.90, f. o. b. Cincinnati; item no. 2, 24-inch upright drill press, Urquhart Service, Cincinnati, Ohio, $1,099 f. o. b., Cincinnati; item no. 3, 10-inch pedestal grinder, The Hisey-Wolfe Machine Co., Cincinnati, Ohio, $168, discount 2 percent, f. o. b. Boulder City.

The Secretary on April 3 approved award of contract to the Alliance Machine Co., Alliance, Ohio, for furnishing turbine gallery crane, jacking frames, trolleys, and lifting beams for the power plant, under Specifications No. 662-D.

The following bids were received at Denver on April 12 for furnishing four overhead revolving cranes for intake towers at Boulder Dam, under Specifications No. 617: Morgan Engineering Co., Alliance, Ohio, $63,200; The Alliance Machine Co., Alliance, Ohio, $86,684; Dravo Contracting Co., Neville Island, Pa., $67,200; Lakeside Bridge and Steel Co., Milwaukee, Wis., $67,800; Judson-Pacific Co., San Francisco, Calif., $58,120; Shaw-Box Crane & Hoist Co., Inc., Muskegon, Mich., $83,536; The Cleveland Crane & Engineering Co., Wickliffe, Ohio, $97,100; Harnischfeger Sales Corporation, Milwaukee, Wis., $61,840. All bids were f. o. b. factory except Cleveland and Harnischfeger, which were f. o. b. Boulder City, Nev. The Judson-Pacific Co. is low bidder.

Ten bids were received at Denver on April 15 for furnishing twelve 86-inch diameter Paradox emergency gates for tunnel plug outlet works at Boulder Dam (Specifications No. 620) as follows: American Locomotive Co., Dunkirk, N. Y., $355,000; Babcock & Wilcox Co., Barberton, Ohio, $326,606; Allis-Chalmers Manufacturing Co., Milwaukee, Wis., $350,000; Bethlehem Shipbuilding Corporation, Ltd., San Francisco, Calif., $376,000; Consolidated Steel Corporation, Ltd., Los Angeles, Calif., $303,000; Joshua Hendy Iron Works, San Francisco, Calif., $269,459; Thomas Spacing Machine Co., Pittsburgh, Pa., $274,000; Hardie-Tynes Manufacturing Co., Birmingham, Ala., $289,642; Steacy-Schmidt Manufacturing Co., York, Pa., $352,000; Bartlett-Hayward Co., Baltimore, Md., $308,800. All bids were bids f. o. b. factory shipping point. The low bidder is the Joshua Hendy Iron Works.

Bids (Specifications No. 682-D) will be received at Denver until 2 p. m., May 15, 1935, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the shipping point or f. o. b. cars at Boulder City, Nev., at the option of the

bidder; two direct-connected, motor-driven, deep-well, turbine-type pumping units, to be used as sump pumps and two direct-connected, motor-driven, deep-well, turbine-type pumping units to be used as drainage pumps in the tunnel plug outlet works at Boulder Dam. The drainage pumping units shall be assembled and rebuilt from parts salvaged from one deep-well, motor-driven turbine pumping unit to be furnished by the Government. All pumping units will be installed by the Government.

Sealed bids (Specifications No. 680-D) will be received at the office of the Bureau of Reclamation, Denver, Colo., until 2 p. m., May 16, 1935, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the shipping point or f. o. b. cars at Boulder City, Nev., at the option of the bidder 12 discharge guides for 72-inch needle valves for installation in the tunnel plug outlet works at the Boulder Dam. All materials will be installed by the Government.

Two manufacturers submitted bids for furnishing water-level gages for the Boulder power plant, under Specifications No. 672-D; bids opened at Denver on April 15. Julien P. Friez & Sons, Inc., Baltimore, Md., bid $2,448, discount one-half percent, f. o. b. Baltimore, and Lenpold, Volpel & Co., Portland, Oreg., bid $3,837, discount 1 percent, f. o. b. Portland.

Bids (Specifications No. 678-D) will be received at Denver, until 2 p. m., May 20 and will, at that hour, be opened for furnishing and delivering f. o. b. cars at the shipping point or f. o. b. cars at Boulder City, Nev., at the option of the bidder; eight cast-steel bulkheads with studs, nuts, tap bolts, and gaskets, and fifty-six 3¼-inch diameter by 18½-inch bolts with nuts and sixty-four 4-inch diameter by 25-inch bolts with nuts, for installation on the flanged ends of 13-foot diameter penstock pipes which will serve the future units at the Boulder power plant. The bulkheads will be installed by the Government.

Bids on the following material for the roof drainage system for the power plant were opened at Denver on May 3 (Specifications No. 677-D): Special drainage fittings; drainpipe leaders and welded fittings; headers and branches for the Arizona and Nevada wings, consisting of welded plate-steel pipes with flange coupling bolts, gaskets, and blind flanges.

New work for which plans and specifications are being prepared in the Denver office includes the following: (dam and appurtenant works) 72-inch needle valves and control; lifting frames for bulkhead gates and trashracks; maintenance platforms and cylinder gate stem installation; walkways, stairs, and ladders in tunnels; bulkheads for penstocks; downstream plug downstream plug outlet observation platforms, ladders, and doors (power plant); telephone cables; station service reactors, oil circuit breakers and generator protective equipment; transmission structures, oil circuit breakers and lightning arrestors for power house roof; transmission line towers and switchyard structures; control equipment for Boulder City water supply pumps; oil storage and pumping system; 15-ton gantry crane for turbine draft tube bulkhead gates; two main generating units.

Humboldt project, Nevada.—Under Invitation No. 20383-A for furnishing 250 tons of steel sheet piling for Rye Patch Dam, and approximately 142 tons for the Ogden River project, Utah, five manufacturers submitted identical bids on March 11 of $62 per ton on schedule 1, and $64 on schedule 2. The bidders were Carnegie Steel Co., Pittsburgh, Pa.; Jones & Laughlin Steel Co., Pittsburgh, Pa.; Inland Steel Co., Chicago, Ill.; Pacific Coast Steel Corporation, San Francisco, Calif.; and Illinois Steel Co., Chicago, Ill. The bid of the last-named company was incomplete and was not given consideration. A drawing will be held to determine the successful bidder.

Under Invitation No. 38517-A for furnishing 10,000 barrels of portland cement in cloth sacks, bids were opened at Denver March 18. The following companies all submitted identical bids of $3.44 f.o.b. Lovelock, less 50 cents for discount and sack allowance: Pacific Portland Cement Co., San Francisco, Calif.; Calaveras Cement Co., San Francisco, Calif.; Union Portland Cement Co., Denver, Colo.; Santa Cruz Portland Cement Co., San Francisco, Calif.; Monolith Portland Cement Co., Los Angeles, Calif.; Henry Cowell Lime & Cement Co., San Francisco, Calif.; Yosemite Portland Cement Co., San Francisco, Calif. All companies except Union stipulated that the Government shall determine its cost f. o. b. mill for invoicing purposes on shipments moving on Government bills of lading to destination, by subtracting from the destination bid the Government land-grant rate, or commercial rate, or special Government rate, whichever is cheapest.

Moon Lake project, Utah.—Award of contract to T. E. Connolly, San Francisco, Calif., for construction of the Moon Lake Dam, under Specifications No. 605, at his bid of $547,221, was approved by the Secretary on April 2.

Vale project, Oregon.—Twenty-five manufacturers submitted bids under Specifications No. 616, opened at Denver on March 20, for furnishing radial gates, radial gate hoists, high-pressure gates and outlet pipes for spillway and outlet works at Agency Valley dam near Beulah. The low bidders were as follows: Item 1, three 18-foot by 17-foot radial gates, Pittsburgh Des Moines Steel Co., Des Moines, Iowa, $2,793; item 2, three radial gate hoists Commercial Iron Works, Portland, Oreg., $2,830; item 3, two 3-foot 3-inch by 3-foot 3-inch high-pressure gates, International Engineering Inc., Dayton, Ohio, $6,450; item 4, two 42-inch diameter welded plate-steel pipes, Consolidated Steel Corporation Ltd., Los Angeles, Calif., $3,845. All prices are f. o. b. factory. Awards of contracts were made by the Denver office on March 27.

Haas, Doughty & Jones, Marshall and Stacy of San Francisco, Calif., contractors on the Vale Main Canal (specifications no. 579) have sublet structures to A. G. Flint and Evan Allstrom.

Ogden River project, Utah.—At Ogden, on April 12, 7 contractors submitted bids on schedule no. 1 and 6 on schedule no. 2 of Specifications No. 618, for constructing the Ogden-Brigham and Ogden Canyon Tunnels. Low bids received were as follows: Schedule no. 1, Union Construction Co., Ogden, Utah, $77,737; Utah Construction Co., Ogden, Utah, and Morrison-Knudsen Co., Boise, Idaho, $100,728; L. Coluccio & Co., Seattle, Wash., $105,017; schedule no. 2, Shofner, Gordon, Hinman Bros., Denver, Colo., $367,731; S. Magoffin & Co., Ontario, Oreg., $400,740; Utah Construction Co., Ogden, Utah, and Morrison-Knudsen Co., Boise, Idaho, $411,070.

At Ogden, Utah, on May 2, bids were received for the construction of the Ogden Canyon Conduit (Specifications No. 622). The work is located near Ogden and estimated quantities are as follows: 50,000 cubic yards of all classes of excavation for trenches for wood-stave pipe; 300 cubic yards of excavation for tunnel enlargements; 25,000 station cubic yards of overhaul; 13,450 cubic yards of compacted back fill; 51,300 cubic yards of back fill over pipe; 125 cubic yards of concrete; 500 cubic yards of rubble masonry; removing 17,670 linear feet of old 72-inch diameter wood-stave pipe; placing 12,500 pounds of reinforcement bars; furnishing and erecting wood staves and metal tongues for 27,218 linear feet of 75-inch diameter continuous wood-stave pipe; furnishing wood staves and metal tongues for 792 additional linear feet of 75-inch diameter continuous wood-stave pipe; furnishing and placing 90,335 metal bands, including metal shoes, for 75-inch diameter continuous wood-stav pipe; furnishing 1,254 additional metal bands, including metal shoes, for 75-inch diameter continuous wood-stave pipe; furnishing and placing 140 timber cradles for 75-inch diameter continuous wood

stave pipe; furnishing and installing 15 manhole saddles; and furnishing and installing forty-eight 8-inch and 6-inch diameter saddle castings.

Specifications No. 623 are ready for inviting bids and cover construction of the first 10 miles of the Ogden-Brigham Canal.

The relocation of the Huntsville highway is being carried on by the Wheelwright Construction Co., of Ogden, Utah, subcontractors to the Utah Construction Co. and Morrison-Knudsen Co. (Specifications No. 584). Ryberg Brothers of Salt Lake City, Utah, has a subcontract for the Ogden City water main.

Columbia Basin project, Washington.—At the opening of bids at Denver on March 21 for furnishing electric storage water heaters for buildings in the Government town of Coulee Dam (Specifications No. 667–D) six manufacturers submitted bids. The Cleveland Heater Co., of Cleveland, Ohio, offered to furnish heaters under schedule no. 1, thirty-five 30-gallon heaters, for $1,337.85 f. o. b. Cleveland, which was low. Under schedule no. 2 for furnishing one 120-gallon, 2,000-watt heater, Wesix Inc., of San Francisco, Calif., was low, at $433.50, f. o. b. Seattle.

Under Invitation 38067–B–1 for furnishing 10,000 barrels of portland cement in cloth sacks, bids opened February 21, identical bids of $3.17 per barrel f. o. b. Odair, with sack allowance and discount of $0.50 were received from the following companies: Santa Cruz Portland Cement Co., Portland, Oreg.; Pacific Portland Cement Co., Redwood Harbor, Calif.; Monolith Portland Cement Co., Monolith, Calif.; Northwestern Portland Cement Co., Grotto, Wash.; Superior Portland Cement Co., Concrete or Seattle, Wash.; Lehigh Portland Cement Co., Metaline Falls, Wash.; Spokane Portland Cement Co., Irvin, Wash.; Calaveras Cement Co., San Francisco, Calif.; the Olympic Portland Cement Co., Bellingham, Wash.; Henry Cowell Lime & Cement Co., Cowell, Calif.; Yosemite Portland Cement Co., Merced, Calif. All bids contained a stipulation that the Government shall determine its cost f. o. b. mill for invoicing purposes on shipments moving on Government bills of lading by subtracting from the destination cost the Government land grant rate. Net mill prices varied from $1.08 at Monolith, Calif., to $1.94 at Irvin, Wash. As acceptance of any of these bids would deprive the Government of the advantage of land grant rate, the Secretary sent all bids to the Comptroller General to determine whether funds available for the Columbia Basin project might properly be charged under a contract containing such a stipulation. The Comptroller General on March 23 gave his decision and held that neither in the National Industrial Recovery Act of June 16, 1933, nor in the code of fair competition for the cement industry is there any authority to deprive the United States of the benefit of land grant rates. Accordingly all bids were rejected and new invitations for bids (no. 38067–B–2) were issued, with copy of the Comptroller General's decision attached to each invitation. These bids were opened at Denver on April 17.

Five bids were received on March 26, under local Invitation No. 91, for furnishing and delivering 24 auto-camp type houses, as follows: White Pine Sash Co., Spokane, $16,135.67; the Modelow Co., Seattle, $16,296; Exchange Lumber Co., Spokane, $18,070; American Builders, Inc., Seattle, $19,184; Lidral Construction Co., Seattle, $26,962. The White Pine Sash Co. was awarded the contract on April 11.

On April 10 the Secretary approved award of contract to the Macdonald Building Co., of Tacoma, Wash., for building four 5-room and one 7-room residences in the Government camp (Coulee Dam), under Specifications No. 615. Their bid was $37,804.50. Other bids received were as follows: R. I. Gummere, Tacoma, Wash., $38,363; Hazen & Clark, Spokane, Wash., $46,865; Lidral Construction Co., $53,635.

Ryberg & McCaul, of Seattle, Wash., have been awarded the contract for building two dormitories at Coulee Dam, under Specifications No. 608, at their bid of $82,137.

The M. W. A. K. contractors on the dam and power plant are subletting a part of their excavation work to Goodfellow Bros. and the Rowland Construction Co.

All-American Canal, California.—Bids were opened at Yuma, Ariz., on April 25 (Specifications No. 621) for the construction of earthwork, All-American Canal, station 1860 to station 3090–75. About 11,261,400 cubic yards of common excavation are involved and there are four schedules: Schedule no. 1, 2,707,000 cubic yards; schedule no. 2, 2,564,000 cubic yards; schedule no. 3, 2,518,000 cubic yards; schedule no. 4, 3,472,000 cubic yards. The work is located from 18 miles west to 43 miles southwest of Yuma, Ariz., and from 10 miles east to 35 miles northeast of Calexico, Calif. Nine hundred and fifty days will be allowed to complete the contract.

The W. E. Callahan Construction Co. and Gunther & Shirley, contractors for 30 miles of canal from station 245 to station 1860, have sublet schedule no. 3, covering 5½ miles of canal from station 800 to station 1089, and including 6,100,000 cubic yards of common excavation to Boyce & Igoe.

Uncompahgre project, Colorado.—The Secretary on April 18 approved award of contract for the construction of Taylor Park Dam (Specifications No. 594) to the Utah Construction Co., Ogden, Utah; W. A. Bechtel Co., San Francisco, Calif.; Henry J. Kaiser Co., San Francisco, Calif.; and Morrison-Knudsen Co., Salt Lake City, Utah, at their joint bid of $798,078.50. This is a 168-foot earth and rock-fill structure and the contractors are allowed 600 days for completion. There are 833,000 cubic yards of earth fill in the dam embankment. The Bureau will purchase for installation by the contractors 437,000 pounds of steel reinforcement bars, 23,000 pounds of trash racks, 189,000 pounds of high-pressure slide gates, and metal conduit linings; 332,000 pounds of 57-inch and 72-inch diameter plate-steel outlet pipes; 118,800 pounds of balanced needle valves; 1,500 linear feet of electrical metal conduit; 71,000 pounds of structural steel and miscellaneous metal work; also drain pipe, cast-iron soil pipe, clay sewer pipe, and all doors, windows, hardware, and roofing materials for the needle-valve house.

Owyhee project, Oregon–Idaho.—Bids were invited on April 9 for construction of Shepard Gulch Drain, Dead Ox Flat division, covered by Specifications No. 676–D, and were opened April 30. The work is located near Weiser and Payette, Idaho, and the estimated quantities involved are as follows: 110,000 cubic yards of all classes of excavation for drain; 260 cubic yards of all classes of excavation for structures; 1,750 cubic yards of back fill; 40 cubic yards of concrete in structures; placing 2,000 pounds of reinforcement bars; laying 1,007 linear feet of 15- and 48-inch diameter corrugated metal pipe; and erecting 10 thousand feet board measure of timber in structures. Completion of the drain in 240 days is required. The Bureau will purchase reinforcement bars and corrugated metal pipe.

J. A. Terteling & Sons, Boise, Idaho, with a bid of $9,740 was low at the opening at Ontario on March 28, under Specifications No. 669–D for constructing Kingman Main Drain and Kingman Drain 2.23. Other bids were the following: Flaherty & Co., Spokane, Wash., $11,683; Haas, Doughty & Jones, San Francisco, Calif., $12,148; George B. Henly, Nyssa, Oreg., $14,301.50; United Contracting Co., Portland, Oreg., $18,918.30; John Papin, Carson, Wash., $20,188.40.

The low bidder for construction of Mitchell Butte Lateral 10.7 (Specifications No. 514–0) was George B. Henly, of Nyssa, Oreg., who bid $2,995. Other bids received on March 26 were: J. A. Terteling

& Sons, Boise, Idaho, $3,810; Dan Teters & Co., Ontario, Oreg., $3,845; Morrison-Knudsen Co., Boise, Idaho, $3,865.

Bids were opened at Ontario on March 28 (Specifications No. 614) for construction of South Canal structures, station 0 to station 736, Succor Creek division, and the following were received: Morrison-Knudsen Co., Boise, Idaho, $92,388 (all 4 schedules); Barnard-Curtiss Co., Minneapolis, Minn., $104,368.10 (all 4 schedules); United Contracting Co., Portland, Oreg., $129,940.50 (all 4 schedules); John Klug, Nyssa, Oreg., $68,078.50 (schedules nos. 1, 2, and 3); Dan Teters & Co., Ontario, Oreg., $71,616.50 (schedules nos. 1, 2, and 3); S. S. Magoffin Co., Adrian, Oreg., $21,337.50 (schedule no. 1); Fife & Co., Nyssa, Oreg., $24,630 (schedule no. 2). The first three bidders specified all schedules or none. Contract was awarded to the Morrison-Knudsen Co. on April 12.

Bids will be received at Ontario until May 15, and then opened for the construction of North Canal lateral structures, under Specifications No. 681-D. The estimated quantities involved are as follows: 3,650 cubic yards of all classes of excavation; 2,400 cubic yards of back fill; 905 cubic yards of concrete in structures; 1,500 square yards of dry-rock paving; placing 57,000 pounds of steel reinforcement bars; laying 1,510 linear feet of 15-inch to 30-inch diameter concrete pipe; installing 4,400 pounds of gate and gate hoists; and erecting 2 M feet b. m. of timber in structures. The work is located near Dunaway, and completion is required within 150 days.

Bids will be received at Ontario, Oreg., until May 14 (Specifications No. 679-D) for the construction of earthwork, North Canal laterals 25.4 to 27.8-0.7, Mitchell Butte division. Estimated quantities are 126,000 cubic yards of all classes of excavation and 3,000 station cubic yards of overhaul. The work is located near Dunaway and Nyssa and must be completed within 180 days.

Casper-Alcova project, Wyoming.—Three cement companies quoted on furnishing 12,000 barrels of portland cement in cloth sacks, under Invitation No. 22153-A. Bids were as follows: Colorado Portland Cement Co., Denver, Colo., $24,000 f. o. b. Boettcher, Colo.; Monolith Portland Midwest Co., Denver, Colo., $33,120 f. o. b. Casper, Wyo.; The South Dakota State Cement Commission, Rapid City, S. Dak., $24,000 f. o. b. Rapid City and $33,360 f. o. b. Casper, Wyo., All three bids were subject to a discount and sack allowance of 50 cents. The Colorado and Monolith bids resulted in the same delivered cost to the Government, and the successful bidder was determined by lot, the name of the Monolith Portland Midwest Co. being drawn. This company was awarded contract on April 16.

Specifications for the Seminoe Dam and power plant are practically complete and ready for issuance, and those for the Alcova diversion dam are being prepared. Other work in progress at Denver includes design of main units and station service control equipment for the Seminoe power plant, and plans for a 12,000-pound radial gate.

Storage in the reservoir formed by Boulder Dam was started on February 1, and at the end of the month approximately 110,000 acre feet were stored.

A modern set of farm buildings is being erected on the Sun River project by the Sioux City Seed Co., which has bought 160 acres of land for experimental purposes.

The Water is There

Late dispatches tell the story of two amphibian planes from the U. S. S. *Saratoga,* landing in the river behind Boulder Dam. Only it isn't a river any more, but is fast developing into a lake that will be completed before most of us realize it.

According to the dispatches the commander of the two planes decided to land behind the dam "to wash the salt water off the fuselage." No difficulties were experienced in landing the planes or taking them off.

While the scoffer might point out that where there is water amphibian planes can land and that there is nothing remarkable about it, we will agree with him, but would at the same time remind him that only a few weeks ago there was no water there. The fact that water is there now is the important thing, vastly more important than having the planes land there.—*Imperial Valley Press, El Centro, Calif.*

Summer Office Hours Effective April 15, 1935

Order No. 912.—Effective April 15, 1935, the Department of the Interior and the Public Works Administration will commence the summer schedule of office hours from 8 a. m. to 3:30 p. m., except Saturdays, when the hours will be 8 a. m. to 12 noon.

It is expected that administrative officers will not be required to transact business with members of the staff after the closing period except in emergencies. The effectiveness of this schedule last summer was greatly hampered by visits from staff members, who delayed transacting business until after the closing hour, consuming the time of administrative officials until as late as 6 o'clock, which prevented them from using the latter part of the day for necessary desk work or recreation.

Harold L. Ickes,
Secretary of the Interior and
Administrator of Public Works.

Hyrum damsite, Hyrum Project, Utah

Recent Publications and Articles of Interest

Financial Statistics of State and Local Governments (wealth, public debt, and taxation), 1932. United States Department of Commerce, Bureau of the Census. For sale by Superintendent of Documents, Government Printing Office. Price $2.50 per copy.

Report of the Water Conservation and Irrigation Commission of New South Wales for the year ended June 30, 1934, 48 pp., Hugh Main, chairman, Sydney, Australia.

Farmhouse plans, Agriculture Department, Farmers Bulletin No. 1738. Contains plans of low-cost farm dwellings. For sale by Superintendent of Documents, Government Printing Office. Price 10 cents.

Boulder Canyon project: Boulder Dam—Hot cakes for breakfast, at rate of 300 per minute, illus., Construction Methods, March 1935, vol. 17, p. 56.

National Power Survey, Interim Report, Power Series No. 1, Federal Power Commission, illus. For sale by Superintendent of Documents, Government Printing Office. Price 75 cents per copy.

All-American Canal: Horse-drawn Fresnos construct large canal as a relief project, illus., Eng. News-Record, Mar. 21, 1935, vol. 114, pp. 422–423.

Columbia Basin: World's largest construction conveyor speeds excavation at Grand Coulee, illus., Western Construction News, March 1935, vol. 10, pp. 80–82.

Gubin, F. F.: Water Power Plant Engineering (describes Bureau of Reclamation plants) illustrated, 310 pages (in Russian language).

McConaughy, D. C.: Additional data on model tests for Boulder Dam spillway, illus., Eng. News-Record, Apr. 4, 1935, vol. 114, pp. 480–482.

Scattergood, E. F.: Some features of the Boulder Canyon project, map and charts, Electrical Engineering, Apr. 1935, vol. 54, pp. 361–365.

Eddy, Clyde: He dared Grand Canyon, illus. A thrilling tale of a 350-mile tussle with the world's wildest river, This Week, Apr. 14, 1935, pp. 8 and 13.

Lane, E. W. and W. F. Bingham: Protection against scour below overfall dams, illus., Eng. News-Record, March 14, 1935, vol. 114, pp. 373–378.

Nelson, W. R.: Spillways first of major structures of Boulder Dam completed, illus., Southwest Builder and Contractor, March 8, 1935, vol. 85, pp. 12–14.

Shipments from Savage, Mont., Increase Despite Drought

That the general depression and devastating drought through which we have so recently passed have had no adverse effect on the tonnage shipped from the town of Savage, Mont., during the past 4 years is clearly shown in the following statement:

Year:	*Tonnage*
1931	16, 491
1932	18, 834
1933	20, 420
1934	26, 338

This steady increase in business is the result of agricultural development on the Lower Yellowstone project, where an abundant water supply is available even during extreme dry seasons.

The remodeling of the Powell school building on the Shoshone project is practically completed. The Powell school system is now one of the best in the State of Wyoming.

Attebery cattle take 5-year "top"

CHICAGO, April 17 (A. P.).—The highest price here since March 1930, $15.50, was paid recently for a load of prime Nebraska steers as revived demand for kosher cattle sent beef prices soaring. The top was paid for a load of 19 Nebraska-fed steers averaging 1,483 pounds. The owner obtained $222 per head or a total of $4,235. The per head price for top steers on the corresponding day a year ago was $115.

The 19-head shipment which topped the Chicago market recently was owned by Fred Attebery, of Mitchell, Nebr. Topping the market is a habit with him. In the past 7 weeks he has had 7 shipments and each of them took the Chicago top. He has 14 more shipments to go out this spring.

Attebery's cattle were raised and fed north of Mitchell, in Sioux County. He prepared them for market on beet pulp, ground barley and corn, and cottonseed cake, he told the Daily Star-Herald.

Comparative Crop Statistics

Federal reclamation projects do not, as a rule, produce enough wheat to take care of the local project needs, and the figures contained in the article "Relation of irrigated agriculture to the economic well-being of the Nation" appearing in the opening pages of this issue of the "Era" give conclusive evidence of this fact. In this same connection the following comparison between small grain imports and production on the Federal reclamation projects for the year 1934 further emphasize the small part these products have in adding to the troublesome agricultural surplus:

Imports of grain crops (U. S.)[1]

	Bushels	Produced on Federal reclamation projects (bushels)
Wheat	18, 542, 395	3, 632, 790
Oats	5, 580, 407	7, 744, 017
Barley	6, 579, 767	2, 834, 369
Rye	7, 622, 032	58, 041
Flax	14, 170, 002	7, 340
Corn	2, 959, 256	1, 012, 204

[1] Statistics furnished by Bureau of Foreign and Domestic Commerce, Department of Commerce.

New river bridge on Highway 79, Belle Fourche Project, South Dakota

Organization Activities and Project Visitors

Dr. Elwood Mead, Commissioner of Reclamation, was invited to be present and to address the Colorado Engineering Council which met in Fort Collins, Colo., on April 13. Because of the multiplicity of legislative and other matters demanding his attention in Washington, Dr. Mead was compelled to decline.

In the Commissioner's absence, E. B. Debler, hydrographic engineer, ably represented the Bureau of Reclamation on that occasion.

Miss Katherine F. Tully, secretarial stenographer in the Office of the Commissioner, Bureau of Reclamation, left Washington April 10 for Lincoln, Nebr., to assist Prof. O. V. P. Stout, in charge of investigations financed by funds from the Public Works Administration to determine the availability of the water supply in the North Platte Valley of Nebraska.

S. O. Harper, assistant chief engineer, Bureau of Reclamation, arrived in Washington April 14 to discuss various administrative matters with the Commissioner and his staff.

D. S. Stuver, formerly superintendent of the Newlands project, Nevada, and within the past year on duty in the Public Relations Division of headquarters office of the Bureau of Reclamation in Washington, has been assigned to take charge of the work connected with the operation of 45 E. C. W. camps on the Federal reclamation projects. John S. Martin, of the Accounting Division in Washington, has been assigned to Mr. Stuver as chief clerk.

In order to get the work immediately started, L. R. Smith, chief clerk of the Denver office, has been called to Washington for 10 days or 2 weeks to assist in the work of organization.

Miss Mae A. Schnurr, Assistant to the Commissioner, was Acting Commissioner on May 3 and 4 during the absence from the city of Commissioner Mead.

The following civil-service employees have been transferred from the Boulder Canyon project to the Denver office of the Bureau of Reclamation: Hollis Sanford, William T. Moody, Harvey W. Hillyard, and John E. Soehrens, assistant engineers; and John L. Newell, junior engineer.

Col. B. F. Fly, for many years in Washington in the interest of the Yuma project, writes his former contacts in the Bureau of Reclamation that he is living with his sister at 305 East Fifth Street, Texarkana, Ark. Colonel Fly is in very poor health.

YUMA PROJECT OFFICE STAFF.

Left to right, standing: Noble O. Anderson, chief clerk; Chase Pulsifer, William B. Richmond, Jacob T. Davenport; Horace A. Johnson, Walter A. Boettcher, Ernest A. Haley, Clyde Boydston, Wallace C. D. Cochran, C. M. White, Daniel Martinez, R. C. E. Weber, superintendent; seated, left to right: Miss Margaret J. Roxburgh, Mrs. Clara E. Chambers.

Death of R. E. Branstad, Engineer

Richard E. Branstad, engineer in the Denver office of the Bureau of Reclamation, died on March 5, 1935, as a result of injuries incurred in an automobile accident on February 25 last.

Mr. Branstad was born in Eau Claire, Wis., December 6, 1888. He was a graduate of the University of Wisconsin with B. S. degree in civil engineering. He served in the United States Army from May 1917 to August 1919. His first period of service in the Bureau of Reclamation was as senior draftsman from October 26, 1920, to March 31, 1933. He entered upon his last assignment as engineer on October 10, 1930.

Seth H. Dibble, assistant clerk on the Milk River project, has been designated by the superintendent as local correspondent for the RECLAMATION ERA.

New Assignments on Sun River Project

D. P. Thurber, until recently associate agricultural agent for the Sun River project, Montana, with headquarters at Fairfield, resigned his position effective April 1 to take over the duties of county agent for Cascade County, Mont.

R. E. Cameron, former county agent, succeeds C. E. Potter, former State 4-H Club leader.

Claude Windecker, a graduate of the Montana State College and reared on the Huntley irrigation project, has been appointed to the position of assistant county agent of the Sun River project.

The Bureau of Reclamation extends congratulations to each of these new appointees, with whom the promised interchange of friendly relations will, the Bureau believes, work for the common good of the Sun River project.

The following employees have been transferred from Boulder Dam to the projects indicated: Harold M. Crowell, inspector, to the Moon Lake project Utah; Maj. O. Simons, assistant engineer, to the Humboldt project, Nevada; and Gilbert Waddell, inspector, to the Upper Snake River project, Idaho.

Before proceeding to their respective headquarters these employees will be stationed temporarily in Denver.

ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead,** Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; Miss Mary E. Gallagher, Secretary to the Commissioner; George O. Sanford, Chief Engineering Division; Wm. F. Kuhach, Chief Accountant; Charles N. McCulloch, Chief Clerk; Jesse W. Myer, Chief, Mails and Files Division

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H. Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Younghlutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
Carlshad	Carlshad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen [1]	C. M. Voyen	W. J. Burke	Billings, Mont.
Columbia Basin, Grand Coulee.	Coulee Dam, Wash	F. A. Banks	do	C. B. Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
Grand Valley	Grand Junction, Colo	W. J. Chiesman	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Engineer	George B. Snow		do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent	N. G. Wheeler	C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Resident engr	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif	Ralph Lowry	do	George H. Bolt		R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wenzel [1]	C. B. Wenzel	W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo	L. J. Windle [1]	Superintendent	L. J. Windle [1]	Denver office	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Denver office	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Engineer			J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		Denver office	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Engineer	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo	C. B. Elliott	do	do	do	do	Do.
Upper Snake River Storage [3]	Idaho Falls, Idaho	H. A. Parker	Constr. engr	Emmanuel V. Hillius		B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrig. dist	Baker, Oreg	A. J Ritter	President	F. A. Phillips	Keating
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	C. W. Tharp	Superintendent	C. J. McCormick	Grand Junction.
Huntley	Huntley irrigation district	Ballantine, Mont	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza
Klamath, Horsefly	Horsefly irrigation district	do	Irl Davis	President	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	D. E. Norton	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	F. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district.	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo	Bert L. Adams	do	Nellie Armitage	Torrington.
Northport division	Northport irrigation district	Bridgeport, Nebr	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan
Salt Lake Basin (Echo Reservoir.)	Weber River Water Users' Association.	Layton, Utah	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Gen. supt and ch. engr	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	Superintendent	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw
Greenfields division	Greenfields irrigation district	Fairfield, Mont	A. W. Walker	do	A. W. Walker	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg	E. D. Martin	do	Enos D Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley Water Users' Association.	Montrose, Colo	C. B. Elliott	do	Wm. W. Price	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	do	R. E. Rudolph	Ellensburg.

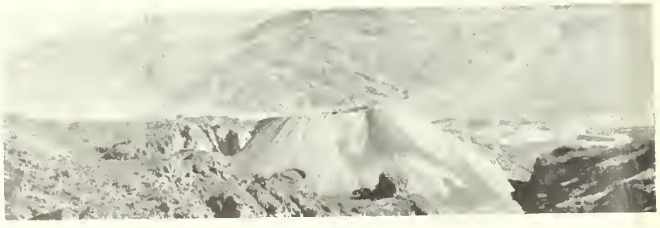
Important investigations in progress

Project	Office	In charge of—	Title
Buffalo Rapids	Terry, Mont	R. R. Robertson	Assistant engineer.
Colorado River Basin, sec. 15	Denver, Colo	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes	do	C. C. Fisher	Engineer.
Gila Valley	do	P. J. Preston	Senior engineer.
Grande Ronde	do	Foster Towle	Associate engineer.
San Luis Valley	do	R. F. Walter	Chief engineer.
Umatilla River	do	Foster Towle	Associate engineer.
Grand Lake-Big Thompson Transmountain	Grand Lake, Colo	P. J. Preston	Senior engineer.
North Platte Valley	Lincoln, Nebr	O. V. P. Stout	Consulting engineer.

SALLIE A. B. COE, *Editor.*

COLUMBIA BASIN PROJECT

WASHINGTON



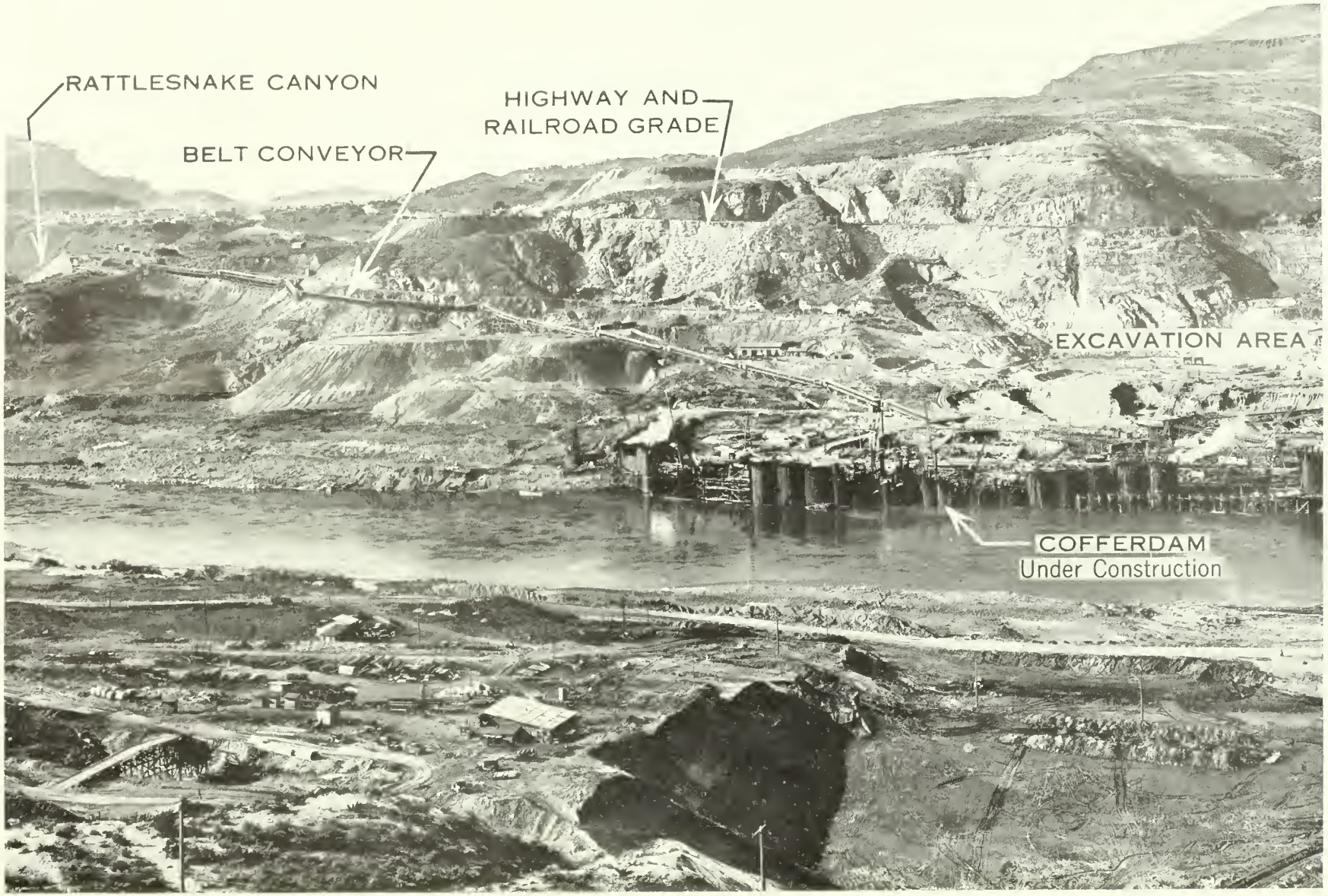
1, Conveyor hub, conveyors Nos. 2 and 5, bleeder, shuttle and cofferdam filling boom; 2, west excavation; 3, traveling boom unit of stacker after spoil bank slide; 4, conveyor boom from shuttle filling cofferdam; 5, hub showing bleeder, shuttle, and cofferdam filling boom; 6, looking east, showing north portion of west excavation.

U. S. GOVERNMENT PRINTING OFFICE 1935

THE RECLAMATION ERA

VOL. 25, NO. 6 JUNE 1935

MAINTENANCE ON HIGHWAY OF CONSTRUCTION CAMP, TAYLOR PARK RESERVOIR, UNCOMPAHGRE PROJECT, COLORADO



CONVEYOR SYSTEM—GRAND COULEE DAM

(See boxed description on page 109)

THE
RECLAMATION ERA

Issued monthly by the DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C.
Price 75 cents a year

HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 6 JUNE 1935

The Belt Conveyor System at Grand Coulee

By O. G. F. Markhus, Assistant Engineer, Columbia Basin Project

THE United States Bureau of Reclamation is now actively engaged in building the most extensive project of all its undertakings. It is located in north central Washington and is known as the "Grand Coulee Dam" of the Columbia Basin Project.

The general contractor, the Mason-Walsh-Atkinson-Kier Co., has developed several unique and outstanding construction features in carrying on this gigantic work and one of the most interesting of these to date is the scheme for transporting material excavated on the west side for dam abutment, powerhouse, and tailrace.

Investigations at the dam site revealed a possible minimum of 11,000,000 cubic yards of overburden to be removed and it was found that it could probably be disposed of most economically by dumping into Rattlesnake Canyon, located some 3,000 feet south of the dam.

The construction program provides for the placing of concrete in the dam structure to be started by October 1935, which means that excavation must go on at a rate of about 50,000 yards per day. This element of time, the large amount of material involved, and the location of the "spoil-bank" made this an ideal situation for the use of belt conveyors, and particularly when coupled with a low power rate. As a consequence, a complete belt conveyor system was contracted for with the Jeffrey Manufacturing Co., of Columbus, Ohio, and field construction work on the plant was started November 15, 1934. A mile of main-line conveyors and two feeders were completed within 4 weeks and dirt was first dumped into Rattlenake Canyon on December 13, 1934.

The method of transporting excavated material is by short hauling from shovels to several centrally located conveyor feeders that converge at a central hub where a "surge" feeder loads the main line conveyor belts leading out of the excavation area to the stacker unit that is building up the big dump in the canyon. There follows a general summary of the conveyor system as adapted to conditions on the west side.

Largest Conveyor System in the World

Length of conveyor from center of excavation to rim of Rattlesnake Canyon, March 31, 1935, 1⅛ miles; final length (end of excavation), 1⅝ miles. Rise in grade from present excavation level to discharge end, 350 feet; final rise at end of elevation, 550 feet.

Width of conveyor belt, 60 inches; speed of conveyor, 620 feet per minute; capacity, 2,500 cubic yards per hour—1.2 tons per second.

Spoil-bank, located in Rattlesnake Canyon, 200 feet deep; dump pile has top 300 feet wide, base 700 feet wide; height at canyon rim, 200 feet; at completion of excavation, 350 feet high; will be ⅝ mile long.

Amount of material to be removed on west side, approximately 9,000,000 cubic yards; amount carried by conveyor, December 13, 1934, to March 31, 1935, 2,746,000 cubic yards.

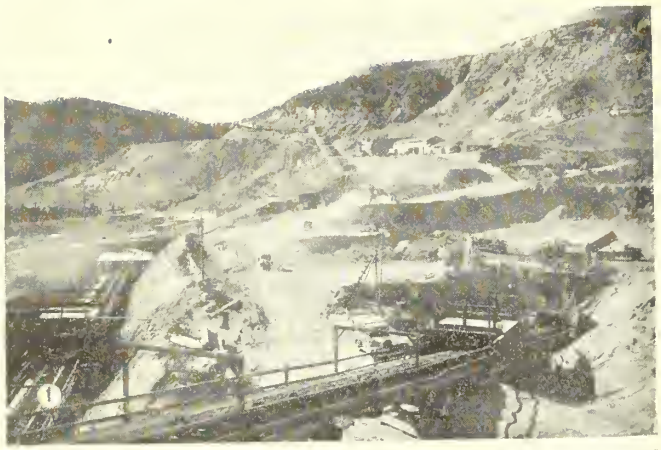
When considering the length of conveyor, amount of material to be handled, and the raise to top of dump, this becomes the largest conveyor installation in the world.

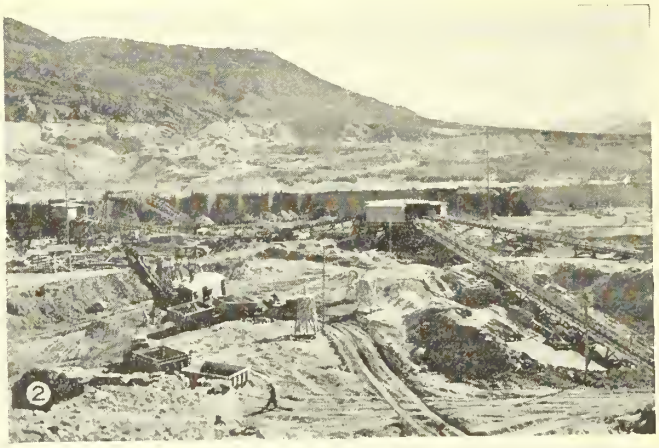
Feeders.—The feeder arrangement is contained in a heavily constructed steel chassis and consists essentially of a steel skirt and hopper of 40 cubic yards, capacity, protected above against dumping of heavy boulders by a rigid grizzly; and underneath the hopper is the steel belt feeding the conveyor belt leading to the center hub. This steel belt is 6 feet wide and 40 feet long, carries a load approximately 5 feet deep, and travels at a speed of 40 feet per minute. This feeder is made up of double-headed steel apron flights, well stiffened and supported at each end on an extremely heavy type of steel roller chain. The drive unit is located on top of the steel frame and consists of a 75-horsepower motor and an enclosed reduction gear.

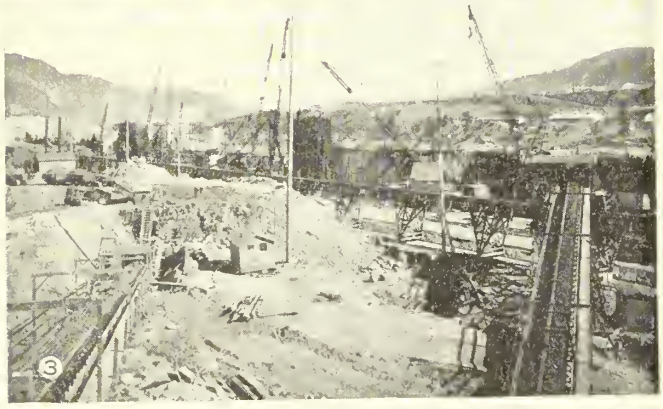
When beginning excavation at a new feeder, the shovel will at first cast directly into the hopper and then stock pile, the material being pushed in by bulldozers. From there on, cat-wagons and trucks bring the material to the grizzlies. Two feeders are ordinarily sufficient to load the main conveyor to rated capacity, but as the hauls become longer, another feeder is brought into service, leaving the fourth as a spare for emergencies or when a feeder is being reset to a lower level. Boulders screened out by the 13-inch spacing of the grizzlies are shoved off by bulldozers and hauled out by truck.

The feeder at the hub spoken of is essentially of the same type as the loading feeders, except that it is 20 feet in length and has a speed of 80 feet a minute. It is known as a "surge" feeder in that it delivers a uniform load to the foot of the main-line belt conveyor units.

Conveyor belts.—All belts are made up of 8-ply, 32-ounce canvas duck, with 5/32-inch rubber cover. Both the converging conveyor belts (from feeders) and that in the main line are 60 inches wide. The converging belts travel at a speed of 400 feet per minute and the main-line units at 620 feet per minute. The belt carrying idlers, or troughing rolls, are 3 to a set, spaced 42 inches apart, and the return rolls on 7-foot centers. These idlers are made of heavy steel tubing with welded ends and have Timken bearings.







1, Main line of belt conveyor; 2, Converging conveyors from feeders Nos. 2 and 3 and central hub; 3, Bleeder and shuttle conveyors; 4, Boom of stacker unit; 5, "Spoil bank" showing a slip near stacker boom; 6, "Spoil bank" showing approximately 2¼ million cubic yards; 7, Shuttle and boom conveyors filling cofferdam cells; 8, Ten-yard buggies dumping into feeder No. 2.

The drive of each section of conveyor belt, both converging and main line, consists of a 200-horsepower, 700 revolutions per minute, slip-ring type motor, with V belts running to reduction gears and roller-bearing sprocket chains.

The lengths of these uniformly powered conveyor sections depend on the vertical angle, or lift, and on this work, so far, vary from 450 to 150 feet—the maximum angle being 14 degrees. The total length of 60-inch conveyor in use at the end of March was approximately 6,600 feet.

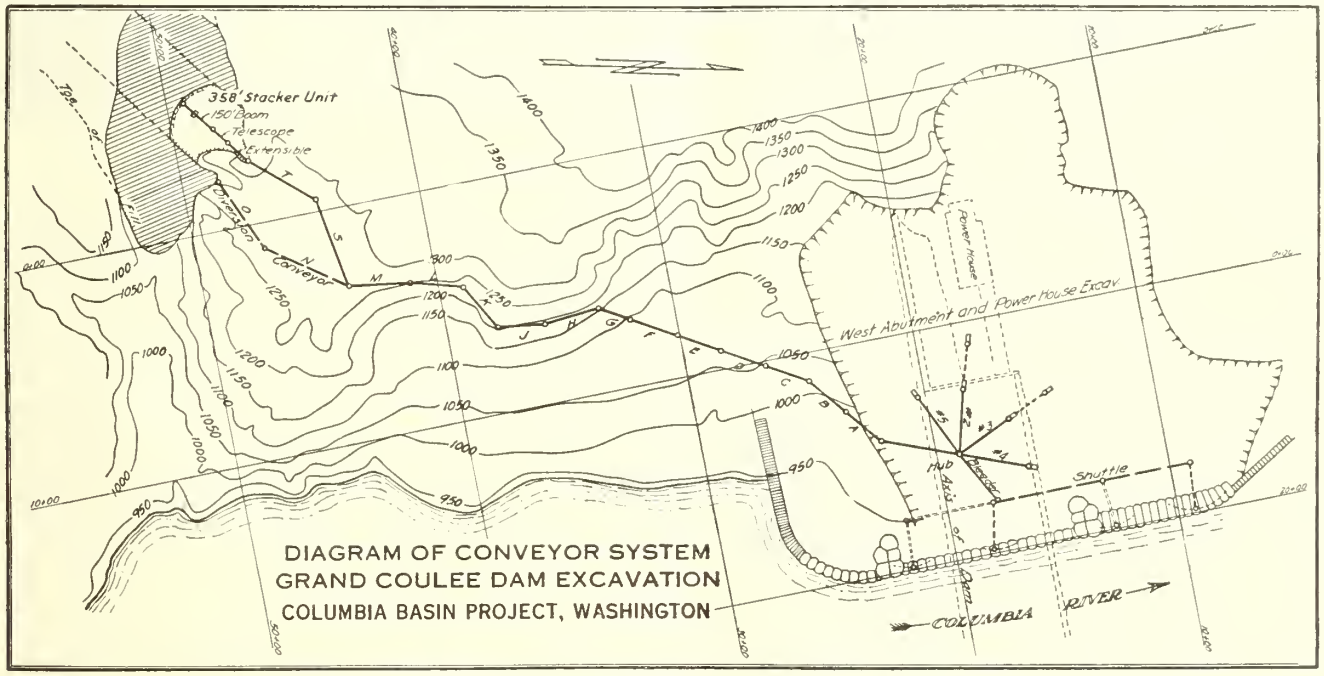
Each conveyor section is completely interlocked into the system, in order to obtain sequence in starting. The master control is automatic in that starting at the head end, each succeeding section starts only when the preceding section is up to normal speed; and when closing down, rear sections stop, one by one, after delivering the load to the preceding conveyor section. Start, stop, and test buttons are located at each section terminal, controlling only rear sections, when used for stopping, and only front sections when starting. The test buttons are used only for separate conveyors in training belts and for inspection. A telephone system connects all sections with the master control operator, located at the head terminal. The starting up of the mile-long main belt line now in place requires about 10 minutes.

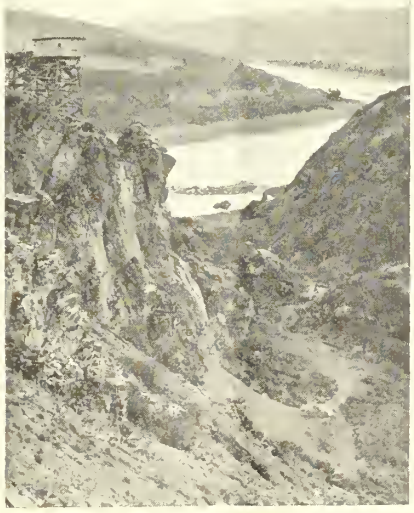
Stacker unit.—This is comprised of an extensible conveyor, a telescope conveyor, and a boom conveyor.

The forward section of the main line conveyor delivers its load to what is known as the "extensible" section of the stacker unit, which in turn discharges to the telescope conveyor. This section rests on rails and permits a forward movement of 49 feet under the head end of the extensible, as the pile advances ahead of the boom. After each 49 foot movement of the telescope, a new section of similar length is added to the extensible conveyor and when 6 or 7 extensions have been added, these are replaced by a complete new drive unit and become a section of the lengthening main line conveyor.

The boom conveyor is 150 feet long and is supported at its loading end on a turntable resting on a structural steel chassis that runs on T-rails directly in front of the telescope conveyor terminal. The boom is supported 100 feet toward the discharge end on a motor-driven caterpillar frame, permitting a circular movement of 180° and consequently stacking on the sides of the loading point as well as in front of the boom. A unique feature is the universal pivot support for the turntable mentioned, enabling the boom chassis to travel on an upward grade—the maximum being 7½ percent. A universal support is also used between the boom and outer caterpillar frame, to permit the caterpillar being turned to any angle to the axis of the conveyor. The boom is powered for radial travel by two 10-horsepower motors connected through speed reducers and chain drives to each of the "cat" treads. A 7½-horsepower gear-motor propels the boom and telescope conveyor forward movements. Both speeds are at the rate of 10 feet per minute.

The "spoil bank" will have a flat top 300 feet wide, and as the angle of repose of this particular material is approximately 45°, the base will have a width of about 700 feet. This huge pile will advance into Rattlesnake Canyon about one-half mile by the time bedrock in the west side excavation has been cleared of its overburden, and as the conveyor is on a gradual incline of about 7½ percent, the final height will be approximately 300 feet above the canyon floor. The total conveyor lift toward the end of the excavation will be about 550 feet.



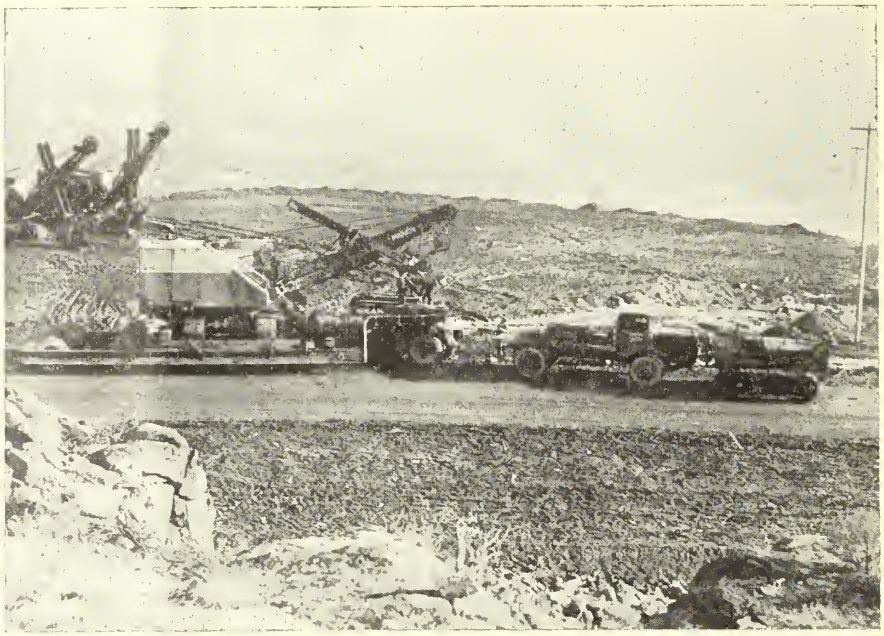

Rattlesnake Canyon before "spoil bank" was started.

Several slides have occurred at the forward edge of the material in the "spoil bank", with escarpment approaching close to the caterpillar boom support, but these have not been of a serious nature.

The shuttle conveyor.—In conjunction with the major conveying system, there is operated a secondary system, used in conveying selected material for filling the walls and cells of the cofferdam. This

has a capacity of 1,200 cubic yards per hour and consists of a feeder at the central hub, a "bleeder" conveyor, a shuttle conveyor, and two booms. The feeder is essentially of the same type as the large main belt feeders, except that it is smaller, being 42 inches wide and 9 feet long. The conveyor from this feeder is on an incline, travels 500 feet per minute, is 270 feet in length and 48 inches wide. It discharges onto a reversible shuttle conveyor 870 feet long, operating on a track 200 feet from the center line of the cofferdam, and in turn discharging to a boom conveyor on either end. The 200-foot boom is of steel bridge design and is supported near the outer end by a traveling tower running on tracks near the cofferdam wall, thus making the entire system flexible and reaching every point to be filled.

General.—Shovels, hauling equipment, and bulldozers work together as a smoothly operating unit, to the end that each feeder performs its part in providing the main-line belts with a uniform and constant load and as near to its rated capacity of 2,500 yards per hour as possible. On a weight basis this amounts to about 1 ton per second. The loss of time from interruptions has averaged less than 6 percent, and the insertion of the 49-foot extensible sections as the pile moves forward is so well organized that this is accomplished during the noon-hour shutdown. As a large amount of clay is handled, the entire main-line belts are roofed over as protection from rain and wet snows. The excavating equipment used in connection with the feeders includes: Two 5-yard and two 4-yard electric shovels, and two 2-yard Diesels; two 10-yard Linn trucks, two 4-yard Indianas, two 10-yard Whites, two 6-yard Internationals, and six 11-yard Mack trucks; also twenty 9-yard Athey wagons, two 16-yard Woolridges, and a 16-yard Isaacson wagon; 5 caterpillar-75 bulldozers, and 13 caterpillar-75 Diesel tractors.



Heavy duty trailer at Grand Coulee

The amount of material carried out by the conveyor to the end of March 1935 was 2,746,132 cubic yards, which was raised an average of 350 feet to the dump, while the shuttle unit handled 157,168 yards of filling for the cofferdam cells. The belt, as a whole, shows no appreciable wear although it has handled rocks of considerable size, such as pass through the 13-inch spacing in the grizzlies.

When taking into account the quantity of material handled per hour, distance of travel and elevation of the dump, this becomes the world's largest known conveyor system, taking its place with other equipment of unusual proportions in building a project of such dimensions as the Grand Coulee. The results obtained have more than fulfilled the expectations of the contractor.

Industrial Activities on Shoshone Projects

By George W. Atkins, Secretary, Shoshone Irrigation District

In the line of industrial activities the Associated Seed Growers, Inc., has expanded rapidly, and in its 10 years of existence its operations have grown from a small acreage and smaller facilities for handling until it is now a huge industry. It has constructed a large mill and warehouse for taking care of the large bean and pea crop grown on the project and in other parts of the Big Horn Basin and southern Montana, and during the past year it has added to its mill and warehouse in order adequately to take care of its increasing business. The total cost of this enlargement was approximately $22,000.

This company now employs a total of 45 men, who operate the mill and warehouse, and 150 women, who are engaged in the picking department, in addition to a large number of men on its seed farm, which has been increased from 260 to 420 acres. A large crew of rougers are also employed during the summer in the bean and pea fields. The monthly pay roll of the company runs well above $10,000. Fred O. Arnold is manager in charge.

The Rodgers Seed Co. and the Sioux City Seed Co., also large contractors of seed beans and peas, employ quite a large number of men and women pickers in carrying on their business.

In addition to the above the following firms buy commercial beans: Big Horn Basin Cooperative Association, Bloom & Swallow, O. E. Bever & Sons.

The Big Horn Basin Cooperative Association handles annually the bulk of the Great Northern bean crop, as well as poultry, such as chickens and turkeys. Bloom & Swallow, a new firm, has erected a warehouse on the railroad right-of-way and is fixed to handle its commodities in wholesale quantities. O. E. Bever & Sons handles also large quantities of hay, grain, and potatoes.

The Farm Light & Power Co. is gradually extending its electric lines in the farming community and has covered practically one-fourth of the rural communities.

The Reclamation Era

Issued monthly by the Bureau of Reclamation, Department of the Interior.

Subscription 75 cents a year to other than water users, payable in advance by check or postal money order drawn in favor of the Bureau of Reclamation.

Special reduced rates are given individual water-user owners or water-users organizations for mass subscriptions on Federal irrigation projects.

JUNE 1935

Federal Emergency Administration of Public Works

The Bureau has received many inquiries as to how the $4,000,000,000 appropriated by Congress will be spent and this article is designed to give some of the high lights relative to the type of project that will be considered, the method of making application, and the manner of dealing with applications after they are filed.

Applications are divided into three major groups as follows: Federal projects, non-Federal projects, and work-relief projects.

On Federal projects the entire cost will be borne by the Federal Government.

Non-Federal projects are those submitted by a State, territory, possession, etc., or the District of Columbia, which will be financed in whole or in part by a loan and/or grant from the Federal Government.

Work-relief projects will be useful projects of the type designed to insure a maximum of employment, and will be supervised by the Works Progress Administration.

The fundamental principles which will determine the eligibility of projects enunciated by the President are as follows:

The projects shall be useful.

Projects shall be of a nature that a considerable proportion of the money spent will go into wages for labor.

Projects which promise ultimate return to the Federal Treasury of a considerable proportion of the costs will be sought.

Funds allotted for each project should be actually and promptly spent and not held over until later years.

In all cases projects must be of a character to give employment to those on the relief rolls.

Projects will be allocated to localities or relief areas in relation to the number of workers on relief rolls in those areas.

To move from the relief rolls to work on such projects or in private employment the maximum number of persons in the shortest time possible.

Filing of applications.—Allotment applications may be filed only by the governmental department or agency having principal jurisdiction of the contemplated work. Such Government department or agency may receive recommendations or suggestions from interested parties with respect to the initiation of Federal projects, will consider them, and determine whether or not the contemplated projects should be made the basis of allotment applications. If the decision is in the affirmative, applications are prepared and forwarded to the Division of Applications and Information, of which Mr. Frank C. Walker is executive director.

Routing of applications.—After receipt of an application from a governmental department or agency, the Division of Applications and Information makes a notation on its records and transmits copies as follows:

(*a*) One copy to the Bureau of the Budget.

(*b*) Two copies to the Works Progress Administration, one of which is returned to the Division of Applications with its recommendations and, in the case of unfavorable recommendations, with its comments.

Upon receipt of the recommendations of the Bureau of the Budget and recommendations (and comments, if any) of the Works Progress Administration, such recommendations and comments will be transmitted with the application to the Advisory Committee on Allotments, of which Mr. Harold L. Ickes is chairman. The Bureau of the Budget is given 3 days after receipt of an application within which to furnish its recommendation. If none is forthcoming within that period, the application may be transmitted to the Committee on Allotments without the recommendation or comments of the Bureau of the Budget.

The Committee on Allotments is constituted as follows: Secretary of the Interior, chairman; Secretary of Agriculture; Secretary of Labor; Director, National Emergency Council; Director, Progress Division; Director of Procurement; Director of the Bureau of the Budget; Chief of Engineers, U. S. Army.; Commissioner of Reclamation; Director of Soil Erosion; Chief of the Forest Service; Director of Emergency Conservation Work; Chief, Bureau of Public Roads; Director of Rural Resettlement; Director of Rural Electrification; Chief of the Division of Grade Crossing Elimination; Director of Relief; Chief of the Urban Housing Division; a representative of the Business Advisory Council; a representative of organized labor; a representative of farm organizations; and a representative of the American Bankers Association.

President has final authority.—Under the law the actual allocation of amounts to be expended under the work relief bill must be made by the President. The President will therefore receive the recommendations from the Works Allotment Division before allocations are made by him. After such allocations have been made they will be transmitted to the various Government agencies, which will be charged with the prosecution of the work.

(Cut along this line)

COMMISSIONER, (Date)_____

Bureau of Reclamation,

Washington, D. C.

SIR: I am enclosing my check [1] (or money order) for 75 cents to pay for a year's subscription to The Reclamation Era.

Very truly yours,

(Name)_____

(Address)_____

_____

NOTE.—30 cents postal charges should be added for foreign subscriptions.

[1] Do not send stamps.

Tenancy on Federal Reclamation Projects

By L. H. Mitchell, Economic Analyst, Bureau of Reclamation

IN RESPONSE to a recent circular letter from the Commissioner to project superintendents requesting information relative to the trend of tenancy on the projects of this Bureau, interesting facts have been brought out.

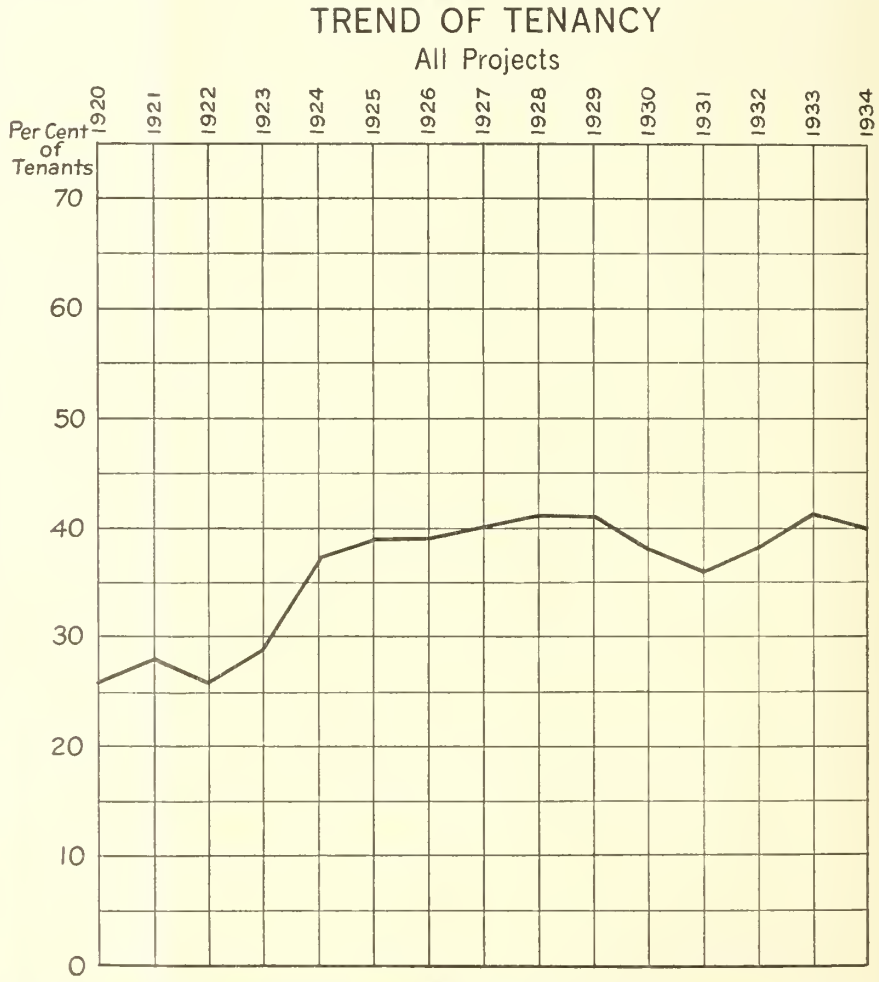
An analysis of the replies showed that the projects with dairying as one of the principal industries had the smallest percentage of tenants. It was also obvious that projects having the highest percentage of cropped area devoted to cash crops, such as cotton, sugar beets, etc., were the ones with the greatest percentage of tenants.

There was a marked increase in the number of tenants on all but three of the projects during the years 1922 to 1925, inclusive, when the percentage increased from 26 to 39. During the past decade the trend of tenancy for all projects has not materially changed. The projects have three types or classes of tenants, namely, (I) those who move frequently, not necessarily on the same project, but from State to State; (II) those who on account of circumstances over which they have no control, and not having sufficient capital to buy farms, are compelled temporarily to rent; and (III) those who rent as a business undertaking.

Those in class I are sometimes termed "professional soil robbers." They reduce rather than increase the soil fertility. The class II tenant frequently is a young man starting out for himself. In this class are also found, especially during recent years, those who being unable to pay taxes and mortgage obligations, are not home owners. Class III tenants differ from those in class I in that they are generally a much better class of farmers. They maintain the fertility of the soil and conduct their farming operations on a business basis. They know from experience there is a greater income in farming as tenants than as landowners. During times of low returns for farm products, of high cost for farming operations, and of little, if any, reductions in State and county taxes, there has been little incentive for a tenant of this class to become a home owner.

The trend of tenancy during the past year shows there is a marked demand or desire for one to own his home. The old law of supply and demand is demonstrating its tried and true meaning. Lack of capital has prevented many a deserving settler from becoming a home owner.

Owners of land who are not farm operators are often classified as speculators. Such people or companies have holdings both large and small resultant from: (*a*) Owning large stock ranches prior to the building of the irrigation works; (*b*) buying irrigated land for purely speculative purposes; and (*c*) foreclosing on mortgages. The last named is often an indirect result of speculation because the rate of interest demanded has been out of reason, if not usury, and only the very thrifty farmers during reasonably prosperous times could pay the interest to say nothing of reducing the principal.



The following quotations from a few of the replies from project superintendents give a cross section of the trend, with supporting reasons:

"It is probable that this increase of tenants does not indicate any change in basic conditions, although it is influenced to some extent by the fact that 47 pieces of land containing a total of 1,919 acres have passed from private ownership to mortgage holders."

"The last 5 years of the period, the so-called 'depression' so curtailed the independent incomes of absent land owners as to force them to either return to their land or sell it."

"There appears to be no pronounced trend in the past few years, but real-estate dealers advise that there is now a noticeable movement toward the purchase of farms by renters."

"Irrigated lands have been very much in demand for the past few years and owners who do not care to farm their tracts are able to dispose of them. The district and county have also been able to dispose of most of their delinquent lands to settlers from the drought-stricken regions. Only the most desirable of tenants are able to lease farms this spring."

(Continued on page 129)

Intake Towers at Boulder Dam

By Wesley R. Nelson, Associate Engineer, Boulder Canyon Project

THE Four intake towers that rise in the reservoir immediately upstream from the dam are notable examples of the possibilities presented for combining artistry and usefulness, of building for beauty as well as for strength and utility. These graceful concrete spires resemble huge fluted columns and have all the appearance of memorial monuments rather than serviceable structures designed for the particular purpose of regulating the flow of water from the Boulder Canyon Reservoir.

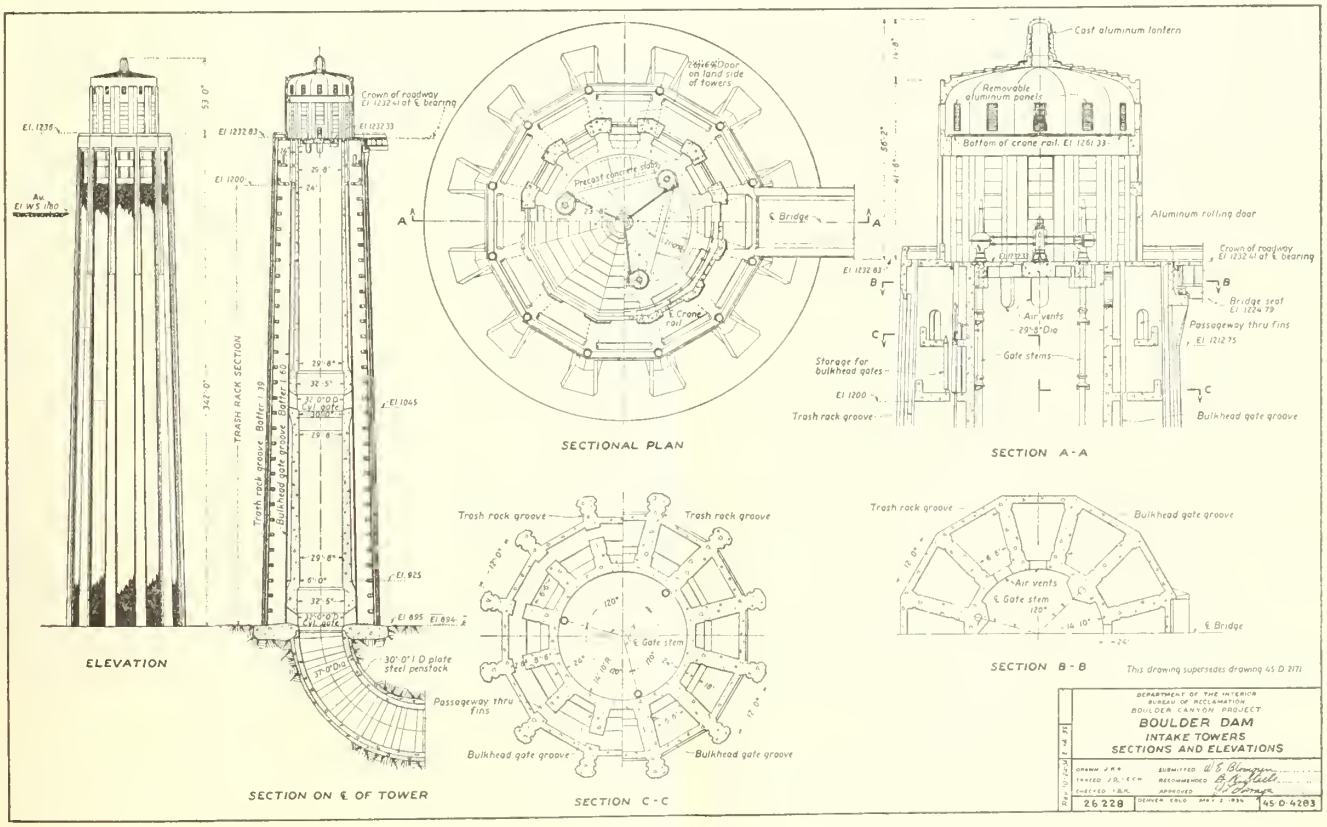
Actually each tower is a hollow concrete cylinder of 29 feet 8 inches internal diameter and 75 feet average outside diameter from which 12 fins project radially, the openings between the fins being spanned by steel trashracks. A hoist house of more than four stories sits atop the tower and contains electrically operated hoists for raising and lowering the cylindrical gates that are installed, one at the tower base and another 150 feet higher. The overall height of each tower is 403 feet above its rock foundation, equal to that of a 34-story building.

Water from the reservoir will enter the tower through the steel passage liners and gate opening (the gate being in raised position) to a 30-foot diameter steel pipe line that connects with the tower base. It then flows downstream to the power-plant turbines or continues farther downstream past the turbines to outlet works, which open into the river channel. Each of the two downstream towers is connected with a battery of six 84-inch needle valves in the canyon wall outlet works, and each of the two upstream structures with the six 72-inch needle valves contained in the downstream plug of an inner diversion tunnel. Connections between the 30-foot pipe line and the power-plant turbines are through 13-foot diameter steel pipes.

Foundations for the towers are on rock shelves cut in the canyon walls 250 feet above the old river surface, and the high points of the structures rise 56 feet above the Boulder Dam crest. Two towers are on each side of the canyon, the center line of the downstream ones being approximately 135 feet from the dam face and the other two 185 feet farther upstream. Bridges join the upstream and downstream towers with each other and with the dam.

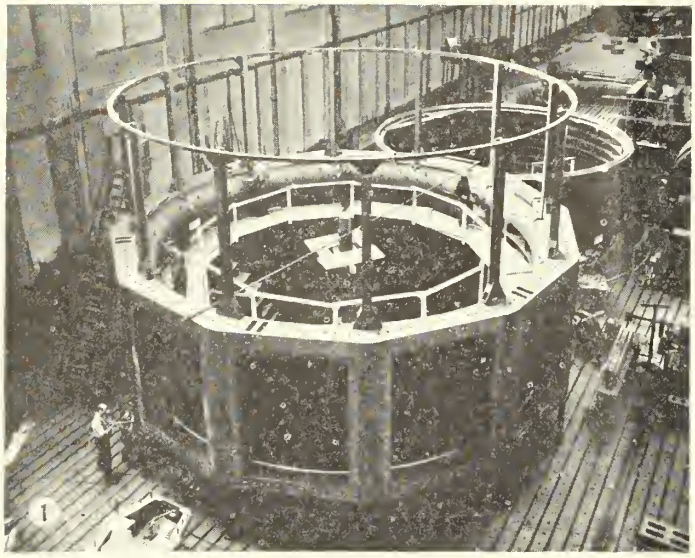
CONSTRUCTION METHODS

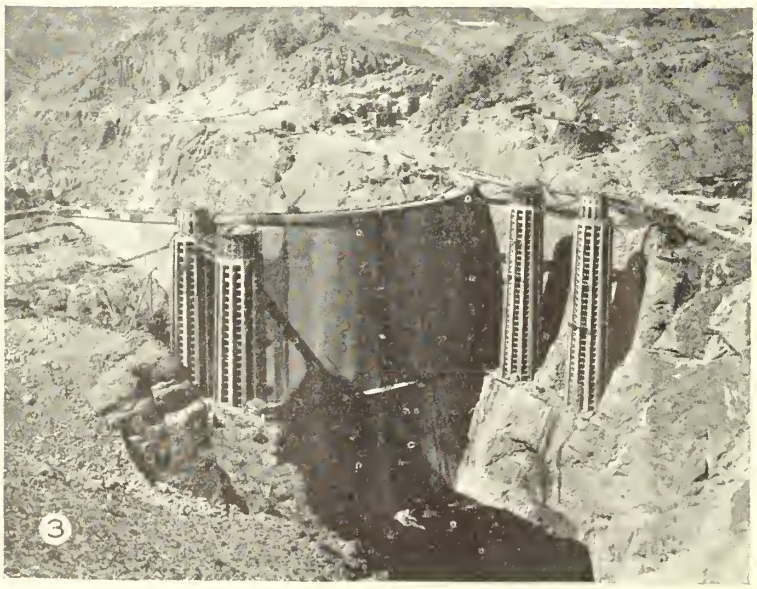
Immense grooves were cut in the canyon walls for all four structures by the spectacular high-scaling methods, wherein the men were held in working position on the cliffs by ropes fastened to safety belts or boatswain's chairs, while they pried off the loose rock or drilled for blasting. The rock

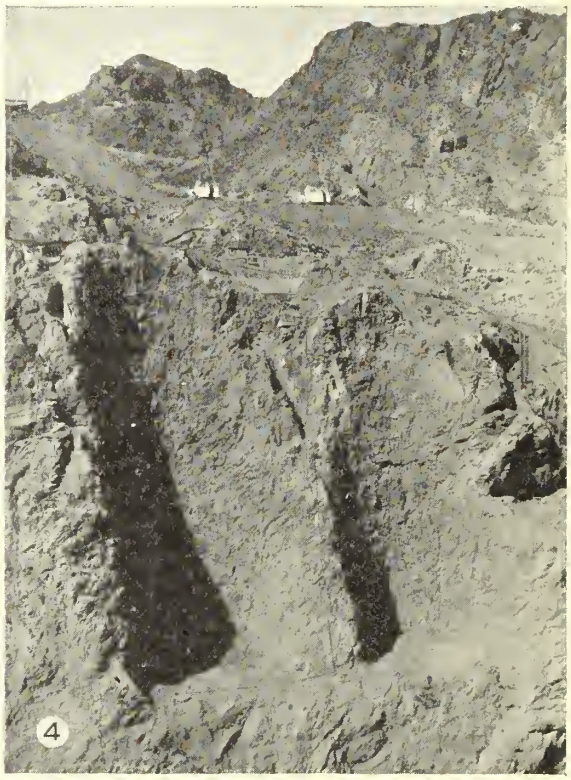


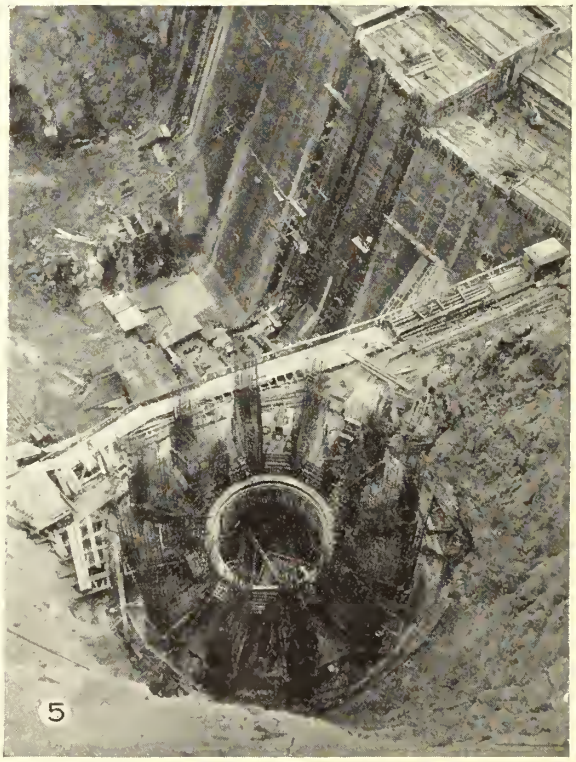
BOULDER CANYON PROJECT

ARIZONA - NEVADA









1, Gates and liners being fabricated at Westinghouse plant; 2 High scalers at work on intake towers; 3, Intake towers and upstream face of dam; 4, Completed excavations for Nevada towers: 5, Commencing construction of Nevada upstream tower.

shot down into the canyon was removed by power shovels and trucks, the muck being hauled to dumps in side canyons. Excavation amounted to 360,000 cubic yards, the rock cuts being 110 feet in diameter at the base, and those on the Nevada side 338 feet in depth.

A stiff-legged steel derrick was then erected at the top of each canyon wall cut and between the towers, to be used in the succeeding construction for lowering men and materials to the working site. These were of 12-ton capacity, equipped with 180-foot booms and 300-horsepower hoists.

Concrete for the towers was mixed at the high-level plant of the contractor, Six Companies, Inc., dumped into 4-cubic-yard spout dump buckets, and transported along the canyon rim by truck or train to position opposite the towers. The bucket was then picked up by the derrick, or if intended for the Arizona structures, first by cableway and then by derrick, and conveyed to a hopper erected immediately above the center of the rapidly rising tower, from where the concrete flowed through short chutes to the barrel, fins, and trash-rack beams. Collapsible wooden forms were employed for pouring the fins and outer portion of the tower, while steel forms were used inside. Concrete placed in the towers amounted to 95,000 cubic yards, which was reinforced with steel at the rate of 158 pounds per cubic yard. This unusual degree of reinforcement was provided so that the high towers could successfully withstand any heavy earthquake shocks and the consequent intensive surging in the reservoir.

GATES AND HOISTS

The lower cylindrical gates and liners were completely installed, except the inner liner plates and hoist connections, after the tower bases were poured, and the upper gates as soon as concreting had reached a sufficient elevation. These gates are approximately 32 feet in outside diameter, 9 feet in height, and are composed of a steel cylindrical outer shell, 2 inches thick in the lower installations and 1½ inches in the upper, supported by heavy annular rings and cross ribs. A liner plate of ¾-inch thickness is added to the inner part of the lower gate to offer an unobstructed passage to water flow passing through the tower from the upper gate opening.

Each gate contains a monel metal seal around its base, the surface of which curves inward and downward, contacting in closed position a similar seal that is fastened to the throat liner. Another pair of circular monel seals are affixed to the top of the gate and the opening. All joints were welded, requiring more than 8 miles of welding for the 8 gates, and the stresses set up in the metal by rolling and welding were relieved by heating in a normalizing furnace.

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Three screw-stem hoists in the house at the top of a tower shaft, connected to two centrally located 440-volt induction motors of 16-horsepower rating, raise and lower the gates separately or together. The three tubular stems of nickel steel, that extend from the gates to the hoists, are affixed at equal spacings around the periphery of the gate, and the stems to the lower gate, 7¾ inches in outer diameter, 1⅛ inches thick and 337 feet long, are telescoped through the ones to the upper gates, which are 9½ inches in outer diameter, ⅝ inch thick and 187 feet in length. The weight of the moving parts of a lower gate is 340,000 pounds, and upper one 220,000. Either gate may be raised or lowered in 52 minutes. A control circuit for the hoists will connect with the powerhouse for emergency closing, but ordinarily the gates will be operated from the hoist houses.

Grooves for trashracks and others for bulkhead gates were formed in the fins. Reinforced concrete beams connecting the fins were poured integral with them at approximately 10 foot 7 inch heights, from the base upward 306 feet. The outer surfaces of the beams are protected by steel plates. A steel trashrack section, about 10 feet 7 inches high and 12 feet 8 inches wide, is lowered down its groove to rest on the tower base, or on another section, and bears against the cross beams. The vertical cross bars of these racks are 5 inches by ¾ inch in section and the horizontal spacer bars 3 inches by ⅝ inch, forming openings approximately 2 feet high and 4 inches wide. Total weight of racks for all towers is nearly 6½ million pounds.

Bulkhead gates are provided to close cylindrical gate passageways whenever it becomes necessary to unwater a tower for inspection and maintenance of cylinder gates and gate seats. The bulkheads are steel castings of cellular construction 11 feet 6 inches high by 7 feet 2 inches wide, and of 10¾ inches minimum thickness for the upper gate and 12⅜ inches for the lower. One set of bulkheads, 12 for the lower and 12 for the upper cylindrical gates, is provided for all the towers. A crane hoist mounted on a circular track in each intake tower raises and lowers the bulkheads by a single cable, the grooves in the fins being lined with bronze guides. A section of upper gate bulkhead weighs 9,500 pounds and a lower 13,500 pounds.

ARCHITECTURAL TREATMENT

The architectural treatment of the hoist house at the top of each tower is a model of artistry and form. Aluminum casement windows, 6 feet wide and 20 feet high, are inset in the 12-sided edifice, and above are narrow metal louvres, all accentuating the slenderness of the structure. The domed roof is covered with huge concrete shingles to form a dais on which stands the ornate aluminum lantern. Even the metal rolling doors, 8 feet wide and 15 feet 5 inches high, in the towers opposite the bridges, detract in no way from the artistic treatment.

Bridges connecting the towers to each other and to the dam mask their strength in molded concrete. Beneath the sides and floor are steel girders 9 feet in height connected by floor beams, and beneath the beams by struts and diagonals in vertical and horizontal planes. The length of bridges between the towers is 118 feet, from the dam to the Nevada tower 109 feet, and to the Arizona structure 94 feet. The floor system contains the 14-inch I floor beams, attached to the main girders at approximately 8-foot centers, on which are laid concrete slabs 8 inches in minimum thickness. The concrete bridge parapets are of the same size and type as those on the dam to which they connect. Lights of 300-watt power will shine from recesses in the parapets, being spaced 26 feet to 30 feet in each wall and in staggered position. The lanterns atop the towers will shed their refulgent gleam over lake and dam from six 300-watt bulbs in each light.

Water is now rising toward the tower bases, under control of slide gates in the plug of the Nevada outer diversion tunnel. Melting snows from the high mountains of the Colorado River Basin are expected to pile up behind the dam in June to an elevation above the lower gates. However, the gates may not be operated this year, as much work remains to be done in the penstock system, outlet works, and powerhouse before water passes through them. Thus it may be in 1936 before the towers commence their centuries' toil of curbing the tempestuous power of the Colorado.

George W. Malone, State Engineer of Nevada, Returns to Private Engineering Practice

George W. Malone, prominently identified with Government commissions and committees, has resigned the position of State engineer of Nevada, effective May 25, to give his undivided attention to private engineering consulting practice, specializing in reclamation and public utilities work. His firm, King & Malone, has offices in Reno, San Francisco, and Washington, D. C.

Shortly after his appointment as State engineer of Nevada in 1927, he undertook the compilation of a history of the Colorado River development. There was a demand for this kind of a compilation and his report was printed in 1929 as Senate Document No. 186, Seventieth Congress, second session.

Notes for Contractors

Boulder Canyon project, Arizona-Nevada.—The successful bidder under Specifications, No. 651–D for furnishing rolling, vertical folding and swing doors for Boulder Dam, power plant, and appurtenant works, was determined by lot and the name of The Kinnear Manufacturing Co. was drawn. The following six manufacturers had identical bids of $38,007, f. o. b. Boulder City, for items 1, 2, 3, and 4 (aluminum) and all agreed to equalize the greatest difference between commercial and land-grant freight rates from the shipping point of any other bidder: Soule Steel Co., Cincinnati, Ohio; Cornell Iron Works, Long Island City, N. Y.; Moeschl Edwards Corrugating Co., Covington, Ky.,; The R. C. Mahon Co., Detroit, Mich.; The Kinnear Manufacturing Co., Columbus, Ohio; and the George W. Johnson Mfg. Co., Kansas City, Mo.

Two bids were received under Specifications No. 672–D for furnishing water level gages for the power plant, as follows: Julien P. Friez & Sons, Inc., Baltimore, Md., $2,448 f. o. b. Baltimore, discount one-half percent; Leupold, Volpel & Co., Portland, Oreg., $3,837, f. o. b. Portland, discount 1 percent. The bids were rejected and new bids will be invited.

On April 26 a contract was awarded to the Electric Storage Battery Co. of Denver, Colo., under Specifications No. 668–D, for furnishing two 120-cell and one 60-cell storage batteries for the power plant. This company's bid was $8,550.57 f. o. b. Philadelphia, Pa.

Under Specifications No. 673–D, for furnishing a 180-ton transfer car for the power plant, the following bids were received: Consolidated Steel Corporation, Los Angeles, Calif., $5,050; Morgan Engineering Co., Alliance, Ohio, $5,560; Atlas Car & Manufacturing Co., Cleveland, Ohio, $4,542; Judson-Pacific Co., San Francisco, Calif., $5,214; Geo. P. Nichols & Bros., Inc., Chicago, Ill., $6,550, discount 1 percent; alternate bid, $8,000, discount 1 percent. All bids were f. o. b. factory shipping point. On the basis of delivered cost the Atlas Car & Manufacturing Co. was low by 83 cents.

Identical bids of $7,152, f. o. b. Boulder City were received from the following companies for furnishing and delivering 104 luminaries for the illumination of the main roadway over the dam (Specifications No. 674–D): General Electric Co., Schenectady, N. Y.; Crouse-Hinds Co., Syracuse, N. Y.; General Electric Supply Corporation, Denver, Colo.; The New England Electrical Co., Denver, Colo.; Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo.; The Mine & Smelter Supply Co., Denver, Colo.; Graybar Electric Co., Inc., Denver, Colo. All bids were subject to a discount of 2 percent. Contract was awarded to The New England Electric Co.

The Secretary on May 11 approved award of contracts to the following bidders under Specifications No. 601 for furnishing control equipment for the power plant: Schedules 1 and 2, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $216,161; schedule 3, Graybar Electric Co., Denver, Colo., $21,720.70; schedule 4, award of contract now under advisement; schedule 5, Wolfe and Mann, Baltimore, Md., $10,291.

Bids were opened at Denver on May 16 under Specifications No. 680–D for furnishing 12 discharge guides for 72-inch needle valves to be installed in the tunnel plug outlet works at Boulder Dam. One hundred and twenty days will be allowed for delivery.

At Denver on May 15 bids were opened for furnishing and delivering two direct-connected, motor-driven, deep-well, turbine-type pumping units, to be used as sump pumps in the tunnel-plug outlet works at Boulder Dam. The specifications number is 682–D. The drainage pumping units are to be assembled and rebuilt from parts salvaged from a deep-well, motor-driven turbine pumping unit to be furnished by the Government. All pumping units will be installed by the Government.

Bids were received at the Denver office until May 17 and then opened for furnishing and delivering observation platforms, ladders, railings, and doors for installation in the tunnel-plug outlet works at Boulder Dam (Specifications No. 683–D). The materials will be installed by the Government. Thirty days are allowed for delivery.

On May 27 bids were opened at Denver, under Specifications No. 687–D (readvertisement of No. 643–D) for furnishing and delivering insulated wire and cable for installation in the Boulder power plant, as follows: 16,175 linear feet of 5,000-volt varnished cambric insulated cable; 330,175 linear feet of 5,000-volt, 1,000-volt and 600-volt rubber-insulated cable; 6,055 linear feet of vertical cable; 23,700 linear feet of telephone wire; and 13,000 linear feet of asbestos-covered fixture wire. The material is required in 60 days, and will be installed by the Government.

Bids were received at Denver until May 31 and then opened for furnishing and delivering one 15-ton gantry crane (Specifications No. 686–D) for the turbine draft tube bulkhead gates at the power plant. The crane will be installed by Government forces.

Three bids were received under Specifications No. 675–D, opened at Denver on May 2, for furnishing and delivering a hydraulic control board and position transmitters for needle valve position indicators for the Boulder power plant. The bids were as follows: Square D Co. Inc., Los Angeles, Calif., $6,145, discount 2 percent, f. o. b. Los Angeles, 3,200 pounds, Boulder City, 150 pounds; General Electric Co., Schenectady, N. Y., $6,234, f. o. b. Schenectady, 2,322 pounds; Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $7,142, f. o. b. East Pittsburgh, 4,200 pounds, Newark, N. J. 480 pounds.

The Lacy Manufacturing Co. of Los Angeles, Calif., on items 1 and 3 and the California Steel Products Co., San Francisco, Calif., on item 2, were low bidders and were awarded contracts under Specifications No. 677–D for furnishing drain piping and appurtenances for the roof drainage system for Boulder power plant. Bids received on May 3 were as follows: Western Pipe & Steel Co., Los Angeles, Calif., item 3, $8,750; Lacy Manufacturing Co., Los Angeles, Calif., item 1, $1,550, item 2, $490, item 3, $7,600; Associated Piping & Engineering Co., Los Angeles, Calif., item 1, $2,843, item 2, $536, item 3, $8,886, all discount 2 percent; California Steel Products Co., San Francisco, Calif., item 1, $1,979, item 2, $296, item 3, $8,897; Southwest Welding & Manufacturing Co., Inc., Alhambra, Calif., item 3, $9,230.60, discount one-half of 1 percent. The first four bids were f. o. b. factory and the last named was part destination and the remainder f. o. b. Alhambra.

Under Invitation No. 23,447–A for furnishing valves, pipe and fittings for supply inlet and drain lines for the tunnel plug outlet works, bids opened at Denver April 25, the following bids were received: Associated Piping & Engineering Co., Los Angeles, Calif., $22,638.57; Grinnell Co. of the Pacific, Los Angeles, Calif., $22,638.57; Crane O'Fallon Co., Denver, Colo., $22,793.33; Commercial Iron Works, Los Angeles, Calif., $23,071; Midwest Piping & Supply Co. Inc., Los Angeles, Calif., $3,658.06, discount 1 percent (item 1 only); Standard Sanitary Manufacturing Co., Las Vegas, Nev., $22,638.57; Boulder City Builders Supply Co., Boulder City, Nev., $22,793.33; Los Angeles Valve & & Fittings Co., Los Angeles, Calif., $3,665.12 (item 1 only). All bids were f. o. b. Boulder City and all except Midwest were subject to a discount of 2 percent. On the basis of lowest delivered cost and shipment on Government bills of lading the Associated Piping & Engineering Co., with a weight of 150,820

pounds, and shipping from Hartford, Conn., Pittsburgh, Pa., and Los Angeles, Calif., was the low bidder. Contract was awarded to this company on May 11.

Bids were opened at Denver on June 6 (Specifications No. 625) for furnishing and delivering either f. o. b. shipping point or Boulder City, aluminum and steel pipe railings, aluminum doors, steel doors, and structural and architectural metal work for Boulder Dam, power plant and appurtenant works. All materials will be installed by the Government.

On June 6 bids were opened at the Denver office for furnishing twelve 72-inch diameter internal differential needle valves (Specifications No. 628) for installation in the tunnel plug outlet works at Boulder Dam. The gates will be installed by the Government.

Specifications are being prepared in Denver for inviting bids on furnishing two 115,000-horsepower turbines, governors, and pressure regulators, four 55,000 kilovolt-ampere transformers, and two 82,500 kilovolt-ampere generators. This is the initial installation for the metropolitan water district.

Specifications No. 627, which call for furnishing valves, piping, and fittings for the power plant are ready for bidding.

Two pump manufacturers bid on supplying sump and drainage pump units for tunnel plug outlet works, bids opened at Denver on May 15 under Specifications No. 682-D. The bids were as follows: Bingham Pump Co., Portland, Oreg., item 1, $1,546, and item 2, $5,514, both f. o. b. Portland, Oreg.; Byron-Jackson Co., Berkeley, Calif., item 1, $2,518.40, f. o. b. Boulder City, and item 2, $5,650 (250-hp. motor) f. o. b. Berkeley, $6,955 (200-hp. motor) f. o. b. Berkeley.

The following bids were received on May 16 for furnishing discharge guides for 72-inch needle valves for tunnel plug outlet works (Specifications 680-D): Babcock & Wilcox Co., Barberton, Ohio, $18,000; Lacy Mfg. Co., Los Angeles, Calif., $19,550; Consolidated Steel Corporation, Los Angeles, Calif., $20,000; California Steel Projects, San Francisco, Calif., $20,881, discount 1 percent; Southwest Welding & Mfg. Co., Alhambra, Calif., $22,194, discount ½ percent; Lakeside Bridge & Steel Co., Milwaukee, Wis., $22,245 f. o. b. Boulder City, Nev., discount ½ percent; McClintic-Marshall Corporation, Leetsdale, Pa., $24,898; Alco Products, Inc., Dunkirk, N. Y., $27,850; Steacy-Schmidt Mfg. Co., York, Pa., $28,000; Los Angeles Shipbuilding & Dry Dock Co., San Pedro, Calif., $31,330; Allis-Chalmers Mfg. Co., Milwaukee, Wis., $33,378, discount ½ percent.

Bids were opened at Denver on May 17 for furnishing observation platforms, ladders, railings, and doors for tunnel plug outlet works under Specifications No. 683-D, and the following were received: The Kawneer Co., Chicago, Ill., $2,461; Galvin Kadala Inc., Chicago, Ill., $1,750, discount ½ percent; Silver-Roberts Iron Works Inc., Denver, Colo., $2,000; Lacy Mfg. Co., Los Angeles, Calif., $1,540; Ornamental Iron Works Co., Akron, Ohio, $1,367, f. o. b. Boulder City, discount ½ percent; Consolidated Steel Corporation, Los Angeles, Calif., $1,500; John W. Beam, Denver, Colo., $2,050, f. o. b. Peotone, Ill., discount ½ percent; A. J. Beyer Co., Los Angeles, Calif., $1,789. The preliminary abstract showed the Ornamental Iron Works Co. as the apparent low bidder.

Humboldt project, Nevada.—On April 25 the First Assistant Secretary approved award of contract to the Union Portland Cement Co., Devils' Slide, Utah, for furnishing 10,000 barrels of portland cement, under Invitation No. 38,517-A, for the Rye Patch Dam. The price is $3.44 per barrel f. o. b. Rye Patch, with discount and sack allowance of 50 cents. Bids of six other manufacturers contained a stipulation preventing the Government taking advantage of land-grant rates, and in view of a recent Comptroller General's decision, these bids were not given consideration.

A drawing was held on May 14 to determine the successful bidder under Invitation No. 20,383-A for furnishing 250 tons of steel sheet piling for the Rye Patch Dam, Humboldt project, and 150 tons for the Pine View Dam, Odgen River project. Five steel companies, Inland, Illinois, Jones & Laughlin, Carnegie, and Pacific Coast Steel had submitted identical bids. The name of Inland was drawn.

Owyhee project, Oregon-Idaho.—Dan Teters, of Ontario, Oreg., submitted the low bid of $6,776.50 for building structures on the advancement pump laterals under Specifications No. 515-O. The only other bid was $7,019.50 made by Otis Williams & Co., Vale, Oreg.

Bids were opened at Ontario on May 14 (Specifications No. 679-D) for the construction of earthwork for north canal laterals; the estimated quantities involved are 90,000 cubic yards, class 1 excavation; 35,000 cubic yards, class 2 excavation; 1,000 cubic yards, class 3 excavation; 3,000 station cubic yards of overhaul. The work is located near Dunaway and Nyssa and must be completed within 180 days after receipt of notice to proceed.

Two bids were received on May 1 for the construction of earthwork and structures on the south canal, station 736 to station 1340 and south canal lateral 17.7 (Specifications No. 619). The contractors and amounts of their bids were: Morrison-Knudsen Co., Boise, Idaho, $127,485; Bernard-Curtiss Co., Minneapolis, Minn., $149,876. The unit prices for class 1 and class 2 excavation were $0.092 per cubic yard, and $0.45 for class 3.

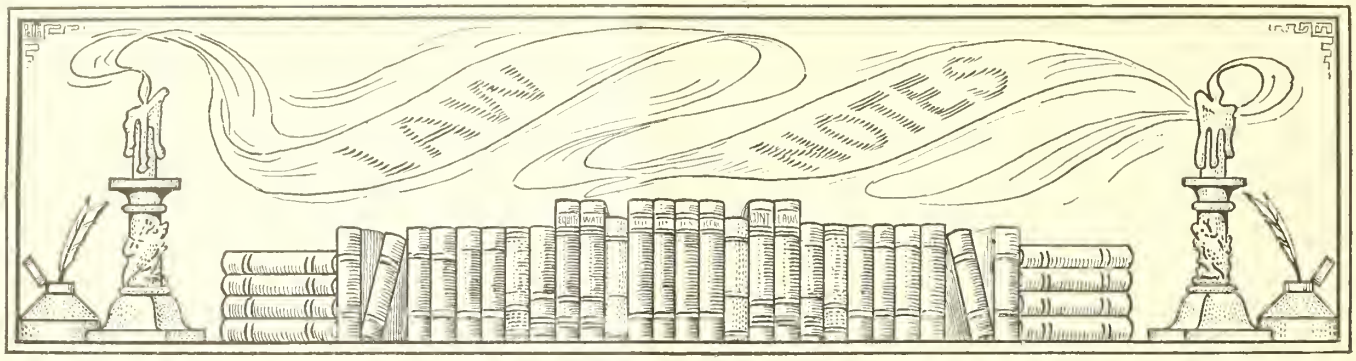
Uncompahgre project, Colorado.—The earth and rock-fill type of dam having been selected for Taylor Park, and contract awarded, purchase of 15,000 barrels of portland cement in cloth sacks under Specifications No. 658-D, bids opened February 18, is now in order. Three bids were received as follows: Monolith Portland Midwest Co., Denver, Colo., $2 per barrel f. o. b. Laramie, Wyo.; United States Portland Cement Co., Denver, Colo., $3.56 per barrel f. o. b. Almont, Colo.; Colorado Portland Cement Co., Denver, Colo., $3.56 per barrel f. o. b. Almont, Colo. All bids were subject to a 50 cents discount and sack allowance. The last two companies named were low and the successful bidder will be determined by drawing.

Vale project, Oreg.—Bids were opened at Denver on May 27 (Specifications No. 685-D) for furnishing and delivering, either f. o. b. shipping point or Juntura, Oreg., roof trusses for outlet works control house; outlet works stairways, floors, and walkways; oil tanks, 36-inch needle-valve discharge guides, heating plant stack, and miscellaneous metal work for the Agency Valley Dam. The Government will install all material.

Ogden River project, Utah.—The following bids for constructing the Ogden-Brigham tunnel and Ogden Canyon tunnel were received at Ogden, Utah, on April 18 (Specifications No. 618): Schedule No. 1, Ogden-Brigham tunnel, station 127+10 to station 168+96—Union Construction Co., Ogden, Utah, $77,737.50; Shofner & Gordon, Los Angeles, Calif., Hinman Bros. Construction Co., Denver, Colo., $102,779.50; S. S. Magoffin Co., Adrian, Oreg., $105,754; Utah Construction Co., Ogden, Utah, Morrison-Knudsen Co., Boise, Idaho, $100,728; L. E. Dixon Co., Bent Bros., Inc., Los Angeles, Calif., $134,014.50; L. Coluccio & Co., Seattle, Wash., $105,017; Siems-Spokane Co., Spokane, Wash., $128,464.90. On schedule No. 2, Ogden Canyon tunnel, the Union Construction Co. did not bid. The other contractors bid as follows: Shofner & Gordon, Hinman Bros., $367,731.50; Magoffin, $400,740; Utah, Morrison-Knudsen, $411,070; Dixon, Bent Bros., $424,120; Coluccio, $512,465; Siems-Spokane, $513,966. The bids have been taken under advisement.

Three contractors submitted bids under Specifications No. 622 for constructing the Ogden Canyon Conduit, opening at Ogden on May 2. The bids were as follows: schedule 1—Barnard-Curtiss Co., Minneapolis, Minn., $211,810.36; Utah Construction Co., Ogden, Utah, Morrison-Knudsen Co., Boise, Idaho, $260,016.33; Olof Nelson, Logan, Utah, $286,201; schedule 2—Barnard Curtiss Co., $399,554.51; Utah-Morrison-Knudsen, $491,425.83; Nelson, $492,149.50.

(Continued on page 124)



Rights-of-Way for Reclamation Ditches or Canals, Act of August 30, 1890

By S. Rothbard, Counsel, Bureau of Reclamation

THE Act of August 30, 1890 (26 Stat. 391), contains the following provision:

"That in all patents for lands hereafter taken up under any of the land laws of the United States or on entries or claims validated by this act, west of the one hundredth meridian, it shall be expressed that there is reserved from the lands in said patent described a right-of-way thereon for ditches or canals constructed by the authority of the United States."

It was the evident purpose of Congress to reserve to the United States such a right-of-way over lands as might be needed for the necessary construction, operation, and maintenance of any ditches and canals that the Government might construct at any time in the future for the reclamation and irrigation of arid lands.

This provision has been the subject of considerable litigation and a clear and concise outline of the facts which led to the adoption of the provision can best be gained by reviewing a few of the decisions of the courts which, on a number of occasions, have construed this provision in favor of the United States.

"When we consider * * * the previous legislation by Congress on the same and kindred subjects, and the policy that the Congress was then outlining with reference to the irrigation and the reclamation of arid lands, we get an insight into the purpose of this legislation * * *. By act of October 2, 1888 (ch. 1069, 25 Stat. 526; U. S. Comp. St. 1901, p. 1552), Congress enacted a law 'for the purpose of investigating the extent to which the arid region of the United States can be redeemed by irrigation and segregation of the irrigable lands in said arid region and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water for irrigation and the prevention of floods and overflows.' By the terms of that act it was provided that 'all lands which may hereafter be designated or selected by such United States surveys for sites for reservoirs, ditches, or canals for irrigation purposes, and all the lands made susceptible of irrigation by such reservoirs, ditches, or canals, are, from this time henceforth, hereafter reserved from sale as the property of the United States and shall not be subject after the passage of this act to entry, settlement, or occupation until further provided by law.' Under the foregoing provisions of the statute the Secretary of the Interior, on the advice of the Attorney General (opinion of the Attorney General, May 27, 1890), held that no entry of any kind could be made upon any land west of the one hundredth meridian until irrigable lands had been determined and the proclamation of the President had been made opening the lands to settlement. The interpretation and construction of the Attorney General and the Secretary of the Interior placed upon the act of 1888 aroused the Congress * * * to take immediate steps toward the repeal of that portion of the act of 1888 reserving unselected reservoir, ditch, and canal sites from settlement.

"It will be seen, from an examination of all the reports and debates had in reference to the proposed amendments, and the amendment itself as finally passed on August 30, 1890, that the members of Congress, both those favoring and those opposing the act, believed and understood that it would have the effect of reserving a perpetual easement and right-of-way to the Government for ditches and canals that might thereafter be constructed by authority of the Government over lands which should be entered and patented subsequent to the passage of the act. It is further worthy of notice that prior to that time the Government had not entered upon the construction of irrigation works, ditches, and canals, and had never authorized the construction of any such works, except in Indian and military reservations. The first intimation of such a scheme as a national project was contained in the act of October 2, 1888. The act authorized the irrigation surveys and was made in the nature of a provision for obtaining accurate information concerning arid lands and the feasibility of the construction of reservoirs, dams, and canals and the amount of lands that could be irrigated thereby. This policy had more fully developed in the minds of the members of Congress when the act of Congress of August 30, 1890, was passed, and at that time a national irrigation policy seems to have been at least anticipated by some of the members. IT IS CLEAR THAT IN THE ADOPTION OF THIS PROVISO IT WAS INTENDED TO RESERVE TO THE GOVERNMENT EASEMENTS AND RIGHTS-OF-WAY OVER THE LANDS IT MIGHT SUBSEQUENTLY GRANT FOR ANY DITCHES OR CANALS THAT IT MIGHT CONSTRUCT IN THE FUTURE. Congress had made no provision for constructing any canals or ditches by the Government, and, if it should be held that the act only applied to ditches or canals that had been constructed at the time patent issued, it would in effect amount to a holding that the proviso had no meaning or effect whatever. Without subsequent legislation authorizing the Government to construct ditches and canals, it would have been impossible for any ditches or canals to have been constructed by the Government prior to the issuance of patents to anyone, and the proviso would have been meaningless. The Congress was taking this precautionary measure for the protection of a right-of-way to the Government in the event it should later adopt a reclamation policy and enter upon such works. It intended thereby to save the Government from the expense of purchasing and condemning rights-of-way when it got ready to construct any canal or ditch." (*Green* v. *Wilhite et al.*, 14 Idaho 238, 93 Pac. 971.) (Emphasis supplied.)

In *Ide* v. *United States*, 263 U. S. 497, the court said:

"The patents for the tracts acquired from the plaintiff expressly reserve to it rights of way 'for canals and ditches constructed or to be constructed by its

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Operating Projects to Report Direct to Washington Effective July 1, 1935

DURING the past 2 years the activities of the Bureau have been greatly expanded. The works now being built will more than double the area irrigated from Federal projects. On the Bureau rests the great responsibility of planning this development so as to conserve and use to the best advantage the land and water resources of the arid States. These irrigation works will determine where people may live and help to establish and improve conditions under which they live. Out of this activity will come opportunities for homemaking for farmers who now live on marginal land and for the unemployed who are attracted by rural life.

To do these things in the best way there must be cooperation and teamwork between all the parties concerned—the engineers who plan and build the works, the administrators who operate them, and the water users. As a means of securing this cooperation, providing closer personal contacts, and enabling the public to better understand the operations and achievements of Federal reclamation, certain changes in organization are being made. Among the more important is that of having the superintendents of operating projects report direct to Washington. In the work on the projects it is desired that particular attention be given to the following:

(*a*) Improvement of conditions affecting the social and economic well-being of water users.

(*b*) Problems connected with water supply, storage, carriage, and delivery of water.

(*c*) Improvement of irrigation methods so as to secure a more efficient and economical use of water.

(*d*) Examination of seepage conditions.

(*e*) Revisions and improvements in crop census.

(*f*) Status of class 5 lands.

(*g*) Status of excess holdings.

Effective July 1, 1935, the following projects will report direct to Washington:

O. & M. by Bureau:

- Belle Fourche
- Boise
- Carlsbad
- Grand Valley
- Klamath
- Milk River
- Minidoka
- North Platte
- Orland
- Owyhee
- Rio Grande
- Riverton
- Shoshone
- Umatilla (McKay)
- Vale
- Yakima
- Yuma

O. & M. by water users:

- Baker
- Bitter Root
- Boise
- Huntley
- Lower Yellowstone
- Minidoka
- Newlands
- North Platte
- Okanogan
- Salt Lake Basin (Echo)
- Salt River
- Shoshone
- Stanfield
- Strawberry Valley
- Sun River
- Umatilla
- Uncompahgre
- Yakima-Kittitas

The Denver office will continue to function in matters relating to engineering and construction, operation of power plants, purchase of equipment, supplies for operation and maintenance, and maintaining personnel records. Status changes of operation and maintenance employees will be handled directly with Washington.

George O. Sanford has been designated to have general charge of operation and maintenance and will spend considerable time in the field conferring with superintendents. To further unify policies in operation and maintenance and to advance efficiency, five districts have been created, and the following have been named supervisors of these districts:

District no. 1 (including Montana and western North Dakota), H. H. Johnson; No. 2 (including Washington, Oregon, Idaho, and northern California), J. S. Moore; No. 3 (including Wyoming and western South Dakota and Nebraska), H. D. Comstock; No. 4 (including Colorado. Utah, Nevada, and central California) L. H. Mitchell; and No. 5 (including New Mexico, Arizona, and southern California) R. C. E. Weber.

Imperial Valley's 1934 Record Crop Values

The Imperial County crop and livestock report for 1934, recently completed by B. A. Harrigan, secretary of the Board of Trade, shows 57,487 carloads of products worth $33,951,554 shipped from the valley.

Melons were the largest cash crop, 16,124 carloads representing $9,525,944. First in importance were cantaloups, 7,594 cars valued at $5,447,935. Watermelons worth nearly $1,000,000 also were shipped last season.

Lettuce was second in cash value, 9,244 carloads being listed at $6,396,848. Alfalfa hay shipments totaled 9,137, valued at $1,425,372; carrots filled 2,297 cars, worth $1,417,249.

Imperial produced 907 cars of tomatoes, valued at $910,800. The valley's pea crop was worth $500,000; asparagus, $237,200; grapefruit added 1,010 cars to the tonnage and $961,015 in cash.

Creameries reported 4,246,379 pounds of butter worth $1,050,557, and other dairy products, 6,873,575 pounds, valued at $871,564.

Barley, wheat, and flax returned $1,000,000 to county growers.

Beef cattle reported are worth $3,978,440; dairy cattle $1,427,000; and sheep $656,006.

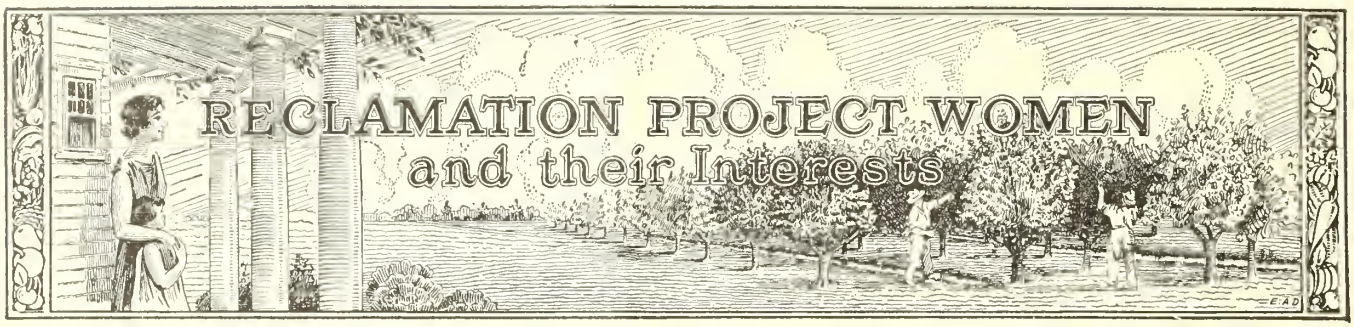
Pay rolls for lettuce, melons, alfalfa, and mixed vegetables during the year amounted to $3,294,000.—*Los Angeles Times.*

A top price of $16.25 per hundredweight was received by Fred Attebery, of Mitchell, Nebr., North Platte project, on the Chicago market for 22 head of steers. This was his tenth consecutive shipment for which he received the top price, each one establishing a new high for the season, the last one setting a high mark for 6 years.

Application has been made for a permit to construct another cold-storage plant in Yakima. Plans call for a building having a floor dimension of 100 by 126 feet to cost approximately $40,000.

The construction of the parallel-bar type of fish screen at the head of the Kittitas Canal, Yakima project, has been completed at a total cost of approximately $7,000.

Appropriate dedication ceremonies were held on April 28 at the site of the fish screen on the Sunnyside Canal, Yakima project, Washington. Speakers included Thomas Lalley, chairman of the State game commission; Miller Freeman, chairman of the fisheries division of the State planning council; John C. Kuhns, supervisor of the Snoqualmie National Forest; C. J. Lynch, president of the Conservation League, and Project Superintendent J. S. Moore.



Pioneering in Electricity

By Anne H. T. Donaldson [1]

LESS than 6 months ago the site of the world's first all-electric town, Mason City, Wash., was a desert waste of sagebrush and sand. To a New York tenderfoot, viewing for the first time last August the location of her future home town (soon to be built by the Mason-Walsh-Atkinson-Kier Co. for the construction of the Grand Coulee Dam), the prospect was not inspiring. To be sure, after the monotonous hundred-mile drive from Spokane across the brown and yellow parched plains, the sudden drop into the magnificent gorge of the Columbia River was a thrilling experience. We seemed to have reached without warning the rim of another world. We looked down a thousand feet and several miles across one of the wildest and finest stretches of the glorious "River of the West."

Dark and towering granite walls form one side of the basin. Through these walls a jagged chasm indicates that here the Columbia once, ages ago the geologists say, cut herself a new course for an unknown period of time, forming that spectacular river bed with its Dry Falls, known as the Grand Coulee. Within our present view the stream, swift and imposing, makes two wide bends, coming out of the East and turning due North, and at the far end of the gorge disappearing westward. Undisturbed by man through the ages, ranges of high bare hills of every shape and shade surround these grand sweeps of the river, forming a scene of wild beauty.

But already the site of the future dam was shown by earthworks just below the first bend. The Government engineers had been making preliminary excavations, and everywhere could be seen disfiguring but eloquent signs of the arrival of desperate job hunters. Hideous shanties and houses on wheels were grouped into little settlements here and there, where, according to the optimistic real-estate notices, all-electric cities would soon develop.

The particular spot pointed out as the future Mason City seemed the most remote and desolate in the whole wild landscape, a high plateau 250 feet above the river, so perpendicular that the road to the top was cut zigzag along the cliff, and the river itself can only be seen from the edge of the plain. We ferried across in a small but jaunty boat, which was suddenly snatched by the swift current in midstream and whirled around alarmingly, but miraculously managed to edge itself back to the landing. We climbed the bank through sand a foot deep and there surveyed our future home. Not a tree or shrub in sight on the whole extent of the plateau, not a sign of life except one immense jack rabbit that resented my attempt to share with him the doubtful shelter of a sagebush, and leaped straight toward me and then away. As the first woman visitor, I was offered the privilege of turning the first soil of the future city, but the heat of midday, 110°, and the prospect generally did not combine to make me appreciate the honor. I should be proud today to say that I had accepted it.

Typical electric kitchen.

OVER-NIGHT, A BRAND NEW TOWN

As I write, the 1st of March, we are a full-grown town of 2,500 inhabitants. There are more than 280 bungalows, 2-, 3-, 4-, and 5-room houses, all with baths and excellent modern plumbing, with garages and leveled lawn space. There are 10 blocks of bunkhouses for men, comfortably furnished, and an attractive dormitory with dining hall for women. There is a huge mess hall, where 1,000 persons are fed three meals a day, and a good hotel of 40 rooms that cannot begin to take care of the daily visitors. There is a well-equipped hospital of 37 beds, a large general store, where every kind of household necessity, excellent food and clothing, and many luxuries may be purchased at the prevailing prices of the region. There is a post office, a branch of one of the Spokane banks, a model laundry, a fine garage and service station. There is a large recreation hall with billiard and pool rooms and a well-managed lunchroom, a theater which seats 450 people and has good moving pictures every afternoon and evening; all this in addition to the splendid administration building and other offices, the carpenter and paint shops, the vast machine shops and boiler works—all the elaborate and most up-to-date plant required for the actual construction of the largest dam in the world, and all working just now full speed ahead in order to finish the gigantic west cofferdam before high water.

FEMININE MISGIVINGS—ALLAYED

During the autumn months the question of interest to the women, who were waiting in Spokane to join their husbands at Mason City, was just what was to be our part in such an absorbingly masculine undertaking in so remote a section of the country. There were predictions of a long, cold winter. How did we expect to keep warm in the 20-below-zero weather

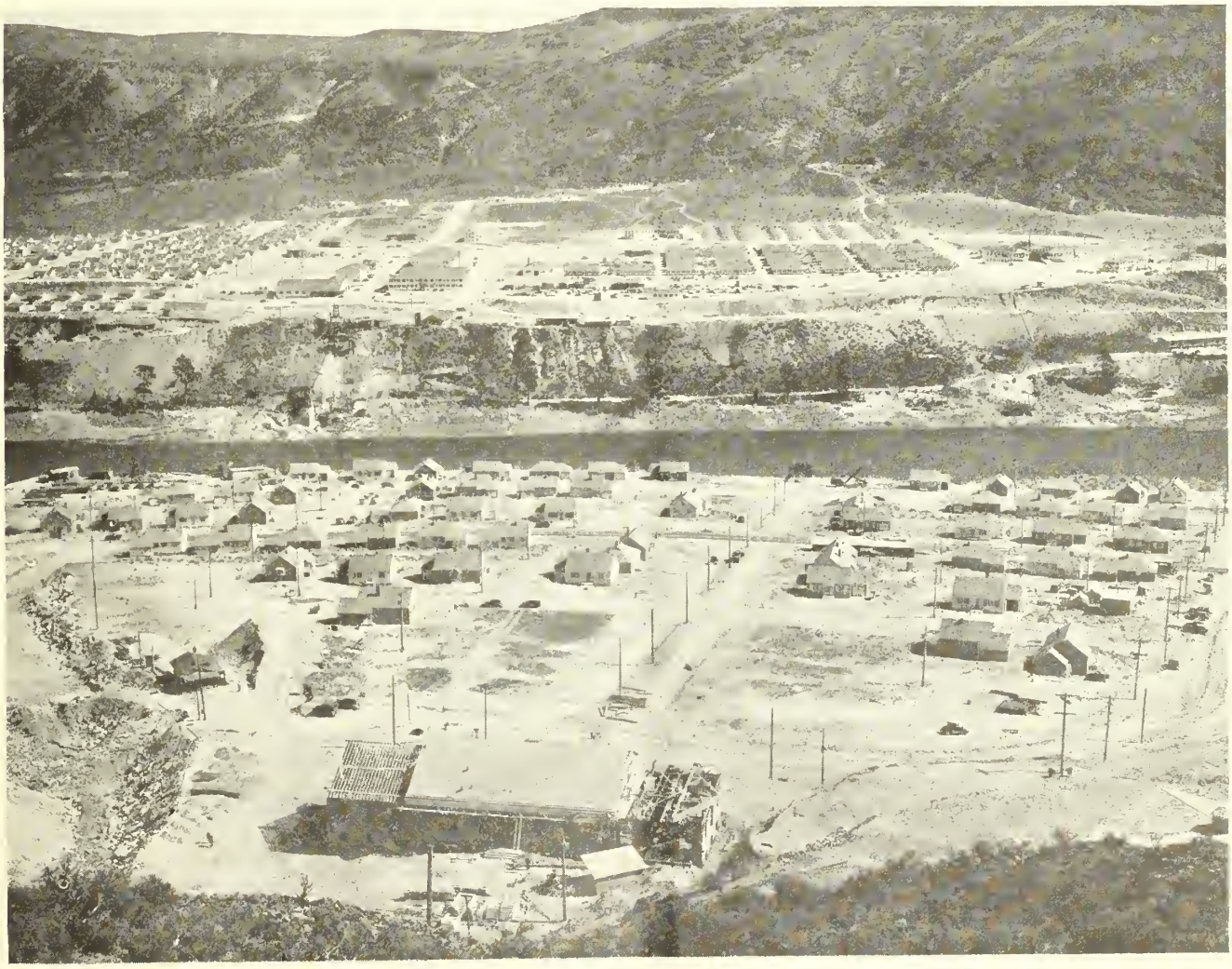
[1] Mrs. Francis Donaldson is the wife of the chief engineer of the Mason-Walsh-Atkinson-Kier Co., contractors for construction of the Grand Coulee Dam.

that was expected? All this talk about electric heating! Who knew that it would work? Only Juan Hargrove, the architect responsible for the electric heating, cheered us by his assurance. The houses we saw being built in sections in Spokane and carried out on trucks were to be assembled without chimneys or cellars, without plaster or insulation, stuck up on concrete blocks and banked with earth. No hope of other heating than electricity! Would there ever be enough power available for all the needs of a town in zero weather? My own heart failed when my husband pointed out the three slender wires bringing, from 30 miles away over the mountains and in one long span across the river, the wonderful "juice" that was to work the miracle!

It was the last of November before there was enough current for domestic use, and the first houses to be ready—the little three-room cottages were in great demand. I drove out through the first blinding blizzard of the winter, the last 20 miles entirely in second gear, unable to see beyond the hood of the car or steer straight on the icy road. Arriving cold and hungry, I found that everybody had forgotten to "connect up" the just completed house assigned to me, which I had planned to get in order as a surprise for my husband who had gone East on a business trip. The three rooms were piled to the ceiling with crated furniture from the second-hand stores of Spokane. It was icy cold and damp; there was no kitchen range, heat, or water. In less than an hour all these important details had been supplied by a simple process of "hooking up", the house was marvelously warm and dry, dinner was cooking on the excellent electric range—rented from the company at $2.50 a month—and I had become one of the most enthusiastic converts to electric heating. We spent December and January in this small workman's cottage, and except for space—there were three of us—we could not have been more comfortable anywhere.

At the end of January, during the coldest week of the winter, we moved into our five-room bungalow on the exposed hill-top overlooking the town, and from our well-heated living room incredulously watched the thermometer on the front porch descend to 12 below zero. In these larger houses we are trying out different kinds of insulating materials between the siding and insulation board, and are finding that these greatly reduce the amount of electricity required. The heating units in general use are of different sizes and power according to the size of the rooms. They "plug in" and turn on and off as simply as electric lamps. They are equipped with fans which keep the heated air circulating and the whole room an even temperature. They heat the house very rapidly and are now being built with thermostats so that they will operate automatically at a given temperature. They require no special care and have safety devices, making it possible to leave them turned on in a closed or empty house. It is expected that the fan device will keep the houses comfortable during the hot summer months.

(Continued on page 125)



Columbia Basin Project—Government Camp, and part of Mason City on the far bank

Social Phase of the Shoshone Irrigation District

By Marie Boise, District Stenographer, Powell, Wyo.

Powell is truly a friendly city. A community spirit seems to prevail which gives the Shoshone project a homelike atmosphere unexcelled elsewhere. As has been its custom heretofore, the Garland Club entertained the Powell faculty and school board during the past season. The club also held innumerable dances and rendered community programs. Each of the other communities has had its social gatherings and has met frequently with the county home-demonstration agent.

The Library Club has sponsored the construction of a new library building, which will be strictly modern and of Spanish style. Federal money aided in this work. Three small schoolhouses were placed together and remodeled into one building. The new schoolhouse and gymnasium was dedicated early in March. Powell now has one of the finest school buildings in the State. For the first time in 8 years the town participated in the annual Big Horn Basin basketball tournament. The high school has an organized, uniformed pep squad consisting of about 30 girls, who also took part in the tournament, presenting a formation.

The band, under the direction of Alfred Samuelson, again broadcast over station KGHL, Billings, and presented its concert to the public in the new auditorium the latter part of March. The other schools of the Basin were invited to a spring concert early in May. Cody, Lovell, Byron, Greybull, Basin, Worland, Thermopolis, and Riverton participated.

The new Baptist church, which is a fine looking brick building, has been completed and is now ready for occupancy.

The local Masonic lodge celebrated its 25th anniversary in the Masonic hall on February 15, when a large delegation of Masons from all parts of the Big Horn Basin were present and assisted in the celebration.

Many other fraternal organizations, such as the Modern Woodmen, the Order of De Molay, Royal Neighbors, and the Eastern Star hold regular meetings in Powell.

One of the old school buildings has been moved from Garland to one of the small parks across from the Legion hall and will be used for a home for the Boy Scouts. It will be covered with native slabs so that it may harmonize with the Legion building and other surroundings. The Legion hall, which was completed a year ago, has been the scene of many delightful community gatherings. The Legion holds regular dances; various community meetings have been held there; and before the completion of the new schoolhouse the junior-senior prom and several other school parties were put on at this hall.

Gruss En Triplitz rose bush grown by E. C. Dennis, Yuma, Arizona, an employee on the All-American Conal project.

Notes for Contractors

(Continued from page 119)

All-American Canal, Calif.—Fifteen contractors submitted bids on 11,261,000 cubic yards of common excavation (Specifications No. 621) at the opening of bids at Yuma on April 26. The Lewis-Chambers Construction Co., New Orleans, La., was the low on schedules 1, 2, and 3 with the following bids: Schedule one, 2,707,000 cubic yards, $175,684.30; schedule two, 2,564,000 cubic yards, $166,403.60; schedule three, 2,518,000 cubic yards, $163,418.20. The unit price on all three schedules was $0.0649 per cubic yard. Other bids ranged up to $0.13. Mittry Bros. Construction Co., Los Angeles, Calif., bid $0.075 per cubic yard, or $260,400 on schedule four, including 3,472,000 cubic yards of common excavation. The high bid on this schedule was $0.105. Award of contracts to the two low bidders was approved by the Secretary on May 24. Other contractors bidding were the following: J. H. Boyce Sons Co. and Roy L. Igo, Baton Rouge, La.; Interior Construction Co., San Francisco, Calif.; W. E. Callahan Construction Co., St. Louis, Mo., and Gunther and Shirley, Dallas, Tex; A. Guthrie & Co. Inc., St. Paul Minn., with Mark C. Walker & Son Co., Omaha, Nebr.; J. A. Terteling & Sons, Boise, Idaho; W. S. Hardwick Construction Co., Memphis, Tenn.; Foley Bros. Inc., St. Paul, Minn.; Broderick Bros., Villisca, Iowa; George Pollock Co., Sacramento, Calif.; S. S. Magoffin Co., Inc., Adrian, Oreg.; V. R. Dennis Construction Co., San Diego, Calif.; David H. Ryan, San Diego, Calif.; Hallett Construction Co., Crosby, Minn. The second low bid was that of J. H. Boyce Sons & Roy L. Igo, Baton Rouge, La., in the sum of $770,932.80.

Columbia Basin project, Washington.—Bids were opened at Coulee Dam on May 25 (Specifications No. 624) for constructing a garage and fire station in the Government town. This was a readvertisement of No. 613, bids opened March 24, which were rejected.

Casper-Alcova project, Wyoming.—Specifications No. 590, Alcova diversion dam, and Specifications No. 630, Seminoe dam and power plant, are ready for bidding. Both dam sites are on the North Platte River, the Alcova near the town of Alcova and the Seminoe site is about 33 miles northeast of Rawlins.

This year's grapefruit crop on the Yuma auxiliary project is estimated at a total of 475,000 field boxes. Apparently more fruit is developing on the trees than was the case last year.

Progress of Investigations of P. W. A. Projects

Silt survey, Colorado River, Ariz.-Calif.—Work in connection with silt surveys on the Colorado River was continued. One field party was engaged on cross-section surveys on the Colorado River between Parker and Imperial damsites. Three cross-sections at intervals of about 5 miles, were completed and permanent monuments set on both sides of the river at each section. The locations of the permanent monuments and elevations with respect to section corners were determined.

Northern transmountain diversion investigations, Colorado.—Investigation of a transmountain diversion from the Colorado River watershed near Grand Lake to the South Platte watershed near Fort Collins was continued. A base map on a scale of 2 inches to the mile was prepared for the area to be studied, upon which was shown all available data. Dam and reservoir sites were examined on Gore Creek, a tributary of Eagle River, and Crystal River, a tributary of Roaring Fork River. A gaging station was started on Willow Creek 7 miles northwest of Granby, Colo. Maps of the irrigated areas under the Cache La Poudre River, Big Thompson and St. Vrain Creeks are in preparation.

Upper Snake River storage, Idaho.—On the South Fork drilling at the Grand Valley damsite was completed during the month. Three drill holes were completed to depths of 104 feet, 67 feet, and 62 feet, respectively. The material encountered being generally river fill to a depth of about 20 feet, followed by the bedrock, which is composed of a compacted silt, clay, sand, and gravel series. A geological report was completed for the Grand Valley damsite. A preliminary geological examination was made, and a report prepared on a damsite located on Snake River below the mouth of Burns Creek. Operation of the four river stations between Irwin and Heise were commenced during the month. Observations were also made of stage and discharge of the surface tributaries, to help define the losses and gains in various sections of Snake River. Observations were also made of the various wells in Swan Valley to aid in determination of the amount of stream flow used in building up the ground storage in that valley. Preliminary designs and estimates were practically completed for dams at the Johnny Counts and the Grand Valley damsites. A draft of report on these investigations is now being prepared.

American Falls enlargement, Idaho.—Various Snake River interests have in the past suggested the possibility of creating holdover storage by enlargement of the existing American Falls reservoir. In order to obtain data on this proposal, preliminary designs and estimates are being prepared on the cost of raising the present American Falls Dam by 20 feet. Study was also given to the possible additional losses that would occur as a result of raising the American Falls Dam.

Buffalo Rapids project, Montana.—Data have been assembled in the field office relative to geological conditions at the site of the proposed diversion dam on the Yellowstone River. Test pits were excavated on the abutments at both ends of the diversion site to ascertain foundation conditions. Field investigations to outline the irrigable area of the project are in progress. Work was continued on the preparation of preliminary cost estimates for the various alternative canal systems. Water right filings for the proposed Buffalo Rapids project were made by the Mid-Yellowstone Recovery Association.

North Platte Valley, Nebr.—The engineer in charge has been engaged throughout the month in reviewing reports on present and contemplated future irrigation projects along the Platte River in Nebraska and in making an inspection of the Platte River Valley. Conferences were held with representatives of various irrigation interests and plans formulated for the execution of the requisite field work.

Deschutes project, Oregon.—Preliminary plans and estimates were completed for dams at the Crane Prairie, Wikiup, Davis Lake, Crescent Creek, Black Rock, and Big Marsh reservoirs. Water-supply studies were completed. A draft of report on these investigations has been completed.

Grande Ronde, Oregon.—Drilling in the Grande Ronde River Valley continued throughout the month. Damsite "E" is located on Meadow Creek, a short distance above its confluence with the Grande Ronde River. Hole no. 1, in about the center of the canyon, is 65.4 feet deep and revealed strata of lava, with a thin layer of clay 0.83 feet thick located about 18 feet below the top lava stratum. At 34.5 feet the hole took 90 gallons per minute of water under 25-pound pressure. Hole no. 2 is located about 140 feet from the creek on the south hillside and is 165 feet deep. It revealed strata of lava of various colors and textures with clay seams at intervals. The water table stood at 20 feet from the top but the hole was tight to the bottom under 100-pound pressure.

(Continued on page 128)

Pioneering in Electricity

(Continued from page 123)

Because of the low rate for current charged us by the MWAK Co., we women have become electrically minded, and use freely all the wonderful appliances on the market—water heaters (furnished in all the houses), refrigerators, washing machines, vacuum cleaners, coffee percolators, waffle irons, and toasters. All the more difficult problems of housekeeping are thus solved for us. Camp life in the wilds offers us none of the usual hardships. We have time and leisure to appreciate and enjoy our privilege in watching the miracle of the slender wires under man's competent control and management transform, almost between two seasons, a wilderness into a complete and attractive city. We have strength left over from our daily tasks to help with the big achievement, to interest ourselves in the school with its fine new building soon to be started, in organizing the several churches to be built shortly, to visit the sick in the hospital, the recreation hall, the movies and the library. Yes, we really have time for books and study. Some of us are poring over garden catalogs and botanies, preparing ourselves for gardening intelligently in unfamiliar soil and climate, and for familiarity with the particularly beautiful wild flowers of the region. For, already, spring is throwing her veil of tender green over the bare hills and shadowy canyons, and we are joyfully discovering why our Indian neighbors in the valley call this blustery month of March, "the Month of Blossoming Buttercups."

If, as we hope, our Government will be able, by harnessing these great waterways of our country, to develop electric power to the point of practical everyday use by all the people, as we are using it here, there will be a new era of emancipation, a veritable New Deal for women. The machine age will not have deprived us of our jobs, but releasing them from drudgery will set our spirits free for greater and more inspiring accomplishment. We women of Mason City will then be proud indeed to have had our small share in the building of the Grand Coulee Dam, which is to pioneer in electricity.

Interior Department Appropriation Act, Fiscal Year 1936

[Extracts from] An Act making appropriations for the Department of the Interior for the fiscal year ending June 30, 1936, and for other purposes (Act of May 9, 1935, Public No. 53, 74th Cong.).

That the following sums are appropriated, out of any money in the Treasury not otherwise appropriated, for the Department of the Interior for the fiscal year ending June 30, 1936, namely:

* * * * *

BUREAU OF RECLAMATION

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 (U. S. C., title 43, secs. 391, 411), and therein designated "the reclamation fund", to be available immediately:

Salaries: For the Commissioner of Reclamation and other personal services in the District of Columbia, $96,500; for office expenses in the District of Columbia, $15,000; in all $111,500;

Administrative provisions and limitations: For all expenditures authorized by the Act of June 17, 1902, 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 $100,000 for personal services and $15,000 for other expenses in the office of the chief engineer, $20,000 for telegraph, telephone, and other communication service, $5,000 for photographing and making photographic prints, $41,250 for personal services, and $7,500 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 $18,000 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 vehicles; not to exceed $20,000 for purchase and exchange 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 installed in private houses when authorized under regulations established by the Secretary of the Interior; not to exceed $1,000 for expenses, except membership fees, of attendance, when authorized by the Secretary, upon meetings of technical and professional societies required in connection with official work of the Bureau; payment of rewards, when specifically authorized by the Secretary of the Interior, for information leading to the apprehension and conviction of persons found guilty of the theft, damage, or destruction of public property: *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 public relations: *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, the unexpended balance of the appropriation for this purpose for the fiscal year 1935 is continued available for the same purpose for the fiscal year 1936;

Operation and maintenance of reserved works: 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 1935 is continued available for the same purpose for the fiscal year 1936;

Yuma project, Arizona-California: For operation and maintenance, Reservation division, $45,000; Mesa division (Yuma auxiliary project), $25,000; in all, $70,000: *Provided*, That not to exceed $25,000 from the power revenues shall be available during the fiscal year 1936 for the operation and maintenance of the commercial system: *Provided further*, That notwithstanding the provisions of section 4 (a) and (b) of the Act of June 26, 1934 (48 Stat., p. 1224), hereafter all moneys re-

ceived under the provisions of the Act of January 25, 1917 (39 Stat., p. 868), as amended, shall be paid into the Treasury of the United States and be covered into the reclamation fund, special fund, and any unexpended balance in the auxiliary reclamation fund of the Yuma project shall be transferred to and consolidated with the general reclamation fund;

Orland project, California: For operation and maintenance, $36,000;

Boise project, Idaho: For operation and maintenance, $30,000;

Minidoka project, Idaho: For operation and maintenance, reserved works, $11,600: *Provided*, That not to exceed $50,000 from the power revenues shall be available during the fiscal year 1936 for the operation of the commercial system; and not to exceed $100,000 from power revenues shall be available during the fiscal year 1936 for continuation of construction, south side division;

North Platte project, Nebraska-Wyoming: Not to exceed $60,000 from the power revenues shall be available during the fiscal year 1936 for the operation and maintenance of the commercial system; and not to exceed $6,000 from power revenues allocated to the Northport irrigation district under subsection I, section 4, of the Act of December 5, 1924 (U. S. C., title 43, sec. 501), shall be available during the fiscal year 1936 for payment on behalf of the Northport irrigation district to the Farmers' irrigation district for carriage of water;

Rio Grande project, New Mexico-Texas: For operation and maintenance, $340,000;

Owyhee project, Oregon: For operation and maintenance, $50,000;

Klamath project, Oregon-California: For operation and maintenance, $50,000: *Provided*, That revenues received from the lease of marginal lands, Tule Lake division, shall be available for refunds to the lessees in such cases where it becomes necessary to make refunds because of flooding or other reasons within the terms of such leases;

Yakima project, Washington: For operation and maintenance, $265,000: *Provided*, That not to exceed $25,000 from power revenues shall be available during the fiscal year 1936 for operation and maintenance of the power system;

Riverton project, Wyoming: For operation and maintenance, $25,000: *Provided*, That not to exceed $25,000 from the power revenues shall be available during the fiscal year 1936 for the operation and maintenance of the commercial system;

Shoshone project, Wyoming: For operation and maintenance, Willwood division, $13,000: *Provided*, That not to exceed $25,000 from power revenues shall be available during the fiscal year 1936 for the operation and maintenance of the commercial system;

Secondary and economic investigations: For cooperative and general investigations, including investigations necessary to determine the economic conditions and financial feasibility of projects and 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, the unexpended balance of the appropriation for these purposes for the fiscal year 1935 shall remain available for the same purposes for the fiscal year 1936: *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: *Provided further*, That the expenditure of any sums from this appropriation for investigations of any nature requested by States, municipalities, or other interests shall be upon the basis of the State, municipality, or other interest advancing at least 50 per centum of the estimated cost of such investigation;

Giving information to settlers: For the purpose of giving information and advice to settlers on reclamation projects in the selection of lands, equipment, and livestock, the preparation of land for irrigation, the selection of crops, methods of irrigation and agricultural practice, and general farm management, the cost of which shall be charged to the general reclamation fund and shall not be charged as a part of the construction or operation and maintenance cost payable by the water users under the projects; $20,000, together with the unexpended balance of the appropriation for this purpose for the fiscal year 1935;

Limitation of expenditures: 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 1936, 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 1936 exceed the whole amount in the "reclamation fund" for the fiscal year;

Interchange of appropriations: 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

(Continued on page 131)

Statement of funds made available for the fiscal year 1936 under the Interior Department Appropriation Act approved May 9, 1935, together with estimate of unexpended balances and funds to be advanced for operation and maintenance

Projects	Direct appropriations	Estimated unexpended balance reappropriated	Power revenues	Estimated funds to be advanced	Estimated total available
Washington office	$111,500				$111,500
Examination and inspection of projects		$20,000			20,000
Operation and maintenance of reserved works		55,000			55,000
Yuma, Ariz	45,000		$25,000	$125,000	195,000
Yuma Auxiliary, Ariz	25,000				25,000
Orland, Calif	36,000				36,000
Grand Valley, Colo				42,000	42,000
Boise, Idaho	30,000			14,000	44,000
Minidoka, Idaho	11,600		150,000	63,400	225,000
Milk River, Mont				39,600	39,600
North Platte, Wyo			66,000	30,000	96,000
Carlsbad, N. Mex				45,000	45,000
Rio Grande, Tex	340,000				340,000
Owyhee, Oreg	50,000				50,000
Umatilla, Oreg				$4,000	$4,000
Vale, Oreg				15,000	15,000
Klamath, Oreg	$50,000	(1) $9,000		63,000	122,000
Belle Fourche, S. Dak				67,500	67,500
Yakima, Wash	265,000		$25,000		290,000
Riverton, Wyo	25,000		25,000		50,000
Shoshone, Wyo	13,000		25,000	2,000	40,000
Secondary		40,000			40,000
Giving information to settlers	20,000	20,000			40,000
Subtotals	1,022,100	144,000	316,000	510,500	1,992,600
Colorado River front work and levee system	50,000	10,000			60,000
Total	1,072,100	154,000	316,000	510,500	2,052,600

NOTE.—(1) Estimate of $9,000 from leases of land revenues available for refund.

Transient Relief Camps on the Newlands Project, Nevada

By W. H. Wallace, Project Manager, Fallon, Nev.

Through efforts of the drought relief committee of the board of directors of the Truckee-Carson irrigation district and with the cooperation of the Nevada Federal Emergency Relief Administration, there have been established two transient relief camps on the Truckee Canal of the Newlands project.

The first camp was established on October 22, 1934, at a site about half-way between the towns of Fernley and Hazen on what is known as the Jensen ranch, where a good supply of pure water was available. The second camp was established on December 15, 1934, near the old Derby town site.

The Jensen camp contains 19 sleeping tents and 1 store tent, all supplied by the transient relief service, and a frame kitchen and dining room constructed by the district. There are at the present time 91 men in this camp.

The Derby camp comprises 13 sleeping tents and 1 store tent, housing 66 men. The kitchen and dining room at this camp were also supplied by the district.

The district has attempted to fully cooperate with the F. E. R. A. in this work, and in addition to furnishing the kitchen and dining-room buildings it has supplied all tools and also four trucks for the transportation of the men between the camps and the job as well as for use in outside trips for supplies. In addition to this the district has furnished electricity to the Jensen camp which is located near one of the district's electrical distribution lines.

The work accomplished by these men has been of great value to the district. A heavy growth of willows, brush, and trees had established itself in the canal just above the low-water level and was so dense that when there was any flow above 200 cubic feet per second the growth was in the water and greatly obstructed the flow.

The men from the two camps have been engaged in cutting and grubbing out willows, trees, and old stumps on the inner slopes of the canal. The growth has been cut from 32 miles of canal bank, on 10 miles the roots have been grubbed out, and hundreds of cottonwood trees ranging from 3 feet to 30 inches in diameter have been cut down and the stumps grubbed out.

The value of this work has been recently realized when it was possible to divert into the canal large amounts of water. On one date when the gage reading was 10, indicating a flow of 666 cubic feet per second, current-meter measurements showed a flow of 720 cubic feet per second, an increase of 54 feet per second. It is estimated that this cleaning work will permit the carrying of 900 cubic feet per second without raising the water above the previous high-water line at which the capacity was then 750 cubic feet per second. The benefit from this increased capacity will be of great value this season and in the years to come.

1. Truckee Canal before cleaning, carrying 80 c.f.s.
2. Cleaned section of canal, carrying 775 c.f.s.
3. Jensen camp of the Transient Relief Service

Progress of Investigations of P. W. A. Projects

(Continued from page 125)

North Platte River power, Wyoming.—A study was made of Seminoe Reservoir operation with the recorded stream flow during the recent drought period with the reservoir full as of July 1, 1933. The plant was assumed to be operated both independently and in conjunction with dump power from the Guernsey plant, which would thereby be converted into firm power.

Umatilla River flood control, Oregon.—Preliminary designs and estimates were prepared in the Denver office for the Ryan Creek dam site on the Umatilla River and for a canal line to serve the irrigable area near Pendleton. The draft of report on these investigations was completed during the month and is now being reviewed by the chief engineer.

Colorado River Basin.—Investigations under section 15 of the Boulder Canyon Project Act were continued. Land classification and irrigable area surveys were carried forward in the vicinity of Grand Junction, Colo., throughout the month. Irrigable area and land classification surveys were completed above Grand Valley High Line Canal, 36 square miles; irrigated area survey, Plateau Valley, 20 square miles; irrigated area survey along Colorado River near DeBeque, 4 square miles. Land classification and irrigable area surveys in the southern part of Nevada were commenced. Arrangements were made to complete the reports on land classification within the San Juan Basin. Work was continued on maps of the classified areas and of the reservoir sites, and on the preparation of capacity tables for proposed reservoirs in the Green River Basin, Utah.

C. C. C. Camps Assigned to Bureau of Reclamation

UNDER the expanded C. C. C. program approved by the President, a total of 46 camps will be assigned to Bureau of Reclamation projects, as announced by Robert Fechner, director of Emergency Conservation Work. These projects, located in 14 States will employ approximately 9,200 enrollees. Thirty-seven of the forty-six will be new camps provided under the expanded program.

The work to be done on these Bureau of Reclamation projects will be typical of the activities which are incidental to irrigation projects in arid sections of the West. Some of the more important work features to be included in the program are as follows: General cleaning and maintenance of irrigation distribution and drainage systems; removal of trees and vegetation from ditches and rights-of-way; concrete lining of canals and laterals; construction of levees and embankments; clearing timber from reservoir sites; clearing and improvement of river channels for protection against flood damages; repair, improvement and construction of dams for small storage reservoirs; construction and improvement of operating and supply roads; erosion control around reservoirs to prevent silting and depletion of storage capacities; repair and replacement of pipe lines and conduits; planting and care of trees for wind-breaks; landscaping and improvement for camp grounds; and development of recreational areas around reservoirs: rodent control for protection of canals and farm property and control of noxious and poisonous weeds or plants.

Locations of the new expanded camps will be as follows:

Arizona (5).—Yuma, Yuma County; Two in Mohave County, post office, Earp, Calif.; Topock, Mohave County; Tempe, Maricopa County.

California (2).—Tulelake, Siskiyou County; Truckee, Sierra County.

Colorado (2).—Grand Junction, Mesa County; Montrose, Montrose County.

Idaho (5).—Huston, Canyon County; Cascade, Valley County; Boise, % Cumtux State, Boise County; Minidoka, Minidoka County; Island Park, Fremont County.

Montana (3).—Sidney, Richland County; Babb, Glacier County; Teton, Fairfield County.

Nebraska (1).—Mitchell, Sioux County.

Nevada (4).—Fallon, Churchill County; Lovelock, Pershing County; Reno, Washoe County; Yerington, Lyon County.

New Mexico (2).—Las Cruces, Dona Ana County; Engle, Sierra County.

Oregon (5).—Merrill, Klamath County; Ontario, Malheur County; Nyssa, Malheur County; Vale, Malheur County; Stanfield, Umatilla County.

Utah (3).—Ephraim, Sanpete County; Altonah, Duchesne County; Provo, Wasatch County.

Washington (3).—Osborne, Grant County; Goose Prairie, Yakima County; Easton, Kittitas and Yakima Counties.

Wyoming (2).—Denver, Big Horn County; Riverton, Fremont County.

Foresees Big Population for Sun River Project

Project Manager A. W. Walker, addressing the directors of the Great Falls Chamber of Commerce at a luncheon at the Hotel Rainbow on a recent date, expressed the belief that there will be such a development of the Sun River project that the area will have a permanent population of 5,000. He said that including the Fort Shaw unit, there are now about 1,600 residents on the irrigated tracts, and that with contracts let for the improvement of more than 8,000 acres and contracts for an additional 12,000 expected to be awarded soon, about 1,500 more people can be cared for in the immediate future with more settlers coming as development progresses. Then, he added, if the Sun River slope area west of Fairfield is developed, the project should care for upwards of 5,000 persons.

At present the tracts under ditch total about 46,000 acres and the acreage under contract for improvement or to be placed under contract for improvement, soon will bring the total to about 65,000 acres, all of which should be available before the end of the year.

Another speaker at the luncheon, according to the Tribune's account, was S. B. Robbins, of Simms, known as the "father" of the project and he told of the prediction he made many years ago that the Sun River project would prove a greater asset to Great Falls than the smelter and he declared to the directors of the chamber that this prediction is coming to be a recognized fact on the basis of the number of people supported there and the value of the products they raise. He said the farmers there have demonstrated that they do not need to ask for outright gifts of money but that they can and are paying back the money advanced by the Government. Mr. Robbins said the people on the Fort Shaw division have already paid about 50 percent of the cost and will continue to make payments until the entire obligation is retired.

As an indication of the financial status of the residents, Mr. Robbins said that tax delinquencies on the Fort Shaw division last year were slightly in excess of 1 percent as compared with about 13 percent for the rest of the county.—*Fairfield (Mont.) Times.*

Tenancy of Federal Reclamation Projects

(Continued from page 114)

"While the percentage in change of tenancy varies little from year to year, the actual number of farms operated by owners has increased 113, while the increase in tenants is only 43. This increase in ownership comes about principally through the subdivision of the larger holdings and the sale of the smaller units to farmers from submarginal dry lands of the vicinity."

"Changes in percent of tenants are due chiefly to foreclosures on farms by banks and the banks placing tenants on the farms."

"The better class of farms on the project are operated by owners or directly managed by them. The poorer farms are generally operated by tenants."

"It is believed that the increase in tenancy shown in 1930–31 is due to shortage of work in the lumber mills and the tendency of families to rent a small tract of irrigated land and move onto it. The high percentage shown in 1933 is probably due to tax foreclosures on farms that were subsequently rented by the new owners."

"The increase in tenancy between the years 1925 to 1928 is due principally to establishment of a sugar factory which attracted beet growers to this project from other irrigated sections where land rentals were less favorable. The additional increase, 1929 to 1933, is due to retirement of land owners on account of unprofitable farming and leasing of such farms to new tenants."

"The slump in farm prices rendered mortgages very hard of repayment with the result that the land reverted to the mortgagee. Many of the original mortgagors are still working the land under a crop-rental plan with the hope of ultimate purchase when times get better."

"Ownership of project lands by nonresidents is the chief cause of tenancy on this project."

Umatilla Cooperative Creamery

By C. L. Tice, Reservoir Superintendent, Pendleton, Oreg.

Cooperative associations have been quite successful around the Hermiston district, and one of the outstanding ones is the Umatilla Cooperative Creamery, started in July 1931 at about the very bottom of the depression, but has paid for itself from the start and has earned a profit. It has raised the standard for cream and butter throughout the entire district, which extends for a radius of about 25 miles. Hermiston cream formerly had a questionable reputation, but through the efforts of the creamery the previous poundage of 92 score butter was doubled in 1933, and in 1934 it nearly doubled that of 1933, with a poundage of 490,000.

Organization work was carried on during the spring of 1931. Charter members signed stock subscription agreements which were used as collateral to obtain a loan from the local bank. The sum borrowed, $3,500, was repaid through deductions from the cream checks at the rate of 25 cents per cow per share, payable each month. Business and equipment of the Hermiston Creamery was purchased, and the Umatilla Cooperative Creamery started operations in July of the same year.

As the old creamery equipment was out of date and soon became inadequate to handle the increased volume of butterfat, it was gradually replaced with new modern machinery, and a butter cutter and cream tester are the only remains of the old equipment.

COLD-STORAGE PLANT OPENED

In the fall of 1933 the farmers decided that a cold-storage plant was needed, and as the creamery had the extra space and also needed new refrigeration, it was decided that this was the logical place for cold-storage lockers and equipment. Financial assistance was provided by the Farm Bureau Cooperative and the Umatilla Project Farm Bureau. Construction was started early in 1934 and completed in May. The plant was opened to the farmers on May 23, and the lockers rented rapidly.

The adjoining brick building, which was built and used for a bank in earlier days until a change in the highway left it too far away, was purchased and converted into the cold-storage plant, the largest rural one in this part of Oregon. Four hundred lockers were built for meat and food storage, and two large precooling rooms were also put in. The lockers were rented to members and other ranchers at a yearly charge of 60 cents per cubic foot per year. As most of them are of 10 cubic foot capacity, that charge amounts to but $6 a year. Approximately 150,000 pounds of meat have gone through the lockers during the first 9 months of operation. This consumption of farm-killed meats has not affected materially the local butchers. Most people on the farms were unable to use much of the fresh meat before the lockers were put into use, and much of the pork, veal, and some beef were shipped. At the present time, 350 lockers have been fully paid for in advance. Not one renter is displeased with the locker service, and rent collections are no trouble even though farm incomes are low. Both locker rooms and creamery are a revelation in cleanliness, all machinery is direct driven by individual motors, which are covered and painted with white enamel to harmonize with the entire interior.

A novel delivery service was inaugurated last year. Each of the cream trucks has an insulated box, and the locker holder, by notifying the driver in advance, may obtain whatever article is desired from the patron's cold-storage locker, and deliver it when he collects the cream. This makes it possible to obtain fresh meat, still frozen, three times each week. The charge is but 5 cents for each delivery, which amount goes to the driver for his trouble in making the pick-up and delivery. This means that any rancher may have fresh meat at any and all times, with no danger of waste from spoilage, even in the hottest summer. It is not known that there has been a single case of spoilage of meat after being removed from the lockers in a still frozen state. The quality of the meat after storage is determined by the quality of that put into the lockers, there being practically no change, other than a slight loss of moisture, after several months. One woman on the project estimates that she saved more than the yearly cost of her locker during one harvest time.

To further this advantage, the lobbies of the precooling rooms are equipped with butcher blocks and power-driven grinders. A butcher is available who will cut the meat up in any desired manner, charging but one-half cent per pound. For an additional quarter cent, he will wrap in paper, label, and tie the various cuts.

Another feature gained by the use of the lockers, not generally known, is that by cleaning and hulling berries before putting in the boxes, and sprinkling with sugar, it is possible to have strawberry shortcake, or fresh strawberries, at any time of the year.

In building the old bank into the cold-storage plant, everything was salvaged. Brick from the old vault was used to close the old door and window openings, and the vault door went onto a smaller vault built in the creamery for storage of records. The creamery department is practically clear of indebtedness, and the cold-storage department is paying out in a very satisfactory manner. The investment in buildings, real estate, machinery, and equipment amounts to $18,950, but the improvement in living conditions brought about cannot be measured in any such manner.

Much credit and many thanks are due M. G. Hedwall, the secretary and treasurer, and also manager, for his assistance in obtaining these data.

Recent Publications of Interest

Averill, Walter A.: World's largest cellular cofferdam, illus., Pacific Builder and Engineer, May 4, 1935, vol. 41 no. 18, pp. 24–31. Editorial p. 23, Achievement at Coulee.

Lane, E. W.: Determining designs of dam spillways through use of hydraulic models, illus., Western Construction News, April 1935, vol. 10 no. 4, pp. 96–99.

Lewis, A. D.: Report of the Director of Irrigation, Union of South Africa, for the period April 1, 1933 to March 31, 1934, 29 pages.

McCord, C. G.: The use of X-rays in detecting defects in welding and riveting, illus., Western Construction News, April 1935, vol. 10 no. 4, pp. 98–101.

Power Commission: Interim Report, Power Series No. 1, National Power Survey, Federal Power Commission, 1935, 58 pages with numerous maps, cuts, charts, and illustrations (4 one-page maps, 5 folding maps, 4 cuts, 7 charts, 2 illus., and 18 tables). For sale Superintendent of Documents, Government Printing Office, 75 cents.

Scattergood, E. F.: Engineering Features of the Boulder Dam, Los Angeles Lines, illus. and charts, Electrical Engineering, May 1935, vol. 54 no. 5, pp. 494–512.

Throckmorton, R. I.: Dust Storms: Their cause and suggested remedies, illus. Eng. News-Record, May 9, 1935, vol. 114, pp. 669–671.

Young, Walker R.: Significance of Boulder Canyon project, illus., Civil Engineering, May 1935, vol. 5, no. 5, pp. 279–283.

Rights-of-Way for Reclamation Ditches or Canals

(Continued from page 120)

authority', and that reservation is based on a direction in the act of August 30, 1890, c. 837, 26 Stat. 391, that there be expressed in all patents issued under the public land laws for lands west of the one hundredth meridian a reservation of rights of way 'for ditches or canals constructed by the authority of the United States.' Because the patents say 'constructed or to be constructed' when the statute only says 'constructed', it is contended that the reservation is broader than the direction, and is to that extent void. But we think the contention ascribes to the direction a narrower scope than Congress intended it should have. The officers of the land department, as the patents show, regard it as comprehending all canals and ditches constructed under the direct authority of the United States, whether the construction precedes or follows the issue of the patent. That the words of the direction admit of this interpretation is plain, and that it accords with the legislative purpose is demonstrable. When the direction was given the United States had no canals or ditches on the public lands west of the one-hundredth meridian, either constructed or in process of construction. As yet it had not become engaged in the reclamation of its arid public lands in that region. But it was actively conducting investigations and collecting data with a view to developing and formulating a feasible plan for taking up and prosecuting that work. At an early stage of the investigations Congress became solicitous lest continued disposal of lands in that region under the land laws might render it difficult and costly to obtain necessary rights-of-way for canals and ditches when the work was undertaken. To avoid such embarrassment Congress at first withdrew great bodies of the lands from disposal under the land laws. (Act of Oct. 2, 1888, c. 1069, 25 Stat., 526; 19 Ops. Atty. Gen. 564; 9 L. D. 282; 11 L. D. 296.) That action proved unsatisfactory, and, by the act of August 30, 1890, Congress repealed the withdrawal, restored the lands to disposal under the land laws, and gave the direction that in all patents there should be a reservation of rights of way, etc. Of course the direction must be interpreted in the light of the circumstances which prompted it, and when this is done the conclusion is unavoidable that the direction is intended to include canals and ditches constructed after patent issues quite as much as those constructed before. All courts in which the question has arisen have taken this view. *Green* v. *Wilhite*, 160 Fed. 755; *United States* v. *Van Horn*, 197 Fed. 611; *Green* v. *Wilhite*, 14 Idaho, 238.–93 Pac. 971."

At the very outset the Department took the position that the United States in exercising the right to use such portion of the tract entered as is necessary is not liable for damages resulting to the land "because it did that which it had a right to do" (*Jackson* v. *United States*, 230 U. S. 1–22). The Department has held, however, that compensation *may* be paid for the actual loss of improvements but that no allowance can be made for the resultant damages to land (47 L. D. 158). See also 53 L. D. 399.

The following is a reference to printed land decisions construing or citing the act of August 30, 1890: 32 L. D. 147, 33 L. D. 607–608, 36 L. D. 482, 38 L. D. 629, 40 L. D. 28 (see also p. 656), 41 L. D. 31, 42 L. D. 408–410, 44 L. D. 22–24, 46 L. D. 407.

Interior Department Appropriation Act, Fiscal Year 1936

(Continued from page 127)

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;

Total, from reclamation fund, $1,022,100.

To defray the cost of operating and maintaining the Colorado River front work and levee system ajdacent 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), $50,000, together with the unexpended balance of the appropriation for the fiscal year 1935.

No part of any appropriation in this Act for the Bureau of Reclamation shall be used for investigations to determine the economic and financial feasibility of any new reclamation project.

During April 89 carloads of packed grapefruit were shipped from the Yuma auxiliary project to Pacific coast and mid-western markets, and the equivalent of 53 carloads of packed and loose fruit were shipped by truck to the Pacific coast. First-grade fruit sold during the month at $1.75 to $2.25 per packed box, while second-grade fruit was priced at $1.25 to $1.50 per box. The market was 10 to 15 cents per box higher than last season.

Passing of W. E. Johnson, Yuma, Ariz.

The Yuma project has lost one of its most highly respected and greatly beloved residents, and one whose passing deserves more than ordinary notice. W. E. Johnson was well known as school instructor, principal, superintendent, progressive farmer, and the owner of a citrus orchard.

As a matter of well-known history, George Maxwell, a brilliant Los Angeles lawyer, organized the National Reclamation Association and persuaded the railroad companies and leading chambers of commerce of the West to subscribe funds to pay him a small salary and meet the expenses of a trip through the Western States as he tried to arouse the people and their representatives to a sense of the importance of national reclamation. Mr. Maxwell's efforts enlisted the united support of all the Western States, overcame the opposition of the East, and on June 17, 1902, the Reclamation Act became law, and with the strong support of Theodore Roosevelt was vigorously pushed.

Mr. Johnson was living at Lancaster and owned some land in the Antelope Valley. The need of water was great and irrigation was in a chaotic condition, as was the case in most communities. At his solicitation, Mr. Maxwell undertook the work of persuading the communities to combine on a comprehensive irrigation system. Neither he nor Mr. Johnson had any prospect of direct return.

Mr. Johnson and wife, with their team and buckboard, took Mr. Maxwell and wife, traveled from house to house, and held meetings in school houses, spending considerable time in this way, and having some success in their work. In relating these facts Mr. Maxwell publicly acknowledged Mr. Johnson as his inspiration in matters of national reclamation, and it is gratifying to know that Mr. Johnson lived to see the service grow into its present strong organization.—*W. B. Cloyd, The Yuma Morning Sun.*

Employment totals at Grand Coulee Dam for the week ending May 4, according to figures issued through the Columbia Basin Commission, were 3,083. This included the Reclamation engineers. The MWAK Co. had the largest number, 2,405.

A large tract of land on the Milk River project, Montana, has been purchased by the rural rehabilitation section of the Federal Emergency Relief Administration, for the purpose of development and colonization by farmers from the adjacent bench lands.

Organization Activities and Project Visitors

Dr. Elwood Mead, Commissioner of Reclamation, has been designated a member of the Works Allotment Division, which has been set up by the President under the 4-billion-dollar works relief bill.

Dr. Hubert Work, former Secretary of the Interior, called on Commissioner Mead and his assistant, Miss Schnurr, during a recent visit to Washington.

On May 24, Mr. John C. Page, office engineer at Boulder Dam, gave a lecture illustrated by motion pictures on Boulder Dam, before the Cleveland Patent Lawyers' Association, at Cleveland, Ohio.

Charles H. Carter has been transferred from the engineering force in the Denver office of the Bureau of Reclamation to the engineering division of the Washington office.

Death of John G. Heinz

The Commissioner has been notified of the death from influenza pneumonia on May 6 of John G. Heinz, general manager and secretary of the Coachella Valley County Water District.

Mr. Heinz was a former employee of the Bureau of Reclamation, having been assigned to the Yakima project in 1908, where he remained until 1921. He was well known in irrigation and engineering circles in the Bureau and elsewhere. Death occurred in Los Angeles at the California Hospital.

Floyd O. Hagie, managing secretary of the Yakima Chamber of Commerce, has been in Washington for several weeks working in the interest of the Roza project.

J. R. Moore, special assistant attorney general of Arizona is in Washington in the interest of development of the lower Colorado River.

Edward Hyatt, State engineer of California, has been in Washington for some time in connection with plans for the Central Valley project, California.

Lin B. Orme, president, and Greig Scott, counsel for the Salt River Valley Water Users Association, are in Washington working with the local counsel of the association; Northcutt Ely, in connection with plans looking to securing an allotment from the works relief fund for repairs to the spillways of dams on the Salt River project, and the construction of the Bartlett Dam.

W. P. Whitsett, chairman, board of directors, F. E. Weymouth, general manager and chief engineer, and J. H. Howard, general counsel, all of the Metropolitan Water District of Southern California, are in Washington transacting business in the interest of the district.

Robert A. Allen, until April 30 State engineer for the Public Works Administration in Nevada, has been appointed to the position of State highway engineer, assuming office on May 1.

J. A. Fitzgerald, of Ely, Nev., has been appointed labor commissioner for the State of Nevada to succeed William Royle, taking office during May.

Among the visitors to the Boulder Canyon project during the month of April were the following: Carl Pontoppidan, of F. L. Schmidt Co., Copenhagen, Denmark; Charles Elbert Scoggins, novelist for the Saturday Evening Post, Boulder, Colo.; and Mrs. Dorothy Jenner, special correspondent, London Times and Australian newspapers.

F. F. Smith, engineer in the Denver office, was a recent visitor on the Humboldt project, Nevada, at which time the Rye Patch Dam was inspected, as was also the Shurz Dam which is being constructed by the Indian Service on the Walker River near Shurz.

Mr. Smith also inspected all dam sites and the dike location in Little Truckee Canyon on the Truckee River Storage.

The Orland Boosters Club is becoming quite active in its efforts to further the interests of the community and the results are becoming noticeable.

The Golden State Creamery Co. is erecting at a cost of $60,000 a plant for producing powdered milk in Orland. This plant will take whole milk and will fill a long felt want. It will give employment to five men and will be a decided asset to the project. Evidently, some one has faith in the Orland project.

Miss Katherine Glover, nationally known magazine writer of Washington, D. C., visited the Yakima project for a few hours recently, in company with B. H. Kizer, chairman of the State planning council, and James O'Sullivan, secretary of the Columbia Basin Commission. Miss Glover was spending a week in the State during which she studied reclamation and other developments, having visited Grand Coulee Dam and gone over proposed developments on the west side prior to coming to the Yakima Valley.

Norman G. Wheeler

1898–1935

Norman G. Wheeler, chief clerk of the Klamath project, died on May 1, at the age of 37. While the immediate cause of his death was septic sore throat, following an attack of the flu, he had been troubled for a year with arthritis. Last December his condition became so serious that he spent 2 months in the University of California Hospital in San Francisco. He returned to work the last of February but became worse and was obliged to leave the office again early in April.

Mr. Wheeler entered the service on April 24, 1917 as underclerk on the North Platte project, and was employed in various clerical capacities until January 1921, when he was transferred to the Klamath project. He was made chief clerk of that project on July 1, 1924.

Mr. Wheeler was considered to be one of our best chief clerks, being exceptionally well versed in all clerical details and regulations. His untimely passing is felt to be a distinct loss to the Bureau.

Robert F. Skinner, assistant engineer, has been transferred from the Boulder Canyon project to Taylor Park Dam. He will be temporarily stationed in Denver before proceeding to his new assignment.

Harold M. Crowell, inspector, has been transferred from the Boulder Canyon project to the Moon Lake project, Utah.

The first official car crossed Boulder Dam on April 4. Those making the trip were Walter Bracken and James Cashman of Las Vegas, General Superintendent Frank T. Crowe of Six Companies Inc., and Construction Engineer Walker R. Young.

U. S. GOVERNMENT PRINTING OFFICE: 1935

ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead**, Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; Miss Mary E. Gallagher, Secretary to the Commissioner; George O. Sanford, Chief Engineering Division; Wm. F. Kubach, Chief Accountant; Charles N. McCulloch, Chief Clerk; Jesse W. Myer, Chief, Mails and Files Division

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H. Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
Carlsbad	Carlsbad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen [1]	C. M. Voyen	W. J. Burke	Billings, Mont.
Columbia Basin, Grand Coulee Dam.	Coulee Dam, Wash	F. A. Banks	do	C. B. Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
Frenchtown	Missoula, Mont	J. W. Taylor	Resident engr				
Grand Valley	Grand Junction, Colo	W. J. Chiesman	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Engineer	George B. Snow		do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent		C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Resident engr	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif	Ralph Lowry	do	George H. Bolt		R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wentzel [1]	C. B. Wentzel	W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo	L. J. Windle [1]	Superintendent	L. J. Windle [1]	Denver office	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Denver office	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Engineer			J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		Denver office	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Engineer	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo	C. B. Elliott	do	do	do	do	Do.
Upper Snake River Storage [3]	Idaho Falls, Idaho	H. A. Parker	Constr. engr	Emmanuel V. Hillius		B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

Projects or divisions of projects of Bureau of Reclamation operated by water users

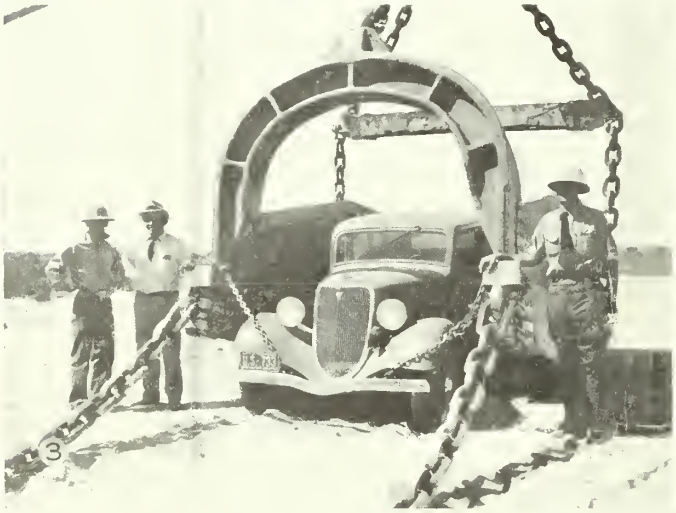
Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrig. dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	C. W. Tharp	Superintendent	C. J. McCormick	Grand Junction.
Huntley	Huntley irrigation district	Ballantine, Mont	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Irl Davis	President	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	D. E. Norton	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	F. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district.	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo	Bert L. Adams	do	Nellie Armitage	Torrington.
Northport division	Northport irrigation district	Bridgeport, Nebr	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan
Salt Lake Basin (Echo Reservoir.)	Weber River Water Users' Association.	527 Eccles Bldg., Ogden, Utah.	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Gen. supt and ch. engr	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	Superintendent	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw
Greenfields division	Greenfields irrigation district	Fairfield, Mont	A. W. Walker	do	A. W. Walker	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg	E. D. Martin	do	Enos D Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley Water Users' Association.	Montrose, Colo	Jesse R. Tompson	Acting superintendent	Wm. W. Price	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	Manager	R. E. Rudolph	Ellensburg.

Important investigations in progress

Project	Office	In charge of—	Title
Buffalo Rapids	Terry, Mont	R. R. Robertson	Assistant engineer.
Colorado River Basin, sec. 15	Denver, Colo	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes	Bend, Oreg	C. C. Fisher	Engineer.
Gila Valley	do	P. J. Preston	Senior engineer.
Grande Ronde	Pendleton, Oreg	Foster Towle	Associate engineer.
San Luis Valley	Denver, Colo	R. F. Walter	Chief engineer.
Umatilla River	Pendleton, Oreg	Foster Towle	Associate engineer.
Grand Lake-Big Thompson Transmountain	Denver, Colo	P. J. Preston	Senior engineer.
North Platte Valley	Lincoln, Nebr	O. V. P. Stout	Consulting engineer

SALLIE A. B. COE, *Editor*.

ALL AMERICAN CANAL PROJECT, CALIFORNIA

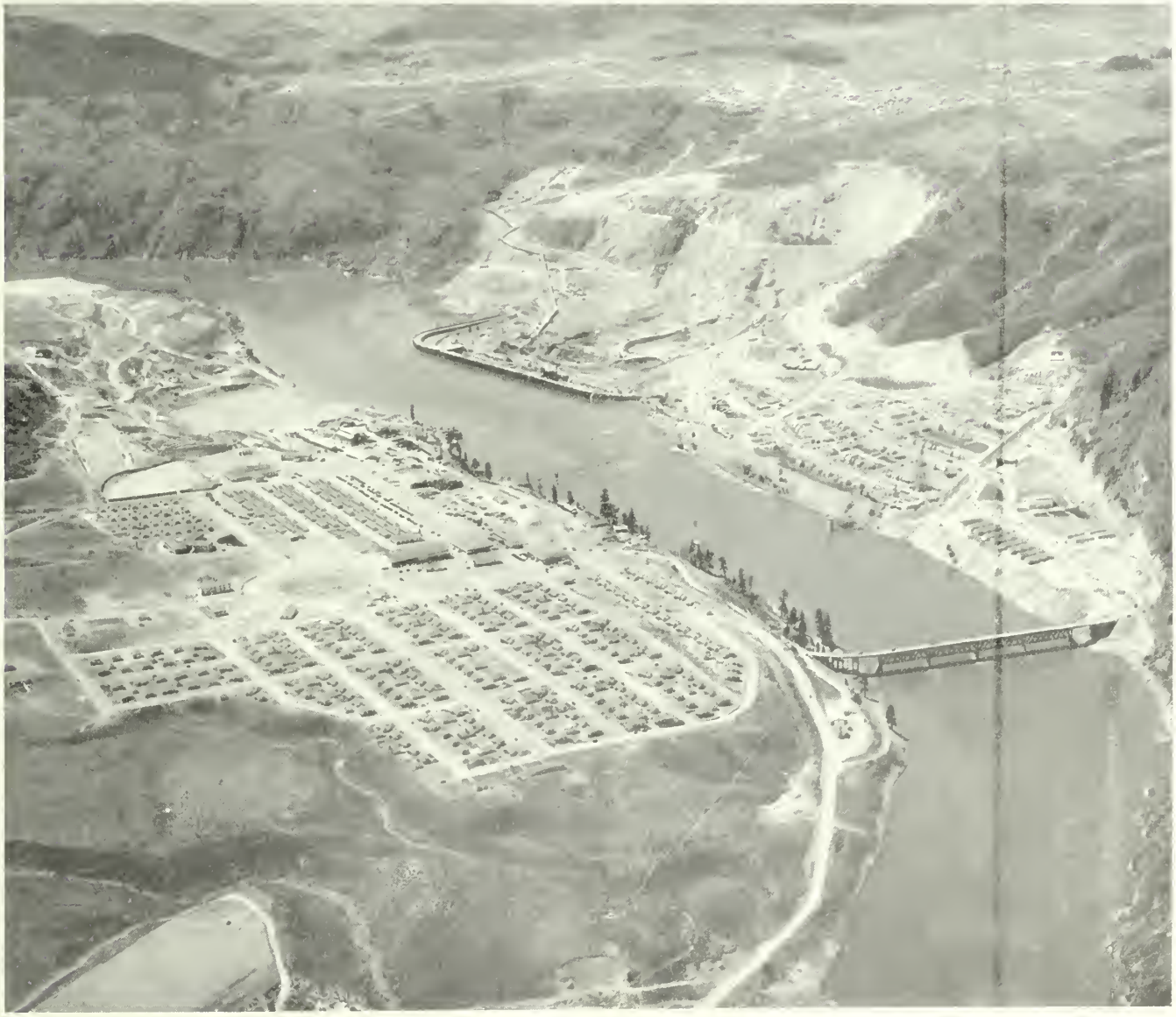


UNDER CONSTRUCTION

1, EXCAVATING WITH TRACTORS; 2, EXCAVATING WITH HORSES; 3 AND 4, A 12-CUBIC YARD BUCKET; 5 AND 6, EXCAVATING WITH DRAGLINES.

THE RECLAMATION ERA

VOL. 25, NO. 7 JULY 1935



PANORAMA VIEW OF GRAND COULEE DAM SITE WITH MASON CITY AND GOVERNMENT CAMP IN FOREGROUND

Boulder Dam

Unveiling of Memorial Plaque

By

Boulder City Central Labor Council

Address of WALKER R. YOUNG, Construction Engineer
Boulder Dam, May 30, 1935

Today we witness the unveiling of a plaque placed in memory of those who have made the supreme sacrifice that future generations might prosper through benefits derived from Boulder Dam.

This project, because of its natural setting, has been fraught with hazard, and loss of life in its construction was not unexpected. That more lives were not lost is evidence of the effort made to avoid accidents and speaks well for the caliber of the workmen themselves, since each one's safety of necessity depended not alone upon his own actions but upon the actions of his fellowmen.

As the representative in charge of the Project for the Federal Government, I wish on this occasion to pay tribute, not only to those in whose honor we are gathered, but to all who have had a part in the construction of Boulder Dam and appurtenant works. I desire also to express, in behalf of your Government, deep sympathy for those who have suffered the loss of a relative or friend. May this dam stand a lasting monument to his courage.

THE
RECLAMATION ERA

Issued monthly by the DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C.
Price 75 cents a year

HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 7 JULY 1935

Spread of the Work at Boulder Dam

By William E. Warne, Public Relations Division

CANVAS water bags, 32,664 of them, 23,144 pairs of rubber boots, 19,384 paint brushes, 190,500 pounds of rags, 355,000 gunny sacks, and 13,356 shovels.

These things also went into the construction of Boulder Dam, which for more than 4 years has been gulping down tons of cement daily like a voracious monster.

Machinery, lumber, concrete, and steel—these are the materials the casual visitor sees the workmen shaping into a dam. And they were used, in tremendous quantities, too, in construction of Boulder Dam.

But the 86,968 hack-saw blades, 1,291,550 machine bolts, 1,416 tin dippers, 7,360 flashlights, 13,046 hard-boiled hats, 18,111 kegs of nails, 12,912 water buckets, 20,232 sheets of emery paper, 495 miles of manila rope, and 5,348 sponges, while not so often seen, helped to spread over the entire country the work of building Boulder Dam.

GROSS AND CARLOAD

From brooms to dynamite caps, Boulder Dam required a myriad of things, usually by the gross often by the carload.

Six Companies, Inc., the dam contractors, have provided a list of 47 firms from each of which they received between February 1931 and February 1935 at Boulder City supplies costing more than $50,000. These firms are spread from the Atlantic to the Pacific.

The Bureau of Reclamation, under the direction of which the great Colorado River barrier is approaching completion, during the same period purchased $20,558,823.79 of cement. structural and reinforcing steel, gates and machinery for the dam. This figure includes the cost of transportation of this material, more than 5 millions of dollars.

The Bureau bought steel and machinery in Pittsburgh, Birmingham, and Newport News, and cement in California and Utah. It has remaining to buy $8,000,000 of pipe and $14,000,000 of machinery for power generation, which still further will spread the benefits derived by labor from the largest dam construction job ever undertaken.

Up to June 1, 1935, Six Companies used 4,938,118 gallons of gasoline, 522,757 gallons of lubricating oil, and 777,755 pounds of greases.

The contractors used 8,551,300 pounds of dynamite, 915,000 feet of fuse, and 1,139,500 exploders.

OXYGEN AND VENEER

They used 32,306 220-cubic-foot tanks of oxygen, 2,215 carloads of lumber, 96 fish poles, 2,331 gross of wood screws, 2,300 sacks of sulphur, 9,510,000 square feet of veneer, 588 police whistles, 5,542 dozen files.

Some idea of this vast amount of material, all of which required off-the-site labor in production and transportation, may be obtained from the fact that between February in 1931 and February 1935, 47 months, a total of 27,092 freight carloads of stuff for the dam was received in Boulder City. During 8 of these months, October 1933, and March, April, May, July, August, September, and October 1934, more than 1,000 cars were received. The largest number, 1,296 cars, was received in April 1934. In these months not one passed during which less than 100 cars of material for Boulder Dam was received.

The best means of demonstrating where, and for what, went parts of the $54,616,891.90 the contractors had earned in Boulder Dam construction to the end of April this year is found in the list of ex-

Building Boulder Dam with drills, air hose, pipe, and dynamite. These men, like those who worked in the factories from coast to coast and those who actually poured the concrete, constructed Boulder Dam.

penditures of $50,000 or more made by Six Companies, Inc., up to about the same time.

BUY THROUGH DEALERS

Some of the purchases were made through dealers comparatively close to Boulder Dam, but the material itself came from much farther away. Generally these items can be recognized and no effort has been made to follow them back farther than the dealer.

For each of these firms which supplied upward of $50,000 in supplies and materials, there were several others with smaller orders, generally as widely spread.

BUREAU'S BREAK-DOWN

A break-down of the Bureau's larger expenditures for materials shows that $620,535 went to Los Angeles; $1,049,395 to Birmingham; $10,908,000 to Barberton, Ohio; $172,110 to Elizabeth, N. J.; $124,684 to Newport News, Va.; $65,186 to Rockford, Ill.; $2,405,367 to East Pittsburgh; $105,989 to Susanville, Calif.; $1,883,217 to Milwaukee; $2,185,415 to Schenectady, N. Y.; $2,086,000 to southern California cities for cement; $148,160 to Denver; $419,191 to Gary, Ind.; $46,090 to Muskegon, Mich.; $107,023 to Niles, Mich.; $108,430 to Chicago; $298,048 to Philadelphia; $547,825 to San Francisco; $62,377 to St. Louis; and smaller amounts to more than a dozen other communities.

SPREAD OF PURCHASES

Firms from which Six Companies, Inc., have purchased equipment, materials, or services in excess of $50,000 for Boulder Dam contract work, and the approximate amounts of the purchases:

Apache Power Co., Benson, Ariz., explosives, $287,000.

Bucyrus Erie Co., Milwaukee, Wis., excavating equipment and parts, $77,000.

General Motors Corporation, James Cashman, agent, Las Vegas, Nev., motor trucks, automobiles, and parts, $50,000.

Caterpillar Tractor Co., Stockton, Calif., and Peoria, Ill., tractors, $137,000.

Chapman Lumber Co., Portland, Oreg., lumber, $127,000.

Columbia Steel Co., San Francisco, Calif., structural steel, pipe, wire rope, $1,022,000.

Consolidated Steel Corporation, Ltd., Los Angeles, Calif., fabricated structural steel, $504,000.

Crane Co., Los Angeles and Chicago, pipe, fittings, and plumbing fixtures, $211,000.

Crucible Steel Corporation of America, Chicago, Ill., drill steel, $149,000.

California Western Oil Co., Los Angeles, Calif., locomotive fuel oil, $113,000.

(Continued on page 151)

A trainload of steel on a siding at Boulder City during construction of Boulder Dam. A total of 27,092 carloads of material arrived at this yard between February 1931 and February 1935 for use in building the dam.

Boulder Broadcasts

Recognizing the degree and spread of the demand to "know more" about Boulder Dam, an interest felt and expressed by persons in all sections of the country, The National Broadcasting Co. presented two broadcasts recently over a Nationwide hook-up.

The first, on Friday afternoon, May 31, was from the dam site. A description by staff announcers of the appearance and proportions of the giant structure was made vivid by the roar of the Colorado River as it emerged from the mouth of a diversion tunnel, and sounds of work being done.

These sound effects were accomplished by switching controls from apparatus located at different positions—at the diversion tunnel to pick up inside the mountain what has been described as the "world's loudest riveting racket" with echoes that reverberate through a maze of tunnels and cross galleries; at the peak of the canyon wall; on a skip hanging from a huge cable that stretches across the yawning chasm; and on the floor of the canyon where power-house construction now is in progress. The screams of the whistles, and the noises of trucks, compressors, tractors, hoists, and cranes made the scene of operations very real to the listener.

The second broadcast, on Sunday, June 2, was from Boulder City and originated in the theater building. This program was a series of interviews with Government engineers, contractors, officials, and construction workers who told of their carefully dovetailed parts in the undertaking.

Sims Ely, city manager of Boulder City, during the second broadcast, talked on a phase of the Boulder Dam job that has received little, but merited much, attention—the operation of Boulder City.

"In the past 4 years a million visitors have come here to see the greatest of all engineering and construction projects underway", Ely said. "In the future even greater numbers will come, we believe, to see the completed job and to boat and fish on the world's largest artificial lake."

Ely said that due to Bureau regulation of the city all business firms prospered greatly, that workers remitted $80,000 a month to dependent relatives or in payment of past debts from the city to every part of the country, and that the city's Postal Savings deposits reached $521,000 in June 1935.

BALLARD DIES IN IDAHO

E. L. Ballard, for 17 years reservoir superintendent at Arrowrock Dam on the Boise project in Idaho, died at his home in Boise April 23, 1935. Mr. Ballard became camp superintendent at Arrowrock Dam in 1911 during its construction, and remained as reservoir superintendent until his retirement in February 1932. Mr. Ballard was survived by his widow, Mrs. Nellie L. Ballard, and a son.

Change of Plan for Grand Coulee Dam

By Charles H. Carter, Assistant Engineer, Bureau of Reclamation

THE signing of a change order, under which the Grand Coulee Dam contractors will alter the shape of the structure they have under construction, was announced June 7 by Secretary of the Interior Harold L. Ickes. The new plans call for construction up to a height of about 177 feet of a complete foundation for a 500-foot dam. The original plans called for construction at this site of a 297-foot power dam and a permanent cofferdam, both of which eventually would have been incorporated into the larger structure.

NECESSITY FOR CHANGE

The contract for the construction of Grand Coulee Dam, Columbia Basin project, Wash., was dated July 16, 1934. Since that time excavation operations of the general contractors have resulted in extensive slides within the area of the dam. These are likely to continue, and to avoid duplicating the excavation work already done, it has become necessary to place concrete for the foundation of the high dam to an elevation that will insure against damage from floods.

The original dam was essentially a power development. Present economic conditions affecting power demands, as well as the construction of other power projects, have emphasized the need for making storage for irrigation purposes the primary requirement. The high dam will eventually afford maximum benefits by developing both irrigation and power possibilities. Although the original dam was always considered as a unit of the ultimate development under one scheme, the changed plan of placing concrete for the complete foundation is a different order of procedure. Approximately the same amount of work is necessary in either case. Savings made by eliminating any power-house construction above the level of the turbine floors are partially offset by a nominal increase in concrete required to bring the foundation high enough for flood protection.

ORDER FOR CHANGES NO. 1

The order for changes notifying the Mason, Walsh and Atkinson-Kier companies, present contractors, was approved June 5, 1935, by the Secretary. Principal changes as set forth in the order include increased excavation, changes in shape and dimensions as shown by figure 1, elimination of the permanent cofferdams below the spillway, decreasing the length of spillway 150 feet, and moving the west power plant a corresponding distance toward the river.

Of the $15,000,000 allotted to the Columbia Basin project, approximately $10,000,000 has been expended to June 1 on construction work. Everything accomplished under the original contract is necessary to the ultimate development and can be fully utilized for the changed designs. It has been estimated that 2 years will be necessary to construct the foundation of the high dam under the changed plans and that $45,000,000 will be required to finance the work over this period.

Figure 1 illustrates the sections of the original design or low dam, the ultimate development or high dam, and the foundation for the high dam called for in the order for changes. In addition to the contrast of the three sections, shown by dimensions, the reservoir for the high dam is 150 miles in length, compared to 70 miles for the reservoir impounded by the original structure. Usable irrigation waters stored by the 2 dams are 5,200,000 acre-feet and 250,000 acre-feet, respectively. Provision for future power development is made by constructing the foundations for power plants on both east and west sides of the river capable of generating 1,890,000 kilovolt-amperes, while the single power plant, planned for the low dam, would have generated 520,000 kilovolt-amperes.

PROGRESS

The record of work performed by Mason, Walsh, and Atkinson-Kier companies has been one of remarkable progress. Of the 9 million cubic yards to be excavated from the west side, nearly 6 million have been moved. On the east side more than 1 million of the required 3 million yards to be excavated, have been moved. Daily average excavation has been in excess of 50,000 cubic yards.

The conveyor system handles a large percentage of all excavated material removed by the shovels, and has been handling approximately a million yards per month. Part of the 20,000 tons of steel sheet piling purchased by the Government for the contractors has been driven to form the world's largest cellular cofferdam to protect the foundations during construction operations.

Present progress of the contractors indicates completion of the foundation excavation by September and preparation for concreting operations have started. Removal of overburden from gravel pits as well as the initial work on pumping station and aggregate handling plant has already begun. Purchase of machinery and materials has been made and it is expected the actual pouring of concrete will commence in October of this year.

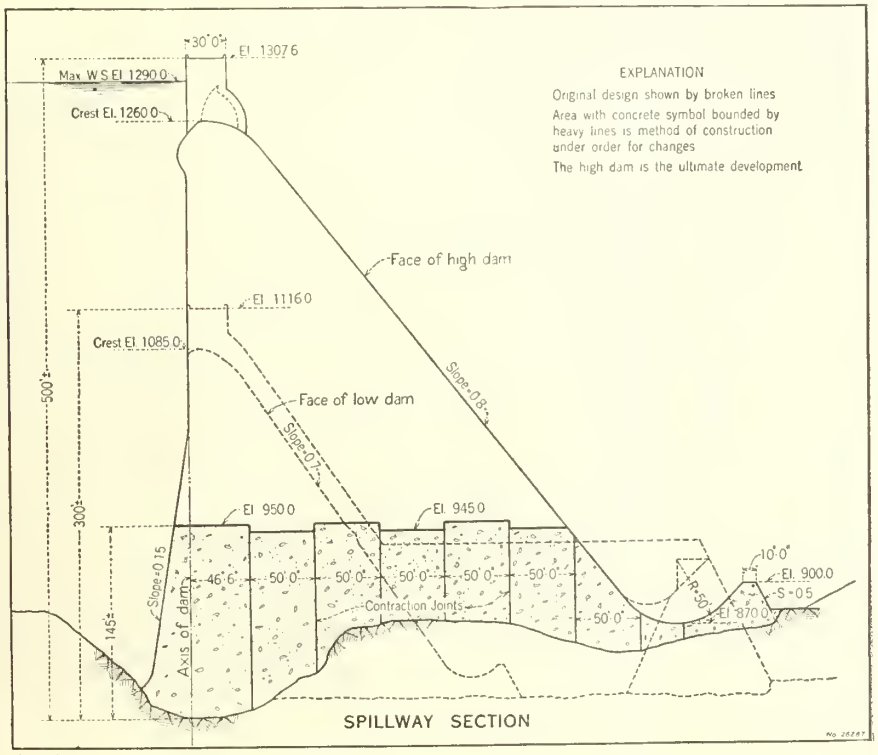
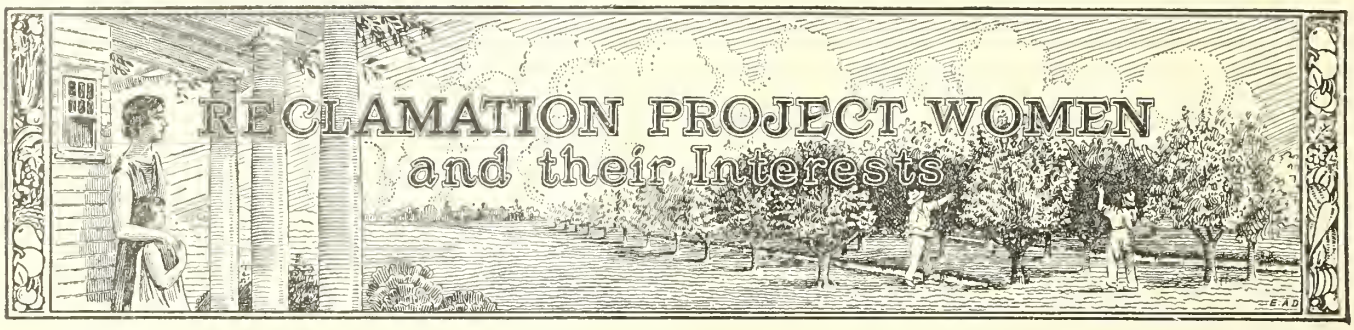


Fig. No. 1



Women's Place in the Works-Relief Program

By Margaret C. Feast, Public Relations Division

WHEN in 1933 the Administration faced unemployment as a major problem requiring basic attention, and Federal funds were appropriated for its relief, one phase of the situation assumed a natural category. That phase was the group of women, heads of families so called, who depend on their own earnings to live, and on whom others depend. So Women's Work was made an essential division of the Federal Emergency Relief Administration, and Mrs. Ellen S. Woodward was placed as Director. The job was a gigantic one. Of the unemployed employable population, women constitute one-eighth.

WORK ORGANIZED

Like the little boy in the First Reader, Mrs. Woodward set about breaking her huge bundle of sticks one stick at a time. Relief work was organized on a national scale by State and county branches. Each community faces and attacks its own problems in its own way, and in each State there is a director of women's work whose job it is to solve the problem in her State. With the objective of finding a job for every woman whose application for relief shows her to be in the group of employable persons eligible for relief, a State program is determined. The director works with all established agencies, governmental and outside—the Reemployment Service of the Labor Department, the Extension Service of the Department of Agriculture, the Office of Education, women's clubs, the Red Cross, the Boy and Girl Scouts, the religious and civic organizations. Surveys are made of vacancies actual or potential, of work that needs to be done, and of the qualifications of the women eligible for work.

With the surveys made, the procedure is begun of placing women on projects suitable to their skills, and of training other women for types of work for which there is a potential demand. In many States local women's organizations have cooperated by making surveys to determine the fields in which there are possible jobs for women. Until outside jobs are located, women are placed on the administration pay rolls, but instead of receiving direct relief they become part of the machinery designed to make themselves and others better fitted to stand alone when standing room is found, and in the meantime do a piece of work that needs to be done and in the doing more than pays its way.

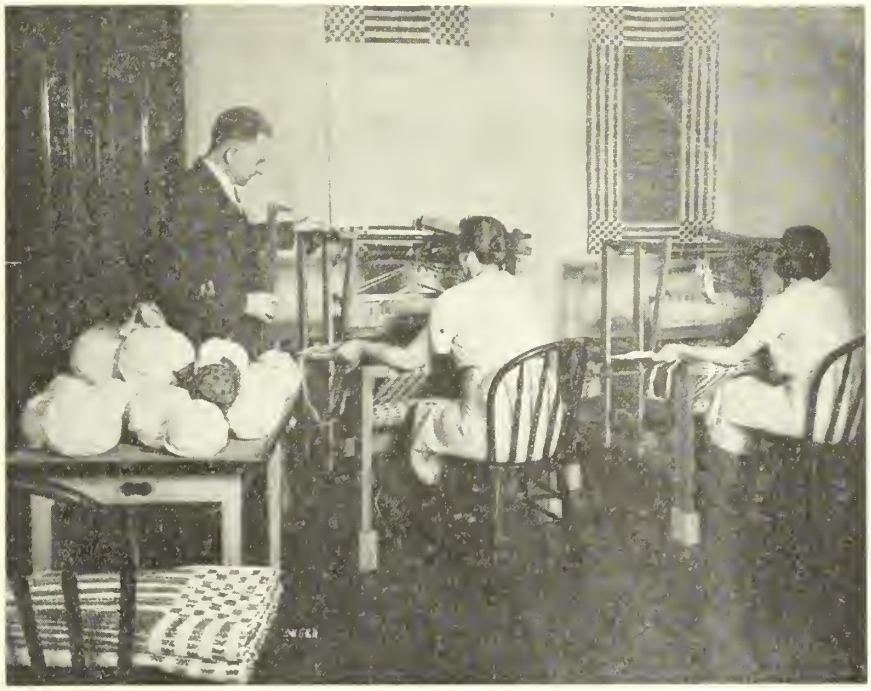
PROJECTS DEVELOPED

One important project is repair of public-library books and school textbooks. In one State a book-repair project added 1 year's life to the school books, a saving of $105,000.

The complete list of projects in operation is a long one. It includes such projects as nursing, nutrition, library extension, surveys, handicrafts, furniture making and repair, community service centers, recreation programs, sewing, making surgical dressings, canning, laundering, propagation of plants and beautification of highways and public grounds, cleaning and refinishing furniture in public buildings, restoration and preservation of historical records and museum materials, training courses for household workers, and many others.

One type of project of which Mrs. Woodward is especially proud is called "Emergency homemaking." Its scope is to give help by actual manual assistance, to instruct, encourage and advise in those homes on relief rolls where various emergency situations exist. Illness may be the immediate problem, or lack of knowledge of the principles of good management required to balance meager funds and an adequate standard of living. These projects provide the special service needed. It is a far-reaching service, for in addition to relieving the emergency,

Women on relief learn to mend books in Seattle school. In one State $105,000 was saved in book replacements



Weaving carpets from rags, these women find relief employment at worth-while work.

by teaching and enlisting the interest of the woman of the family, the groundwork is laid for a happier and more efficiently managed home.

WORTH RECOGNIZED

From a skeleton staff the Women's Division has developed into a functioning vital part of the relief organization. The current works-relief appropriation gives congressional and Administration approval to the type of thing the Women's Division has been doing, and gives sailing orders to a movement this division has recognized from its inception. Too serious to be lightly described as picturesque, the work has nevertheless a dramatic quality that appeals to the imagination. Wherever something worthwhile needs to be done, something that women trained or trainable may do, here is a corps of workers to do it. Most everyone who may read this article will remember the spirit of cooperation that ran so valiantly high among volunteer groups during the war—canteen services, Red Cross workrooms, and the like. Today there is need for just such cooperation from individuals whose good fortune it is not to require work relief. The success of each project to a large degree, Mrs. Woodward feels, depends on the cooperation of every member of society.

Dr. Streeter Honored

Dr. Victor L. Streeter has resigned his appointment with the Bureau of Reclamation having been awarded the Freeman Scholarship for the current year. This competitive scholarship in hydraulics provides $1,500 for 15 months' study of current hydraulic practice abroad.

Even more valuable than the monetary award are the contacts and courtesies extended to the holder of the scholarship by European engineers. About 25 engineering graduates have received this award since it first was established in 1927. Much of the current advance in American hydraulics has come through them.

In this connection it is worth noting that the Bureau has two former holders of the scholarship on its hydraulic laboratory staff: S. Shulits and D. P. Barnes, assistant engineers.

Through such contacts the Bureau is constantly improving its hydraulic designs.

Subsistence Homesteads

By Executive order, the President has transferred the "property, functions, funds, etc.", of the Subsistence Homesteads Division from the Department of the Interior to the Resettlement Administration under the Department of Agriculture. This Administration is headed by Rexford Guy Tugwell, Under Secretary of Agriculture.

The order of transfer moved the records, options, and property as well as the entire personnel of the division to Dr. Tugwell's jurisdiction.

Funds allotted to the division when it was within the Interior Department were realloted to the Resettlement Administration.

Secretary Ickes Writes Book on P. W. A. Program

Secretary Harold L. Ickes is the author of a book, "Back to Work—The Story of P. W. A.", a stirring account of the early recovery drive and a lucid review of accomplishments of the Public Works Administration, which came off the presses June 25.

Three chapters of the book are devoted to the events leading up to the passage of the National Industrial Recovery Act and the actual launching of the works program. Across their pages stride such vigorous personalities as General Johnson, Senator Robert Wagner, Dr. Tugwell, Secretary Perkins, Director of the Budget Douglas, and the reader is given a candid camera shot of them.

Included also are the actual records, published for the first time, of the debates between members of the Special Board for Public Works over the best methods of spending the $3,300,000,000 Congress made available.

The second part of the book is a popular summary of the Public Works program, with chapters on the construction of reclamation dams in the West, flood control and electric power, the T. V. A., on railroad loans, and so on.

The book is valuable both as informal history and entertaining instruction. It contains 268 pages and was published by the Macmillan Co.

R. E. A. Established

The President, by Executive order, recently established in connection with the Works Relief program, the Rural Electrification Administration, headed by Morris L. Cooke, Administrator.

The duties of the Administration, as set out in the order, are, "To initiate, formulate, administer, and supervise a program of approved projects with respect to the generation, transmission, and distribution of electric energy in rural areas."

The order authorized the rental of office space, the purchase of materials and supplies, and the appointment of a staff by the Administration. It provided that so far as practicable, persons employed should come from relief rolls.

The Administration also was empowered to acquire property as follows: "To the extent necessary to carry out the provisions of this Executive order the Administrator is authorized to acquire, by purchase or by the power of eminent domain, any real property or any interest therein and improve, develop, grant, sell, lease (with or without the privilege of purchasing), or otherwise dispose of any such property or interest therein."

TREMENDOUS BOULDER DAM JOINS WALL TO WALL IN BLACK CANYON AND THE MIGHTY COLORADO RIVER IS IN HARNESS. THE LAST DUMP OF CONCRETE WAS POURED AT 10 A. M., MAY 29, 1935, AND THE DAM ITSELF WAS DONE.

The Reclamation Era

Issued monthly by the Bureau of Reclamation, Department of the Interior.

Subscription 75 cents a year to other than water users, payable in advance by check or postal money order drawn in favor of the Bureau of Reclamation.

Special reduced rates are given individual water-user owners or water-user organizations for mass subscriptions on Federal irrigation projects.

JULY 1935

It Was a National Job

Boulder Dam, of course, was built in the Black Canyon of the Colorado River. But where was the work done?

"At the dam site", one could answer with perfect accuracy as far as the actual placement of materials was concerned. That was a tremendous job. That accounted for a staggering total of man-hours of labor.

But was all the work done at the dam site?

No; not all the work provided by construction of Boulder Dam was done at the dam site. Many thousands were given employment elsewhere. Many thousands were given employment making cement, fabricating steel, preparing explosives, and many additional thousands must have worked to make the hundreds of thousands of little things used at Boulder Dam.

Trucks, tires, lumber, tacks, screw drivers, alemite fittings, anvils, and axes; jacks, batteries, cotter keys, and chains; sprinkling cans, tin cups, and electric conduit.

It is impossible to estimate, except in a broad and general way, how many people found work making these things used at Boulder Dam during the trying years of the depression. It is hard to estimate how many families were kept off the relief rolls by the demand created at Boulder Dam for such things as dish pans, dr lls, electric bulbs, and gasoline.

But the fact that Six Companies, Inc., the dam contractor, bought from $50,000 to $1,585,000 worth of materials and services from each of 47 firms operating from coast to coast may give some idea of the importance of this indirect labor.

The fact that 27,092 carloads of material were received at Boulder City between February 1931 and February 1935 further illustrates the spread of the work. Transportation was a big item.

Materials and products from every State and from many communities in some of them found their way to Boulder City, some to become part of Boulder Dam and others to help in its construction.

There may have been little drama in the fashioning of a wire broom or a padlock or an air hose which was to find its way to the walls of Black Canyon. It may have been easier to see the connection with the completed Boulder Dam of the work done by the scalers, who swung perilously over the brink of the canyon at the end of ropes to scarify the walls before construction started, than to see the connection with that same completed dam of the work done by a husky in a stamp mill or a lumberjack who felled the trees out of which was made the 2,215 carloads of lumber used. But the connection undeniably was there in the latter, as well as the former case.

Truly, construction of Boulder Dam was a national job.

Year's Extension of Moratorium Enacted

President Roosevelt in June approved a bill extending for another year the provisions of the act of April 1, 1932, granting a temporary moratorium on reclamation construction payments coming due under contracts. This is the fourth year Congress has granted a moratorium.

As the Senate passed the bill, the Secretary of the Interior would have been authorized to grant the moratorium only in cases where hearings on the projects disclosed that the irrigation district or the homesteaders were financially unable to meet the payments due.

The House of Representatives, however, adopted an amendment suggested by the Committee on Irrigation and Reclamation, striking out this proviso and leaving the bill in the form of a straight extension of the moratorium on the same basis as it was granted originally.

When the bill was returned to the Senate for consideration of the amendment, the bill as it was passed by the House was adopted without debate. It was in this form, a straight moratorium, that the President signed it.

Representatives Compton I. White, of Idaho, chairman of the House committee, said regarding the bill when it came up on the floor:

"Mr. Chairman, this bill has passed the Senate and provides a moratorium on the construction charges for irrigation projects. The matter has been fully and thoroughly considered by the Irrigation and Reclamation Committee, and after numerous conferences with the Department of Interior and the Bureau of Reclamation the bill has been reported favorably. It simply extends the time for paying the construction charges on irrigation projects another year and in no way takes funds from the United States Treasury. This money invested in reclamation projects has been accumulated from the sale of public lands, coal lands, and so forth, and this bill grants a moratorium in order to permit the people living on these projects to catch up with their interest payments and indebtedness."

Representative Isabella Greenway, of Arizona, made a plea for passage of the bill during the debate in which she answered some charges that had been made against reclamation in general.

"The first problem you must accept", Mrs. Greenway told the House, "is our problem, and I know that you will want to make it yours when you understand that the good Lord does not send rain down in the West as He does in the East. It rains at irregular seasons that have no relation to the growing crops. We must store our water and use it as we need it."

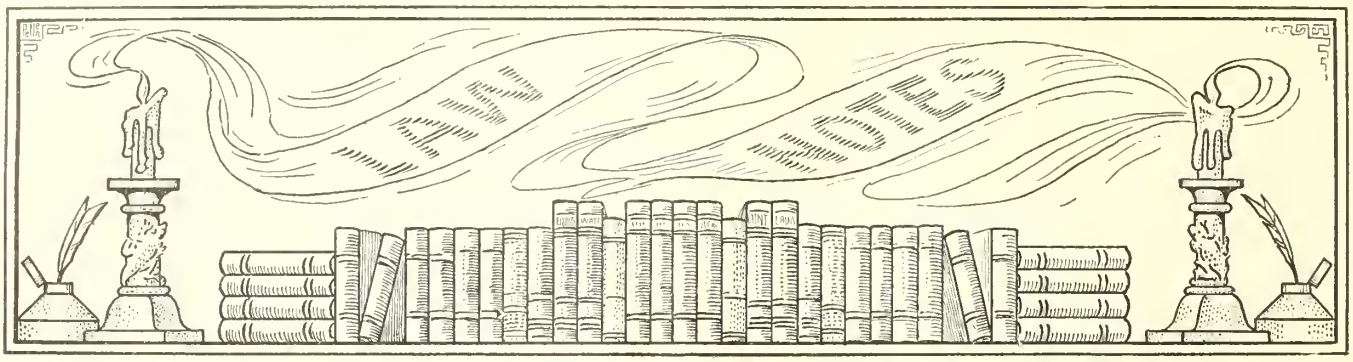
Mrs. Greenway described the development of the Salt River project in Arizona, saying, "We had comparatively little agriculture until Roosevelt Dam was built. Last year, the revenue from crops on this project, our only great agriculture picture, was $16,000,000."

"It is exceedingly interesting", Mrs. Greenway said, "that the people are beginning to realize that a man who can earn his living with certainty and regularity on 5 to 10 acres or a little more is a far more fortunate man than he who has a hundred or four hundred acres, where the water is not dependable.

"I can think of no greater or more terrible calamity than for our friends in the East not to share with us the victory and economical trend of reclamation."

The pay rolls of the Government and various contractors on the Boulder Canyon project for the month of April listed 3,650 employees, Six Companies, Inc., taking the lead with 2,403, with Babcock & Wilcox Co. second, having 799 enrolled.

Farmers on the old lands of the Owyhee project are practising greater diversification of crops. This season a considerable acreage has been planted to seed crops, especially the small seeds. Five hundred acres have been planted for the raising of cucumbers for seed, and smaller acreages for carrots, turnips, onions, and seeds of that nature. In excess of 700 acres have been planted for the raising of pod peas for shipment to eastern markets. There is also a considerable increase in the acreage of head lettuce.



Riparian Water Rights in Western States

IN THE RECLAMATION ERA, April 1935, will be found quotations from the case of *California-Oregon Power Co.* v. *Beaver Portland Cement Co.*, 73 Fed. (2nd) 555, decided by the Circuit Court of Appeals, Ninth Circuit.

The case was appealed to the Supreme Court of the United States and decided April 29, 1935 (United States Law Week, Apr. 30, 1935, p. 41).

The facts of the case were summarized in the April ERA. The following extracts from the decision will show the holding of the court upon the point discussed in the April issue. The decision was rendered by Justice Sutherland.

"The court below held (1) that the homestead patent of 1885 carried with it the common-law right to have the stream continue to flow in its accustomed channel, without substantial diminution but (2) that, while this was a substantial property right which could not be arbitrarily destroyed, it nevertheless was subject to the police power of the State and might be modified by legislation passed in the interest of the general welfare; and upon the latter ground the water code was upheld and the claims of respondents sustained.

"First. The first question is of especial importance to the semiarid States of California, Oregon and Washington, where climatic conditions in some sections so differ from those in others that the doctrine of the common law may be of advantage in one instance, and entirely unsuited to conditions in another.

"Probably, it was this diversity of conditions which gave rise to more or less confusion in the decisions—not only of Oregon but of California—in respect of the subject. We have already spoken of the former; and one has only to compare the decision of the Supreme Court of California in *Lux* v. *Haggin*, 69 Cal. 255, with *Modoc L. & L. S. Co.* v. *Booth*, 102 Cal. 151, to realize that the rule with respect to the extent of the application of the common law of riparian rights is, likewise, far from being clear in the latter.

"The question with which we are here primarily concerned is whether—in the light of pertinent history, of the conditions which existed in the arid and semiarid land States, of the practice and attitude of the Federal Government, and of the congressional legislation prior to 1885—the homestead patent in question carried with it as part of the granted estate the common-law rights which attaeh to riparian proprietorship. If the answer be in the negative, it will be unnecessary to consider the second question decided by the court below.

"For many years prior to the passage of the act of July 26, 1866, chapter 262, section 9, 14 Stat. 251, 253, the right to use of waters for mining and other beneficial purposes in California and the arid region generally was fixed and regulated by local rules and customs. The first appropriator of water for a beneficial use was uniformly recognized as having the better right to the extent of his actual use.

"The common law with respect to riparian rights was not considered applicable, or, if so, only to a limited degree. Water was carried by means of ditches and flumes great distances for consumption by those engaged in mining and agriculture. *Jennison* v. *Kirk*, 98 U. S. 453, 457–458.

"The rule generally recognized throughout the States and Territories of the arid region was that the acquisition of water by prior appropriation for a beneficial use was entitled to protection; and the rule applied whether the water was diverted for manufacturing, irrigation, or mining purposes.

"The rule was evidenced not alone by legislation and judicial decision, but by local and customary law and usage as well. *Basey* v. *Gallagher*, 20 Wall. 670, 683–684; *Atchison* v. *Peterson*, 20 Wall. 507, 512–513.

"This general policy was approved by the silent acquiescence of the Federal Government, until it received formal confirmation at the hands of Congress by the act of 1866, supra. *Atchison* v. *Peterson*, supra. Section 9 of that act provides:

"'That whenever, by priority of possession, rights to the use of water for mining, agricultural, manufacturing, or other purposes, have vested and accrued, and the same are recognized and acknowledged by the local customs, laws, and the decisions of courts, the possessors and owners of such vested rights shall be maintained and protected in the same; and the right of way for the construction of ditches and canals for the purposes aforesaid is hereby acknowledged and confirmed.'

"This provision was 'rather a voluntary *recognition of a preexisting right of possession*, constituting a valid claim to its continued use, than the establishment of a new one.' *Broder* v. *Water Co.*, 101 U. S. 274, 276; *United States* v. *Rio Grande Irrig. Co.*, 174 U. S. 690, 704–705. And in order to make it clear that the grantees of the United States would take their lands charged with the existing servitude, the act of July 9, 1870, chapter 235 section 17, 16 Stat. 217, 218, amending the act of 1866, provided that—

"'* * * all patents granted, or preemption or homesteads allowed, shall be subject to any vested and accrued water rights, or rights to ditches and reservoirs used in connection with such water rights, as may have been acquired under or recognized by the ninth section of the act of which this act is amendatory.'

"The effect of these acts is not limited to rights acquired before 1866. They reach into the future as well, and approve and confirm the policy of appropriation for a beneficial use, as recognized by local rules and customs, and the legislation and judicial decisions of the arid-land States, as the test and measure of private rights in and to the nonnavigable waters on the public domain. *Jones* v. *Adams*, 19 Nev. 78, 86; *Jacob* v. *Lorenz*, 98 Cal. 332, 335–336.

"If the acts of 1866 and 1870 did not constitute an entire abandonment of the

common-law rule of running waters in so far as the public lands and subsequent grantees thereof were concerned, they foreshadowed the more positive declarations of the Desert Land Act of 1877, which it is contended did bring about the result.

"That act allows the entry and reclamation of desert lands within the States of California, Oregon, and Nevada (to which Colorado was later added) and the then Territories of Washington, Idaho, Montana, Utah, Wyoming, Arizona, New Mexico, and Dakota (later to become the States of North and South Dakota), with a proviso to the effect that the right to the use of waters by the claimant shall depend upon bona fide prior appropriation, not to exceed the amount of waters actually appropriated and necessarily used for the purpose of irrigation and reclamation. Then follows the clause of the proviso with which we are here concerned:

" * * all surplus water over and above such actual appropriation and use, together with the water of all lakes, rivers, and other sources of water supply upon the public lands and not navigable, shall remain and be held free for the appropriation and use of the public for irrigation, mining, and manufacturing purposes subject to existing rights.' Ch. 107, 19 Stat. 377.

"For the light which it will reflect upon the meaning and scope of that provision and its bearing upon the present question, it is well to pause at this point to consider the then existing situation with respect to land and water rights in the States and Territories named.

"These States and Territories comprised the western third of the United States—a vast empire in extent, but still sparsely settled. From a line east of the Rocky Mountains almost to the Pacific Ocean, and from the Canadian border to the boundary of Mexico—an area greater than that of the Thirteen Original States—the lands capable of redemption, in the main, constituted a desert, impossible of agricultural use without artificial irrigation.

"In the beginning, the task of reclaiming this area was left to the unaided efforts of the people who found their way by painful effort to its inhospitable solitudes. These western pioneers, emulating the spirit of so many others who had gone before them in similar ventures, faced the difficult problem of wresting a living and creating homes from the raw elements about them, and threw down the gage of battle to the forces of nature.

"With imperfect tools they built dams, excavated canals, constructed ditches, plowed and cultivated the soil, and transformed dry and desolate lands into green fields and leafy orchards. In the success of that effort, the General Government itself was greatly concerned—not only because, as owner, it was charged through Congress with the duty of disposing of the lands, but because the settlement and development of the country in which the lands lay was highly desirable.

"To these ends, prior to the summer of 1877, Congress had passed the mining laws, the homestead and preemption laws, and finally the Desert Land Act. It had encouraged and assisted, by making large land grants to aid the building of the Pacific railroads and in many other ways the redemption of this immense landed estate.

"That body thoroughly understood that an enforcement of the common-law rule, by greatly retarding if not forbidding the diversion of waters from their accustomed channels, would disastrously affect the policy of dividing the public domain into small holdings and effecting their distribution among innumerable settlers.

"In respect of the area embraced by the desert-land States, with the exception of a comparatively narrow strip along the Pacific seaboard, it had become evident to Congress, as it had to the inhabitants, that the future growth and well-being of the entire region depended upon a complete adherence to the rule of appropriation of a beneficial use as the exclusive criterion on the right to the use of water.

"The streams and other sources of supply from which this water must come were separated from one another by wide stretches of parched and barren land which never could be made to produce agricultural crops except by the transmission of water for long distances and its entire consumption in the processes of irrigation.

"Necessarily, that involved the complete subordination of the common-law doctrine of riparian rights to that of appropriation. And this substitution of the rule of appropriation for that of the common law was to have momentous consequences. It became the determining factor in the long struggle to expunge from our vocabulary the legend 'Great American Desert', which was spread in large letters across the face of the old maps of the far West.

"In the light of the foregoing considerations, the Desert Land Act was passed, and in their light it must now be construed. By its terms, not only all surplus water over and above such as might be appropriated and used by the desert-land entrymen, but 'the water of all lakes, rivers, and other sources of water supply upon the public lands and not navigable' were to remain 'free for the appropriation and use of the public for irrigation, mining, and manufacturing purposes.'

"If this language is to be given its natural meaning, and we see no reason why it should not, it effected a severance of all waters upon the public domain, not theretofore appropriated, from the land itself. From that premise it follows that a patent issued thereafter for lands in a desert-land State or Territory, under any of the land laws of the United States, carried with it, of its own force, no common-law right to the water flowing through or bordering upon the lands conveyed.

"Only four of the desert-land States have spoken upon the matter, and their decisions are not in harmony. The Supreme Court of Oregon in *Hough* v. *Porter*, 51 Ore. 318, held that the legal effect of the language already quoted from the Desert Land Act was to dedicate to the public all interest, riparian or otherwise, in the waters of the public domain, and to abrogate the common-law rule in respect of riparian rights as to all lands settled upon or entered after March 3, 1877. The supplemental opinion which deals with the subject beginning at page 382 is well reasoned, and we think reaches the right conclusion. Subsequent decisions in Oregon are to the same effect. *Hedges* v. *Riddle*, 63 Ore. 257, 259–260; *Hill* v. *American Land & Livestock Co.*, 82 Ore. 202, 207; *Allen* v. *Magill*, 96 Ore. 610, 618–619.

"This view was followed by the Supreme Court of South Dakota in *Cook et al.* v. *Evans et al.*, 45 S. D. 31, 38, and *Haaser* v. *Englebrecht*, 45 S. D. 143, 146.

"The Supreme Court of Washington in *Still* v. *Palouse Irr. & Power Co.*, 64 Wash. 606, 612, gave a more limited construction to the Desert Land Act, holding that thereby Congress recognized and assented to the appropriation of water in contravention to the common-law right of the riparian owner only in respect of desert lands granted under the act. See also *Bernot* v. *Morrison*, 81 Wash. 538, 559–560.

"In *Canal & Irrigation Co.* v. *Worswick*, 187 Cal. 674, 690, the Supreme Court of California followed the Washington court in holding that the language of the Desert Land Act applied only to desert-land entries.

"To accept the view of the Washington and California courts would, in large measure, be to subvert the policy which Congress had in mind, namely, to further the disposition and settlement of the public domain. It is safe to say that by far the greater part of the public lands in the desert-land States and Territories susceptible of reclamation in 1877 was remote from the natural sources of water supply. But these lands were subject to entry, not only under the Desert Land Act, but under other acts as well.

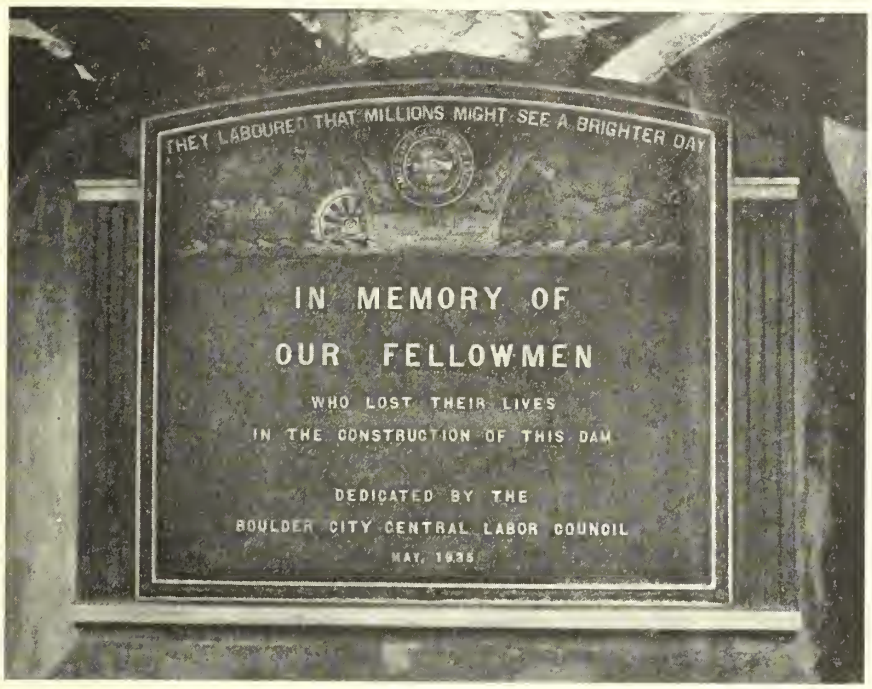
"Congress must have known that innumerable instances would arise where

(Continued on page 150)

Emergency Conservation Program in Pictures

WORK and play and outdoor life are all parts of the emergency conservation program on Federal reclamation projects. Six camps with 1,200 boys are now in operation, and the total reclamation conservation program calls for 42 camps. Here are shown (1) Huntsville, Utah, company dismantling old wooden pipe line, Ogden River project; (2) C. C. C. Camp at Guernsey, Wyo.; (3) Currant Creek, Utah, company excavating a cut; (4) a company at Carlsbad, N. Mex., cleaning a lateral; (5) Orman, S. Dak., camp basketball team, champions of their league; (6) Huntsville company cleaning out a willow thicket.

Labor's memorial to its dead at Boulder Dam



ON May 30, 1935, a tablet dedicated by the Boulder City Central Labor Council to the memory of those who lost their lives in the construction of Boulder Dam was unveiled at the site of the dam.

An invocation was delivered by Parson Tom Stevenson, of the Grace Community Church. Senator Pat McCarran, of Nevada, was the principal speaker. Others who spoke were Walker R. Young, construction engineer of the Boulder Canyon project; John Sherwood, president of the Nevada Federation of Labor; Howard Keener of the Arizona Industrial Commission, representing Governor Moeur of Arizona; and Judge C. D. Horsey, representing Governor Kirman of Nevada. Following a musical program Father J. J. Lambe, of St. Andrews' Catholic Church, concluded the ceremony with a benediction.

The tablet reads, "They Labored That Millions Might See a Brighter Day", and carries the insignia of the American Federation of Labor. R. W. Oliver, chairman of the memorial committee of the Boulder City Council, arranged the program.

Young's comments, made in behalf of the Bureau of Reclamation, appear on the inside cover page.

Senator McCarran said:

"It is an extreme privilege to be here today that I may have the touch of the handshake and a look in the eye of those who gave their efforts, to the end that this monumental structure might take its place in the service of civilization.

"Mankind may create, but it is through individual effort that great projects like these are realized. We, as a nation, may accumulate all the gold in the world, but it could not check a single acre-foot of water in the stream of the Colorado River.

"We might store all the gold in the world in one segment of this dam, and it would not check the flow of the Colorado River.

"We now have 8 billions of dollars in gold and 1½ billions in silver in the Treasury of the United States. If we were to pile it all in the middle of the stream, the Colorado River would still flow on.

"But we have gathered here the power to harness this great river. Not alone to check its flow, but to utilize its energy to generate power that will serve mankind for 500 years.

"You may gather all the gold in the world, but without the mental energy and the physical energy of mankind it would be worthless. You may garner gold, you may hold it in store, and worship it as you will, but the greatest treasure a nation ever held to its bosom is the worker—the men and women who toil contentedly to contribute their bit, be it great or small, to the advancement of civilization.

"There are abroad in this land those who would spread the gospel of communism. Let no man plant the seed of discontent in the hearts of the workingmen of America. Let them go back to China or to Russia whence they came, and reform their own government."

The Senator then discussed briefly the battle being fought to maintain the American standard of wages saying, 'so when this project is completed, the workers will not have to go into a new field and compete with workers from China and Russia.

"Labor has gone through many battles, and will go through many more, for we are determined that American standards shall always be maintained and that America shall lead the world.

"Let us not be radical, however. Let us be fair, and above all, let us be Americans first.

"In all history there never was a project so great as Boulder Dam. Its completion is the crowning effort of the Federal Government and the toilers who gave their lives, and those who remained to complete it. Man's toil is not a commodity to barter or trade; it is part of his life and as part of his life is part of the red blood of the nation in which he is a citizen.

"I am proud to be here today to pay my tribute and the tribute of my country to the men who toil and whose mental power and physical power have builded this great project; and to the memory of the 89 men who sacrificed their lives. May we never forget when we gaze on this project the part they played."

Recent Publications

Boulder Dam: Construction of the Boulder Dam, illus. booklet 5 by 6¾ inches, 48 pages, 6th edition, issued by the Boulder Dam Service Bureau. Price 25 cents.

Boulder Canyon Project: Extensive rock grouting at Boulder Dam, illus., Eng. News-Record, June 6, 1935, v. 114, pp. 795–797.

Ickes, Hon. Harold L.: Public Works for Social Gain, illus. New York Times Magazine, May 12, 1935, sec. 7, pp. 1–2 and 23.

McClellan, L. N.: Engineering features of Boulder Dam and Power Plant, illus., Electrical Engineering, June 1935, vol. 54, no. 6, pp. 583–594.

Owyhee Dam: Construction of the Owyhee Dam, illus., John Burky, '35 (University of) Colorado Engineer, May 1935, pp. 55–57 and 67. ($15 price—student article contest.)

Owyhee Tunnels: Soft ground and lining work on the Owyhee project tunnels, illus., Eng. News-Record, June 6, 1935, v. 114, pp. 804–807.

United States vs. *Arizona* (Parker Dam Case) no. 18 Original (1935):

1. Jan. 14. Motion leave to file bill of complaint, 18 pages.

1a. Jan. 16. Application order to show cause, restraining order, 8 pages.

2. Jan. 18. Affidavit Secretary Ickes in support application, 10 pages.

(Continued on p. 152)

Excerpts from Project Reports for May

THE May reports from the projects showed a general increase in water stored and with but few exceptions an ample supply on hand or in prospect. Crops are late in the mountain regions due to cold weather. In these regions, however, the open ranges are in excellent condition with a good prospect for the season. Most of the livestock moved to the ranges in May.

Riverton Project, Wyoming

Crop conditions: Early prospects excellent. Livestock in good condition. Ready market at good prices for surplus farm products. Thirty-five inquiries received in May from home seekers; 21 homestead entries made; 54 farms remain available. Water available: Ample for season.

Carlsbad Project, New Mexico

Crop conditions: Cotton—some replanting was made necessary by an infestation of worms. Alfalfa—first crop small, second indicated good. Livestock condition good. Two cars of horses and six cars of sheep shipped. One car of sheep received Water available: Storage still low, but fairly good rainfall in May.

Sun River Project, Montana

Crops delayed 3 weeks by cold weather. Prices better than a year ago. Water available: Water supply indications are excellent although the rainfall on the project is below normal. The reservoir is filled.

Belle Fourche Project, South Dakota

Crop conditions: Generally excellent. The long drought was broken in May. The outlook for storage was much improved during the month, but storage is still low.

North Platte Project, Nebraska-Wyoming

Crops delayed by cold weather. Water available: Prospects are for sufficient supply.

Minidoka Project, Idaho

Crop conditions: Generally good. First lambs shipped May 8; 12,700 fleeces sold at 25⅛ cents per pound. One hundred and thirty-one carloads produce shipped. Water available: Ample.

Lower Yellowstone Project, Montana

Beet crop a little late but an excellent stand obtained. Alfalfa good.

Moon Lake Project, Utah

First section of 9 miles of the Duchesne Canal completed during May.

Grand Valley Project, Colorado

Crop conditions: Except for the first cutting of alfalfa, the outlook is good. Water available: Ample.

Yuma Project, Arizona

Crop conditions: Wheat and barley harvested. Cotton up in a good stand; 9,294 acres of cotton planted against 9,113 last year. Carrot harvest completed May 7. Cantaloupes delayed by weather ripened June 10. Tomatoes harvested during month with good yields obtained. Boulder Dam removes all threats of water shortages in the lower Colorado River this year.

Yuma Auxiliary Project, Arizona

The grapefruit crop marketed by the end of May with satisfactory prices for good sizes and grades. The new crop was very promising.

Salt Lake Basin Project, Utah

Crops delayed by cold weather, but planting of beans well under way by end of month. Water run-off good during May.

Yakima Project, Washington

Late frost reduced the fruit prospects somewhat. Asparagus crop attacked by beetles but the pest was being overcome. Fattening beef cattle during the winter proved profitable and farmers expect to increase the number of feeders next fall. One hundred and fifty-one cars of potatoes marketed in May against 119 a year ago.

Uncompahgre Project, Colorado

Water supply normal.

Rio Grande Project, New Mexico-Texas

Cotton crop delayed by weather and worms. Water inflow 64 percent of normal with prospects for a better run-off in June.

Vale Project, Oregon

Crops good. Storage good.

Owyhee Project, Oregon

Water was delivered to new lands under the Kingman laterals May 1, and to lands under the Kingman Irrigation District May 10. A total of 125,890 acre-feet of live storage was added to the Owyhee Reservoir during May.

Klamath Project, Oregon-California

Potato plantings totaled 15,500 acres, an increase of 10 percent over last year. Grains were delayed but their condition excellent. Remainder of last season's potato crop was shipped in May bringing the total shipments to 5,005 cars. Water supply abundant.

Owyhee Recovery Noted

Reclamation Bureau officials at Owyhee report:

"A decided change has taken place in the spirit prevailing throughout this section of eastern Oregon. Two years ago, with crops selling at prices that barely paid for harvesting, the morale of farmer and merchant alike was extremely low. Last year, with a slight increase in the price of farm products, came a noticeable improvement in morale. This year, with poultry and dairy products and livestock selling at prices double those of a year ago, a real spirit of optimism prevails once more.

"The towns in this section directly affected by the returns received by farmers are booming. Merchants generally report business on a par with, and in many cases better than in the predepression days. Building activities are being renewed once more. Vacant store buildings are filling up. Everywhere evidence of better times is at hand.

"That the standards of living are keeping pace with the general improvement in business conditions is evidenced by the sale of luxury items. In Ontario, Oreg., a town of 2,000 inhabitants, 46 electric refrigerators were sold in the first 4 months of the year. The telephone company reports 36 new phones installed during this same period, and the power company reports a considerable increase in the number of customers served and in the sale of electricity and electrical appliances. Automobile dealers state that at the present rate of increase, the sales of cars for the year will exceed any year in their history."

Milk River Project, Montana

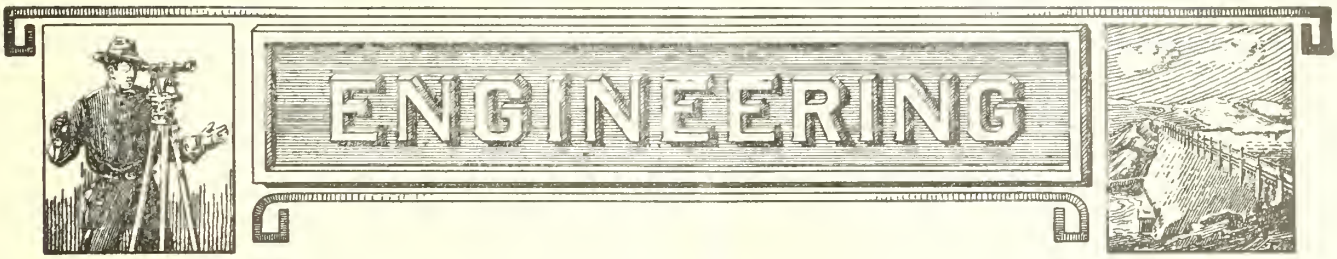
Crops 10 days late due to cold weather. The F. E. R. A. bought 600 acres from a rancher on the project and divided it into 5 units, settling 5 families from submarginal lands near the project. Additional resettlement of this nature is anticipated.

Orland Project, California

The almond, prune, and apricot crops will be small. Citrus prospects bright; pasture excellent. Three cars of Valencias shipped in May, a record equalled only once in the history of the project. Both reservoirs flowing over the spillways.

Humboldt Project, Nevada

Crop conditions: Hay prospects excellent. Water prospects brighter as a result of late rains.



Elastic Movements of the Reservoir Walls at Boulder Dam

IN THE RECLAMATION ERA for April 1935 appeared a brief review of some studies made in the Chief Engineer's office at Denver concerning anticipated settlement of the earth's crust in the vicinity of the Boulder Dam due to the added weight of the water in the new reservoir and in accord with the geological theory of isostasy. Of perhaps greater interest to engineers, since the results more directly apply to dam design, are companion studies and field investigations made with reference to the probable elastic spread of the canyon walls due to the pressure of the great depth of water of Boulder Reservoir. That the walls tend to spread and so might produce a crack in the canyon bottom will be readily appreciated by those of our readers who have attempted to keep an old flume from breaking by yoking the side posts together with baling wire.

According to the computations of the engineers the total spread of the canyon walls at the base of the Boulder Dam will be of the order of one fourth inch. Happily however, and strange as it may seem at first sight, such spreading will neither result in a crack under the dam nor cause tension in the rock of the canyon floor. Without going into the mathematics of the subject the reason can be easily understood. To a degree it has been found that rock has much the same kind of elasticity as a piece of rubber. If a small volume of such a substance be imagined several hundred feet below the ground surface the weight of the material above would compress it vertically. Like rubber it would expand laterally were not such expansion prevented by the presence of surrounding material. Not being able to expand the result is horizontal compressive forces, these being the greater the deeper the point considered. Since the Colorado Canyon in effect is but a narrow crack with its floor many hundreds of feet below the surface of the surrounding tableland it seemed probable to the engineers of the bureau that prior to the dam construction the weight of the canyon walls would produce large horizontal compressive stresses in the rock of the canyon bottom. In this case the application of the water load to the canyon walls would only serve to somewhat relieve the existent compression in the rock and providing the movement of the walls were not too great the dam would give enough so that no cracks would form.

To one who is practical-minded the above discussion may sound highly speculative. It might well have been argued that surface cracks known to exist in the canyon would have relieved all compressions, even if they once existed. Such reasoning could not have been overcome by argument. Fortunately, since the contractor at Boulder Dam drove a small tunnel below the toe of the dam for the purpose of drainage, an experimental answer to such objections was possible. It was decided to actually measure such stresses as existed in the rock of the canyon bottom before the reservoir was filled. For this purpose at eight stations within the tunnel, located more or less symmetrically on either side of the canyon axis, strain gages in groups of four arranged at 45° in star fashion were mounted in the solid rock. After zero readings were taken the rock surrounding each mounting was completely channeled away leaving the instruments isolated on a pedestal so that any strain existent in the rock was relieved. As anticipated, the rock was found to have expanded, and from the strain readings obtained the unit expansion was computed. These results corrected for the local strains in the rock caused by driving the tunnel gave data from which the existent compressive stress across the canyon could be computed. The values found were from 1,500 to 6,000 pounds per square inch, or from 110 to 440 tons per square foot. That such large stresses may exist in apparently unloaded canyon bottoms is perhaps surprising, but as has been pointed out, in the case of the Boulder Dam, it is an advantageous factor.

The above-discussed measurements in the drainage tunnel settled one point about which considerable uncertainty had existed, and is typical of the care which has been taken to investigate every possibility however remote which might affect the security of the Boulder Dam. At some future date the same tunnel will be used to measure the stresses caused by the load from the dam and reservoir. Such data may well result in knowledge which will mean cheaper dams and less irrigation charges to the farmers of the future. There is such a thing as pioneering in engineering as well as in land settlement.

Notes for Contractors

BOULDER Canyon project, Arizona-Nevada.—Twelve manufacturers bid on furnishing penstock bulkheads and bulkhead flange bolts for the Boulder power plant, under Specifications No. 678-D, opening at Denver on May 20. The bids were as follows: Erie Forge Co., Erie, Pa., $33,639 f. o. b. Boulder City, discount one-half percent; Sterling Steel Foundry Co., Braddock, Pa., item 1, $32,199.82 f. o. b. Boulder City, discount one-half percent; Bedford Foundry & Machine Co., Bedford, Ind., item 2, $2,538, discount one-half percent; Arthur J. O'Leary & Son Co., Chicago, Ill., item 2, $2,598, discount one-half percent; Continental Roll & Steel Foundry Co., Pittsburgh, Pa., $39,520 f. o. b. Boulder City; Consolidated Steel Corporation, Ltd., Los Angeles, Calif, $37,350; Newport News Shipbuilding & Drydock Co., Newport News, Va., $49,720; Bethlehem Steel Co., Bethlehem, Pa , $52,392; Hardie-Tynes Manufacturing Co., Birmingham, Ala., $36,199; Steacy-Schmidt Manufacturing Co., York, Pa., item 1, $35,000; John W. Beam, Denver, Colo., item 2, $1,955, discount one-half percent; Baldwin-Southwark Corporation, Eddystone, Pa., $33,860. The Erie Forge Co. was the low bidder and contract was awarded on June 8.

The bids received at Denver on April 2, under Invitation No. 23, 418-A, for supplying 5,300 suspension type insulator units 10-inch diameter, 3,000 of 10½-inch diameter, and 685 of 11⅛-inch diameter, were all rejected on June 8 and new bids will be invited. The manufacturers and agents bidding were the Electric Service Supplies Co., Denver, Colo.; Porcelain Products Co., Parkersburg, W. Va.; Graybar Electric Co., Denver, Colo.; Illinois Electric Porcelain Co., Macomb, Ill.; Joslyn Manufacturing & Supply Co., Chicago, Ill.; Ohio Brass Co., Mansfield, Ohio; Lapp Insulator Co., Le Roy, N. Y.;

General Electric Supply Corporation, Los Angeles, Calif.; Jeffery-Dewitt Insulator Co., Kenova, W. Va.; The Mine & Smelter Supply Co., Denver, Colo.; Westinghouse Electric & Manufacturing Co., Denver, Colo.

Bids were opened at Denver on June 17, under Specifications No. 688–D, for furnishing two sets of oil storage tanks, with platforms, ladders, handrails, and appurtenances for the Boulder power plant and 16 manufacturers quoted. The Ornamental Iron Works of Akron, Ohio, was low on item 1 (roof trusses and angle posts) with a bid of $120 f. o. b. destination and was awarded the contract. On item 2 (handrails, brackets, supports, anchors, ladders) the Worden-Allen Co., of Milwaukee, Wis., was low with a bid of $1,515 f.o.b. Milwaukee. All bids under item 3 (fabricated plate-steel work) were rejected and this item will be readvertised. The tanks and other equipment will be installed by Government forces.

The Ornamental Iron Works Co., Akron, Ohio, was awarded contract on May 22 for furnishing observation platforms, ladders, railings, and doors for the tunnel plug outlet works, under Specifications No. 683–D, their price being $1,367 f. o. b. Boulder City, discount one-half of 1 percent, penalty for late delivery $75. Other bids were as follows: The Kawneer Co., Chicago, Ill., $2,461; Galvin, Kadala, Inc., Chicago, Ill., $1,750, discount one-half of 1 percent; Silver Roberts Iron Works, Inc., Denver, Colo., $2,000; Lacy Manufacturing Co., Los Angeles, Calif., $1,540; Consolidated Steel Corporation, Ltd., Los Angeles, Calif., $1,500; John W. Beam, Denver, Colo., $2,050 f. o. b. Peotone, Ill., discount one-half of 1 percent; A. J. Bayer Co., Los Angeles, Calif., $1,789; Hansell Elcock Co., Chicago, Ill., $1,164, discount one-half of 1 percent.

Bids were opened at Denver on June 18, under Specifications No. 689–D, for furnishing gages for indicating water levels in the forebay and tailrace at the power plant, and in the river at the gaging station. This was a readvertisement of Specifications No. 672–D. Leupold, Volpel & Co., Portland, Oreg., offered the gages at $1,867 and Julien P. Friez & Sons, Inc., Baltimore, Md., submitted two bids of $2,194 and $2,394, both subject to one-half percent discount. Bids were f. o. b. shipping point. Contract was awarded to the low bidder on June 22.

Under Specifications No. 680–D for furnishing 12 discharge guides for 72-inch needle valves, bids opened at Denver on May 16, the following bids were received: Babcock & Wilcox Co., Barberton, Ohio, $18,000; Lacy Manufacturing Co., Los Angeles, Calif., $19,550; Southwest Welding & Manufacturing Co., Inc., Alhambra, Calif., $22,194, discount one-half of 1 percent; Lakeside Bridge & Steel Co., Milwaukee, Wis., $22,245 f. o. b. Boulder City, discount one-half of 1 percent; California Steel Products Co., San Francisco, Calif., $20,881 discount 1 percent; Los Angeles Shipbuilding & Drydock Corporation, San Pedro, Calif., $31,330; Steacy-Schmidt Manufacturing Co., York, Pa., $28,000; Alco Products, Inc., New York, N. Y., $27,850 f. o. b. Dunkirk, N. Y.; McClintic-Marshall Corporation, Bethlehem, Pa., $24,898 f. o. b. Leetsdale, Pa.; Allis-Chalmers Manufacturing Co., Milwaukee, Wis., $33,378 discount one-half of 1 percent; Consolidated Steel Corporation, Ltd., Los Angeles, Calif., $20,800. Babcock & Wilcox is the low bidder, shipping from Barberton, Ohio, on Government bill of lading, weight 192,000 pounds. Contract was awarded on June 8.

The Bingham Pump Co., Portland, Oreg., was awarded contract on May 23, for furnishing two direct-connected, motor-driven, deep-well, turbine-type pumping units to be used as sump pumps in the tunnel-plug outlet works (Specifications No. 682–D). Their bid for items 1 and 2 was $7,060 f. o. b. Portland. Byron Jackson Co., Berkeley, Calif., submitted the only other bid of $8,168.40 f. o. b. Berkeley.

Twenty-five manufacturers and manufacturers' agents submitted bids on May 27 for furnishing insulated wire and cable for the Boulder power plant under Specifications No. 687–D, as follows: Associated Wholesale Electric Co., Los Angeles, Calif., Doubleday-Hill Electric Co., Washington, D. C.; American Electrical Works, Phillipsdale, R. I.; Circle Wire & Cable Corporation, Brooklyn, N. Y.; United States Rubber Products, Inc., New York, N. Y.; Simplex Wire & Cable Co., Boston, Mass.; Habirshaw Wire & Cable Corporations, New York, N. Y.; The M. B. Austin Co., Chicago, Ill.; The Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo.; General Electric Co., Schenectady, N. Y.; General Electric Supply Corporation, Los Angeles, Calif.; Triangle Conduit & Cable Co., Inc., Brooklyn, N. Y.; California Electric Supply Co., San Francisco, Calif.; Listenwalter & Gough, Inc., Los Angeles, Calif.; Anaconda Wire & Cable Co., New York, N. Y.; Westinghouse Electric Supply Co., Butte, Mont.; The Mine and Smelter Supply Co., Denver, Colo.; General Cable Corporation, Chicago, Ill.; Graybar Electric Co., Inc., Denver, Colo.; American Automatic Electric Sales Co., Chicago, Ill.; American Steel & Wire Co., Denver, Colo.; Westinghouse Electric Supply Co., Salt Lake City, Utah; The Okonite Co., Chicago, Ill.; Colony Corporation, Rock Springs, Wyo.; Hazard Wire Rope Co., Denver, Colo. All bids were made f. o. b. Boulder City, Nev. Under schedule 1, all bids were $15,029.06, discount one-half percent, except the Circle Wire & Cable Corporation, whose bid was $14,217.13. All bids under schedule 2 were $55,340.16, discount one-half percent, except Circle, $49,230.89, California Electric, $55,488.66, and Listenwalter & Gough, $55,282.83. Under the three remaining schedules all bids were alike, as follows: Schedule 3, $8,302.39, discount one-half percent; schedule 4, $373.18, discount one-half percent; schedule 5, discount, 2 percent, $132.08. Bids have been taken under advisement.

At Denver on May 31 bids were opened for furnishing a 15-ton gantry crane under Specifications No. 686–D, and the following were received: Omaha Steel Works, Omaha, Nebr., $4,876, discount one-half percent; Shaw-Box Crane & Hoist Co., Inc., Muskegon Mich., $6,695; Bedford Foundry & Machine Co., Bedford, Ind., $8,212, discount one-half percent; Alliance Machine Co., Alliance, Ohio, $7,094; The Morgan Engineering Co., Alliance, Ohio, $7,160; Consolidated Steel Corporation, Ltd., Los Angeles, Calif., $7,780. The Omaha Steel Works is the low bidder and contract was awarded on June 5.

The Square D Co., Inc., Los Angeles, Calif., has been awarded the contract for furnishing hydraulic control board and position transmitters as required under Specifications No. 675–D, their bid being $6,145, with shipment from Los Angeles and Schenectady. Two other bids received were the following: General Electric Co., Schenectady, N. Y., $6,234; Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., $7,142.

Bids were received at Denver on July 8 for furnishing pipe, fittings and valves for the Boulder power plant under Specifications No. 627. The material includes approximately 1,000,000 pounds of valves for the various piping systems and fabricated pipe and fittings. Delivery within 120 days is required for most of the material. The installation will be made by the Government.

The following bids were received on June 5 for furnishing twelve 72-inch needle valves under Specifications No. 628: Hardie-Tynes Mfg. Co., Birmingham, Ala., $217.770; Thomas Spacing Machine Co., Pittsburgh, Pa., $214.100, discount one-fourth of 1 percent; American Locomotive Co., Dunkirk, N. Y., $233,650; Steacy-Schmidt Mfg. Co., York, Pa., $243,540; Joshua Hendy Iron Works, Sunnyvale, Calif., $258,903; Consolidated Steel Corporation Ltd., Los Angeles, Calif., $256,300 f. o. b. Boulder City; Babcock & Wilcox Co., Barberton, Ohio, $260,225; Bartlett-Hayward Co., Baltimore, Md., $264,050. All bids except Consolidated were f. o. b. factory shipping point. On the basis of delivered

cost the Hardie-Tynes Mfg. Co. is the apparent low bidder.

Bids were opened at Denver on June 6 for furnishing metal doors, railing and structural and architectural metal work as called for in Specifications No. 625, and the following manufacturers quoted: The Kawnser Co., Niles, Mich.; The Flour City Ornamental Iron Co., Minneapolis, Minn.; General Bronze Co., Long Island City, N. Y.; The Michaels Art Bronze Co., Covington, Ky.; Vulcan Rail & Construction Co., Maspeth, N. Y.; Federal Ornamental Iron & Bronze Co., San Francisco, Calif.; Atlas Ornamental Iron Works, Huntington Park, Calif.; Associated Piping & Engineering Co., Los Angeles, Calif.; North America Iron & Steel Co., Inc., Brooklyn, N. Y.; A. J. Bayer Co., Los Angeles, Calif.; Superb Bronze & Iron Co., Inc., Brooklyn, N. Y.; The Cincinnati Mfg. Co., Cincinnati, Ohio; The Gorham Co., Providence, R. I. The low bidders are the following: General Bronze Co., schedule 1 and 2, $95,765; North America Iron & Steel Co., Inc., $5,585.

At Denver on July 1 bids were opened under Specifications No. 691–D for furnishing miscellaneous metal work for the Boulder power plant including platforms, supports for lighting cables, railings, gratings, etc.

At Denver on July 10 bids were opened for furnishing one new or used diesel-engine-powered towboat with equipment for service on the Boulder Reservoir. The specifications number is 693–D, a readvertisement of 670–D.

The Denver office is preparing plans and specifications for the following new work: two 82,500 kv-a generators; two 115,000 hp. turbines with governors; electrical installation in downstream tunnel plugs and upper penstock tunnels; walkways and stairways in upper penstock tunnels; lighting installation in power house; high voltage switchyard; switchyard oil house; switchyard relay house; high voltage circuits power house to switchyard; 287 kv installation on power-house roof; station service switching apparatus, communication circuits and apparatus and control apparatus; two 168-inch butterfly valves; and oil treating equipment.

Bids will be received at Denver until 2 p. m. July 22 for furnishing and delivering at shipping point or Boulder City, Nev., two 168-inch diameter butterfly valves and two butterfly valve bulkheads (Specifications No. 629) for installation in the Boulder power plant. Valves and bulkheads will be installed by the Government.

Bids were opened at Denver on July 11 for furnishing four switchyard oil storage tanks and two oil sump tanks and appurtenances for the Boulder power plant. The specifications are numbered 695–D. Tanks will be installed by the Government.

At Denver on June 17 the following bids were opened for furnishing and delivering oil storage tanks, under Specifications No. 688–D: John W. Beam, Denver, Colo., $9,436 f. o. b. Chicago; Western Pipe & Steel Co. of Calif., Los Angeles, Calif., $8,560; Consolidated Steel Corporation Ltd., Los Angeles, Calif., $9,500; Graver Tank & Mfg. Co. Inc., East Chicago, Ind., $7,422; Steel Tank & Pipe Co., Portland, Oreg., $8,660; Columbian Steel Tank Co., Kansas City, Mo., $9,052; California Steel Products Co., San Francisco, Calif., $7,747; National Tank & Mfg. Co., Los Angeles, Calif., $9,445; Lacy Mfg. Co., Los Angeles, Calif., $8,995; Southwest Welding & Mfg. Co., Alhambra, Calif., $8,531; Buehler Tank & Welding Works, Los Angeles, Calif., $7,830; Eaton Metal Products Co., Denver, Colo., $9,425. Incomplete bids were received from Heine Boiler Co., St. Louis, Mo., Valley Iron Works Inc., Yakima, Wash., Chicago Bridge & Iron Co., Chicago, Ill., Brown Sheet Iron & Steel Co., St. Paul, Minn., and the Berkeley Steel Construction Co. Inc., Berkeley, Calif. All bids were rejected and readvertisement was issued as Specifications No. 697–D, opening of bids July 1.

The Denver office will receive bids until July 15 for furnishing and delivering eight safety doors and appurtenances for penstock anchor passageways at Boulder Dam, under Specifications No. 689–D.

Columbia Basin project, Washington.—Bids were opened at Denver on June 14 (Specifications No. 690–D) for furnishing structural-steel roof trusses, with ties, bracing, shelf angles and erection bolts for the garage and fire station at Coulee Dam. The following bids were received: John W. Beam, Denver, Colo., $1,836, f. o. b. Peotone, Ill., discount ½ percent, alternate $1,946; Omaha Steel Works, Omaha, Nebr., $2,400, discount ½ percent; Midwest Steel & Iron Works Co., Denver, Colo., $2,387, f. o. b. Odair, Wash.; Spuck Iron & Foundry Co., St. Louis, Mo., $2,863, f. o. b. Odair, Wash.; Wallace Bridge & Structural Steel Co., Seattle, Wash., $2,674, discount ½ percent; Pacific Car & Foundry Co., Renton, Wash., $2,950; Pennsylvania Iron & Steel Co., Los Angeles, Calif., $2,858, alternate $3,170, f. o. b. Odair, Wash.; Valley Iron Works, Yakima, Wash., $4,082; Minneapolis-Moline Power Implement Co., Minneapolis, Minn., $2,200; Wisconsin Bridge & Iron Co., Milwaukee, Wis., $2,745, f. o. b. Odair, Wash.; Des Moines Steel Co., Des Moines, Iowa, $2,670, f. o. b. Odair, Wash., discount ½ percent; The Ingalls Iron Works Co., Birmingham, Ala., $2,710, f. o. b. Odair, Wash.; Star Iron & Steel Co., Tacoma, Wash., $2,950; Pittsburgh-Des Moines Steel Co., Des Moines, Iowa, $2,268, discount ½ percent; Pacific Coast Steel Corporation, Alameda, Calif., $2,647; American Bridge Co., Gary, Ind., $2,900, f. o. b. Odair, Wash.; California Steel Products Co., San Francisco, Calif., $2,792; St. Paul Foundry Co., St. Paul, Minn., $2,786, f. o. b. Odair, Wash.; Duffin Iron Co., Chicago, Ill., $2,035, discount ½ percent; E. J. White, Seattle, Wash., $2,597, alternates $2,768 and $2,860, f. o. b. Odair, Wash.; Silver-Roberts Iron Works, Inc., Denver, Colo., $3,200, f. o. b. Odair Wash.; alternate $2,800, f. o. b. Denver; McClintic-Marshall Corporation, Chicago, Ill., $2,600; Clinton Bridge Works, Clinton, Iowa, $2,070, discount ½ percent; Joseph T. Ryerson & Son, Inc., Chicago, Ill., $2,200, discount ½ percent; Virginia Bridge & Iron Co., Roanoke, Va., $1,812, f. o. b. Birmingham, Ala.; Isaacson Iron Works, Seattle, Wash., $2,584, discount ½ percent; Worden-Allen Co., Milwaukee, Wis., $2,494, discount ½ percent, f. o. b. Odair, Wash.; Midland Structural Steel Co., Cicero, Ill., $2,709, discount ½ percent, f. o. b. Odair, Wash.; Stupp Brothers Bridge & Iron Co., St. Louis, Mo., $2,057; Belmont Iron Works, Eddystone, Pa., $2,113, discount ½ percent; Steel Fabricators, Inc., Seattle, Wash., $2,549; Milwaukee Bridge Co., Milwaukee, Wis., $2,725, f. o. b. Odair, Wash.; Bethlehem Fabricators, Inc., Bethlehem, Pa., $2,145. Contract was awarded to the Worden-Allen Company on June 21.

Only two contractors bid on constructing the garage and fire station at Coulee Dam (Specifications No. 624). Bids were opened on May 25, schedule 1 with concrete walls and schedule 2 with brick walls being alternative. The bids received were as follows: A. S. Hansen & Co., Seattle, Wash., schedule 1, $21,804; schedule 2, $23,186; Clark & Earley, Seattle, Wash., schedule 1, $22,415; schedule 2, $23,815. This was a readvertisement of Specifications No. 613, bids opened March 4, 1935, all of which were rejected. Award of contract was made to Hansen on June 22, for schedule 1.

New work in progress at Denver includes preparation of design of 135 feet by 28 feet spillway drum gates, spillway bridge, and sluiceway trashrack structures; and studies of 102-inch Paradox gates, 174-inch sphere valve and tractor gates.

Owyhee project, Oregon.—Three contractors submitted bids on the construction of earthwork for North Canal laterals, Mitchell Butte division (Specifications No. 679–D) bids opened at Ontario on May 14. Bids received were as follows: Joseph P. Brumbach, Parma, Idaho, $16,550; J. A. Tertling & Sons, Boise,

Idaho, $17,590; P. R. Teters & Co., Spokane, Wash., $18,360. The contract was awarded to Brumbach on June 8.

The following bids were received at Ontario on May 15 for building structures on North Canal laterals under Specifications No. 681-D: Winters & Ashcraft, Nyssa, Oreg., schedule 1, $7,469.50; J. A. Terteling & Sons, Boise, Idaho, schedule 1, $7,606—schedule 2, $13,161; Fife & Co., Adrian, Oreg., schedule 1, $7,783—schedule 2, $13,274.50; H. L. Horn, Nyssa, Oreg., schedule 1, $8,090—schedule 2, $14,075; Dan Teters & Co., Ontario, Oreg., schedule 1, $8,377—schedule 2, $14,487.50; John Gardner, Nyssa, Oreg., schedule 1, $7,587.50. Winters & Ashcraft were awarded the contract for schedule 1, and Fife & Co. for schedule 2, these being approved by the Secretary on June 8.

Only one bid was received at Ontario on May 31 for the construction of North Canal laterals 28.7 to 30.2—0.9 on the Mitchell Butte division, under Specifications No. 516-0. J. A. Terteling & Sons, Boise, Idaho, bid $9,992.

Bids will be received at Ontario, Oreg., until July 15 and then opened for the construction of North Canal lateral structures (Specifications No. 694-D) on the Mitchell Butte division. The principal items of work and quantities involved are as follows: 3,560 cubic yards of excavation for structures; 2,700 cubic yards of back fill; 980 cubic yards of concrete in structures; 1,750 square yards of dry-rock paving; placing 56,000 pounds of reinforcement bars; laying 1,800 linear feet of 15-inch to 48-inch diameter concrete pipe; installing 9,300 pounds of gates and gate hoists; and erecting 3 M feet b.m. of timber in structures. The work must be completed within 180 days. The bureau will purchase steel reinforcement bars, pipe, gates, and gate hoists.

At Denver on July 12 bids were opened for furnishing, under Specifications No. 696-D, cast-iron and radial gates, gate-hoists, miter and two-way bevel gear sets, shaftings, railings, and miscellaneous metal work for the South Canal structures. All materials will be installed by the Government.

Vale project, Oregon.—Bids were opened at Denver on May 27 for furnishing roof trusses for outlet works control house, outlet works stairways, floors and walkways, oil tanks, 36-inch needle valve discharge guides, heating plant stack, and miscellaneous metal work for Agency Valley Dam, under Specifications No. 685-D. Sixteen manufacturers quoted and the low bidders were as follows: Item 1, roof trusses and angle posts, Ornamental Iron Works, Akron, Ohio, $115 f. o. b. destination, discount one-half of 1 percent; item 2, handrails, brackets, supports, anchors, and ladders, Hansell-Elcock Co., Chicago, Ill., $1,725 f. o. b. Boulder City, discount one-half of 1 percent. All bids under item 3 fabricated plate-steel work, were rejected, and this item will be readvertised.

All-American Canal project, Arizona-California—Bids were opened at Denver on July 8 for furnishing and delivering f. o. b. factory shipping point or Yuma, Ariz., four 75- by 23-foot roller gates with operating mechanisms (Specifications No. 631) for the canal headworks at the Imperial diversion dam and desilting works. Schedule 1 called for riveted plate-steel gates, with operating mechanisms, pier armatures, and accessories, while schedule 2 requires gates of welded plate-steel construction, the two schedules being alternative. All of the material will be installed by the Government.

At Yuma, Ariz., on July 8, bids were opened for furnishing labor and materials for the preparation of concrete aggregates at station 90 of the canal (Specifications No. 633). The work involves stripping gravel deposits 60,000 cubic yards and preparing and stock piling 320,000 cubic yards of sand and gravel. Four hundred days are allowed to complete the work.

Bids under Specifications No. 692-D were opened at Denver on June 24 for supplying 500 tons of sand and 800 tons of gravel for concreting operations during June, July, and August of this year.

New work for which plans and specifications are being prepared in the Denver office include the Imperial Dam and desilting works; Picacho, unnamed, and 424 wash siphons; drainage inlets into canal; overshot wash crossings; wash siphon at station 120; hoist for spillway radial gate at Imperial Dam; sluiceway gates and hoists.

Uncompahgre project, Colorado.—The United States Portland Cement Co. of Denver, Colo., was successful in a drawing held June 10, and has been awarded a contract for furnishing 15,000 barrels of cement, under Specifications No. 658-D, for the Taylor Park Dam. Both the United States Co. and the Colorado Portland Cement Co. bid $3.56 per barrel f. o. b. Almont, Colo., subject to a 50-cent discount and sack allowance.

Specifications No. 636 covering the building of structures on the South and West canals are printed and ready for distribution.

Sanpete project, Utah.—Bids were received at Salt Lake City until July 8 and then opened for constructing the Ephraim and Spring City Tunnels under Specifications No. 602. The items of work are as follows: 3,100 cubic yards of all classes of open-cut excavation; 16,440 cubic yards of tunnel excavation; 2,230 cubic yards of concrete in tunnel; 5,700 cubic feet of gunite tunnel coating; placing 1,300 pounds of reinforcement bars; and furnishing and erecting 60 M feet board measure of permanent timbering in tunnel. The work must be completed within 625 calendar days.

Ogden River project, Utah.—Bids were opened at Ogden, Utah, on July 8 for the construction of Ogden-Brigham Canal, station 0 to station 587, under Specification No. 623. The items of work are as follows: 163,100 cubic yards of all classes of excavation for canal; 6,580 cubic yards of all classes of excavation for structures; 5,500 station cubic yards of overhaul; 5,000 cubic yards of compacted embankment; 31,350 cubic yards of back fill; 7,060 square yards of preparing canal sections in rock for concrete lining; 77,550 square yards of trimming earth sections for concrete lining; 3,020 cubic yards of concrete in structures; 800 cubic yards of concrete in combination sections; 6,650 cubic yards of concrete in canal lining; 50 cubic yards of rubble masonry; 805 cubic yards of dry-rock walls; 315 square yards of dry-rock paving; 500 cubic yards of riprap; placing 637 pounds of reinforcement bars; laying 1,990 linear feet of 12-inch to 36-inch diameter concrete pipe; laying 1,552 linear feet of 4-inch to 8-inch diameter clay sewer pipe; laying 480 linear feet of 12-inch and 18-inch diameter corrugated metal pipe; erecting 372 linear feet of No. 48 and No. 144 metal flume; erecting 33,200 pounds of structural steel; erecting 69 M feet board measure of timber in structure; installing 9,100 pounds of gates and gate hoists; and installing 6,650 pounds of blow-off valves and connections. The work must be completed within 320 days.

The First Assistant Secretary on May 25 approved award of contract to the Union Construction Co., of Ogden, Utah, at their bid of $77,737.50 for the construction of the Ogden-Brigham Tunnel, schedule 1, Specifications No. 618. There were six other bids ranging up to $128,464.90. All bids under schedule 2 were rejected. The work must be completed in 6 months. The Government will furnish cement, reinforcement bars, gates and gate hoists, and other materials.

Barnard-Curtiss Co., of Minneapolis, Minn., was awarded a contract on May 25 for schedule 2 of Specifications No. 622, covering construction of the Ogden Canyon conduit, to be built of continuous wood-stave pipe. Their bid was $399,554.51. The pipe material will be furnished by the National Tank & Pipe Co., of Portland, Oreg. The work is to be completed in 140 days. All bids under schedule 1 were rejected.

The Denver office is preparing a specification for the purchase of radial gates, slide gates, gate hoists, and structural metal work.

Casper-Alcova project, Wyoming.—Bids will be received at Casper, Wyo., until July 15 for constructing the Alcova Dam on the North Platte River near Alcova under Specifications No. 590. The principal items of work are as follows: 1,651,300 cubic yards of all classes of open-cut excavation for dam; 1,720 cubic yards of spillway tunnel and shaft excavation; 1,500 cubic yards of back fill; 1,500 cubic yards of riprap at spillway outlet; 935,300 cubic yards of earth fill in embankment; 127,000 cubic yards of sand, gravel, and cobble fill in embankment; 388,000 cubic yards of rock fill in downstream portion of embankment; 61,000 cubic yards of riprap on upstream slope of embankment; 275 cubic yards of gravel fill on trash-rack structure; 730 cubic yards of concrete in drainage tunnels and shaft; 920 cubic yards of concrete in gate chamber and tunnel plug; 20,130 cubic yards of concrete in spillway; 3,185 cubic yards of concrete in other parts of dam; 150,000 cubic feet of pressure grouting; placing 2,200,000 pounds of reinforcement bars; drilling 54,000 linear feet of grout and drainage holes; drilling 3,700 linear feet of holes for anchor bars; constructing 6,150 linear feet of 4-inch to 15-inch clay pipe drains; installing 1,754,800 pounds of metal work; and installing 6,500 linear feet of electrical conduit. The Bureau will purchase reinforcement bars, metal work, electrical conduit, and other materials. Nine hundred and thirty days are allowed for completion of the dam, with a penalty of $200 for each day of delay.

Bids will be received at Casper, Wyo., until July 22 for constructing the Seminoe dam and power plant on the North Platte River, near Rawlins, under Specifications No. 630. The principal items of work are as follows: 541,500 cubic yards of all classes of open-cut excavations; 22,000 cubic yards of tunnel excavation; 5,600 cubic yards of back fill; 1,000 cubic yards of riprap; 330 cubic yards of rubble masonry; 190,340 cubic yards of concrete; 90 cubic yards of porous concrete; 29,600 cubic feet of pressure grouting; drilling 28,100 linear feet of grout, drainage, weep, and anchor bar holes; placing 2,550,000 pounds of reinforcement bars and fabric; constructing 610 linear feet of 4 inch to 12 inch diameter sewer pipe drains; manufacturing and placing 7,000 linear feet of porous concrete draintile; installing 397,000 pounds of metal pipe and fittings; installing 1,002,000 pounds of gates and appurtenances; installing 339,000 pounds of power panstock and outlet pipes; installing 1,542,000 pounds of needle valves and miscellaneous metalwork; installing 8,400 square feet of asphalt-saturated felt roofing; installing 25,700 linear feet of electrical conduit; installing 10,000 linear feet of electrical cable for testing apparatus; furnishing, installing, and operating a concrete cooling plant; and transporting 30,000 hundredweight of freight for the Government. The Bureau will purchase cement, steel reinforcement bars, pipe, gates, needle valves, and miscellaneous metal work and electrical conduit and cable. Nine hundred and fifty days are allowed for completion of the dam and power plant, with a penalty of $250 for each day of delay.

The Denver office is designing 84-inch needle valves for the outlet works and making studies of 25-foot 8-inch by 40-foot spillway fixed-wheel gates at Alcova Dam; also preparing designs for a 60-inch needle valve for the outlet works at Seminoe Dam.

Sun River project, Montana.—At Fairfield, Mont., on July 8 proposals were received and opened which called for construction of earthwork and structures for Greenfields Main Canal and Greenfields South Canal enlargement and extensions and laterals (Specifications No. 626). The items of work are as follows: 186,000 cubic yards of excavation, all classes, for canals and laterals; 25,000 station cubic yards of overhaul; 4,400 cubic yards of excavation, all classes, for structures; 4,500 cubic yards of back fill; 2,150 cubic yards of concrete; 800 square yards of grouted paving; 300 square yards of dry-rock paving; placing 138,000 pounds of reinforcement bars; erecting 2 M feet board measure of timber in structures; laying 2,584 linear feet of 15-inch to 30-inch diameter concrete pipe; laying 1,324 linear feet of 15-inch to 30-inch diameter corrugated metal pipe; constructing 845 linear feet of clay sewer pipe underdrains; and installing 52,500 pounds of gates and miscellaneous metal work. The Government will purchase steel reinforcement bars, concrete and corrugated metal pipe, gates and metal work. The work must be completed within 320 days.

Specifications No. 637 covering improvement work on the Pishkun and Sun River Slope Canals are printed and ready for distribution.

Humboldt project, Nevada.—Purchase of radial gates, slide gates, hoists, conduit liners, outlet pipes, and structural steel for the Rye Patch Dam will be made under one specification which is now being prepared in the Denver office.

As a result of the recent Supreme Court decision, all paragraphs relating to N. R. A. should be eliminated from all contracts, advertisements for which have not been approved. The "Certificate of Compliance" should be omitted from all future specifications and a paragraph on "Hours of Labor" inserted in accordance with General Orders No. 763, dated June 11, 1935, issued by the Office of the Chief Engineer.

Program of Investigations of P. W. A. Projects

Silt survey, Colorado River, Ariz. Calif.—Investigations are being continued to determine the effect of desilted water released from the Boulder Canyon Reservoir on the river channel.

Cross-sections at roughly 5-mile intervals have been located and the work divided between the All-American Canal forces at Yuma, Ariz., and the Parker Dam forces at Earp, Calif. The reach of the river assigned to the Parker Dam forces comprises 17 sections. The field party worked first out of Earp and later Blythe, Calif., Ten sections have been completed to date, with land ties and elevations. Three were completed in May 1935.

Grand Lake-Big Thompson transmountain diversion, Colorado.—Investigation of a transmountain diversion from the Colorado River watershed near Grand Lake to the South Platte watershed near Fort Collins are being continued.

Work was continued on a rectangular coordinate system for the transmountain survey and the geographical coordinates of the United States Geological Survey triangulation system in the area were reduced to the plane system. Hydrographic studies were made to determine run-off from the drainage area adjacent to the tunnel. Automatic gages were located on Crystal River south of Glenwood Springs, and on Willow Creek and Arapahoe Creek near Granby, Colo., in cooperation with State engineer's office and the United States Geological Survey.

Upper Snake River project, Idaho.—Drilling and testing of the various sites on tributaries of the upper Snake River were continued, including wash borings at the Teton River Dam site and a topographic survey of the site was completed. Diamond drilling was in progress at the Spring Creek site and percolation tests and detailed topography taken of the dam site and reservoir basin. A survey was made of the Fremont-Madison Irrigation District, and about 53,000 acres, or 50 percent of the area, has been mapped. Gaging stations have been constructed on Henrys Fork, including 2 cable stations below Island Park Dam site, and gagings are being made of 9 creeks in cooperation with the United States Geological Survey. Work in the Denver office during the month consisted of completion of preliminary designs and estimates and preparation of drawings for two dams at the Johnny Counts site, a high and a low dam, and for a high dam at the Grand Valley site. Drawings were reproduced for inclusion in the report.

(Continued on page 151)

Law Notes

(Continued from page 141)

lands thereafter patented under the Desert Land Act and other lands patented under the preemption and homestead laws, would be in the same locality and would require water from the same natural sources of supply. In that view, it is inconceivable that Congress intended to abrogate the common-law right of the riparian patentee for the benefit of the desert-land owner and keep it alive against the homestead or preemption claimant.

"As the owner of the public domain, the Government possessed the power to dispose of land and water thereon together or to dispose of them separately. *Howell* v. *Johnson*, 89 Fed. 556, 558. The fair construction of the provision now under review is that Congress intended to establish the rule that for the future the land should be patented separately; and that all nonnavigable waters thereon should be reserved for the use of the public unde the laws of the States and Territories named.

"The words that the water of all sources of water supply upon the public lands and not navigable 'shall remain and be held free for the appropriation and use of the public' are not susceptible of any other construction. The only exception made is that in favor of *existing* rights; and the only rule spoken of is that of *appropriation*. It is hard to see how a more definite intention to sever the land and water could be evinced.

"The terms of the statute, thus construed, must be read into every patent thereafter issued, with the same force as though expressly incorporated therein, with the result that the grantee will take the legal title to the land conveyed, and such title, and only such title, to the flowing waters thereon as shall be fixed or acknowledged by the customs, laws, and judicial decisions of the State of their location.

"If it be conceded that in the absence of Federal legislation the State would be powerless to affect the riparian rights of the United States or its grantees, still the authority of Congress to vest such power in the State, and that it has done so by the legislation to which we have referred, cannot be doubted.

"The proceedings in connection with the adoption of the Desert Land Act bear out this view. The bill which subsequently became the act was called up for consideration in the Senate on February 27, 1877.

"The report of the committee, among other things, said that the larger portion of the lands bordering on the streams had been appropriated; that the provisions of the bill would enable settlers by combined efforts to construct more extensive works and reclaim lands now worthless; that a system had already grown up in the States and Territories included in the bill which recognized priority of appropriation as the rule governing the right to the use of water, limiting the amount to that actually used, and thus avoiding waste.

"Senator Sargent of California, who was in charge of the bill, in the course of the debate said that one great difficulty had been that 'cattlemen go under a fictitious compliance with the terms of the preemption law and take their land along the margin of the streams, and then there is no possibility of getting water to the back country at all. I want to provide so that persons in the back country may go above such a person, for instance, on Humboldt River, and take the water out and conduct it on to the back lands' (Cong. Rec., vol. V, pt. 3, 44th Cong., 2d sess., pp. 1965, 1966).

"There is nothing in the language of the act, or in the circumstances leading up to or accompanying its adoption, that indicates an intention on the part of Congress to confine the appropriation of water in contravention of the common-law doctrine to desert-land entrymen.

"Second. Nothing we have said is meant to suggest that the act, as we construe it, has the effect of curtailing the power of the States affected to legislate in respect of waters and water rights as they deem wise in the public interest. What we hold is that following the act of 1877, if not before, all nonnavigable waters then a part of the public domain became publici juris, subject to the plenary control of the designated States, including those since created out of the Territories named with the right in each to determine for itself to what extent the rule of appropriation or the common-law rule in respect of riparian rights should obtain.

"For since 'Congress cannot enforce either rule upon any State', *Kansas* v. *Colorado*, 206 U. S. 46, 94, the full power of choice must remain with the State. The Desert Land Act does not bind or purport to bind the States to any policy. It simply recognizes and gives sanction, insofar as the United States and its future grantees are concerned, to the State and local doctrine of appropriation, and seeks to remove what otherwise might be an impedient to its full and successful operation. See *Wyoming* v. *Colorado*, 259 U.S. 419, 465.

"The public interest in such State control in the arid-land States is definite and substantial. In *Clark* v. *Nash*, 198 U. S. 361, 370, this court accepted that view to the extent of holding that in arid-land States the use of water for irrigation, although by a private individual, is a public use; and sustained as constitutional a State statute which, for purposes of irrigation, permitted an individual to condemn a right-of-way for enlarging a ditch across the land of another. Mr. Justice Peckham, delivering the opinion of the court, said:

"'The rights of a riparian owner in and to the use of the water flowing by his land are not the same in the arid and mountainous States of the West that they are in the States of the East. These rights have been altered by many of the Western States, by their constitutions and laws, because of the totally different circumstances in which their inhabitants are placed, from those that exist in the States of the East, and such alterations have been made for the very purpose of thereby contributing to the growth and prosperity of those States arising from mining and the cultivation of an otherwise valueless soil, by means of irrigation. This court must recognize the difference of climate and soil, which render necessary these different laws in the States so situated.'

"For the foregoing reasons, we affirm the decree of the court below, passing without consideration the second question discussed by that court and upon which its decision rested, as to which we express no opinion.

"Decree affirmed."

COMMISSIONER,
Bureau of Reclamation,
Washington, D. C.

(Date)_____

SIR: I am enclosing my check[1] (or money order) for 75 cents to pay for a year's subscription to THE RECLAMATION ERA.

Very truly yours,

(Name)_____

(Address)_____

_____

[1] Do not send stamps.

NOTE.—30 cents postal charges should be added for foreign subscriptions.

Spread of Work

(Continued from page 134)

Chain Belt Co., MILWAUKEE, Wis., truck mixers and pumpcretes $86,000.

Dorr Co., CHICAGO, DENVER, and LOS ANGELES, desilting and sand grading equipment, $79,000.

Electric Steel Foundry Co., PORTLAND, Oreg., buckets, $58,000.

Elliott Core Drilling Co., LOS ANGELES, Calif., detachable drill bits, $79,000.

Ford Motor Co., DETROIT, Mich., autos and trucks, $96,000.

Foss Heating & Ventilating Co., PASADENA, Calif., air conditioning equipment, $78,000.

General Electric Supply Co., SCHENECTADY, N. Y., electric supplies and wire, $425,000.

Giant Powder Co., GIANT, Calif., explosives, $217,000.

Goodyear Tire & Rubber Co., AKRON, Ohio, and LOS ANGELES, Calif., tires, $80,000.

Hammond Lumber Co., PACIFIC COAST POINTS, lumber and millwork, $56,000.

Hercules Equipment & Rubber Co., SAN FRANCISCO, Calif., and AKRON, Ohio, rubber hose and supplies, $74,000.

Hercules Powder Co., HERPOCO, Calif., explosives, $500,000.

Ingersoll Rand Co. of California, PHILLIPSBURG, N. J., PAINTED POST, N. Y., and LOS ANGELES, Calif., compressor, air drills, and air hoists, $501,000.

International Harvester Corporation, FORT WAYNE, Ind., motor trucks and parts, $352,000.

C. S. Johnson Co., CHAMPAIGN, Ill., batching equipment, $52,000.

Kelly-Springfield Tire Co., CUMBERLAND, Md., tires, $199,000.

Linde Air Products Co., LOS ANGELES, Calif., oxygen, acetylene, and rod, $177,000.

Los Angeles & Salt Lake Railroad Co., locomotives, repairs, and car rentals, $223,000.

Lidgerwood Manufacturing Co., ELIZABETH, N. J., cableways, $145,000.

Leschen Wire Rope Co., ST. LOUIS, Mo., wire rope, $71,000.

Marion Steam Shovel Co., MARION, Ohio, excavating machinery, $431,000.

Moreland Motor Truck Corporation, BURBANK, Calif., trucks and parts, $137,000.

Mack International Motor Corporation, NEW BRUNSWICK and PLAINFIELD, N. J., trucks and parts, $274,000.

Mountain States Implement Co., OGDEN, Utah, electric fittings and globes, $51,000.

National Equipment Corporation, MILWAUKEE, Wis., concrete mixers, $69,000.

Paraffine Co., Inc., SAN FRANCISCO, Calif., building supplies, $109,000.

Pioneer Rubber Mills, PITTSBURG, Calif., belting and hose, $53,000.

Pacific Wire Rope Co., LOS ANGELES, Calif., wire rope, $130,000.

Standard Oil Co., LOS ANGELES, Calif., gasoline, lubricants, and fuel oil, $557,000.

Union Hardware & Metal Co., LOS ANGELES, Calif., light and heavy hardware, $501,000.

Union Oil Co., LOS ANGELES, Calif., gasoline, lubricants, and fuel oil, $562,000.

Union Pacific System, freight, $1,585,000.

United Commercial Co., SAN FRANCISCO, Calif., rail, cars, and locomotives, $251,000.

United States Rubber Co., AKRON, Ohio, hose, insulated wire, $52,000.

Westinghouse Electric & Manufacturing Co., PITTSBURGH, Pa., electric motors and transformers, $293,000.

Western Wheeled Scraper Co., AURORA, Ill., dump cars, $65,000.

White Motor Co., CLEVELAND, Ohio, trucks and parts, $106,000.

CARLOADS RECEIVED

Freight car loadings received in Boulder City by months during the construction period up to February of this year follow:

1931—March, 164; April, 116; May, 192; June, 335; July, 278; August, 230; September, 323; October, 397; November, 233; December, 298.

1932—January, 215; February, 278; March, 277; April, 291; May, 300; June, 397; July, 379; August, 428; September, 512; October, 417; November, 407; December, 293.

1933—January, 444; February, 283; March, 210; April, 265; May, 287; June, 360; July, 621; August, 673; September, 842; October, 1,122; November, 880; December, 856.

1934—January, 918; February, 954; March, 1,291; April, 1,296; May, 1,251; June, 996; July, 1,161; August, 1,059; September, 1,206; October, 1,037; November, 806; December, 814.

1935—January, 700.

Recent Publications

(Continued from page 143)

3. Feb. 1. Return to shown cause and motion to dismiss, 36 pages.
4. Feb. 8. Bill of United States supporting application, 73 pages.
5. Feb. 19. Supplemental affidavit of Arizona, 23 pages.
6. Feb. 28. Answer by State of Arizona, 20 pages.
7. Mar. 23. Arizona's Reply Brief, 13 pages.
8. Apr. 29. Decision of Supreme Court, 11 pages.

Young, Walker R.:

Mission of Boulder Dam fulfilled, illus., Civil Engineering, June, 1935, vol. 5, pp. 352-356.

P. W. A. Investigations

(Continued from page 149)

Buffalo Rapids project, Montana.—Investigation of irrigation possibilities near Miles City and Glendive, Mont., are being continued.

Field work during the month consisted of main canal location from a headgate site in the vicinity of Miles City to opposite Glendive, Mont., an overland distance of about 80 miles. Alternate pumping and siphon lines have also been examined. The plotting of profiles and alinements and computing earthwork quantities was continued in the field office.

The land classification has been continued and has covered 62 square miles to date, with about 60 square miles yet to cover. Mapping and area determination are being kept apace of the field work.

Data sheets for the design of the diversion dam, power plant, and main siphons are in preparation.

North Platte Valley investigations, Nebraska.—Water supply studies have been commenced, and detailed surveys of the Keystone Dam site has been begun, and drilling will be commenced the latter part of June. A reconnaissance trip has been made over the Tri-County area.

Deschutes project, Oregon.—Investigation of storage possibilities for supplemental irrigation supply of lands along the Deschutes River in Oregon has continued.

A "Progress Report on the Deschutes Investigations" was completed, which summarizes the data collected and studies made since April 1934. A topographic survey of the Wikiup Reservoir and Dam site has been made and 4 test pits were completed and 3 partially completed at Dam Site No. 4. Data are being assembled relative to the possibility of direct pumping onto the north unit from a high dam at the Metolius power site on the Deschutes River.

Grande Ronde project, Oregon.—Drilling in the Grande Ronde River Valley was continued to May 10, when hole no. 5, dam site E, was completed at 130 feet. The hole showed 5 feet of lava in the bottom, 75 feet of breccia above that, and 50 feet of miscellaneous lava and clay seams at the top.

Southern Nevada investigations.—Investigation of irrigation possibilities in Nevada below Boulder Dam and in the Moapa Valley area by pumping from the Boulder Reservoir was commenced. Land classification was continued in the Las Vegas Valley. A total of 109 square miles has been completed, with 11 square miles left to finish the area.

Reclamation Organization Activities

Glaha Complimented

Ben Glaha, the Bureau's photographer at Boulder City, is known to all readers of THE RECLAMATION ERA by the many photographs of Boulder Dam reproduced in these columns. Likewise his work is known to readers of dozens of other publications in which these fine pictures have been reproduced.

Glaha's work has excited much favorable comment. This is what the April issue of Camera Craft had to say in an article entitled "The Work of Ben Glaha", by Willard Van Dike:

"Glaha's technic is clean and precise, like the machinery he works with.

"Glaha's significance as an artist and a photographer lies in the fact that he has not turned his back on the subject material offered him in his regular line of duty. For the first time, to my knowledge, a man who is hired to do a big recording job also turns out photographs of rare beauty from every standpoint. Compositionally perfect, his work never loses sight of the more important human thing back of the steel and concrete. His prints are living documents of the heat, the sweat, the effort, and the pain endured by the workers that the dam may be built."

Glaha has been asked to contribute prints of Boulder Dam for the Yearbook of the National Alliance of Arts and Industries, to include the work of men adjudged the most important photographers in this country. His pictures when shown in a San Francisco exhibit were the subject of a lecture by Ansel Adams, photographer and art critic.

Of interest to water users, citizens of the rural districts of the West, is the appointment of John B. McClelland to the staff of the Federal Office of Education, as specialist in agricultural education.

Harvey F. McPhail, senior engineer, Denver office, was in Washington in June to attend hearings in the office of Assistant Secretary Walters.

MASON CITY

Mason City, built to house the contractors' employees, has provided comfortable homes for year-round conditions. In addition to the houses a theater and town hall provide recreation facilities, and there are in addition, a general store, automobile agencies, bank, hotel, laundry, and post office. Approximately 3,000 men have been employed by the general contractors and millions of dollars spent for wages and equipment.

On the occasion of its 1935 commencement exercises in June, the University of Idaho conferred upon Walker R. Young, construction engineer of the Boulder Canyon Project, the honorary degree of doctor of engineering because of his eminent service in connection with the construction of Boulder Dam. Young is a graduate of the university in the class of 1908.

Warne Joins Staff

William E. Warne has been appointed to the staff of the Bureau of Reclamation as a member of the Public Relations Division. Born in Indiana, Warne's family moved to California when he was 8 years old, and until graduation from high school at Holtville he lived on a farm in Imperial Valley. He is a graduate of the University of California at Berkeley, and was news editor first on the Brawley News, at Brawley, and later on the Calexico Chronicle at Calexico. His editorial experience includes also work on the staff of the Associated Press, where his field covered the problems and interests of reclamation. Warne is married and has an infant daughter.

George O. Sanford, of the Washington office, left June 6 on an extended trip over the operating projects of the Bureau, to confer with superintendents and irrigation district officials.

L. H. Mitchell, recently transferred from the Public Relations Division to the Engineering Division and designated supervisor of the operating projects in district no. 4, including Uncompahgre, Grand Valley, Strawberry Valley, Newlands, and Orland, left Washington May 26 for his headquarters at Salt Lake City.

Prof. O. V. P. Stout, in charge of investigations financed by funds from the Public Works Administration to determine the availability of the water supply in the North Platte Valley of Nebraska, with his staff, is now located in Denver.

Miss Katharine F. Tully, secretary-stenographer in the commissioner's office, temporarily assigned to Prof. Stout, has returned to Washington after 3 months' duty in Lincoln, Nebr., and Denver.

At an auction sale held in Ontario, Oreg., recently, and attended by stockmen from eastern Oregon and southwestern Idaho, 91 head of registered Hereford, Angus, and Shorthorn bulls, imported from Canada, were sold at prices ranging from $100 to $180 per head.

George A. Beyer Dies

George A. Beyer, chief photographer of the Bureau, died on June 3 following an abdominal operation. He was 45 years of age.

Mr. Beyer was first appointed as assistant photographer on June 1, 1928. Prior to entering the Bureau he was connected for several years with the United States Navy Department and made a number of photographic trips under the direction of the Recruiting Division of the Bureau of Navigation. Outstanding achievements of these expeditions were the filming in 1922 of "Rolling Down to Rio Janeiro with Secretary of State Charles Evans Hughes", and "A Midshipman Cruise." Both of these pictures were shown throughout the country.

At one time Mr. Beyer held a position as instructor at the naval training station at Norfolk, Va.

Mr. Beyer was an expert photographer, and was well known throughout the projects because of his regular trips. Most of the Bureau's motion pictures (shown at home and abroad) are his work. Mr. Beyer was survived by his widow.

Offutt Retires

Armand Offutt, district counsel of the Bureau of Reclamation, Denver, Colo., was retired June 30 on account of ill health.

He was born in Washington, D. C., August 16, 1885, and in 1912 was graduated from the law department of Georgetown University. He is a member of the bar of Colorado and of the District of Columbia. He was employed in the Navy Department at Washington, D. C., from December 1, 1902, to April 30, 1907, and in the Bureau of Reclamation from May 1, 1907. He had been a legal adviser in the Denver office since 1915.

Offutt specialized in Government accountancy and contract law and was more familiar with these topics than any other member of the Bureau's legal staff.

Secretary Ickes, in reply to Offutt's request for retirement, said: "Before you leave the service I want to compliment you on your long and efficient record and to express the hope that you will be restored speedily to good health that you may enjoy many years of pleasant leisure."

Secretary Ickes expresses a sentiment heartily felt by Offutt's many friends in the Bureau.

Leaflet 105, United States Dept. of Agriculture, Quality Guides in Buying Ready-Made Dresses. Price 5 cents.

ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead,** Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; Miss Mary E. Gallagher, Secretary to the Commissioner; George O. Sanford, Chief Engineering Division; Wm. F. Kubach, Chief Accountant; Charles N. McCulloch, Chief Clerk; Jesse W. Myer, Chief Mails and Files Division

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H. Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak.	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg.	R. J. Newell	Constr. engr.			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev.	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz.	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo.	H. W. Bashore	Constr. engr.	C. M. Voyen [1]	C. M. Voyen	W. J. Burke	Billings, Mont.
Columbia Basin, Grand Coulee Dam.	Coulee Dam, Wash.	F. A. Banks	do	C. B. Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
Frenchtown	Missoula, Mont.	J. W. Taylor	Resident engr.				
Grand Valley	Grand Junction, Colo.	W. J. Chiesman	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev.	L. J. Foster	Engineer	George B. Snow		do	Do.
Hyrum	Hyrum, Utah.	D. J. Paul	Resident engr.	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg.	B. E. Hayden	Superintendent		C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont.	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho.	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo.	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah.	J. R. Iakisch	Resident engr.	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif.	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg.	R. J. Newell	Constr. engr.	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif.	Ralph Lowry	do	George H. Bolt		R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah.	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex.	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	do	C. B. Wentzel [1]	C. B. Wentzel	W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah
Shoshone	Powell, Wyo.	L. J. Windle [1]	Superintendent	L. J. Windle [1]	Denver office	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg.	R. J. Newell	Constr. engr.	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont.	A. W. Walker	Superintendent		Denver office	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev.	L. J. Foster	Engineer			J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg.	C. L. Tice	Reservoir supt.		Denver office	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo.	A. A. Whitmore	Engineer	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo.	C. B. Elliott	do	do	do	do	Do.
Upper Snake River Storage [3]	Idaho Falls, Idaho	H. A. Parker	Constr. engr.	Emmanuel V. Hillius		B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg.	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash.	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz.	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

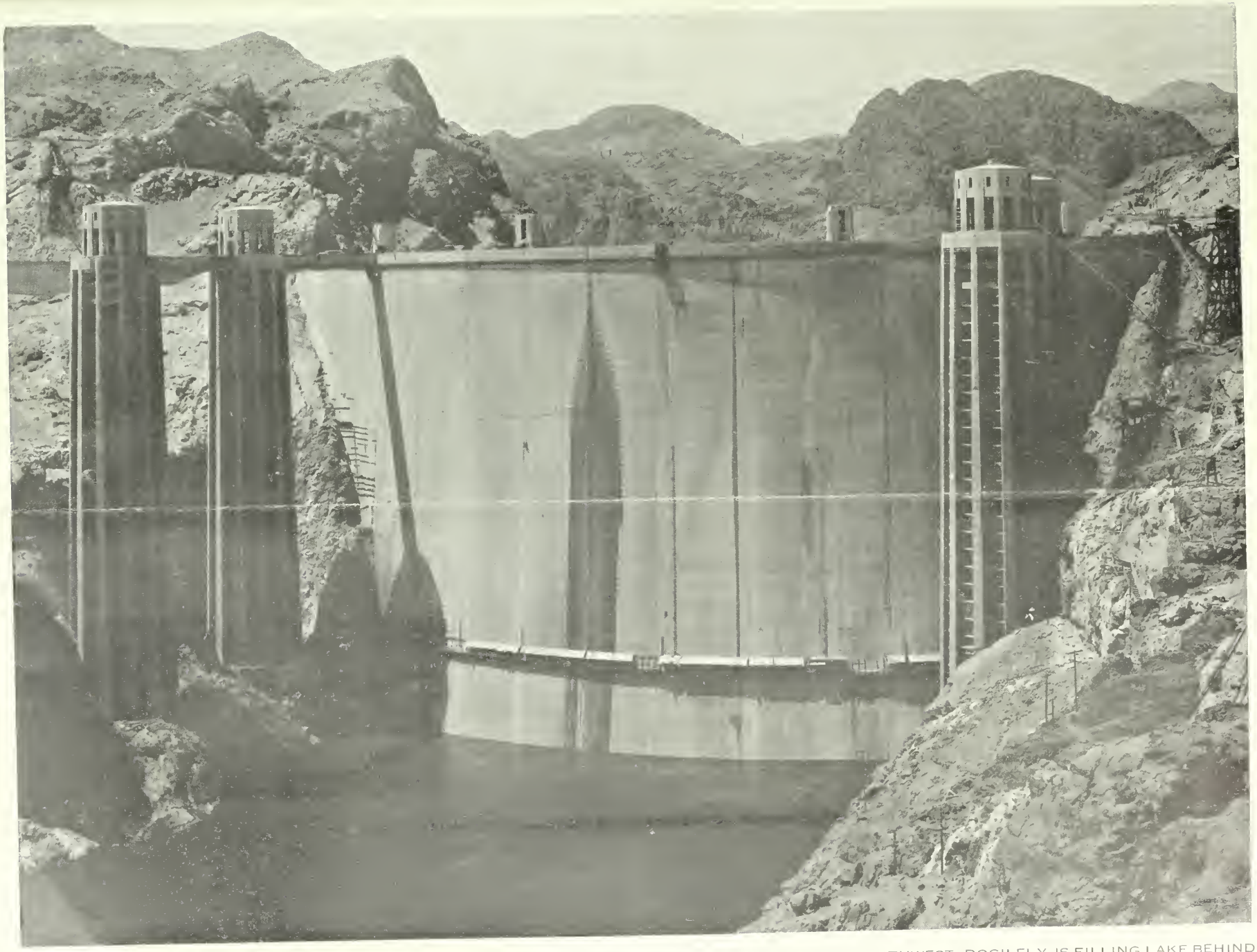
Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrigation dist.	Baker, Oreg.	A. J. Ritter	President	F. A. Phillips	Keating.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont.	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo.	C. W. Tharp	Superintendent	C. J. McCormick	Grand Junction.
Huntley	Huntley irrigation district	Ballantine, Mont.	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg.	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Irl Davis	President	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont.	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont.	A. L. Bentou	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont.	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont.	D. E. Norton	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont.	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev.	W. H. Alcorn	President		Fallon
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr.	T. W. Parry	Manager	F. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district	Gering, Nebr.	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo.	Bert L. Adams	do	Nellie Armitage	Torrington.
Northport division	Northport irrigation district	Bridgeport, Nebr.	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash.	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
Salt Lake Basin (Echo Reservoir).	Weber River Water Users' Association.	527 Eccles Bldg., Ogden, Utah.	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A.	Phoenix, Ariz.	H. J. Lawson	Gen. supt. and ch. engr.	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo.	J. O. Roach	Superintendent	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo.	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn.	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont.	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigation district	Fairfield, Mont.	A. W. Walker	do	A. W. Walker	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg.	E. D. Martin	do	Enos D. Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg.	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley Water Users' Association.	Montrose, Colo.	Jesse R. Tompson	Acting superintendent.	J. Frank Anderson	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash.	V. W. Russell	Manager	R. E. Rudolph	Ellensburg.

Important Investigations in Progress

Project	Office	In charge of—	Title
Buffalo Rapids	Terry, Mont.	R. R. Robertson	Assistant engineer.
Colorado River Basin, sec. 15	Denver, Colo.	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes	Bend, Oreg.	C. C. Fisher	Engineer.
Gila Valley	do	P. J. Preston	Senior engineer.
Grande Ronde	Pendleton, Oreg.	Foster Towle	Associate engineer.
San Luis Valley	Denver, Colo.	R. F. Walter	Chief engineer.
Umatilla River	Pendleton, Oreg.	Foster Towle	Associate engineer.
Grand Lake-Big Thompson Transmountain	Denver, Colo.	P. J. Preston	Senior engineer.
North Platte Valley	Lincoln, Nebr.	O. V. P. Stout	Consulting engineer.

SALLIE A. B. COE, *Editor.*



THE COLORADO RIVER WHOSE FLOODS AND DROUGHTS PRESENTED A CONTINUOUS THREAT IN THE SOUTHWEST, DOCILELY IS FILLING LAKE BEHIND BOULDER DAM

THE RECLAMATION ERA

VOL. 25, NO. 8 AUGUST 1935

SHOSHONE PROJECT, WYOMING
STACKING ALFALFA ON THE WILLWOOD DIVISION

Federal Reclamation self-liquidating and Beneficial to entire Country

The original funds for reclamation were derived from the sale of public lands in the Western States. Subsequently Congress provided that a major share of oil royalties, which accrue entirely in the West, should go into a revolving fund for reclamation purposes. Not only are the reclamation projects financed by the West, but in the course of time the whole cost of construction and maintenance returns to the Federal treasury. They are self-liquidating. The money that the farmers pay for the water and power they use goes back into a revolving fund. Water users have already repaid 49 million dollars and power revenues have added another six and one-half million. All reclamation projects, by law, are on this self-sustaining basis.

Moreover, the rest of the country receives direct benefits from the markets which these areas create for manufacturers, merchants, and carriers. A recent survey revealed that in one year 95,000 carloads of manufactured goods valued at 120 million dollars were shipped to points in seventeen of these reclaimed places. Although Boulder Dam lies in the basin of the Colorado River between Nevada and Arizona, many of the millions of dollars spent there have gone into the tills of manufacturers at Schenectady, Pittsburgh, Gary, Youngstown, Birmingham, and other eastern industrial centers.—Extract from "Back to Work" by Hon. Harold L. Ickes, Secretary of the Interior.

THE
RECLAMATION ERA

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Price 75 cents a year

HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 8 AUGUST 1935

One Hundred Million Dollars Set Aside for Reclamation

ONE HUNDRED million dollars of Works Progress funds were set aside for the use of the Bureau of Reclamation in the prosecution of a comprehensive program during the next year.

This money was earmarked subject to a provision that any new land brought under cultivation by the projects must be balanced by the withdrawal of an equivalent amount from production elsewhere.

Three projects already have been approved. They are, together with the amounts set aside for them, the Grand Coulee Dam, $23,000,000; the Casper-Alcova project, $10,000,000; and the Frenchtown project in Montana, $60,000.

The allocation for use on the Grand Coulee Dam will carry construction of the Columbia River barrier forward for another year. Work has been in progress there for many months under an allotment of $15,000,000 by the Public Works Administration. The excavation at Grand Coulee was below the river level, and, because of the urgency of continuous work, this allotment was the first made under the new program.

The allocation of $10,000,000 for the Casper-Alcova project in Wyoming, likewise, will see this construction carried forward another year. Here also work was begun with money made available by the Public Works Administration, which had allotted $7,000,000.

As for the Frenchtown project, the $60,000 allotment will complete construction of canals begun with $180,000 made available by the Public Works Administration for a canal system to irrigate about 7,000 acres. This land already is under cultivation. The additional water supply which will be provided, however, will make possible a diversification of crops grown.

While the action of the Advisory Board of Allotment in earmarking $100,000,000 for reclamation came after these projects had been approved, the total amount they involved was charged against this fund.

The Bureau of Reclamation had drawn up a complete program of projects in 12 States for presentation to the Works Progress Administration. The earmarking of a $100,000,000 fund for use by the Bureau assured, apparently, approval of the major part of this program.

Secretary Ickes Says—

IF OUR American statesmanship can keep up with American science and American invention and technology, the coming generation will see marvels of human achievement. It is not our capacity to produce that is weak in America, it is our capacity to plan the wisest use of our dazzling wealth of materials and men. Land, water power, minerals, blended race stocks, mechanical inventiveness, organizing experience and ability—these are American assets which forecast an amazing future provided only that we exercise our skill and judgment in sound planning for their wise development and prudent use.

These projects included those upon which work had been started by the Bureau with Public Works Administration allocations, and some new work.

The amount of new land which could be irrigated on the projects proposed by the Bureau totaled 520,000 acres.

The Division of Application and Information announced on July 23 that the Advisory Board of Allotment had recommended allocation of an additional $61,900,000 to specific reclamation projects. This money also was charged against the $100,000,000 earmarked for use by the Bureau.

The projects which were thus recommended by the Board were yet to be approved by President Roosevelt when this issue went to press. The President's approval is necessary before funds can be made available. The policy of the Works Progress Administration has been to delay announcement of the projects until the President's approval has been given.

Plans for commencement of work on new projects are in preparation by the Bureau. A later issue of the Reclamation Era will contain more detailed information in this respect.

Migration to Northwest

As a result of the extensive westward migration of settlers from the drought area, establishment of thousands of new farms in the four Pacific Northwest States of Montana, Idaho, Washington, and Oregon appears to be in prospect. The influx of settlers into the Northwest States assumed large proportions during 1934, and indications suggest strongly that the movement will probably continue through the current year with little abatement. The numerical proportions of this migration are difficult to gage with precision, but a conservative estimate could easily place this number between 5,000 and 7,000 families since the beginning of 1934. This figure is based on comparison of estimates by railroad development agents, county agricultural agents, and chambers of commerce in the territory. The department of conservation and development of the State of Washington has estimated the number of new settlers locating in that State during 1934 at 3,000 families, conceding this to be a conservative estimate with 19 counties omitted from consideration.—"*Land Policy Review*", *Agricultural Adjustment Administration, United States Department of Agriculture.*

3246—35——1

Doing Something About the Weather

By William E. Warne, *Public Relations Division*

An old timer, looking at an empty stream and thinking wistfully of a useless fishing pole up at the shack, will say, "The climate is changing in these parts. I can mind the time when this crick ran bank full at this time of the year."

As a consequence in some sections the theory that the climate is changing rapidly has been accepted.

This, however, the Weather Bureau's meteorological experts deny. While the climate has changed from moist to dry in parts of the world, the shift was so slow it could not have been noticed in one lifetime, or even a few centuries.

The experts say, rather, that the weather fluctuates constantly, but maintains an average mean over a long period of time. Dry spells are followed by wet spells, which in turn precede other dry spells. And this is what makes an intelligent water conservation program valuable.

WEATHER CYCLICAL

The meteorologists have worked out a series of weather cycles based on the theory that floods and droughts recur with cyclical regularity. There are 9 important short cycles, ranging in length from about 2 to 33 years. Some experts have detected what they believe to be longer cycles, one even as long as 152 years, which at present furnishes an interesting subject for thought.

A technical discussion of rainfall cycles has no place in this article. Let it suffice to say that, like all true scientists, the meteorologists refuse to generalize on the subject or to make ironclad weather predictions on their theories.

It has been found that the time between the wet "peaks" and the dry "valleys" of these cycles varies, but, when the rainfall totals are weighted, averaged, and charted over a period of years, the result is a billowing line and the cycles are fairly well illustrated.

The most notable fact the charts prove is that droughts do recur and that floods do recur, and with some show of regularity. If a drought has been experienced during which all the crops dried up and the cattle died, it follows that another drought just as severe will occur again.

DROUGHTS WILL RECUR

Once Dr. Bailey Willis, the eminent seismologist of Stanford University, while speaking to a group in a territory where earthquakes were not unknown, was asked if he could predict when the next quake would be felt.

"I can't do it with accuracy", he replied, although he had been credited with a remarkable prophesy of a recent damaging shock. "The best rule I know of is this: The farther you are from your last earthquake, the closer you are to your next."

Certainly it can be said of droughts, as Dr. Willis said of earthquakes, "The farther you are from the last, the closer you are to the next."

This brings to mind Mark Twain's observation that everyone talks about the weather but no one ever does anything about it.

As a matter of fact something can be done when it is realized that droughts recur. Something has been done about it in the arid West.

STORE THE FLOODS

Irrigationists in the West realized long ago that their only hope for a stable agri-

Water, plentiful even during drought because it has been stored, provides a refreshing sight at the Sun River diversion dam, Sun River Federal Reclamation project in Montana. In sharp contrast is the—

These sheep in an irrigated pasture on the North Platte project are deprived of neither feed nor water by the vagaries of nature, but these—

culture was to be found in storing the waters of the wet season of the year for the time when it would be needed in the dry season. Most of these pioneer reclamationists, however, did not grasp immediately the essential necessity also of storing the excess waters of the wet years against the dry years that surely were to follow. As a consequence some irrigation developments suffered greatly in drought periods, which were not foreseen, although water previously had been plentiful.

The Bureau of Reclamation, after it was set up by Congress in 1902, found the greatest task before it in the rescue of projects the water supplies for which had been proved inadequate by droughts. Storage reservoirs were built almost immediately to protect the Salt River Valley development in Arizona. Several dozen more have been built since in other localities for the same purpose. Eleven are now in process of construction to provide storage for still other areas with inadequate supplies.

This was doing something about the weather in a big way.

Soil drifted high against buidings and orchard in the yard of a farm in the stricken area of nearby South Dakota, where the 1934 drouth was severe

Cattle, bought by the relief administration from farmers whose unguarded fields and ranges were dust dry last year, show plainly the ravages of starvation and thirst

DROUGHT STRIKES IN 1934

The subnormal rainfall period which was climaxed by the severe drought of 1934 in the West served to illustrate what had been done about the weather for these projects.

In a year when farmers in the West who were not safeguarded by stored water were being wiped out, their livestock dying by the thousands, the irrigationist served by a proper water storage system found himself on an oasis hardly affected at all. In some cases he had to be content with prorated water, but he was able to crop some land and he lost no stock from starvation and thirst.

The acute drought of 1934 also demonstrated the need for additional storage in some localities where a supply which would have been adequate was partially wasted through lack of regulation of the streams. Since the drought of 1934 most certainly will find a counterpart in a drought to occur in the future, wise planning dictates that storage to meet such an emergency should be provided where possible.

SUPPLEMENTING STORAGE

The Bureau is doing just that in the construction of 11 dams to provide supplemental storage for existing projects. A notable phase of this program is being carried on in Utah, where irrigation systems built years ago by the far-sighted Mormons were found inadequate to meet the test of an extended period of subnormal rainfall and run-off.

Short-sighted would be any policy which failed to take into account the possibility of fluctuating run-off. One handicap in the early days of irrigation was that run-off records were not available in all localities where dams were needed. Since then, however, the Bureau and other agencies have built up rather a complete library of run-off tables. In making up these records streams have been gaged accurately for more than a quarter of a century.

Meteorologists and engineers in the West have made a very careful study of the weather history of their localities. Records of past droughts and floods on which plans for future emergency periods could be based were of utmost importance to them.

The city of Los Angeles, for instance, located as it is in an arid territory and forced by necessity to bring its water from sources hundreds of miles distant, attached the utmost importance to research to discover just what had been the weather history of southern California.

DROUGHT 29 YEARS LONG

H. B. Lynch, consulting engineer of the Metropolitan Water District of Southern California, discovered from a study of the records of the padres who established the Old Missions in California that a 29-year

drought once was visited upon that country. Of this he reported:

"In 1781 began a period of rainfall shortage which lasted, with only occasional interruptions, until 1810. The total rainfall deficiency in this period was as great as any of which we have a record. Some of the other droughts have been more acute, but of lesser duration. The extent of this drought is told in crop reports and in many references to the character of the seasons. It is also confirmed by a reference to the condition of Lake Elsinore, which in 1810 was little more than a swamp about a mile long. The drought was State-wide and all of the missions experienced the same difficulties."

It is characteristic of a long drought that it may be broken a few times by comparatively wet years, years in which the rainfall may even exceed normal. These years, however, when averaged in with the rest still leave a marked rainfall deficiency for the period. One comparatively wet year wedged in between several dry ones ordinarily will not produce a large amount of run-off or surplus water because of the dry and absorbent condition of the soil on the watersheds.

READING TREE RINGS

These students of the weather in the arid regions, where this summer's crops, hydroelectric supply and comfort may depend on last winter's rainfall, have penetrated beyond the written history of their neighborhoods in their search for dependable data.

One authentic inantimate record was found in tree rings. Tree ringology, as the study of this source has been called facetiously, sprang from the discovery that rings were close set in dry years of short growing seasons and farther apart in years of plentiful rainfall and long growing seasons. What these records disclose has an important bearing on future plans.

Nature provided a unique tree ring record in the giant redwoods of California, some of which are more than 2,000 years old. Through the reading of these rings reliable weather records for that area have been charted back beyond the time of Christ. In this fashion data of tremendous weight in support of cycle theories have been obtained.

Exponents of a theory that the great drought recorded by the good fathers in early California history was a manifestation of the 152-year cycle, mentioned previously, contend they have traced the 152-year cycle through the tree ring charts and the deposit of clay layers in lakes back to 1255 B. C.

THE 152-YEAR CYCLE

They point also to a series of very wet years around 1863 as evidence that the 152-year cycle was then reaching its "peak." If it can be granted, merely for the sake of the argument, that there is a mammoth cycle of 152 years, the peaks of which are very high and the valleys of which are very low, then the next valley of this cycle would fall in the present.

The series of years of deficient rainfall setting in during 1929 might be the start of a counterpart of that 29-year drought which so afflicted the early California missionaries. To say that such is the case would be a prediction of the weather for the next 20 years or so, which expert meteorologists or even fools would not attempt.

However, it has been established that a drought covering more than a quarter of a century can occur, because it did occur.

The fact that it can recur is as important for the purpose of illustrating the need of water conservation for irrigation and domestic use, as would be the fact, if it could be established, which as yet is impossible, that it is now occurring.

MEET MAXIMUM NEEDS

Storage must be provided to meet maximum needs. In other words, the rainfall "peaks" must be leveled off to fill in the rainfall "valleys" through storing water. Otherwise droughts will make themselves felt in the irrigated valleys as surely and as acutely as high up on the watersheds.

Planning in the past enabled Federal projects to escape the sharp edge of the drought last year. Planning in the future must assist still other agricultural areas to skip undamaged over the dry spots on the weather charts.

During a period of deficient rainfall it becomes increasingly important that what water is available be saved and put to a beneficial use.

There was an old saying which ran like this, "You never miss the water 'till the well runs dry." It has its significance.

Turning this idea around, it is obvious that stored water is most appreciated during a drought. Similarly it takes a drought to emphasize the value of reclamation.

RECLAIMED OASES

Amid tragic scenes of desolation created by last year's drought, green patches showed here and there through the cattle country that were lands under irrigation ditches—ditches fed by reservoirs which had caught and held the moisture of preceding months.

At a cost of millions, just a small fraction of the billions lost as a result of this one drought, something had been done about the weather as it affected these oases.

Press reports indicate there will be no fish available this year for stocking the reservoir created by Boulder Dam. Cold weather killed virtually all the spawn at the New Mexico hatchery.

Project Land Listings

Listings of lands on Federal reclamation projects for use in a rehabilitation program were turned over by the Bureau of Reclamation July 1 to the Division of Rural Land Planning, Department of Agriculture, which will have charge of resettlement work. A total of 648 separate listings containing offers to sell 52,413 acres for a total of $1,134,543 was offered. These listings covered lands on 13 projects and divisions in 10 western States.

Some of the land offered frankly was not considered suitable for rural rehabilitation work at the prices asked. The project superintendents said, in transmitting their listings, that they believed in these cases where the prices were too high a lesser cash offer would be accepted. Of course, they made some exceptions.

Superintendents of some of the projects annotated the listings with a statement whether the farm offered could be paid out at the price set.

The Bureau did some field work on the listings prior to delivering them to the Rural Land Planning Division. L. H. Mitchell, Bureau economist, in making reports on these investigations found a relatively high proportion of the offerings suitable for inclusion in a program.

For unimproved land the list price ranged from $1 to $15 an acre. For irrigated lands the prices quoted ranged from $50 to $200 an acre, with the average approximating $100.

These variations in prices occurred not within a single project, but between projects and between States.

The listings received and transferred to the Rural Land Planning Division included:

State	Project	Listing	Area	Price
			Acres	
Arizona	Yuma	15	984	$95,963
California	Orland	4	192	22,250
Colorado	Grand Valley	19	1,562	93,300
Idaho	Minidoka	13	820	62,150
Nevada	Newlands	32	13,864	485,750
New Mexico	Carlsbad	10	1,201	150,125
Oregon	Owyhee	320	12,200	[1] 73,200
	Klamath	19	3,047	268,510
	Vale:			
	Stanfield division	10	2,500	37,500
	Willow Creek	60	4,967	53,990
South Dakota	Belle Fourche	110	[2] 7,981	423,135
Washington	Okanogan	1	33	10,000
Wyoming	Riverton	29	2,740	41,870
	Shoshone	6	421	16,800

[1] Estimated. This is unimproved land principally.
[2] Irrigated.

Recent Legislation Enacted

Rio Grande Compact

Whereas the duly accredited commissioners representing the States of Colorado, New Mexico, and Texas, respectively, signed the Rio Grande compact at Santa Fe, New Mexico, on the 12th day of February 1929, and which said compact was thereafter duly ratified by the legislature of each of the aforesaid States and approved by act of Congress on June 17, 1930 (Public, Numbered 370, Seventy-first Congress, 46 Stat. 767); and

Whereas the legislature of each of the aforesaid States has by appropriate legislation, and pursuant to the express provisions of article 14 of said compact, extended the said compact for the term of 2 years from June 1, 1935, to June 1, 1937: Now, therefore

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent and approval of Congress is hereby given to the extension of the provisions of said Rio Grande compact, and all the terms thereof for the period of 2 years from June 1, 1935, to June 1, 1937, as heretofore ratified by the legislature of the State of Colorado by act approved April 13, 1935, by the legislature of the State of New Mexico by act approved February 25, 1935, and by the legislature of the State of Texas by act approved April 18, 1935.

SEC. 2. That the right to alter, amend, or repeal this act is hereby expressly reserved.

Approved, June 5, 1935.

Moratorium for 1935

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SEC. 1. That all of the provisions of the act entitled "An act to further extend the operation of the act entitled 'An act for the temporary relief of water users on irrigation projects constructed and operated under the reclamation law', approved April 1, 1932", approved March 27, 1934, be, and all of the provisons thereof are hereby, further extended for the period of 1 year.

SEC. 2. The Secretary of the Interior is authorized and directed to extend to water users on Indian irrigation projects during the calendar years 1934 and 1935 like relief to that provided in the acts of January 26th, 1933 (47 Stat. 776), and March 3, 1933 (47 Stat. 1427), applicable to the calendar years 1931, 1932, and 1933.

Approved, June 13, 1935.

Meetings of Boards

The itinerary of members of the All-American Canal and Grand Coulee Dam Consulting Boards during the month of July and to August 4 included visits to Montrose, Colo., to view model tests of the Imperial Dam and the Grand Coulee spillways, Taylor Park Dam site, Norris and Wheeler Dams, and Pickwick and Hiawassa Dam sites (T. V. A.).

Committee meetings at Montrose, Denver, and Fort Collins, Colo., and the first 3 days of the meeting in Washington (July 21–25) were confined largely to All-American Canal matters.

In addition to the board of consulting engineers, the 3-day session in Washington was attended by the following: Charles P. Berkey, consulting geologist; W. J. Dowd, Evan T. Hewes, Richard Emerson, and Phil D. Swing, representing Imperial Valley interests in the matter of the canal location; R. F. Walter, chief engineer, J. L. Savage, chief designing engineer, L. N. McClellan, chief electrical engineer, and Carl Vetter and Henry R. McBirney, engineers, from the Denver office; and R. B. Williams, construction engineer of the All-American Canal project.

On July 26 and 27, the closing days of the meeting in Washington, consideration was given to the final plans for the high dam at Grand Coulee and the required adjustment under the change of plan order with representatives of the contractors. In addition to the members of the consulting board there were present C. P. Berkey; R. F. Walter, chief engineer; F. A. Banks, construction engineer, Grand Coulee Dam; J. L. Savage; and L. N. McClellan, chief electrical engineer.

Messrs. Berkey and Savage also visited the Kennett dam site of the Central Valley project of California.

Members of the two consulting boards are as follows:

All-American Canal.—L. C. Hill, W. F. Durand.

Grand Coulee Dam.—C. H. Paul, Joseph Jacobs, W. F. Durand.

Members of the Denver office staff, as well as members of the consulting boards and C. P. Berkey, consulting geologist, attending one or more of the meetings are as follows:

L. C. Hill, W. F. Durand, C. P. Berkey, C. H. Paul, and Joseph Jacobs, consulting engineers; R. F. Walter, chief engineer; J. L. Savage, chief designing engineer; L. N. McClellan, chief electrical engineer; H. R. McBirney, senior engineer; E. W. Lane, engineer; Carl Vetter, engineer; F. A. Banks, construction engineer, Grand Coulee dam; R. B. Williams, construction engineer, All-American Canal.

Change in Name of Department Proposed

On April 24, 1935, a bill (S. 2665) was introduced in the Senate and was referred to the Committee on Expenditures in the Executive Departments, the purpose of the bill being to change the name of the Department of the Interior and to coordinate certain governmental functions. This will have the effect of changing the name of the Department to the Department of Conservation and Works. The bill passed the Senate on July 17. Action upon it by the House is necessary before its enactment.

Grand Lake-Big Thompson Diversion

Secretary of Interior Harold L. Ickes, at a public hearing held recently in connection with the proposed Grand Lake-Big Thompson diversion in Colorado, said it would be his policy to authorize no development that would mar a national park.

Officials of the National Park Service expressed a fear that the diversion project would impair the beauty of Rocky Mountain National Park.

Colorado was represented at the hearing by Senators Costigan and Adams and Representatives Taylor and Cummings. M. C. Hinderlider, Colorado State engineer; Paul Prosser, Colorado attorney general; and H. C. Hensen, Greeley, Colo., publisher, also were present.

The Public Works Administration allotted $150,000 to the Bureau of Reclamation for a survey of the project. The survey has been held in abeyance pending settlement of the question regarding the park.

Dr. Elwood Mead, Reclamation Commissioner, said the development would not impair the beauty of the park.

It was suggested that routes for the proposed tunnel under the Continental Divide other than the Grand Lake route be considered in making the investigation. Mr. Taylor also suggested that studies be made of sites for compensatory reservoirs to be used in supplying for the western slope water of an amount equal to that diverted.

Senator Costigan and Secretary Ickes agreed that it was in the public interest to make the investigation.

Notice is given elsewhere in this issue of the death of Dr. D. C. Henny, who was a member of both of these important boards.

The Reclamation Era

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Special reduced rates are given individual water-user owners or water-users organizations for mass subscriptions on Federal irrigation projects.

JULY 1935

Reclamation's Program

A misconception of the Bureau of Reclamation's program—the popular belief that large acreages of new land will be put under irrigation immediately as a result of present and proposed developments—has been the source of some embarrassment.

Even after a generation of operation the Bureau finds its principal mission the rescue of irrigation developments where the original developers failed to provide an adequate, stable water supply.

Eleven dams now under construction are designed to provide supplemental water to existing irrigation systems. The future program includes projects in the same category. The value of this kind of work cannot be doubted. By it established communities are saved.

A compilation from the Bureau's immediate program, as proposed for inclusion in the Works Progress program, demonstrates that only 520,000 acres of new land can be brought into cultivation in the next 10 years by this construction. About half that number of submarginal acres will be retired in the same period on these projects.

A roll call of the projects proposed, by which new land may be irrigated during the next decade, shows that they are spread generally over the West. This means that undoubtedly the growing western markets will be able to absorb their produce when it is available.

The Central Valley project in California, by which thousands of drying acres will be saved, might irrigate 50,000 new acres in 10 years, but its immediate effect will be the withdrawal of water rights from 240,000 submarginal acres which no longer can be irrigated or cropped.

The All-American Canal as it is being constructed will irrigate no new land in the Imperial Valley. By construction of the Coachella branch of the canal 300,000 acres could be brought in, but this construction has not been authorized.

The first unit of the Gila Valley project in Arizona will provide water for 150,000 acres, though the greater part of a decade will pass before any part of it is cropped.

The Verde Dam will irrigate no new land, but will provide supplemental storage for the Salt River project.

Parker Dam on the Colorado River will irrigate no lands under present plans.

The program on the Klamath project in Oregon and California contemplates the eventual irrigation of 12,000 additional acres of land.

The Humboldt project program already has resulted in the purchase of the water rights of 59,715 acres in Nevada of a submarginal character. The water withdrawn from this acreage will be applied to better lands already under cultivation in the project.

The Casper-Alcova project in Wyoming toward the end of a decade will irrigate 35,000 new acres.

Most of the new acreage for which water will be supplied under the new program falls into a classification best described as completion of older projects. For these acreages water has been stored and is available. With their development only can the project, with its repayment feature, be brought to full effectiveness in each case. The dams have been built, but the water remains unused.

The program includes in this classification construction by which can be irrigated during the next 10 years 15,000 acres on the Riverton project in Wyoming; 41,000 acres in the Heart Mountain division of the Shoshone project; 30,000 acres in the Greenfields division of the Sun River project in Montana; 40,000 acres in the Payette division off the Boise project in Idaho; 60,000 acres in the Owyhee project; 15,000 acres in the Vale project, and 72,000 acres in the Roza division of the Yakima project in Washington.

Approval of the program cannot mean that all of this acreage, or indeed, that any of it can be placed in production next year. None of it will be watered inside of several years. A large part of it will not become productive until the decade has nearly passed.

Boulder Dam Does Its Work

Boulder Dam already has played its first bit in its role as the Good Samaritan of the Southwest.

In June it caught and held the floodtide of the Colorado River, for the first time removing the danger of a break in the protective system of levees that guard the Imperial Valley in California and Yuma Federal reclamation project.

The discharge at the Grand Canyon gaging station recorded more than 100,000 second-feet for several days on either side of June 20, reaching a maximum of 105,000 second-feet. During the same period in 1934 the discharge stood at about 6,570 second-feet. It was the highest peak the river had reached since May 26, 1932, when it touched 101,000 second-feet.

Had Boulder Dam not stood staunchly in Black Canyon, holding this flood in reserve, the irrigators in the Imperial Valley would have had another anxious week.

Floods of 100,000 second-feet, although somewhat dangerous on the lower river, ordinarily would not have furnished a

(Cut along this line)

COMMISSIONER,
Bureau of Reclamation,
Washington, D. C.

(Date)_____

SIR: I am enclosing my check [1] (or money order) for 75 cents to pay for a year's subscription to THE RECLAMATION ERA.

Very truly yours,

(Name)_____

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_____

NOTE.—30 cents postal charges should be added for foreign subscriptions.

[1] Do not send stamps.

major threat to the levees, which were built to withstand a greater head. Because of the drought last year, however, the levees were cracked and were in no condition to withstand that great a flood. The cost of putting them in shape would have been great, had that been necessary.

This cost was spared, or reduced to a minimum, and will be spared in the future. The saving must represent several millions of dollars. In addition the Bureau of Reclamation has been allowed $100,000 a year since 1926 to maintain the levees protecting the Yuma project.

Although Congress appropriated this sum again this year, in all likelihood it will not all be used. It is anticipated that this appropriation can be dropped in the near future.

Shortly after the flood tide passed Grand Canyon, Boulder Dam cast off this role, and began to perform another good Samaritan act by guarding from drought the farm lands adjacent to the lower Colorado River. By the end of July, Boulder Dam Reservoir contained 4,500,000 acre-feet of water, more than enough for all this year's irrigation needs below the dam site.

What this meant to the people dependent upon the unpredictable river for their livelihood was disclosed by the joyful manner in which newspapers in the Imperial Valley told their readers, "You don't have to worry any more."

(Continued on p. 160)

Boulder Canyon Project Nears Completion

With the last dump of concrete poured into Boulder Dam, the penstocks and power houses now are being pushed toward completion.

The accompanying drawing, made from records of June 21, 1935, provides an excellent illustration of progress made on the penstock tunnels to that date.

The Upper Nevada Tunnel is the nearest completion, with the Upper Arizona Tunnel not far behind it. The steel lining of these tunnels has been fabricated and installation can be made as soon as the actual excavation is completed.

Although the lower tunnels are not so far advanced, progress is being made on them as indicated by the drawing.

The power houses themselves are virtually completed. Fifty carloads of power-house machinery are standing on the tracks at Boulder City ready for installation. The draft-tube liners below the turbines have been installed and a crew of men is at work installing additional machinery. Orders have been placed for the remainder of the machinery.

The power houses will be fed from the penstocks by the long arms shown on the drawing, and each penstock will have an outlet further downstream directly into the canyon for the release of water.

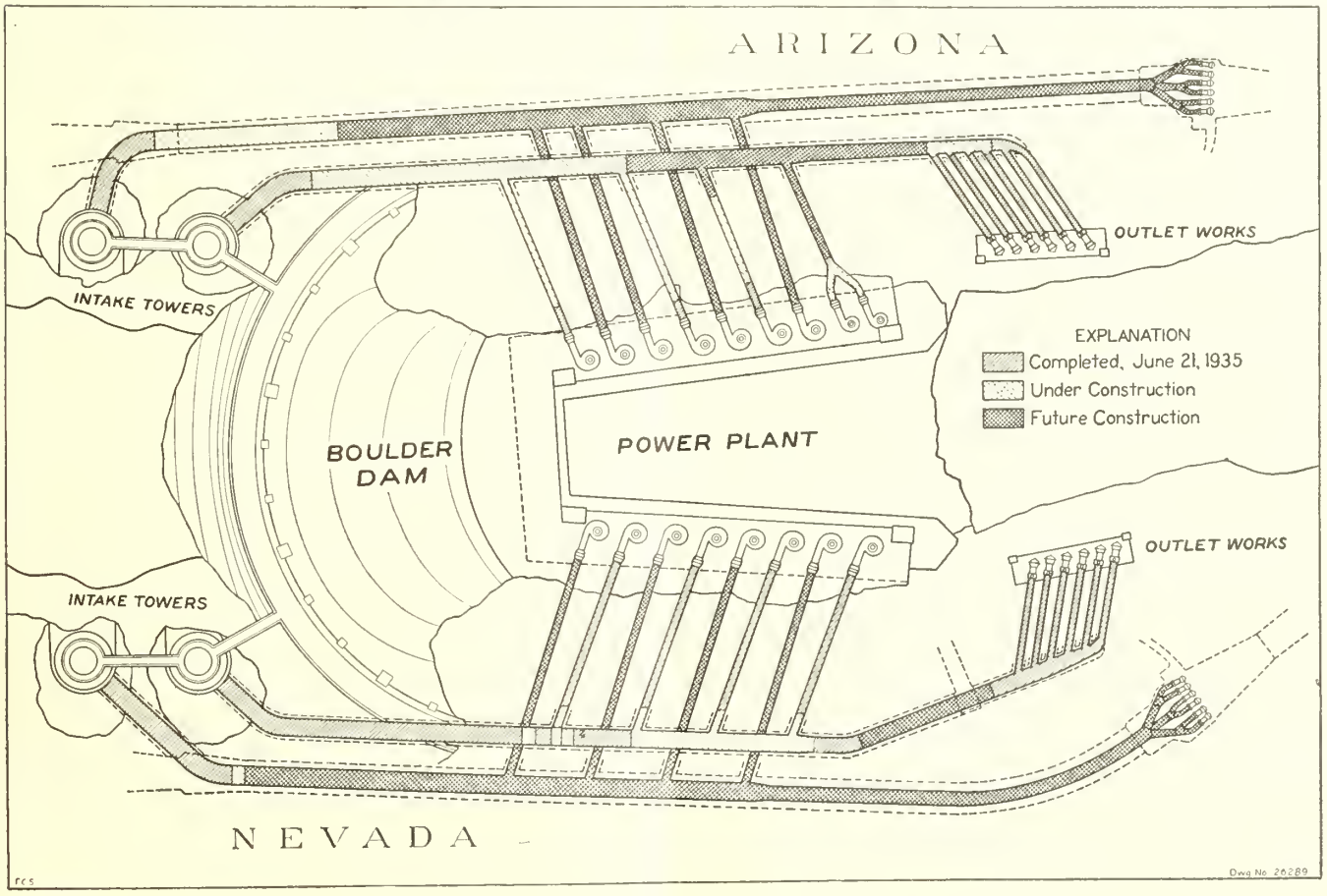
Although not as spectacular as some of the other work done at the dam site, the penstocks and power houses make up a major part of the construction job.

Orville Hiram Ensign 1863–1935

Orville Hiram Ensign, from 1904 to 1915 connected with Reclamation Service as its chief electrical engineer, died at his home in Pasadena, Calif., June 1, 1935.

After completing 2 years of work in the course of "mechanical arts" with the class of 1884 at Cornell University he was, until 1893, variously employed by the Edison United Electric Co. of New York City on construction work, and by the General Electric Co., Schenectady, in which company he rose steadily to the position of chief inspector for the factory. He then moved to California and became consulting engineer for the Redlands Electric Light & Power Co. in connection with the completion and the placing in service of the "first 3-phase power transmission plant in the United States", the historic Mill Creek plant near Redlands.

Mr. Ensign retired from the Bureau of Reclamation in 1915 to assume private practice as a consulting engineer in Los Angeles.



Newly Published History of Nevada

A history of Nevada, including a story of her people from the early days to the present time, as told by Hon. James G. Scrugham, former Governor of Nevada and now Representative in Congress from that State, is just off the press.

The edition is in three volumes attractively bound in artcraft covers of artificial leather. The work is profusely illustrated.

Nevada was the third State presented to the Union by the great West, being preceded only by California and Oregon.

Of considerable interest is the account of "ancient Nevada" from the archeological standpoint, by M. R. Harrington; as is also the story of exploration and the fur trade, under the title "Early Nevada", by F. M. Fletcher. Then follows the history of the State, under the heading "Nevada as Territory and State."

We quote below excerpts from volume 1, as given in a section devoted to irrigation:

"In Nevada the legal recognition of irrigation began in 1866. To quote the words of the master mind of western reclamation work, Elwood Mead, 'the law of that year requires any party desiring to construct a ditch or flume to record, in the county in which the ditch was to be built, a certificate and plat. This record was intended to give constructive notice to all other proposed appropriators. This law, like so many of the western irrigation laws, permitted the indiscriminate filing of indefinite and ridiculous claims.' While many years passed before Nevada undertook to regulate and define the exact rights of individual claimants to the water resources and to impose organization and public control in the diversions and use of public waters, irrigation was extended increasingly, by individual initiative and haphazard methods, to farming in many portions of the State. The surveyor general in 1882 called irrigation 'a necessary adjunct to successful farming in Nevada.'

"The legislature of 1889 passed several acts dealing with irrigation. One divided the State into irrigation districts, the division being according to the drainage area of the principal streams, the Truckee and its tributaries affording the basis for district no. 1, and the boundaries of others were laid out according to their relation to the Carson River, the Humboldt, the Owyhee and the Reese River. The duty of controlling and distributing the waters for irrigation in each district was left to a water commissioner. The settlement of questions involving priority of appropriations was to be determined by the district courts. One section of the law declared that 'the water of every natural stream not heretofore appropriated within this State, is hereby declared to be the property of the public and the same is dedicated to the use of the people, subject to appropriation as herein provided.' Elwood Mead's comment on this law is:

"'The first effect of this act was a rush of statements to the recorder's office. These included anything which could under any circumstances be called a ditch. They included main ditches, laterals, old river channels, and neglected sloughs. In some cases the main channel of the river was claimed as a ditch and the water declared to have been appropriated by original construction. This act was repealed 4 years later, and nothing further was done toward the enactment of an irrigation law until 1899.'"

The chief sources from which this history of the State has been compiled are the official records. These records have been studied and their inner meaning extracted. It is therefore not a book of statistics, but in the best sense a reference book.

This work was published by the American Historical Society, Incorporated, of Chicago and New York.

Boulder Tourist Travel

During the year 1933, 132,646 tourists visited Boulder Dam in 48,322 cars; in 1934 these figures were increased to 265,463 visitors in 84,805 autos; and during the first six months of 1935, 184,983 visitors in 56,782 cars entered the reservation. In June of this year 28,038 visitors, traveling in 8,873 autos, arrived at Boulder Dam.

The Wyoming link of the new Federal highway, Belle Fourche to Miles City, Mont., has been approved for construction and its completion will give a through route from the Twin Cities to the northwest by way of the South Dakota reclamation project.

The plant being erected at Orland by the Golden State Creamery for the production of powdered milk is rapidly approaching completion. This plant is of the most modern type and has a capacity for handling 50,000 pounds of milk daily. One commercial yard for drying fruit is being operated and is employing about 50 persons.

Reclamation Exhibit at Fair

A pictorial history of the work of the Bureau of Reclamation is a feature of the Federal exhibit at the California Pacific International Exposition, now attracting thousands to San Diego.

The Bureau's exhibit is in two parts, one illustrating Federal reclamation projects by which the deserts of the West have been watered to create thriving agricultural communities, and the other demonstrating the emergency conservation work done on reclamation projects.

A series of nine great pictures, transparent and arranged to give a three-dimensional effect tell in brief the history of the Reclamation Bureau. Giant cacti, shown in the first of the series, are replaced, through the damming of rivers and irrigation, by melon fields and orange groves.

The work the C. C. C. boys have done and are doing on irrigated areas in the West is shown in another series. They are shown constructing siphons, building canals, clearing land, and at their recreation, which is an integral part of the program designed both to perform useful work and provide sound development for underprivileged youth.

The reclamation booth in the Federal Building in the Balboa Park fair grounds has attracted attention also because of the printed matter available there. Details of Boulder dam construction, general information on the reclaimed West, and the opportunities such development hold forth are being distributed to hundreds of inquirers each day.

Death of William Mulholland

William Mulholland, 79, of Los Angeles, nationally famed as a dam and aqueduct builder, died July 22 after an extended illness. Mr. Mulhollaud's greatest work was the construction of the Owens Valley Aqueduct, by which water was taken 250 miles from the high Sierras to the city of Log Angeles. Mr. Mulholland entered the employ of Los Angeles in 1876 after immigrating from Ireland. A man of vision, Mr. Mulholland was credited with a large part in the formulation of the ambitious water policies of Los Angeles. He was an early backer of Boulder Dam.

Boulder Dam Does Its Work

(Continued from page 159)

The Imperial Valley sustained a loss of about $10,000,000 due to drought last year, and the fact that there would not be another this year or in the future was indeed good news.

Extracts from June Project Reports

Yuma.—First carload of cantaloupes shipped from project June 8. Yields of 100 crates per acre, with excellent quality. Top price $2 per crate, with an average of $1.25. Forty-five carloads of livestock received on project for fattening; 33 carloads shipped to market by rail, and the equivalent of 16.7 carloads by truck.

The first shipment of cantaloupes consigned to foreign countries left Yuma July 4. The cantaloupes, known as McDaniel Nuggets, were shipped by a local firm to Los Angeles, thence in a refrigerator car to New York. Two crates, one bound for Sussex, England, the other to Holland, will remain in refrigeration during the ocean voyage.

Orland.—Pastures continued in excellent shape and are one of the project's best assets. Olives, which last year were one of the best money crops, are showing up well.

Grand Valley.—In the Palisade area the peach crop is unusually good. With the exception of alfalfa hay, which was damaged by the alfalfa weevil, and potatoes, most crops were doing well at the date of the report, with a normal production in sight.

Boise.—New seeding of alfalfa looking good. Most of grain heading out well.

Minidoka.—All crops grew well throughout the month. The first cutting of alfalfa was well under way at the close of the month and wheat was heading out. Potatoes and sugar beets are thriving especially well. The Minidoka lamb pool marketed a shipment of 1,509 lambs which sold for $7.60 per hundredweight, and yielded their owners a total of $9,131.

Sun River.—Prospects for irrigation water continued excellent with Gibson Reservoir still full, 15,229 acre-feet in Pishkun Reservoir, and 13,547 acre-feet in Willow Creek Reservoir at the close of June.

North Platte.—With the exception of corn, crops are in fair condition. Practically all fat cattle and sheep were shipped from the project previous to June. Project lands should have at least twice as much water at the farms as they received in 1934. The total storage was 589,510 acre-feet as compared with 260,980 on the same date last year.

Milk River.—Subnormal temperatures prevailed during the first half of June and crop growth was slow. The latter part of the month was ideal for irrigated crops and excellent progress was made where ample water was used. Precipitation was practically negligible and a failure in dry-land crops is again probable, except in favored localities. Beet thinning was completed early in the month and excellent stands are the rule. The first cutting of alfalfa was about 80 percent in the stack and good yields generally were reported.

Riverton.—Crops generally in good condition. First cutting of alfalfa was in progress at close of June with prospects of good yield. Grass on the range was excellent.

Hyrum.—Practically all crops were in good condition at the close of the month. About 70 percent of the first cutting of alfalfa had been harvested, the yield being somewhat above the average.

Shoshone.—Water in storage in the Shoshone reservoir increased 79,191 acre-feet during the month of June. At the end of the month there was 473,491 acre-feet in storage as compared with 451,276 at the same time last year. There is still a good supply of snow in the higher altitudes. The weather was cool and very favorable for peas, alfalfa, potatoes, beets, and grain. Excellent stands were obtained on the principal crops, and prospects were for one of the best seasons in the history of the project.

Opportunities at Riverton

The superintendent of the Riverton project in Wyoming, one of the few localities in which public lands capable of immediate irrigation are still available, reported in July continuation of the settlement activities noted earlier this year.

During June, 3 homestead entries were made, 2 farm applications were received, 6 prospective settlers visited the project, and 20 inquiries were made. In the first 6 months of the present year 59 homestead entries were made, 2 were relinquished, and 37 farm applications were received. In this period 295 inquiries were made, 86 prospective settlers visited the project, 2,076 irrigable acres were taken up, and 12 private farms with a total area of 1,129 acres were purchased by new settlers.

The superintendent reports 54 farm units still available on the project. A total of 230 farm units were actually occupied this spring. Water was available for 32,000 acres, of which 19,200 were irrigated.

"Arrangements have already been made to occupy an additional 21 farms for next season", the superintendent said. "These will include 1,600 irrigable acres. This date, however, is early for men to make arrangements for next year's move."

The fifteenth annual field day was held at the State experiment farm near Prosser on the Yakima project in Washington June 12. A feature was the unveiling of a plaque in honor of Mrs. Ina P. Williams, who, as a member of the State legislature in 1917, sponsored the measure creating the station. Guy C. Finley, president of the Washington Irrigation Institute, presented the plaque.

Dairy contest at Sunnyside Dairy Show, Yakima project, Washington—Winning Guernsey bull class

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ENGINEERING

The All-American Canal is Materializing

By R. B. Williams, *Construction Engineer*

THE All-American Canal, a dream of the Imperial Valley farmers for a generation, rapidly is materializing. This great canal, extending 80 miles from the Colorado River to and across the Imperial Valley, will have an initial capacity of 15,000 cubic feet per second.

The Imperial Valley, where half a million acres are irrigated on the American side of the international boundary, is a gigantic depression sloping away from the Colorado to the Salton Sea, more than 250 feet below sea level. At one time the Gulf of California extended into the Coachella Valley, covering all of Imperial Valley, and the old sea line can still be seen high on the rocky cliffs to the north and west of Salton Sea.

The Colorado River, a mighty excavator, threw its delta across the Gulf of California, isolating the upper arm. The huge lake thus formed, evaporated and revealed what is now the Imperial Valley.

When the development of the Imperial Valley began 34 years ago, water was brought from the Colorado by way of the canal running through Mexico for more than 40 miles. An uncontrolled river and foreign control of its water supply formed the two principal problems of this development. With completion of Boulder Dam, the threat of flood to this below-sea-level area has been removed. Completion of the All-American Canal will solve the second problem.

One of the world's largest irrigation ditches, the canal has a bottom width in its upper reaches of 160 feet. The top water surface width at this point is 232 feet and the water depth will be 21 feet.

For about 10 miles the canal traverses towering sand hills that lie along the eastern edge of the Imperial Valley west of the Colorado River, and in this sand hill area there are places where cuts of approximately 100 feet are necessary.

An additional clew to the history of this valley, it might be mentioned parenthetically, was discovered in the eastern edge of these sand hills when one of the huge draglines dug up what appears to be a mammoth or mastodon tooth. This fossil lay 40 feet below the top of the mesa floor. Other bones have been found in this vicinity at depths of 30 to 40 feet underground, indicating that desert has not existed forever along the Colorado channel.

A UNIQUE MACHINE

The excavating equipment being used on the All-American Canal has several unusual features both in design and operation. Although there are several sizes and types of dragline being used, the most outstanding are the 10W Bucyrus-Monighans of the W. E. Callahan Construction and Gunther & Shirley and of Boyce and Igo. There are three of these drag-lines in operation at different points on the canal and each machine has one or more smaller draglines to build roads, assist in the rehandling of material or in the trimming of slopes.

The first 10W Monighan dragline was built in 1930. Although the principle of the walking dragline is not new, this unusually heavy machine travels 7 feet per step without apparent effort or jar. The weight of the whole dragline is 650 tons, while one walking platform or "shoe" weighs 42,100 pounds, and the walking shaft, 18 inches in diameter and 45 feet long, weighs 42,000 pounds.

The boom, having 3,300 feet of 1¼-inch boom line, is 175 feet long. A 2-inch drag cable and a 1¼-inch hoist cable handle a 12-cubic yard bucket which weighs 50,000 pounds when loaded. A complete operation of loading, swinging 180°, dumping and returning to load, requires about a minute and a half under average conditions. In swinging, the main part of the machine revolves on 70 dollies on a circular base 36 feet in diameter.

The main power plant is a 450-horsepower Fairbanks-Morse Diesel motor, weighing 72,500 pounds and a 100 horsepower caterpillar Diesel motor which is direct connected to all auxiliary units. There are 17 different electric motors and generators for operation of fans, centrifuges, pumps, etc., the largest of which are two 125-kilowatt 100-horsepower motors on the swing and the smallest a ½-horsepower on a centrifuge. The hoist is belt-driven by a 36-inch endless belt from the 450-horsepower Diesel. Roller bearings are used on many of the drives.

650-ton dragline at work on All-American Canal

All-American Canal

1. Completed section of canal; 2. tooth-like fossil excavated at about elevation, 153.8; 3. shooting final lift on Griffith Rock Cut; 4. excavation in eastern edge of sand hills; 5. aerial view from elevation 1500 feet, showing plug lift for wash structure.

DESIGNED BY CRAWFORD

In the operation of the machine, all frictions are air controlled, the swing electric, and the brakes manual. Both lubricating oil and water are cooled by equipment built for these machines especially for the extreme temperature of this region. Special air cleaners designed to meet the requirements of desert sandstorms have also been installed.

Maj. L. D. Crawford, vice president of the W. E. Callahan Construction Co. and Gunther & Shirley, which has the contract for excavation of a 30-mile reach of the All-American Canal, was largely responsible for the design and construction of this type of machine. The special equipment, radiators, fans, air cleaners, and the special 12-cubic-yard bucket being used, have been designed and installed under his supervision. About 30 men are required to operate one machine 24 hours. Highly skilled men are required as operators and enginemen.

Previous to starting work on the All-American Canal, these machines were used on levee work in Louisiana. In order to ship them by rail it was necessary to dismantle them; 20 freight cars were required for one machine. Altogether over 100 freight cars were required to ship equipment to excavate this 30-mile stretch of canal.

Three 6W Monighans and many pieces of smaller equipment also are at work on the canal. The 6W Monighans are similar in most respects to the 10W's but on a smaller scale, having booms from 100 to 125 feet in length and handling a 6-cubic-yard bucket. These machines weigh 275 tons with the primary power, a 240-horsepower Diesel motor.

WORK STARTED AUGUST 8, 1934

Construction work began on the All-American Canal on August 8, 1934, when Griffith Co. commenced excavation on the rock cuts. Good progress has been made by this company which anticipated completion of its contract for the excavation of some 500,000 cubic yards of rock excavation in August 1935. To the end of June the Griffith Co. had excavated approximately 497,000 cubic yards, using Bucyrus and Northwest shovels and LeTourneau 25-yard buggies hauled by 75-horsepower caterpillar tractors.

W. E. Callahan Construction Co. and Gunther & Shirley Co., whose contract involves the excavation of approximately 39,400,000 cubic yards, began excavation on December 8, 1934. At the end of June 1935, approximately 9,200,000 cubic yards had been excavated under this contract and approximately 9 miles of canal completed.

Work is under way by this company and Boyce & Igo, subcontractors, at three points on the canal. Working down the canal from near Laguna are one 10W., and one 6W. Bucyrus-Monighan draglines with a smaller 1½-yard machine finishing behind the larger ones.

Near Araz, Boyce & Igo are working one 10W. Bucyrus-Monighan, followed by a 3-yard Bucyrus dragline which finishes up the canal slopes. Starting below the Griffith cut at Andrade, W. E. Callahan and Gunther & Shirley have been working one 10W. and two 6W. Bucyrus-Monighans from this point towards the sandhills. By the end of June this group of machines were well into the sanddune area on the eastern side of the main range of sandhills. Good progress is being made by this company, which expects to complete its contract for the excavation of approximately 30 miles of the All-American canal early in 1938.

MORE WORK READY NOW

Bids were opened on April 25, 1935, for the excavation of about 25 miles of the All-American Canal across the East Mesa, involving the excavation of about 11,300,000 cubic yards. This reach of canal begins at the end of the W. E. Callahan Construction Co. and Gunther & Shirley contract at the western edge of the sandhills and extends to the existing East Highline Canal of the Imperial Irrigation District. Lewis-Chambers Construction Co., of New Orleans, La., were low bidders on schedules 1 to 3, inclusive, and were awarded contract for these schedules. Mittry Bros., of Los Angeles, Calif., were low bidders for schedule no. 4 and were awarded contract for this schedule. By the end of June, Lewis-Chambers were assembling two draglines at the site of the work and expected to start excavation early in July. Mittry Bros. expect to start actual digging operations on schedule no. 4 by late summer.

As a relief measure for the farmers of Imperial Valley who suffered severely from the unprecedent drought which occurred during 1934, when the Colorado River was at its lowest point in history, team excavation by force account methods was authorized for several miles of canal in the vicinity of Calexico. Team excavation began on October 22, 1934, and has continued to date, although it is expected that hot weather will soon force discontinuance of this work. Teamsters with four horses and fresno were hired as a unit. Plowing ahead of the fresnoes was performed by tractors and some of the heavier material was also removed by tractors hauling scrapers. At its peak nearly 1,000 head of stock were engaged on this work. To the end of June 1935, approximately 9 miles of canal excavation had been completed by these methods involving the removal of approximately 1,487,000 cubic yards.

Bids were to be opened on July 8, for processing about 260,000 cubic yards of sand and gravel at a point about 1½ miles below Imperial Dam site near station 90 on the All-American Canal. The deposit of concrete aggregates at this point is considered satisfactory and material for all of the structures along the canal, including Imperial Dam and desilting works, will be processed at this point.

Designs and specifications for Imperial Dam and desilting works are being completed in the Denver office and call for bids for this feature is expected by late summer or early fall. By this time also it is expected that bids will be invited for 120,424, unnamed and Picacho wash crossings which are the four major wash crossing structures on the canal. By early fall invitation for bids should also be out for excavation of the approximate 5-mile reach of canal between Laguna and Imperial Dams. Other major structures, including railroad and State highway crossings, power drops, turn-outs, checks, etc., will be embodied in specifications to be issued at a later date.

L. R. Fiock Appointed

L. R. Fiock, superintendent of the Rio Grande project, has been designated by the Secretary of the Interior informally to collaborate with the American Boundary Commissioner at El Paso, Tex., in the technical investigation now in progress looking toward a determination of the feasibility and best means of effecting the canalization of the Rio Grande from the Caballo Reservoir site in New Mexico to the international diversion dam near El Paso.

Mr. Fiock is the Bureau's logical representative in this matter because of his knowledge of the situation and his availability. His designation is agreeable to the Department of State.

The troop of Boy Scouts at Orland, sponsored by the Orland American Legion Post, covered itself with glory by being rated thus far the best in its area. A large number of the members of the troop are sons of project water users.

All available labor on the Belle Fourche project is now well supplied with jobs, and relief rolls were well eliminated the latter part of June owing to the demand for beet help on the farms and for harvesting alfalfa. It is expected that work will be available to take care of employment well through the summer season.

Notes for Contractors

Upper Snake River storage project, Idaho.—Bids were opened at Ashton, Idaho, on August 5 for the construction of the Island Park Dam (specifications no. 632). The principal items of work and estimated quantities involved are as follows: 112,500 cubic yards of open-cut excavation, common; 472,000 cubic yards of excavation from borrow pits, common; 9,700 cubic yards of open-cut excavation, rock; 45,100 cubic yards of excavation from borrow pits, rock; 7,950 cubic yards of tunnel-shaft excavation, all classes; 1,000 cubic yards of back fill about structures; 474,000 cubic yards of earth fill in embankments; 33,000 cubic yards of rock fill on downstream slope of dam embankment; 50,800 cubic yards of riprap on embankments; 150 cubic yards of gravel surfacing on road; 25 cubic yards of porous concrete; 2,920 cubic yards of concrete in tunnels, shaft, and gate chamber; 3,510 cubic yards of concrete in other structures; 1,500 square yards of special finish of concrete surfaces; 2,500 cubic feet of pressure grouting; placing 350,000 pounds of reinforcement bars; drilling 5,360 linear feet of grout, drainage, and weep holes; constructing 2,090 linear feet of clay pipe drains; installing 1,500 linear feet of metal pipe drains; furnishing and installing 70,000 pounds of steel tunnel liner plates; installing 343,200 pounds of metal work; and installing 714 linear feet of electrical metal conduit. The work is located near Island Park, about 25 miles north of Ashton on the North Fork of Snake River. It must be completed within 440 days.

Boulder Canyon project, Arizona-Nevada.—The Flour City Ornamental Iron Co., Minneapolis, Minn., was low among 22 bidders, for furnishing miscellaneous metal work for the Boulder power plant under Specifications No. 691-D, bids opened at Denver July 1. A bid of $6,665 f. o. b., Boulder City, was received from the Minneapolis concern, while other bids ranged up to $11,979. Contract was awarded to the low bidder.

Twelve bids were received at Denver on July 11 for furnishing oil storage and sump tanks under specifications no. 695-D as follows: Berkeley Steel Construction Co., Inc., Berkeley, Calif., $2,854; Chicago Bridge & Iron Co., Chicago, Ill., $4,144; John W. Beam, Denver, Colo., $4,640, f. o. b. Chicago; Lacy Manufacturing Co., Los Angeles, Calif., $2,990; California Steel Products Co., San Francisco, Calif., $3,460; Southwest Welding and Manufacturing Co., Inc., Alhambra, Calif., $4,996; Valley Iron Works, Yakima, Wash., $3,053; Consolidated Steel Corporation, Ltd., Los Angeles, Calif., $2,145; Buehler Tank & Welding Works, Los Angeles, Calif., $3,020; Steel Tank & Pipe Co. of Oregon, Portland, Oreg., $3,260; McClintic Marshall Corporation, Bethlehem, Pa., $5,340; Graver Tank & Pipe Manufacturing Co., East Chicago, Ind., $3,608. The Consolidated Steel Corporation was awarded the contract on July 18.

Bids were opened at Denver on July 10 for furnishing a towboat for use on Boulder Reservoir (specifications no. 693-D). The bids received were as follows: Item 1 (new towboat) Boat Service Co., Inc., New Orleans, La., $9,998; Tregoning Boat Co., Seattle, Wash., $19,640; William M. Whiting, Long Beach, Calif., $23,500; Harbor Boat Building Co., Terminal Island, Calif., $17,475; item 2 (used towboat) Boat Service Co., Inc., New Orleans, La., $4,700; William M. Whiting, Long Beach, Calif., $12,100; Manitowoc Shipbuilding Corporation, Manitowoc, Wis., $16,170.

The U. S. L. Battery Corporation, Niagara Falls, N. Y., and the Gould Storage Battery Corporation, Depew, N. Y., in their protests to the Comptroller General against award of contract for two 120-cell and one 60-cell storage batteries for the power plant (specifications 668-D) to the Electric Storage Battery Co., Philadelphia, Pa., have been overruled in recent decision.

On July 17 the Comptroller General rendered a decision that there was no objection to award of contract to the Kinnear Manufacturing Co., Columbus, Ohio, under specifications no. 651-D for furnishing doors for the Boulder power plant. The Geo. W. Johnson Manufacturing Co., of Kansas City, Mo., protested the award.

Bids (specifications no. 638) will be received at the office of the Bureau of Reclamation, Denver, Colo., until 2 p. m., September 9, 1935, and will at that hour be opened for furnishing and installing two 82,500 kilovolt-amperes, 180 revolutions per minute, vertical-shaft, alternating current generators for the Boulder power plant. Drawings shall be mailed by the contractor within 60 calendar days after date of receipt by the contractor of notice to proceed, and the installation of the first generator shall be completed within 700 calendar days and the installation of the second generator shall be completed within 750 calendar days from the date of receipt of notice to proceed.

Bids (Specifications No. 639) will be received at the office of the Bureau of Reclamation, Denver, Colo., until 2 p. m., September 9, 1935, and will at that hour be opened, for furnishing and delivering f. o. b. cars at the shipping point or f. o. b. cars at Boulder City, Nev., two vertical-shaft, 115,000 horsepower, 180 r. p. m., hydraulic turbines, and two governors with pumping equipment for regulating the speed of the turbines, for installation in the Boulder power plant. All apparatus will be installed by the Government.

The California Steel Products Co., San Francisco, Calif., has been awarded a contract under Specifications No. 697-D (readvertisement of 688-D) for furnishing oil storage tanks and appurtenances for the Boulder power plant, at their bid of $7,747 f. o. b., San Francisco. The next two low bids were Berkeley Steel Construction Co., Inc., Berkeley, Calif., $7,980, and Western Pipe & Steel Co., Los Angeles, Calif., $8,400. Ten bids were received.

Sun River project, Montana.—At Fairfield on August 5 bids were opened for the construction of earthwork and canal lining for the Pishkun and Sun River Slope canals (Specifications No. 637). The items of work are as follows: 1,019,800 cubic yards of all classes of excavation; 270,000 station cubic yards of overhaul; 750 cubic yards of back fill; 1,050 cubic yards of concrete; placing 84,000 pounds of reinforcement bars; removing 800 cubic yards of defective concrete; and excavating and placing 10,000 cubic yards of blanketing material. The work must be completed in 240 days.

Six bids were received at Fairfield on July 8 for the construction of earthwork and structures on the lateral system of the Greenfields division, under Specifications No. 626. The three low bidders were as follows: Rue Bros., Bismarck, N. Dak., $78,881.90; Lobnitz Bros., Inc., Townsend, Mont., $79,207.40; T. G. Rowland, Salt Lake City, Utah, $101,741.75.

All-American Canal project, Arizona-California.—Opening of bids under Specifications No. 633 took place at Yuma on July 8, the three low bidders being as follows: Triangle Rock & Gravel Co. and Charles Holmes, San Bernardino, Calif., $149,000; Acme Gravel Co., San Antonio, Tex., $170,000; V. R. Dennis Construction Co., San Diego, Calif., $178,360. The preparation of concrete aggregates at station 90 is required and the work comprises 60,000 cubic yards of excavation stripping gravel deposits, preparing and stock piling 98,000 cubic yards of sand, and preparing and stock piling 162,000 cubic yards of gravel. Four hundred calendar days are allowed to complete the contract. The bids have been taken under advisement.

Two bids were received at Denver on July 12, under Specifications No. 635, for

supplying mechanical apparatus for desilting basins at Imperial Dam and desilting works. Dorr Co., New York City, N. Y., bid $564,800 and Hardinge Co., York, Pa., bid $649,800.

The following bids were opened at Denver on July 15 for furnishing roller gates and operating mechanisms for the All-American Canal headworks at Imperial Dam (specifications no. 631): Schedule 1, Dravo Contracting Co., Pittsburgh, Pa., $101,400; McClintic-Marshall Corporation, Bethlehem, Pa., $106,200; Independent Bridge Co., Pittsburgh, Pa., $114,400; S. Morgan Smith Co., York, Pa., $114,650; Treadwell Construction Co., Midland, Pa., $137,000; Lakeside Bridge & Steel Co., Milwaukee, Wis., $169,300; Allis-Chalmers Manufacturing Co., Milwaukee, Wis., $189,900. Schedule 2, Dravo Contracting Co., $98,000; Babcock & Wilcox Co., Barberton, Ohio, $125,850.85.

Ogden River project, Utah.—Four bids were received at Ogden on July 8 for construction of the Ogden-Brigham Canal as called for in Specifications No. 623. The low bids were as follows: Schedule 1, J. A. Terteling & Sons, Boise, Idaho, $156,092; Siems Spokane Co., Spokane, Wash., $166,718; Utah Construction Co., Ogden, Utah, and Morrison-Knudsen Co., Boise, Idaho, $170,050; schedule 2, Utah Construction Co. and Morrison-Knudsen Co., $197,430; J. A. Terteling & Sons, $204,354; Siems Spokane Co., $218,669. The bids have been taken under advisement.

Sanpete project, Utah.—At Salt Lake City on July 8 five bids were received for constructing the Ephraim and Spring City Tunnels under Specifications No. 602. Following are the low bids: Schedule 1 (Ephraim Tunnel) Morrison-Knudsen Co., $162,430; schedule 2 (Spring City Tunnel) Case Construction Co., Alhambra, Calif., $172,487; schedule 3 (both Tunnels) Case Construction Co., $334,176. The bids have been taken under advisement.

Uncompahgre project, Colorado.—Bid were opened at Montrose, Colo., on August 8 for the construction of canal lining and structures for the South Canal and West Canal (Specifications No. 636). The principal items of work and estimated quantities involved are as follows: 37,000 cubic yards of all classes of excavation for structures; 2,000 station cubic yards of overhaul; 580 cubic yards of removing old concrete; 24,100 cubic yards of back fill; 1,300 cubic yards of compacted fill; 2,820 cubic yards of concrete in structures; 365 cubic yards of concrete in canal lining; 310 cubic yards of dry-rock paving; placing 333,000 pounds of reinforcement bars; and installing 3,400 pounds of miscellaneous metalwork. The work is located near Montrose and must be completed within 200 days.

Columbia Basin project, Washington.—Bids will be opened at Denver, the tentative date being August 20, under specifications no. 641, for furnishing either item 1—720,000 barrels of modified portland cement in bulk—or item 2—720,000 barrels of standard portland cement in bulk (Federal Specifications 55-C-191) under schedule no. 1; and either item 3—3,500,000 barrels of modified portland cement in bulk—or item 4—650,000 tons of modified portland cement clinker in bulk under schedule no. 2. No bid will be considered on item 1 without a corresponding bid on item 2, nor on item 3 without a corresponding bid on item 4. The estimated maximum daily delivery of cement required under item 1 or 2 is 6,000 barrels and the estimated maximum monthly delivery is 150,000 barrels over the period October 1935 to October 1937, inclusive. The estimated maximum daily delivery of cement required under item 3 is 13,500 barrels, and the estimated maximum monthly delivery is 300,000 barrels. The estimated maximum daily delivery of cement clinker required under item 4 is 2,500 tons and the estimated maximum monthly delivery is 55,000 tons. The Government reserves the right to divide the award between two or more bidders, providing the lowest bidder cannot furnish the full quantity or meet the maximum daily and/or monthly requirements.

Casper-Alcova project, Wyoming.—The following bids were received and opened at Casper on July 15 for construction of the Alcova Dam, a moistened and rolled fill of sand, clay, and gravel, 180 feet in height above the river bed and containing 1,500,000 cubic yards; W. E. Callahan Construction Co., Dallas, Tex., and Gunther & Shirley, Los Angeles, Calif., $1,482,651.10; Martin Wunderlich Co., Jefferson City, Mo., $1,523,083.20; Winston Bros. Co., Minneapolis, Minn., $1,555,711.50; S. J. Groves & Sons Co., Minneapolis, Minn., $1,633,493.05; J. A. Terteling & Sons, Boise, Idaho, $1,717,989.50; George Pollock Co., Sacramento, Calif., $1,821,391.80; Peterson, Maguire & Lawler, Omaha, Nebr., $1,977,854.65; John Marsch, Inc., Chicago, Ill., $2,988,991.38. The Government will purchase cement, reinforcement bars, metal pipe and tubing, clay sewer pipe, gates and gate hoists, needle valves, cranes and hoists, structural steel, etc.

On July 22 bids were opened at Casper for building the Seminoe Dam and power plant on the North Platte River near Rawlins. The dam is a 260-foot arch with 200,000 cubic yards of concrete. Four bids were received, the lowest being $2,194,007 submitted by Winston Bros. Co., Minneapolis, Minn., Utah Construction Co., Ogden, Utah; Bechtel Co., San Francisco, Calif.; Morrison-Knudsen Co., Boise, Idaho; and Henry J. Kaiser Co., Oakland, Calif. The Government will purchase and furnish to the contractor cement, reinforcement bars and fabric, metal tubing, metal pipe, fittings and valves; plate-steel power penstocks and outlet pipes; paradox and spillway gates with hoisting mechanisms; penstock bulkhead gates, needle valves with operating mechanisms; traveling and gantry cranes; structural steel; trashrack metal work; metal stairways, doors, and windows.

Moon Lake project, Utah.—The following bids were opened at Denver on July 5 for furnishing 13,000 barrels of portland cement in cloth sacks (Invitation No. 43,022-A): Portland Cement Co. of Utah, Salt Lake City, Utah, $2.41 f. o. b. Salt Lake City, and $3 f. o. b. Heber; Henry Cowell Lime & Cement Co., San Francisco, Calif., $1.75 f. o. b. Cowell; Union Portland Cement Co., Denver, Colo., $2.25 f. o. b. Devils Slide, Utah, and $3.01 f. o. b. Heber; Monolith Portland Midwest

(Continued on p. 167)

Horseshoe Island

Horseshoe Mountain is now Horseshoe Island, the waters of the Colorado River having piled up high enough behind Boulder Dam to cut this landmark off from its age-long surroundings.

Old Horseshoe Mountain, however, will lose none of its distinction as a result of its new geographical status. Horseshoe Island will be distinguished in its own right as the only sizable island in the entire 115-mile lake. At high water mark the island will be 1,000 feet long by 200 feet wide, this being the size of the flat top surface of the butte. It will rise out of the water 140 feet.

Reservoir at Boulder Dam now World's Largest

The reservoir at Boulder Dam on July 22, 1935, became the world's largest handmade lake. On that date the reservoir was 286 feet deep, 84 miles long, and held a total of 1,453,915,000,000 gallons of water, or 4,450,000 acre-feet, at the last reading at Boulder City and the lake will continue to grow for months.

The Assuan Reservoir on the Nile in Egypt, which held the position of the largest artificial lake, with a capacity of 1,322,955,000,000 gallons, has been surpassed.

The gates at Boulder Dam were closed 5 months ago, but no effort was made to retain all the water in excess of that needed for irrigation below the dam site in the reservoir. Despite a large discharge, however, the reservoir has filled to about one-seventh of its total capacity, 30,500,000 acre-feet.

Since the gates were closed at the dam early this year, harnessing the mighty resources of the Colorado River and putting Boulder Dam to work, the project has been storing up dividends it will repay in the future in the form of power and water.

The reservoir already is deeper than Lake Erie, which has a maximum depth of 210 feet. Boulder Dam eventually will raise the surface of the river 582 feet.

The reservoir is 12 miles wide at the old Virgin River wash about 30 miles up the river from the dam. While the reservoir has reached a point only 31 miles from its maximum length up the canyons of the Colorado, it still has far to go to reach its maximum capacity. The sharper fall in the mile-deep segment of the lower Grand Canyon will permit the adding of only short distances to its length despite tremendous increases in the amount of water held.

The water is backed up through Boulder, Virgin, and Iceberg Canyons and into the Grand Canyon, covering many an old rapid which prevented navigation of the stream. It now would be possible to enter a boat at Pierce's Ferry between St. Thomas, Nev., and Hackberry, Ariz., and sail on still waters to the dam about 80 miles downstream.

Boulder Dam already has fulfilled one of its major objectives. It has removed the threat of flood and drought forever from the Palo Verde, Yuma, and Imperial Valleys. Last year the river went dry in July and crop damage estimated at $10,000,000 resulted in Imperial Valley.

This spring a peak flood of 105,000 second-feet of water was recorded in the Colorado at Grand Canyon, all of which was caught by Boulder Dam. A flood of that magnitude would have presented a very real threat to the levee system of the Imperial Valley had the river remained uncontrolled, since the drought had cracked the levees in many places.

The amount of water already held in Boulder Reservoir would supply all the needs below the dam for more tnan a year.

More than half of the present inflow of 20,000 second-feet is being allowed to pass the dam. Because of certain construction work still under way the water level was not permitted to rise rapidly this year.

Moon Lake Project Breaks Ground

On June 28 ground-breaking ceremonies on the $1,500,000 Moon Lake project, Utah, were participated in by residents of Duchesne County, when 65,000 acres of land, adequately supplied with water, were visioned as a result of the development in prospect. Preliminary work on the dam to hold back 30,000 acre-feet of water was started on May 10. The dam site is 35 miles north of Duchesne.

At the celebration speeches were delivered by Hon. Henry H. Blood, Governor of Utah; William R. Wallace, chairman of the Utah Water Storage Commission; E. O. Larsen, engineer of the Bureau of Reclamation; and David F. Smith, Commissioner of Agriculture.

The dam will be of the earth fill and concrete cut-off type. The volume of embankment material in the dam is estimated to be 413,000 cubic yards of earth fill, with 77,000 cubic yards of rock fill and 29,000 cubic yards of riprapping on the upstream face. Measuring 115 feet from the river bed, the dam will have a top thickness of 38 feet and a bottom thickness of 680 feet. The length on its crest will be 1,120 feet, creating a reservoir covering 740 acres fed by a watershed area of 108 square miles. The spillway will have a capacity of 10,000 acre-feet equipped with emergency provisions.

Actual construction will not start until 1936, the balance of the present year being required for the completion of the tunnel and diversion of the Lake Fork stream, which will feed the reservoir.

Contract for the work was awarded to T. E. Connelly, of San Francisco, who submitted a low bid of $547,000 for labor on the project. Materials are furnished by the Government. Repayment of the project has been contracted by the Moon Lake Water Users' Association, comprising nine irrigation companies formed for the purpose.

The Casper-Alcova Irrigation District repayment contract was approved by C. D. Murane, judge of the local district court, June 28, 1935.

The Public Works Administration has made available $25,000 to the Bureau of Reclamation for a water resources survey and a determination of irrigation possibilities on the Island of Molokai, of the Hawaiian group. The Territorial legislature had appropriated $5,000 to be added to the allotment.

Notes for Contractors

(Continued from p. 166)

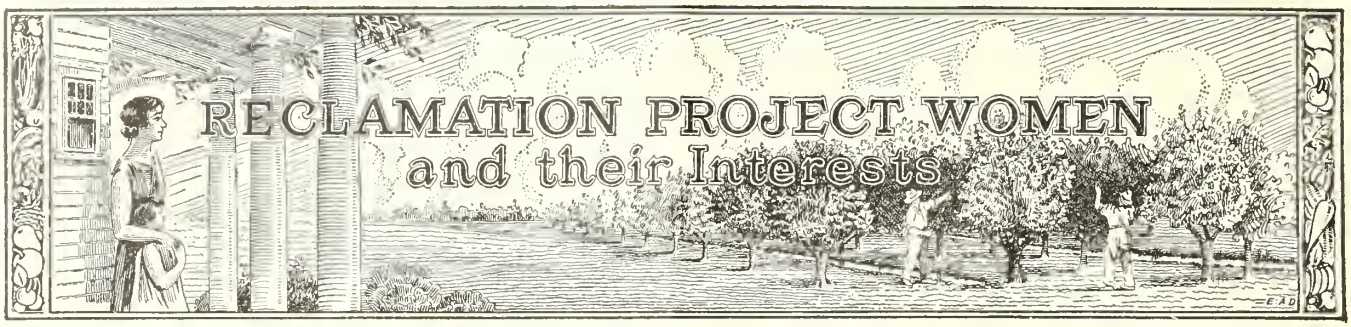
Co., Denver, Colo., $3.01 f. o. b. Heber; Pacific Portland Cement Co., San Francisco, Calif., $3.64 f. o. b. Heber. All bids are subject to discount and sack allowance of $0.50. The low bidder is the Portland Cement Co. of Utah at its bid of $2.41 f. o. b. Salt Lake City.

Humboldt project, Nevada.—Bids under specifications no. 703-D will be received at Denver until August 15, and then opened for furnishing five 20-foot by 17-foot radial gates; two 48-inch diameter welded plate-steel outlet pipes and miscellaneous metalwork consisting of spiral stairways and walkways, roof framing, stair nosings and two 14-inch diameter ventilators for installation in the spillway and outlet works at Rye Patch Dam. The materials will be installed by the Government.

John W. Dodson, inspector, and John P. Jones, assistant engineer, on the Boulder Canyon project, have been transferred to the All-American Canal project at Yuma, Ariz., and William E. Wheeler, from the same project, has been transfered to the Denver office.

Fred E. Tackett, chief of field party at Agency Dam, Vale project, who had been employed in the Service since 1909 and had worked on the Riverton, Minidoka, and Vale projects, died at the Ontario hospital on June 27, after an illness of several weeks.

C. W. Beeman, president of the Carlsbad irrigation district, spent several weeks in Washington for the purpose of obtaining an allotment for the Alamogordo storage.



Yakima Project Boy and Girl Represent State of Washington at National 4–H Club Camp

DELBERT R. LYNCH and Miss Alice Roberts were 2 of the 4 farm boys and girls representing the State of Washington at the National Boys' and Girls' 4–H Club Camp in Washington, D. C., in June. They were selected for outstanding achievement in 4–H club work, leadership, and community activities from about 10,000 boys and girls of the State enrolled in agricultural and home economics projects sponsored by the State College Agricultural Extension Service. Delbert resides near Ellensburg on the Kittitas division, and Alice in the Naches Heights district of the Tieton division of the Yakima project.

Starting in 1928, Delbert R. Lynch has completed 7 years in Sheep Club, 4 years in Potato Club, 3 years in Garden Club, and 2 years in Poultry Club. Offices held have included president and secretary of the Potato Club, vice president of the Garden Club, vice president of the Kittitas County 4–H Club, and secretary-treasurer of the Sheep Club. In 1934 Delbert won the trophy awarded by the Rotary Club of Ellensburg to the outstanding 4–H club boy of Kittitas County.

Delbert R. Lynch with prize-winning exhibit of potatoes grown in land developed from raw sage brush

He has emphasized care and systematic culling of sheep and planting of better potato seed in his club work. Most of the usual varieties of garden vegetables have been grown on land developed from raw sagebrush under the Kittitas division of the Yakima Project and exhibited at the Kittitas County Fair.

Delbert has won 110 ribbons and $281.70 in prizes on exhibits at county and State fairs during his 7 years in club work. Of this total, $227 were awarded his sheep entries. He has twice been a member of the Kittitas County livestock judging teams, and was a member of a cream cooling demonstration team on a farm marketing special train in 1929. He was salutatorian of his high-school graduation class and was active throughout his high-school career in debating, declamatory contests, and judging teams.

Miss Alice Roberts has been active in 4-H Club work for 7 years, and has completed 7 years in sewing club, 3 in room improvement club, 3 in cooking club, and 2 in canning club. She has held every club office, including 2 years as leader and 2 years as assistant leader. As the outstanding 4-H Club girl of Yakima County during 1934, she was awarded a silver loving cup by the Yakima Junior Chamber of Commerce.

Alice has won 67 first prizes at county and interstate fairs on her work in sewing, room improvement, and canning. Her total earnings in club work amount to $283.81. She has twice been a member of Yakima County 4-H Club judging teams. Complete outfits made by her have three times represented the State of Washington in the style show at the International Livestock Exposition in Chicago; have won first prize in the style show at the Pacific International Exposition at Portland, Oreg.; second prize in the State style show; and two firsts and one third prize in club camp at Pullman, Wash.

A farm of 100 acres, with 35 acres in irrigation, situated about 4 miles south of Rupert, Minidoka project, sold recently for $2,000.

Alice Roberts in complete outfit made by her

Photographs Exhibited

Fifty photographs made by Ben Glaha of the work at Boulder Dam are being exhibited throughout the month of August by the United States National Museum at Washington. These portraits are displayed along a balcony in the building which houses the Lindbergh plane.

Construction of the "Rim of the Lake" highway, which will follow generally the edge of Boulder Reservoir from Overton to Las Vegas Wash, was started June 17 by C. C. C. workers from the Overton Camp.

Kenneth C. Miller, secretary of the National Reclamation Association, spent several days in Washington the latter part of June.

Sunnyside Schools Improved

Work-relief projects have been obtained by almost every school district under the Sunnyside division of the Yakima project. Although the total money expended by the Federal and State relief agencies has totaled no great sum, the projects have been numerous and have contributed greatly to the improvement of school plants and facilities. Through the courtesy of R. F. Turner, district engineer of the Washington Emergency Relief Administration; Miss L. Pearl Hibarger, superintendent of schools, Yakima County; and Charles Dishon, supervisor for Benton County W. E. R. A.; we are able to give the following list of C. W. A. and W. E. R. A. projects for the school districts of the Sunnyside division:

Yakima County

School district	*Projects*
No. 81 (Grandview)	Leveling and regrading grounds, painting, repairing roof of the Central School.
No. 31 (Liberty)	Repairing fence, grounds improvement, and sewer.
No. 34 (Outlook)	Installation of skylights and improving ceiling on gymnasium auditorium.
No. 35 (Waneta)	Reconstructing drains, calcimining, and new roof.
No. 51 (Orchardvale)	Installation of sanitary plumbing system.
No. 107 (Independence)	Calcimining and laying new floors.
No. 112 (Granger)	Removal of old furnace room, general repairs, raising roof of gymnasium, laying new floor, and repairing ceiling.
No. 113 (Sunnyside)	Painting and calcimining and improving sewage system; rebuilding high school.

Benton County

No. 16 (Prosser) Contribution $5,736.59.	Prosser High School, remodeling.
No. 32 (Benton City) Contribution, $442.35.	Remodeling and calcimining.

The most important grant was the one to Sunnyside. The morning of March 20, 1933, the old Sunnyside High School burned down. The Washington Emergency Relief Administration matched with its grant the insurance money of the school district and by using a portion of the old building the district rebuilt with a modern, commodious, well-equipped high-school plant.

A chartered airplane for trips from Yuma to Boulder Dam is now available. The plane is a Fokker 7-passenger (including the pilot). The round trip requires 4 hours in the air, with a 1-day stop-over at the dam.

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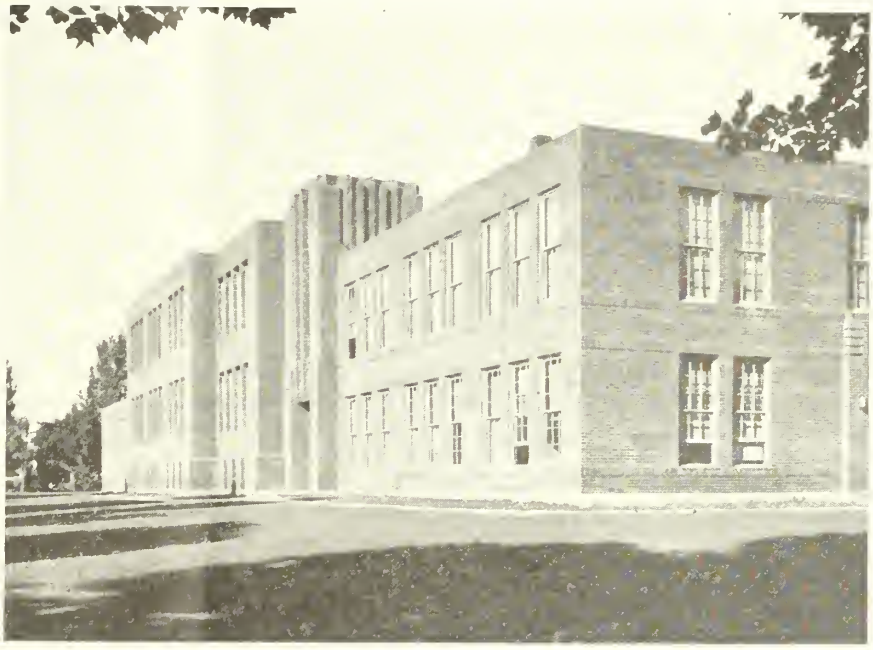

Sunnyside High School

Recent Publications of Interest

All-American Canal. Plans for desilting Colorado River water for All-American Canal, illus., Southwest Builder and Contractor, July 5, 1935, v. 86, no. 1, pp. 12–14.

Bradley, J. N. and J. B. Drisko: Hydraulic model studies for the design of canal chutes, Tech. Memo. No. 458, Denver, Colo. 18 pp., with numerous drawings and illustrations; price $4.75.

Case, Robert Ormond: The Eighth World Wonder, illus., Saturday Evening Post, June 13, 1935, v. 208, no. 2, pp. 23, 34, 36.

Church, J. E.: Snow surveys as an aid to flood forecast and control (Charts of Tahoe), Eng. News-Record, June 20, 1935, v. 114, no. 25, pp. 879–881.

Egiazaroff, Prof. I. B.: Hydroelectric Power Plants, illus., Part second, Elements of hydraulic and energetic design of Hydro-electric structures. 248 pp. 1935 (Silt, ice, and intakes). (In Russian language.)

Glover, Katherine: Taming the River of Kings, illus., Washington, D. C. Sunday Star, July 7, 1935, Editorial Section D, p. 3.

Gubin, F., Professor, University of Moscow. Book descriptive of the Boulder Canyon and other federal irrigation projects, with numerous illustrations showing their design and construction; based on information gathered during the author's recent visit to this country. The front cover carries an attractive cut of Boulder Dam: 1934, 310 pages (Russian).

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Committee Reports on Soil Erosion on Vale Project, Oregon

A committee consisting of C. C. Ketchum, Vale project; Arthur King, Extension specialist in soils, Oregon Extension Service, Corvallis, Oreg.; and L. E. Harris, emergency assistant agent, Ontario, Oreg., having made investigations as to soil erosion conditions on the lands of the Vale project, submits the following report on conditions as found with recommendations as to the handling of this problem:

It was determined that soil erosion on this project could be divided into two classes—(1) wind (2) irrigation.

In the case of wind erosion, this occurs usually during the spring months after the land has been cleared of brush and the land plowed and prepared for seeding. The amount of erosion caused by wind is not serious in its proportions but some little attention to the handling of the land until a crop can be started will prevent to a large extent this movement of surface soil by wind. The committee believes that this type of erosion can be controlled quite largely if the lands are prepared for crop in comparatively small units rather than to clear all of the land in the farm in one block. If the land is cleared and prepared for seeding in units of about 10 acres, it is believed that the erosion will be held down to the minimum.

Also in the opinion of the committee the soil on the newly cleared lands should be worked just as shallow as is possible and still loosen up enough soil for leveling and a proper seed bed. In many cases discing is all the preparation necessary for the first crop. If brush clearing is not done thoroughly then plowing may be necessary but should be at a depth not to exceed 4 inches.

In the case of erosion by irrigation, this is a problem quite largely dependent on the type of land being irrigated, particularly in regard to slope and can be controlled to a large degree by the irrigator. Erosion by irrigation is quite largely caused by the use of too large a head of water and too long runs.

The committee finds that many irrigators are attempting to irrigate these lands for the first time with runs varying all the way from 400 to 2,600 feet. They recommend running water not to exceed 100 feet on the lands where the grade is 5 percent and greater. On lands under 5 percent grade the maximum run should not be in excess of 400 feet.

Head ditches on grades of more than 5 percent wash considerably, and it is believed that more attention should be given to this condition. Ditches on steep slopes could be dropped down more gradually without undue expense to the operator.

The volume of water used on the runs on these new lands is difficult to control without the use of spiling. The use of spiling is recommended particularly on the steeper lands where washing cannot be controlled unless a very small head of water is used.

The system of irrigation which is recommended is a combination of levees and corrugations. The corrugations for the first year or two should possibly be placed a little closer than commonly used on lands which have been under irrigation for some time. Twenty inches between corrugations will enable the irrigator to wet his land more quickly and with smaller heads of water than where the distance between corrugations is greater. Distance between levees should be 24 to 30 feet on the average.

It is the opinion of the committee if the above recommendations are observed that the problem of soil erosion will not be a factor of any importance on the lands of the Vale project.

Benefits of Rural Electrification Program

M. O. Swanson, chief engineer of the Rural Electrification Administration, recently outlined in an address in Washington some of the purposes of this new administration and told how cooperative farm groups may obtain consideration of electrification problems in their districts.

"The question has been asked: How much engineering information will have to be furnished with an application for a rural electrification project? Also, the question has been asked: How much of this engineering will the R. E. A. do?" Mr. Swanson said.

"It is believed", he continued, "that this program can be carried out successfully with a minimum amount of professional service. The information that we desire with the application can usually be presented in quite simple form.

"Setting out the procedure to be followed in preparing to make an application, a group of neighbors in a rural area not now receiving electric service from a central station and interested in a rural electrification development will first contact their county agent and the nearest power company officials. The county agent, or the power company men, will receive the various requests and arrange them in units that will be large enough to be economically feasible. Then a tentative organization should be formed and work of canvassing the prospective customers should be delegated to various groups.

"We are not at this time sending out forms requesting specific engineering information. We are more interested in obtaining as much detail as possible of the kind that can be provided by neighborhood groups.

"Obtain a county map or a highway map which shows clearly the roads where electric service is desired. On this map spot the farm, gas stations, etc., that are interested in receiving electric service, indicating the distances between each. This can be done by taking the mileage readings on the speedometer on your automobile. Also give the distance to the nearest power supply and the name of the organization owning it.

"To assist us in estimating the amount of current that may be used, give the uses that you believe each prospective customer will make of the service. Also indicate the type of farm, whether a large dairy farm, cotton, grain, etc. If possible give information as to arrangements that can be made for operating the extension when made. Give in as much detail as possible the type of construction you suggest including such estimate of cost as might be obtained from a local contractor. This estimate, however, is not necessary.

"The amount of engineering the R. E. A. will do, depends on how much will be necessary. When an application has been received and put in project form, it will be submitted to the engineering department. Here it will be analyzed and checked very carefully for type of construction, the method of constructing, and costs. Operating statements will be made up and the revenue will be checked. The whole project will be studied to determine the pay-out possibilities. Where necessary we will suggest changes that may be made to help the economic set-up. We may be able to suggest simplifications in construction which will reduce the cost of the project. We may find it advisable to suggest a form of operating organization. The desirability of combining projects to spread overhead operating expenses and making the pay-out possibilities more favorable will be considered.

"It is our desire to suggest very soon a few standard types of construction which we believe can be used to advantage in rural line extension. It is not, of course, our belief that we can redesign the products of the electrical industry, but we do hope that it will be possible for us to simplify and to standardize on a few types and designs.

(Continued on p. 172)

Progress of Investigations of P. W. A. Projects

Silt survey, Colorado River, Ariz.-Calif.—Two additional river cross-sections were completed in June, making 12 sections to date and covering 60 miles of river.

Northern transmountain diversion, Colorado.—Investigation of a transmountain diversion from the Colorado River watershed near Grand Lake to the South Platte watershed near Fort Collins was continued. A reconnaissance field survey was made of a dam site on the Colorado River at the southwest corner of the Rocky Mountain National Park and of visibility conditions of prospective triangulation points in the vicinity of Grand Lake and Estes Park. Hydrographic studies were made of the approximate daily amount of water available at Grand Lake based upon records at adjacent stations.

Upper Snake River storage, Idaho.—Investigations of reservoir sites were continued. A tentative form of report on storage investigations on the South Fork on main Snake River, between Jackson and Heise, has been completed. At the upper location of the Teton River Dam site 2 drill holes were completed to a depth of 50 feet and a third to 70 feet in depth. Topographic sheets of the site on a scale of 1 inch equals 50 feet were completed. Drilling of the Spring Creek Reservoir Dam site developed that the water table to the west lies below the reservoir bed and that leaky rhyolite is inadequately covered on the same side of the site. Shallow test pits on the Spring Creek Dam site indicated materials suitable for embankment but limited in quantity.

Surveys were completed for cross-cut canal, 6½ miles long, between Henrys Fork and Teton River. The Island Park Reservoir site is being surveyed. Thirty-five thousand acres have been surveyed of the Fremont-Madison Irrigation District. Stream gaging studies have been completed on Henrys Fork and the Fall River system in Idaho.

American Falls enlargement, Idaho.—Studies are being made of water supply for an enlargement of American Falls Reservoir and of power output to be obtained at the Eagle Rock site. Plans and estimates are being prepared for raising American Falls Reservoir from a capacity of 1,700,000 acre-feet to a capacity of 3,100,000 acre-feet, and for construction of the Eagle Rock Dam.

Buffalo Rapids, Mont.—Investigations of irrigation possibilities between Miles City and Glendive. Mont., were continued. Field work on canal and soil surveys and land classification was completed. Work in the field office consisted of plotting canal lines and estimating yardage, inking soil survey sheets, and measuring irrigable areas. Studies of water supply for irrigation needs and power possibilities with determination of critical periods in the record were made and designs and cost estimates prepared for canals and power plant.

Frenchtown, Mont.—Main canal surveys, including topography of the Frenchtown project, Mont., are in progress, and test pits on canal line have been excavated.

Milk River, Mont.—Exploration and percolation tests are being carried on at the Fresno Dam site, Milk River project, and it is expected that diamond drilling will be completed in July.

North Platte Valley, Nebr.—The engineer in charge has spent the month in studies and conferences. One field trip was made over the principal features of the proposed project. Water-supply studies were continued throughout the month and tentative designs for a dam at Keystone were given some consideration. A census of lands now irrigated in the Platte and North Platte Valleys is being made. The Keystone Dam site was drilled. A hole on the south side disclosed 75 feet of sand, soft sandstones and limestones, overlying Brule clay. A north side abutment hole disclosed 155 feet of open gravel overlying Brule clay and resulted in abandonment of further drilling.

Southern Nevada, Nev.—Investigations of irrigation possibilities in the Las Vegas and Moapa Valley areas by pumping from Boulder Reservoir were continued. Plans are now being studied of the irrigation possibilities of the Las Vegas Valley and a water supply for the city of Las Vegas. The proposed project consists of pumping from the 1,100-foot contour in Las Vegas Wash. A lift of 400 feet brings water to a gravity canal about 6 miles long which runs westerly along the 1,500-foot contour to the eastern edge of the Las Vegas Valley. Here a second lift of 400 feet raises water to about 1,900 feet above sea level from whence it runs around the western base of French Mountain to the northern edge of the irrigable area in the Las Vegas Valley. A 6-mile pipe line would carry water from the canal to the city of Las Vegas for domestic supply. Bench marks and triangulation stations at one-half mile intervals over a 10-mile reach were established. Fifteen miles of topography control levels and 10 miles of stadia traverse were run for canal location control. Topography averaging 2,000 feet in width at 5- and 10-foot intervals were platted on a scale of 1 inch equals 400 feet.

Truckee River storage, Nevada.—Drilling investigations were continued at Boca Dam site, Truckee River storage, to depths of 155 feet, and topographic surveys of the reservoir site and the irrigable lands below, are in progress. An estimate of the maximum capacity of Boca Reservoir was 57,000 acre feet.

Deschutes, Oreg.—Investigation of storage possibilities for supplemental irrigation supply of lands along the Deschutes River in Oregon was continued. Field work was largely extension of reservoir and dam site surveys for an enlargement of the Wikiup Reservoir. Dikes at two saddles or passes were found necessary. Test pits along an extension of the dam site were dug with some difficulty to depths of 12 to 20 feet through gravel, without reaching suitable material for cut-off purposes. The East Dike pits revealed basalt at depths of 4 to 10 feet. At the Crane Prairie Dam site a trench was dug down the side of the bluff to examine more extensively the basalt and sand reported in the drill holes of last season. Information was being assembled on the Metolius power site with a view of providing water for the North Unit by means of high head pumping in lieu of a gravity supply supplemented by storage. The site was found to have been drilled by the Columbia Power Co. and eight boxes of drill cores were found on the site. A geologist examined the site on June 30.

Grande Ronde, Oreg.—Investigations of irrigation possibilities were continued. A reconnaissance of the Sheep Ranch Reservoir site was completed and profiles prepared. A map of the flooded and irrigable areas in the Grande Ronde Valley was also completed.

Umatilla River flood control, Oregon.—During the month of June a plan and cost estimate were prepared for a flood-control reservoir of 19,000-acre-feet capacity at the Ryan Creek site.

Colorado River Basin.—Investigations under section 15 of the Boulder Canyon Project Act were continued. Land classification was completed in the Las Vegas Valley on June 6. A total of 76,800 acres was covered. Work was resumed on June 17 on land calissification in the Duchesne Valley in Utah, which had been discontinued on Januray 7, 1935, on account of inclement weather. Some work was continued on a report on land classification performed in previous years.

Organization Activities and Project Visitors

At a recent meeting of the Advisory Committee on Allotments, of which the Secretary of the Interior is chairman, Dr. Elwood Mead, Commissioner of Reclamation, was appointed to membership on the Subcommittee on Flood Control and Water Storage Projects. The subcommittee in full is as follows:

Frederic A. Delano, vice chairman National Resources Committee, chairman; Elwood Mead, commissioner, Bureau of Reclamation; H. H. Bennett, Director, Soil Conservation Service; Gen. Edward M. Markham, Chief, United States America Engineers.

R. F. Walter, chief engineer; J. L. Savage, chief designing engineer; and L. N. McClellan, chief electrical engineeer, were called to Washington by the Commissioner during the month of July to discuss Reclamation matters.

Marshall N. Dana, president of the National Reclamation Association, was in Washington the latter part of June.

Anson Hubert Smith, age 75, of Kingman, Ariz., publisher, and one of the first in the Southwest to envision Boulder Dam, died June 20 in Kingman. Mr. Smith first proposed such a Colorado River development shortly after establishing the Mohave County Miner 53 years ago. The title "Father of Boulder Dam" once was applied to him by former President Herbert Hoover.

E. B. Debler, hydraulic engineer, was called to Washington by the Commissioner the latter part of July in connection with the protest filed by Texas interests against construction of the Alamagordo Reservoir.

John C. Page, senior engineer, en route from Boulder City to Washington, D. C., spent 2 days on the Boulder Canyon project, early in July.

Frank T. Crowe, general superintendent of Six Companies, Inc., received an honorary degree in engineering, Doctor of Engineering, at the University of Maine on June 10.

Members of the newly organized Nevada Colorado River Commission are Gov. Richard L. Kirman; A. M. Smith, State engineer; C. F. DeArmond, of Elko; A. J. Caton, of Reno; and Ed W. Clark, of Las Vegas.

Captain G. V. Close of the Fort Missoula district, Mont., visited the Huntley project the latter part of June and secured a lease on the tract of land to be occupied by the E. C. W. camp which will be established on the project in the near future.

David Christian Henny, 1860–1935

Word has been received of the death, on July 14, of David C. Henny, of Portland, Oreg. Mr. Henny was born in Arnheim, Holland, November 15, 1860. He received his education at the Holland Polytechnic Institute of Civil Engineers in Delft, where he graduated in 1881. After 3 years of railroad, drainage, and bridge work in Holland, he came to the United States. In 1892 he became manager of the Excelsior Wooden Pipe Co., and in 1902 took over the general managership of the Redwood Manufacturers Co.

He entered the Bureau of Reclamation, following brief assignments in the United States Geological Survey, in 1905 as supervising engineer of the Pacific coast division, having charge of the Okanogan, Sunnyside, Tieton, Umatilla, Klamath, and Newlands projects. In 1910 he was appointed as consulting engineer and rendered invaluable service to the Bureau. He was a member of the Boulder Dam Consulting Board. Effective October 12, 1933, his connection with the Bureau was severed, in order that he might be definitely assigned to the War Department.

Mr. Henny was a member of the Royal Institute of Engineers of Holland and formerly acted in the capacity of vice president of the American Society of Civil Engineers. He was chairman of the Oregon State Planning Commission at the time of his death. He was an internationally known hydraulic engineer and considered an authority on the construction of high-dams, water-power, and flood-control work.

George O. Sanford, supervisor of operation and maintenance, visited the following projects during the month: Boise, Hyrum, Huntley, Milk River, Sun River, Vale, Casper-Alcova, Riverton, and Upper Snake River storage.

Yoshichika Tanaka, civil engineer with the Hazamagumi Contracting Co., Tokyo, Japan; Consulting Engineers Louis C. Hill, of Los Angeles, W. F. Durand, of Stanford, D. C. Henny, of Portland; Chief Designing Engineer J. L. Savage; and Chief Electrical Engineer L. N. McClellan, of the Denver office; Dr. C. P. Berkey, consulting geologist, New York; and Mrs. Marguerite S. Uppercue, in charge of the stenographic section in the Washington office, were among the recent visitors to the Boulder Canyon project.

L. M. Lawson, Commissioner of the International Boundary Commission, United States and Mexico, and H. J. S. DeVries, acting secretary and counsel, were in Washington during July.

Electrification Program

(Continued from p. 170)

"As this program progresses, consideration will be given to the problem of farm wiring. There is an opportunity to assist the farmer not only by reducing the cost of installing wiring but to so install it that it will be of the most service. It is believed that simplification of wiring methods will make it possible to reduce costs to a point where farm wiring will cover more than a few lamp sockets hanging from the ceiling. Electric service is just as desirable in the barn and in the tool shed as it is in the home. There are on the market many appliances that can be used to advantage in the barn.

"Another important need in the rural areas is highway lighting. It is hoped that this rural electrification program will carry along with it some measure of highway lighting. There is not only a demand for this service in the rural areas as a convenience but as protection to life and property.

"Because of the many differing regulations governing wiring methods and distribution construction in the States, it is impossible to adopt any one set of standard specifications. This is a service organization charged with the responsibility of furthering rural electrification. To accomplish this it is essential that there be simplification of present construction practices."

The Rural Electrification Administration has set up headquarters at 2000 Massachusetts Avenue, Washington, D. C., and additional information can be obtained by writing to the main office.

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ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead** Commissioner, Bureau of Reclamation

Miss Mae A. Schuurr, Asst. to Commissioner and Chief, Division of Public Relations; Miss Mary E. Gallagher, Secretary to the Commissioner; George O. Sanford, Chief Engineering Division; Deane S. Stuver, Supervising Engineer, E. C. W. Divisiou; Wm. F. Kubach, Chief Accountant; Charles N. McCulloch, Chief Clerk; Jesse W. Myer, Chief Mails aud Files Division

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E Houk, Senior Engineer, Technical Studies; ----------, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
Carlshad	Carlshad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen	C. M. Voyen	W. J. Burke	Billings, Mont.
Columbia Basiu, Grand Coulee Dam.	Coulee Dam, Wash	F. A. Banks	do	C. B. Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
Frenchtown	Missoula, Mont	J. W. Taylor	Resident engr		Denver	W. J. Burke	Billings, Mont.
Grand Valley	Grand Junction, Colo.	W. J. Chiesman	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Constr. engr	George B. Snow	Denver	do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent		C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Constr. engr	Francis J. Farrell	Denver	J. R. Alexander	Salt Lake City, Utah.
North Platte	Guerusey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Constr. engr	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. eugr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif	E. A. Moritz	do	George H. Bolt	Denver	R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell	Denver	J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wentzel [1]	C. B. Wentzel	W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell	Denver	J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo	L. J. Windle [1]	Superintendent	L. J. Windle [1]	Denver	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Denver	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Constr. engr		Denver	J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		Denver	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Constr. engr	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo	C. B. Elliott	do	do	do	do	Do.
Upper Snake River Storage [3]	Ashton, Idaho	H. A. Parker	Constr. engr	Emmanuel V. Hillius	Denver	B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

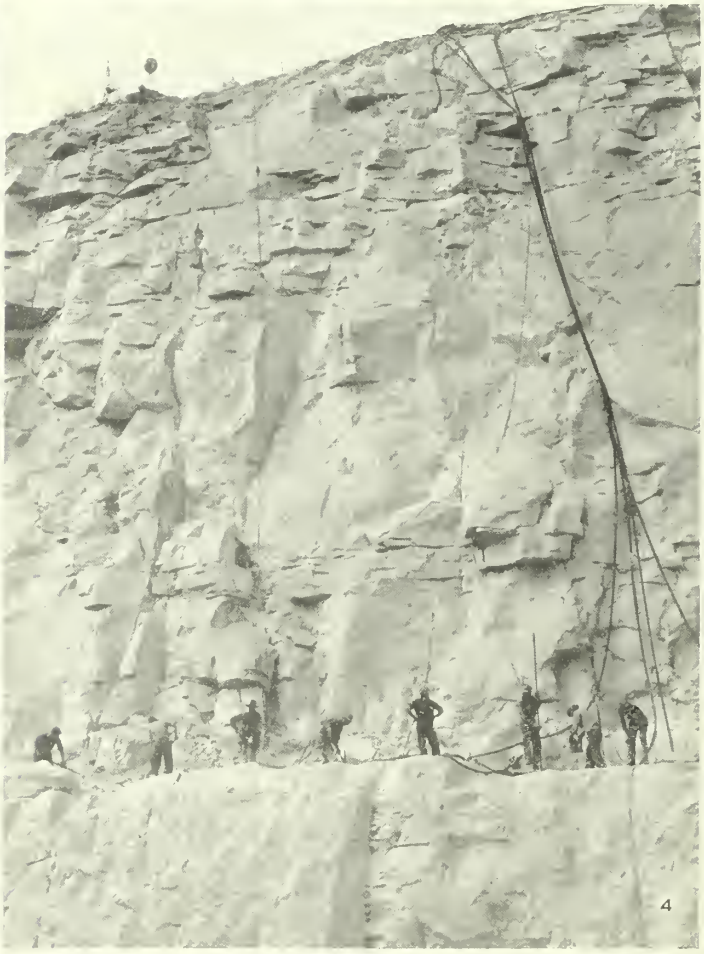
Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrigation dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	C. W. Tharp	Superintendent	C. J. McCormick	Grand Junction.
Huntley	Huntley irrigation district	Ballantine, Mont	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Irl Davis	President	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	D. E. Norton	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Goodiug, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	F. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington ,Wyo.	Bert L. Adams	do	Nellie Armitage	Torriugton.
Northport division	Northport irrigation district	Bridgeport, Nebr.	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
Salt Lake Basin (Echo Reservoir).	Weber River Water Users' Association	527 Eccles Bldg., Ogden, Utah.	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Gen. supt. and ch. engr.	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	Superintendent	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Paysou.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigation district	Fairfield, Mont	A. W. Walker	do	A. W. Walker	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg	E. D. Martin	do	Enos D. Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghtou	Irrigon.
Uncompahgre	Uncompahgre Valley W. U. A	Montrose, Colo	Jesse R. Tompson	Acting supt	J. Frank Anderson	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	Manager	R. E. Rudolph	Ellensburg.

Important Investigations in Progress

Project	Office	In charge of—	Title
Buffalo Rapids	Denver, Colo	R. R. Robertson	Assistant engineer.
Colorado River Basin, sec. 15	Denver, Colo	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes	Bend, Oreg	C. C. Fisher	Engineer.
Gila Valley	Denver, Colo	P. J. Preston	Senior engineer.
San Luis Valley	Denver, Colo	R. F. Walter	Chief engineer.
Grand Lake-Big Thompson Transmountain	Denver, Colo	P. J. Preston	Senior engineer.
North Platte Valley	Denver, Colo	O. V. P. Stout	Consulting engineer.

SALLIE A. B. COE, *Editor.*



COLUMBIA BASIN PROJECT, WASHINGTON—GRAND COULEE DAM

1. Diver at west pier, Government Highway Bridge; 2, south end of west side cofferdam showing 4 feeders running to central hopper or surge feeder loading main line 60-inch conveyor. East side excavation for dam foundation; 3, sloping operations on slide of March 1934; 4, rock cut on highway near dam axis, men working at elevation 1325.

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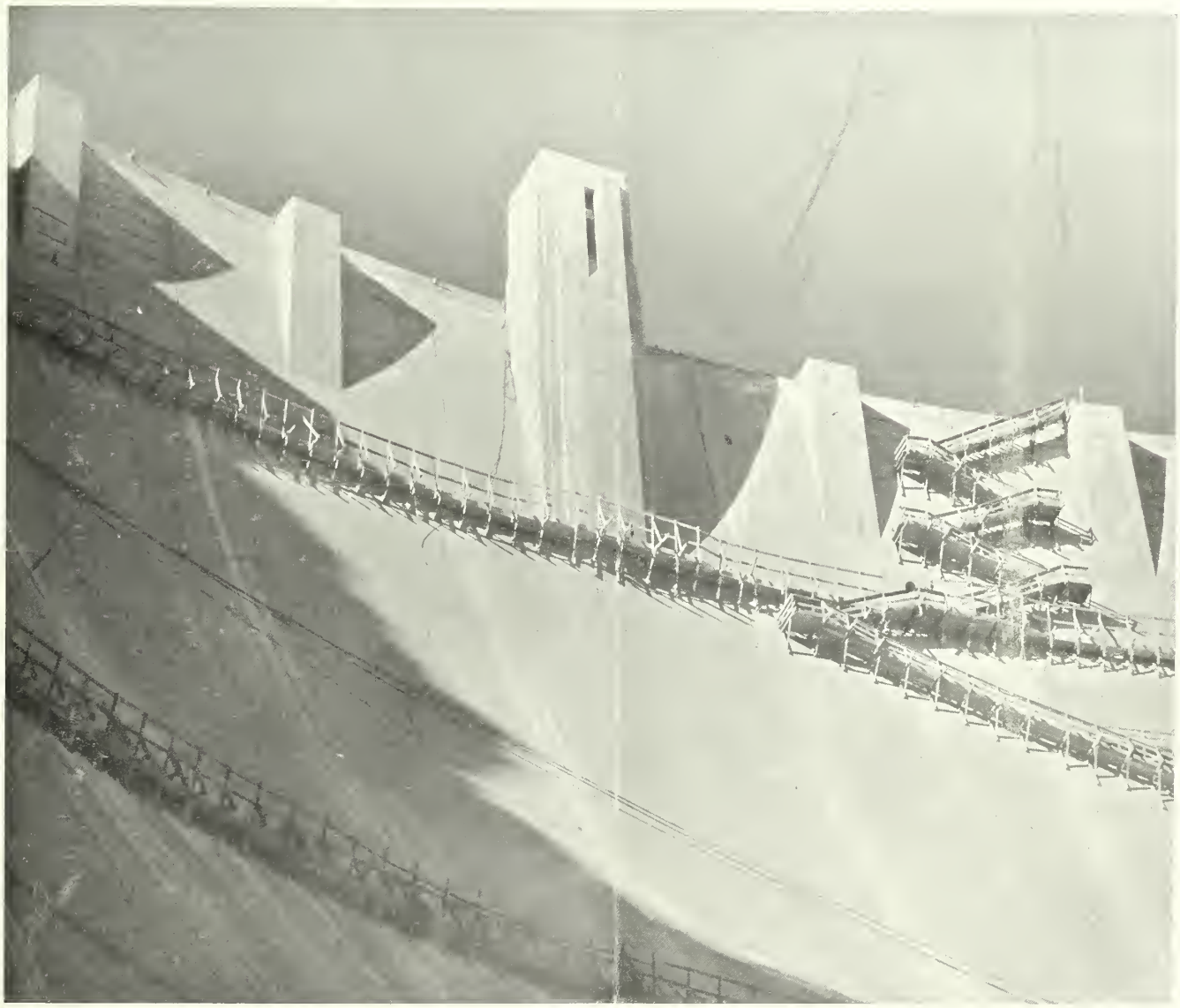
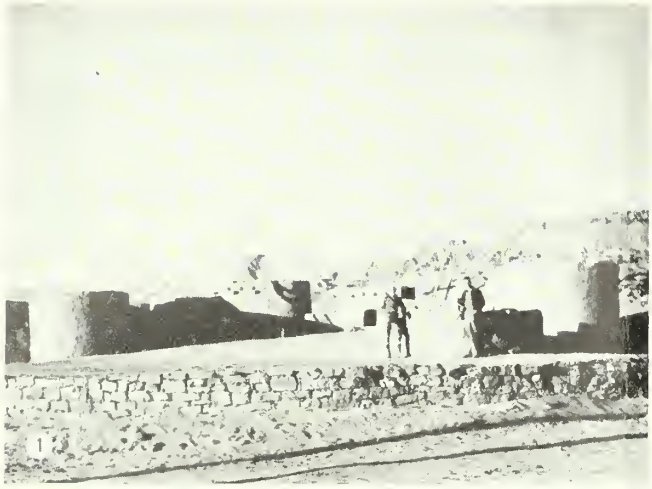
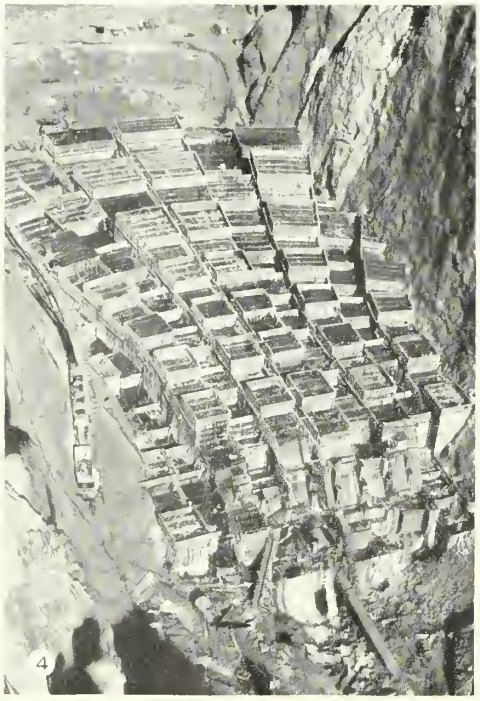
THE RECLAMATION ERA

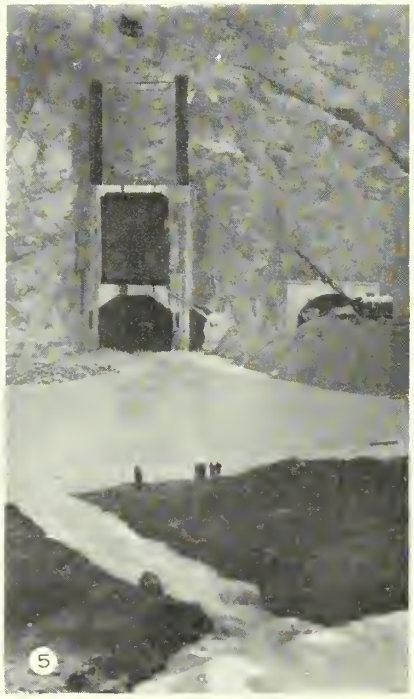
VOL. 25, NO. 9 SEPTEMBER 1935

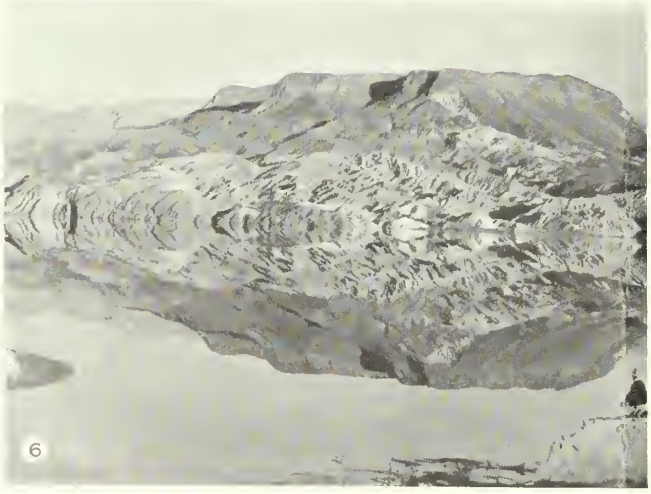


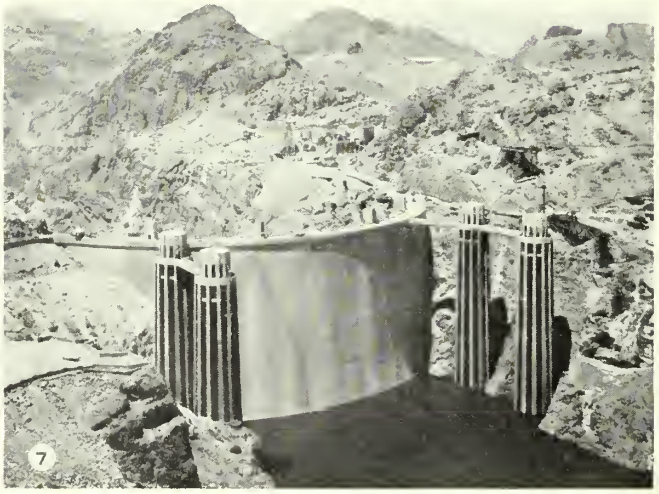
SHADOWS CREEPING ACROSS THE CONCAVE FACE OF BOULDER DAM
BOULDER CANYON PROJECT, ARIZONA-NEVADA











BOULDER CANYON PROJECT, ARIZONA-NEVADA

1. Reconstructed pueblo at Lost City near St. Thomas, Nev.; 2, abandoned homestead, St. Thomas; 3, Arizona intake towers seen from surface at elevation 884—base of towers at elevation 895; 4, Boulder Dam from control cage of 150-ton cableway on Nevada rim; 5, start of reservoir regulation—flow passing through diversion tunnel no. 4, in background and through dike in diversion tunnel no. 1 in foreground; 6, Fortification Hill from Nevada shore of reservoir; 7, upstream face of dam and appurtenant works from high point upstream on Arizona rim of Black Canyon. Water surface at elevation 913.

(See article on "Boulder Canyon Reservoir", p. 180)

THE
RECLAMATION ERA

Issued monthly by the DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C.
Price 75 cents a year

HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 9 SEPTEMBER 1935

Reclamation Receives Additional Allotments

ANNOUNCEMENTS that the President had approved a total of 28 allotments aggregating $72,650,000 of Emergency Relief funds to the Bureau of Reclamation were made to and including August 16.

The August issue of the RECLAMATION ERA carried the first four allotments to be announced. They were: $23,000,000 for continuation of work on Grand Coulee Dam, Wash.; $10,000,000 for continuation of work on the Casper-Alcova project, Wyoming; $60,000 for the Frenchtown project in Montana; and $1,500,000 for administrative expenses.

In addition, one of the first allotments made included a $5,000,000 allocation to the Bureau in order that it might cooperate with the lower Colorado River authority of Texas in the completion of a project near Austin.

The new announcements include the following:

Arizona, Salt River project, $4,500,000;

California, All-American Canal, $15,000,000;

California-Oregon, Klamath project, $135,000;

Colorado, Grand Valley project, $200,000;

Idaho, Boise project, $1,000,000 for the Payette division, $600,000 for repair of Arrowrock Dam, $160,000 for drainage;

Montana, Sun River project, $715,000, and Bitter Root project, $200,000;

New Mexico, Carlsbad project, $1,500,000;

Oregon, Deschutes River, $1,000,000; Vale project, $340,000; Oywhee project, $1,500,000; and Burnt River, $500,000;

South Dakota, Belle Fourche project, $70,000;

Utah, Moon Lake, $240,000; Provo River, $2,900,000; Ogden River, $500,000;

Washington, economic investigation of Columbia Basin $250,000; Yakima project storage, $280,000;

Wyoming, Riverton project, $1,000,000;

General, Colorado River investigations, $250,000, and secondary investigations, $250,000.

President Roosevelt Visits Boulder Dam

ON HIS trip to the West the President of the United States plans to visit the San Diego Exposition and Boulder Dam, and in commemoration of this visit the Bureau has issued a 12-page illustrated booklet which will be distributed in Boulder City on the occasion of his visit to the dam on September 26. Copies of the booklet may be obtained upon application to the Commissioner, Bureau of Reclamation, Washington, D. C., or to the Construction Engineer, Boulder Canyon Project, Boulder City, Nev.

Of the $100,000,000 previously earmarked for the Bureau's use by the advisory committee on allotments, these allotments leave a balance of $32,350,000.

Brief descriptions of the work proposed under each of these allotments follow:

All-American Canal.—The All-American Canal was authorized by Congress in the Boulder Canyon Project Act. Eighty miles long, it is to displace the present intake canal of the Imperial Valley irrigators, which crosses from the river to the irrigated section of the valley largely in Mexico. Work on the All-American Canal was begun last year with $9,000,000 made available by the Public Works Administration.

At the present time 53 miles of the canal is being constructed under contracts awarded during the past year and another section. in the Imperial Valley near Calexico, is being constructed by force account.

The program contemplated under the new allotment of $15,000,000 consists of construction of the canal between the intake and the point about 5 miles southwest, where work is now in progress, construction of siphons at three large washes in this sector, construction of the remainder of the canal through the irrigated section of Imperial Valley and the starting of Imperial diversion dam and the desilting works planned in connection with it. The siphons will be constructed at Picacho, unnamed, and no. 404 washes.

Vale project, Oregon.—The Vale project, the total cost of which is $5,000,000, when completed will provide a stable water supply for 30,000 acres of land near Vale, Oreg. It was started with reclamation funds, and continued since 1933 by Public Works allocations.

Half the area now has water delivered to it. Complete use of the irrigation works will be made possible by the completion with the new allotment of $340,000 for the canals and distribution system.

Completion of Owyhee.—The Owyhee project, including a 405-foot dam, was started with reclamation funds, and by 1933 a total of $11,500,000 had been spent on its construction. The Public Works Administration allotted $5,000,000 to the project, and this sum has carried construction up to the present.

The new allotment of $1,500,000 is in the nature of replacement of a second Public Works allotment of $1,500,000 which was impounded. It will complete construction of canal structures and laterals to finish the lower end of the distribution system.

Lands previously irrigated by pump from the Snake River were supplied with gravity flow water from the Owyhee project for the first time last spring.

Arrowrock Dam.—The lower portion of the dam has been damaged by the freezing during rigorous Idaho winters of water which has seeped through the structure. The repairs, for which $600,000 was allotted, are necessary to maintain the dam in a satisfactory condition.

Ogden River project.—Allotment of $500,000 will carry to completion con-

struction of Pine View Dam, 7 miles north of Ogden, construction of a 75-inch wood-stave pipe line and 25 miles of canals to Brigham City, and it also will provide for reconstruction of the Ogden city water supply system.

Ogden now gets its water from an artesian basin located a few hundred yards above the Pine View Dam. This basin will be submerged. At present the flow of the wells is collected in a main which delivers the water to Ogden.

It now becomes necessary to reconstruct the pipe lines which collect the water and the main leading to Ogden.

In the original estimates of the Pine View project, it was expected that the city of Ogden would be able to finance this work. It has been unable to do so. A contract has been executed through which the United States, thorugh the Bureau of Reclamation, will do the work, the cost to be repaid by Ogden with 4 percent interest in 10 annual installments.

Boise drainage project.—The allotment of $160,000 will add supplemental drains to more than 200 miles of subsurface drains now in operation on the Boise project. The work was started with a $40,000 allotment by the Public Works Administration. The drains are needed to overcome a threat of damage by seepage.

Colorado River.—Work has been progressing on Colorado River water resources investigation under appropriations by Congress and more recently with a Public Works Administration allotment. The new allotment of $250,000 will carry on the work.

Investigations made to date have been located principally in Arizona, Nevada, and New Mexico. With this allotment the Bureau expects to concentrate its work in the upper basin States of Utah, Colorado, and Wyoming.

The objective is a complete study of possible irrigation and power projects looking toward intelligent use by the generation of power and by its application to unimproved land of the water allocated to the several States in the Colorado River Basin by the Boulder Canyon Project Act.

These investigations were started in 1931. No complete report has as yet been made.

Deschutes River.—Allotment of $1,000,000 will provide for the construction of Wikiup Dam and Reservoir on the Deschutes River in Oregon and a diversion tunnel and control works. This reservoir will supply supplementary water to the Deschutes Irrigation District.

Burnt River.—The allotment of $500,000 will provide for construction of a small storage reservoir on the Burnt River to furnish supplemental water for the lands immediately north of Willow Creek.

Yakima project storage.—Allotment of $280,000 will enable the Bureau to construct a parapet wall and spillway gate at the Cle Elum Dam and installation of a permanent spillway at the Kachess Dam on the Yakima project. Utilization of the full storage capacities of these dams will be made possible by these improvements.

Moon Lake project.—The allotment of $240,000 for construction of Moon Lake Dam and the Duchesne Canal was in the nature of replacement of funds previously made available by the Public Works Administration but later impounded. Work now is in progress on this project, $1,200,000 of P. W. A. funds being available.

Grand Valley project.—Allotment of $200,000 for the Grand Valley project will enable the Bureau to complete a division left unfinished by constructing pumping plants and canals. About 10,000 acres now above the line of the gravity canals will be supplied with water. The electric plant needed for this development was constructed last year.

Klamath project.—Additional drains and laterals will be constructed with the $135,000 allocated to this project. The Bureau does not contemplate irrigation of additional lands in the Tule Lake area or the sump which surrounds it.

Belle Fourche project.—Drains and replacement of important structures along the canals of the Belle Fourche project will be financed with the allotment of $70,000 received.

Secondary investigations.—An allotment of $250,000 was made for continuation of the Bureau's regular secondary and cooperative investigation program. Requests for such investigations on hand exceeded the funds available for this purpose for the year.

Columbia Basin investigations.—Allotment of $250,000 for economic surveys in the Columbia River Basin will enable the Bureau to make a topographical map of the 1,200,000 acres which may be irrigated by a high dam at Grand Coulee. Land-ownership maps and a detailed land-classification map also will be made in order that the unirrigated value of the land and the suitability of the land for irrigation may be determined.

"The greatest economical and social benefits from the Columbia Basin project can be obtained only if it is made an irrigation project coupled with power generation", Dr. Elwood Mead, Reclamation Commissioner, said. "This is an appropriate time for an investigation of such a program to determine its feasibility. Nearly all the land to be irrigated is in private ownership.

"Feasibility and economic and social benefits will depend to a great extent on the curbing of speculation in land and enabling home seekers to acquire it at its unimproved value. Recognizing this, a preliminary investigation was made by the Bureau in 1928. Additional work along this line now is needed to obtain basic data in working out economic problems connected with the Columbia Basin project."

Sun River project.—Allotment of $715,000 for Sun River will complete this project. The work consists of installation of gates on the spillway of Gibson Dam, completion of the canals and laterals of the Greenfields division and additional drainage. The spillway gates will increase the capacity of the reservoir from 91,000 to 105,000 acre-feet.

Carlsbad project.—The Alamogordo Reservoir on the Pecos River will be constructed with $1,500,000 allotted for this project. Leakage of McMillan Reservoir makes additional storage necessary, because the usable water supply is insufficient for maximum crop yield.

Salt River project.—The allotment of $4,500,000 will make it possible to construct a storage dam at Bartlett on the Verde River. That part of the allotment not required for the dam will be available for spillway and betterment work.

Provo River project.—The allotment of $2,900,000 for work on this project will enable the Bureau to continue the work already begun with $1,000,000 of Public Works Administration funds. Deer Creek Dam will be completed with the new allotment and the feeder canals constructed. The P. W. A. originally allotted $2,700,000 for this project, but later $1,700,000 was impounded. The new allotment replaces the impounded funds and adds $1,200,000 for the next year's work.

Boise project, Payette division.—Allotment of $1,000,000 for construction of the Payette division of the Boise project will enable the Bureau to build the main canal from the Black Canyon diversion dam to the irrigable lands, of which there are 47,000 acres.

Riverton project.—Bull Lake Reservoir and additional irrigation canals and laterals will be constructed with an allotment of $1,000,000 to the Bureau for use on the Riverton project. This reservoir will have a capacity of 145,000 acre-feet of water. Full use of the division of the project already constructed cannot be made, Dr. Mead said, until the reservoir has been constructed.

Bitter Root project.—An allotment of $200,000 will enable the Bureau to rehabilitate additional sections of the Bitter Root Canal system, where replacements are needed on major structures, such as flumes, siphons, and outlet works of the storage reservoir.

Appointments Approved in New Division

THE Secretary of the Interior on August 12 approved the designation as general supervisor of operation and maintenance of George O. Sanford. At the same time he approved the appointment of H. H. Johnson, J. S. Moore, and L. H. Mitchell as supervisors of districts nos. 1, 2, and 4, respectively.

These three new operation and maintenance supervisors will serve in any of the five divisions under the direction of Mr. Sanford, and will make their headquarters in Washington, D. C. The five divisions include the following territories:

District no. 1, Montana and western North Dakota; no. 2, Washington, Oregon, Idaho, and northern California; no. 3, Wyoming and western South Dakota and Nebraska; no. 4, Colorado, Utah, Nevada, and central California; no. 5, New Mexico, Arizona, and southern California.

Mr. Sanford returned to Washington in August from an inspection trip of projects in the northwestern section of the country. He reported to Dr. Elwood Mead, Commissioner of Reclamation, that crop prospects were excellent on the projects visited and he had found a general improvement over the conditions of a year ago. Mr. Sanford's report follows.

"CROPS DOING WELL

"The prospect for good crops appeared to be excellent and there was an adequate water supply available. On the lower Yellowstone project in Montana about 14,000 acres of sugar beets have been planted—an increase of about 2,000 acres over 1934. On Milk River the area has also increased. On both projects there was an excellent stand of beets. On the Sun River project, near Great Falls, Mont., over 10,000 acres of seed peas had been planted, and while at first the growth was slow, later reports indicate that an excellent crop will be harvested. A large part of this acreage is contracted with the Associated Seed Growers of New Haven, Conn. On the Huntley project crops were in excellent condition and here the principal cash crop will be the white navy and the pinto bean. Owing to failure to reach a satisfactory agreement with the sugar company as to the price of sugar beets, the acreage on this project has been materially reduced

"In Wyoming crop conditions were excellent. The new settlers on the Riverton project are making good progress in subduing the raw land and planting crops of grain and alfalfa. There are now more than 200 farmers on the Riverton project and inquiries are being received daily asking what the opportunities are for securing either homestead or patented lands. The impression left from the inspection of the Riverton project is that it has now reached a point where rapid settlement and development in the future may be expected.

"FARMSTEADS AVAILABLE

"In Idaho, with an adequate supply of water available and a very favorable spring, crops have made a fine growth. The increased water supply for lands under the Gooding division is resulting in increased crop production. On this division there are about 60 unentered tracts of homestead land now open to entry. There is an excellent opportunity for an experienced farmer to establish a home on an irrigated farm. Information relating to these farms may be obtained by writing to E. B. Darlington, Superintendent, Bureau of Reclamation, Burley, Idaho. The prospect for excellent crops on the Boise project in Idaho were equally as good as on Minidoka. On the Vale project in eastern Oregon excellent progress is being made by the new settlers. The first cutting of alfalfa was in the stack by the latter part of July and on some of the farms this crop exceeded 2 tons per acre. In this section it is usually possible to harvest four cuttings of alfalfa hay. Construction work is still in progress on the Owyhee project, but a large portion of the canal system has been completed and water is being carried in the canals for the first time this season for the irrigation of about 6,000 acres of land

"The three divisions of the Yakima project, the Sunnyside, Tieton, and Kittitas divisions, are all in a high state of cultivation with an excellent water supply and a prospect of one of the best crops that has been produced for years. The new farms on the Tule Lake division of the Klamath project showed excellent crops of grain and alfalfa. There is a strong demand for farms on this division of the project, and an earnest desire was expressed that additional funds be made available so that the canal system could be extended to the remaining fertile lands around Tule Lake.

"ALMONDS AT ORLAND

"Some time was spent in investigating conditions on the Orland project in California where difficulties have been experienced in carrying on successful farming operations on some of the gravelly soil where the plant fertility was quickly exhausted and where serious difficulties were being experienced in producing satisfactory crops. On most of the farms under the Orland project excellent crops of oranges, almonds, olives, figs, and grapes are being produced. This project is located in one of the sections of California where more than 90 percent of the almond crop of the United States is produced, and for that reason occupies a particularly favorable location.

"The last project visited was the Newlands in Nevada. Good crops, particularly alfalfa, are grown on this project, but as more than 80 percent of the productive area is planted with alfalfa, the project is subject to ups and downs that are not experienced on a project where a more diversified line of agriculture is followed. Studies are now being made to see if it is not possible to select some cash crop that can be successfully grown and thereby bring about a more prosperous condition on the project. One of the interesting things brought out during the visit to the Newlands project was a new type of clover, known locally as strawberry clover, which is well adapted to damp land with an excess of alkali salts where heretofore only salt grass could be grown. Strawberry clover can be planted on such areas and within a short time has crowded out the salt grass and is producing a fine stand of pasture grass that is as valuable as any of the irrigated clovers. At the present time there is a very limited supply of strawberry-clover seed and it now commands a price of 80 cents per pound."

Lumber Purchase Large

R. E. Chapman, president of the Chapman Lumber Co., Portland, Oreg., has pointed out that according to its records his company had delivered 87,129,528 feet of lumber of a valuation of approximately $2,250,000 to Boulder Dam during the construction period. In an article in the July issue of the RECLAMATION ERA written to demonstrate how money spent in building Boulder Dam was spread throughout the country, it was said that between February 1931 and February 1935, $127,000 worth of lumber had been purchased by the contractor from the Chapman Co. The figure now provided by Mr. Chapman would have made the article more impressive.

Official Federal statistics indicate that Yakima is leading the Nation in residential building for cities with a population of less than 50,000.

The Reclamation Era

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Special reduced rates are given individual water-user owners or water-users organizations for mass subscriptions on Federal irrigation projects.

SEPTEMBER 1935

Silt in Boulder Dam

The mail recently brought a letter from John A. Street, of Los Angeles, a friend of the Bureau of Reclamation, who said he had read an article "purporting to state facts whereby the writer doomed the (Boulder Canyon) project to ultimate uselessness because of continuously piled-up silt deposits on the bottom of the lake."

Mr. Street was worried about the situation. Others may have read and been worried as well. For the purpose of informing all of those who may not have complete information at hand concerning the silt problem at the reservoir of Boulder Dam, the letter Dr. Elwood Mead, Reclamation Commissioner, sent to Mr. Street is quoted as follows:

"It is with a sense of pleasure that I read letters such as yours of July 30. I am encouraged to find that you who are of the general public are so interested in the things the Bureau of Reclamation is trying to do.

"The silt problem at Boulder Dam, of course, has received the most careful consideration by our engineers. While ultimate details of silt control have not been worked out as yet, I can assure you that any statement to the effect that the dam will be rendered useless through silting of its reservoir is exaggerated if not calculated to excite distrust.

"The reservoir at Boulder Dam has a capacity of 30,500,000 acre-feet. It is many times larger than any other man-made lake. It was designed so that of this capacity, from 5,000,000 to 8,000,000 acre-feet of space could be used as a silt pocket without in any way reducing the effectiveness of the dam for flood control, storage, river regulation, and power generation. Our best estimates indicated that the river may carry into the reservoir 137,000 acre-feet of silt annually. In 50 years the total silt deposit will not exceed 3,000,000 acre-feet. If nothing ever were done to curtail the silt problem, the usefulness of the dam could not be impaired within 150 years, and the lake would not be filled within a period of a great many centuries.

"Of course Boulder Dam was designed and built as a permanent structure. It is now a part of the geography of the Southwest. It would be negligent of us if, while laying plans for all time, we overlooked possible destruction of the dam's usefulness, even though the possibility should be centuries distant in the future.

"For this reason a very careful chart of the topography of the bottom of the lake now is being made. By periodic soundings we will be able to trace from year to year the currents within the reservoir and the subsurface deposits they leave.

"Other dams eventually will be constructed above Boulder Dam, and these will catch the silt which now is being dumped into the reservoir. These dams undoubtedly will be built long before the silt problem becomes acute in any sense at Boulder Dam itself.

"It should not be forgotten, in this connection, that one of the purposes of Boulder Dam is to desilt the Colorado River so that irrigators on the lower river will be relieved of a major expense. Irrigators now spend about $1,000,000 a year in maintaining canals that are silted by waters from the Colorado.

"It is characteristic of a river that its silt is deposited largely at the point where its flow is checked, either by reaching a low gradient or, as in the case of the Colorado, entering the reservoir above Boulder Dam, when it finally reaches still water. Since Boulder Reservoir already is 85 miles long, the first silt deposits can hardly be placed against the dam itself. They will be laid down far up the river at or near the upper end of the reservoir. As a matter of fact all the water within many miles of Boulder Dam already is clear and is remaining clear, showing that it carries no silt to that vicinity.

"Please be assured that I appreciate your interest and your friendship with the Bureau. We who built Boulder Dam feel that it will accomplish all the purposes set for it and are determined that its usefulness shall not be impaired."

Drainage on Uncompahgre

Public Works Administrator Harold L. Ickes has announced approval of an alteration in the allotment of $2,725,000 made last year to the Bureau of Reclamation for work on the Uncompahgre project to permit construction of drains.

Under the new order an amount not to exceed $500,000 can be applied after suitable repayment contracts have been entered to drain the lowlands along the Uncompahgre River. The money will come out of the original allotment which was made for the construction of the Taylor Park Dam and Reservoir, repair and relining of the Gunnison Tunnel, and rehabilitation of the canals on the Uncompahgre project. When the contract was let for the dam it was found that the bid was considerably below the estimates of the cost of the work.

Work on the dam and rehabilitation of the project now has been under way several months. The new order amounts to expanding the work authorized without increasing the allotment. At the same time it permits the construction of a comprehensive system of drains that has been greatly needed. The lowlands along the river are made up of a fairly compact soil. Seepage from the irrigated mesas higher up the valley has threatened their productivity. Several small drains have been constructed, but they have not been extensive enough to relieve the situation. The Bureau of Reclamation proposes a network of open drains that will relieve threatened areas.

COMMISSIONER, (Date)_____

Bureau of Reclamation,

Washington, D. C.

SIR: I am enclosing my check [1] (or money order) for 75 cents to pay for a year's subscription to THE RECLAMATION ERA.

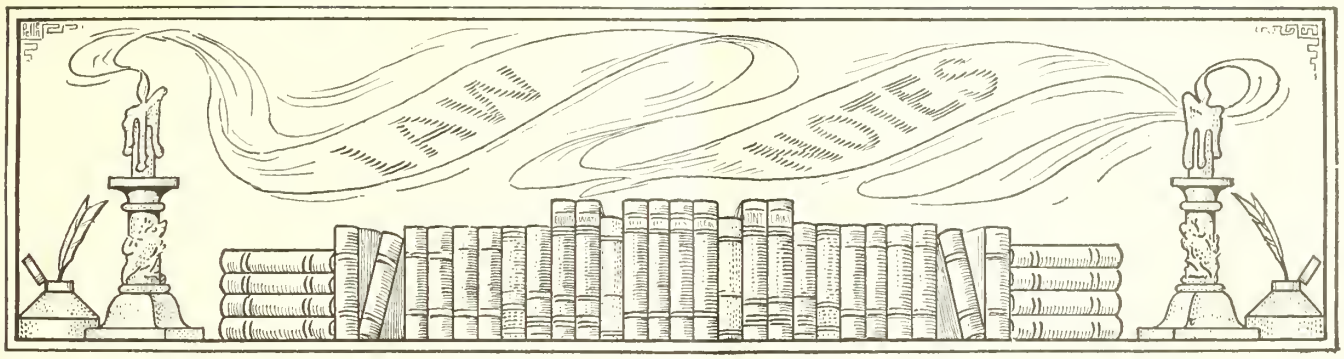
Very truly yours, (Name)_____

(Address)_____

_____

[1] Do not send stamps.

NOTE.—30 cents postal charges should be added for foreign subscriptions



Departmental Decisions

GRAND COULEE DAM AND POWER PLANT

"The Bureau of Reclamation has issued specifications and advertised for bids for the construction of the Grand Coulee Dam and power plant on the Columbia River near Almira, Wash. The possible cost of the structures and machinery will exceed $25,000,000. Twenty-six surety companies have advised the chief engineer of the Bureau of Reclamation at Denver, Colo., that they believe that the surety companies will be unable to furnish a bond in excess of $3,000,000. The specifications require a bond in the sum of $5,000,000. Prospective bidders have, therefore, become interested in offering the United States some form of guaranty bond or other security not offered by the surety companies.

"You have asked for my opinion whether corporations holding stock of the corporation submitting the successful bid will be acceptable as sureties if their assets, independent of the stock of the bidding corporation, are collectively in excess of $10,000,000, and whether more than two individual sureties will be acceptable on a performance bond notwithstanding the statements made in paragraph 64, Bulletin 51, issued by the Federal Emergency Administration of Public Works.

"There are three distinct classes of security acceptable to the United States to guarantee the performance of construction contracts: (1) Deposit of United States bonds or notes; (2) surety bond executed by one or more surety companies; and (3) individual bond, signed by two or more individuals.

"If deposit of the United States bonds or notes is accepted as security in lieu of a surety bond in support of a contract, such bonds or notes shall equal, at their par value, the amount of the required bond stated in the specifications and shall be accompanied by an agreement authorizing the disposal of the same in case of default. This plan is authorized by section 1126, Revenue Act of February 26, 1926 (44 Stat. 9–122); Treasury Circular No. 154, dated April 30, 1926.

"Paragraph 64 and a part of paragraph 65 of Bulletin No. 51, Federal Emergency Administration of Public Works, provide as follows:

"'*Sufficiency of guarantors and sureties.*—The bond of any surety company authorized by the Secretary of the Treasury to do business, or of two responsible individual sureties, will be accepted as security for any bid or contract. Individual guarantors or sureties must make the affidavit appearing on the bond as to their sufficiency and furnish the certificate of a judge or clerk of a court of record, a United States district attorney or commissioner, or the president or cashier of a bank or trust company. Individual sureties shall justify in sums aggregating not less than double the penalty of the bond.'

"'*Restrictions as to guarantors and sureties.*—A firm, as such, will not be accepted as a guarantor or surety, nor a partner for copartners or for a firm of which he is a member. Stockholders of a corporation may be accepted as guarantors or sureties provided their qualifications as such are not dependent upon their stock holdings therein.'

"This regulation amounts to an assertion that bonds executed by surety companies or by individuals are acceptable and that in case of a bond executed by individual sureties at least two individuals must execute the instrument. There is no inhibition against more than two surety companies signing the same performance bond, and in doing so, each company executing the bond may limit its liability to a stated sum less than the full amount of the bond. The only interest of the United States is to secure a good and sufficient bond for a definite total amount designated.

"The Six Companies' contractor for the construction of Boulder Dam offered, and the Department approved, a bond as security for the faithful performance of the contract, signed by more than 20 surety companies, each one limiting its liability at an amount less than the full amount of the bond. This same plan is feasible where the bond is executed by individual sureties. Two or more individuals can execute the bond and limit their liability, but each must justify for double the amount of his stipulated liability. If each of 20 men assume a joint and several liability for $100,000 on a bond for the full sum of $1,000,000, and each bondsman would justify for $200,000, it would be a good bond for $1,000,000.

"A firm as such will not be accepted as surety nor a partner for copartners. A stockholder of a corporation may be accepted as surety on the bond of the corporation, provided he has sufficient property exclusive of his holdings in the company so that he can justify for double the amount of his stipulated liability. In other words, his net assets over and above his ownership of stock in the company must be double the amount of his liability on the bond. If the stockholder is a corporation instead of an individual, the same rule would be applicable.

"It is my opinion that contractors on Government construction may have approved security outlined in any one of the three classes above designated and that two or more individual sureties are acceptable in executing an individual bond and that stockholders, either individual or as corporations, holding stock in the contracting company, may execute bonds if their assets, independent of their stock ownership in the contracting company, permit them to justify in twice the amount of their liability on the bond."—*Decision rendered May 19, 1934, by the Acting Solicitor for the Department of the Interior and approved by the First Assistant Secretary.*

RELIEF OF WATER USERS—ACT OF MARCH 27, 1934

"By the act of April 1, 1932 (47 Stat. 75), irrigation districts, water-users' associations, and individual water-right applicants or entrymen were granted a moratorium on the payment to the Bureau of Reclamation of the construction charges fixed in their various contracts. In that moratorium it was provided that, under

certain conditions, the 1931 charges and one-half of the 1932 charges should be deferred and paid as an additional installment to be due and payable 1 year after the due date of the last installment prescribed by the repayment contracts. The act of March 3, 1933 (47 Stat. 1427), authorized and directed the Secretary of the Interior to 'extend the provisions of' the moratorium 'relating to certain charges coming due for 1931 and one-half of certain charges due for 1932, in like manner to the remaining one-half of such charges coming due for 1932 and to all of similar charges to become due for 1933.' The act of March 27, 1934 (48 Stat. 500), in substantially similar terms, extended the moratorium to 'all similar charges coming due for the year 1934.'

"Under the terms of the repayment contracts executed in connection with several of the reclamation projects, the last regular construction charge installment became due and payable during the year 1933. Under the terms of the act of April 1, 1932, *supra*, any deferred installments will become due and payable during 1934, 1 year after the due date of the last installment prescribed by the contracts. I have been asked whether, in my opinion, the payment of those deferred installments may be again deferred under the act of March 27, 1934, *supra*.

"Although the 1932 act provides only for the deferment of 'regular construction charges' and although a charge already deferred is not a regular construction charge, it does not necessarily follow that the deferred charges cannot be further deferred under the 1934 act. In that latter act the Secretary of the Interior is directed 'to extend such provisions of the' act of 1932, as extended by the act of 1933, 'as relate to the deferment of payment of certain water-right charges for the years 1931, 1932, and 1933, in like manner to all similar charges coming due for the year 1934.' The use in the statute of the word 'similar' introduces an ambiguity. The commonly accepted meaning of that word is 'nearly corresponding; resembling in many respects; somewhat like; having a general likeness' (Webster's New International Dictionary). Under such a definition it is not unreasonable to interpret the language of the statute to permit the deferment of a charge already deferred, although it is not a 'regular construction charge.' Neither is that interpretation imperative.

"For the purpose of resolving the ambiguity it is proper to look to the intent of Congress. An examination of the legislative history of the three moratory statutes discloses no clear intent on the part of Congress concerning the deferment of charges already deferred. Nor does it indicate the intent with which the phrase 'similar charges' was included in the 1934 act. Of doubtful significance is the fact that the 1934 statute passed the Senate with only the following discussion:

"Mr. McKellar. Mr. President, will the Senator from Colorado (Mr. Adams) explain the bill?

"Mr. Adams. Mr. President, this bill is an extension of the provisions of a bill passed in the last Congress, and also in the preceding Congress, designed to give temporary relief to settlers on reclamation projects so as to enable them to defer the payments of installments for an additional year. It does not carry an appropriation, and it does not waive any installments of payments. (Congressional Record, vol. 78, p. 2949.)

"The explanation given by Senator Adams, and upon which the Senate acted, indicates a general purpose to relieve the settlers on reclamation projects and to defer construction charge payments for another year. It does not, however, resolve the ambiguity concerning payments due under a previous deferment.

"To apply the statute to the facts which have been presented to me in the absence of a direct expression of congressional intent concerning those facts, and in the presence of ambiguity in the language of that statute, I must fall back upon the general canons of statutory construction. It is well established that remedial or relief statutes are to be liberally construed. *Grier* v. *Keenan* (1933) 64 Fed. 2d, 605; *Camunas* v. *New York & P. R. S. S. Co.* (1919), 260 Fed. 40. There is no doubt that all of these moratory statutes are remedial, having as their expressed purpose the relief of settlers on reclamation projects.

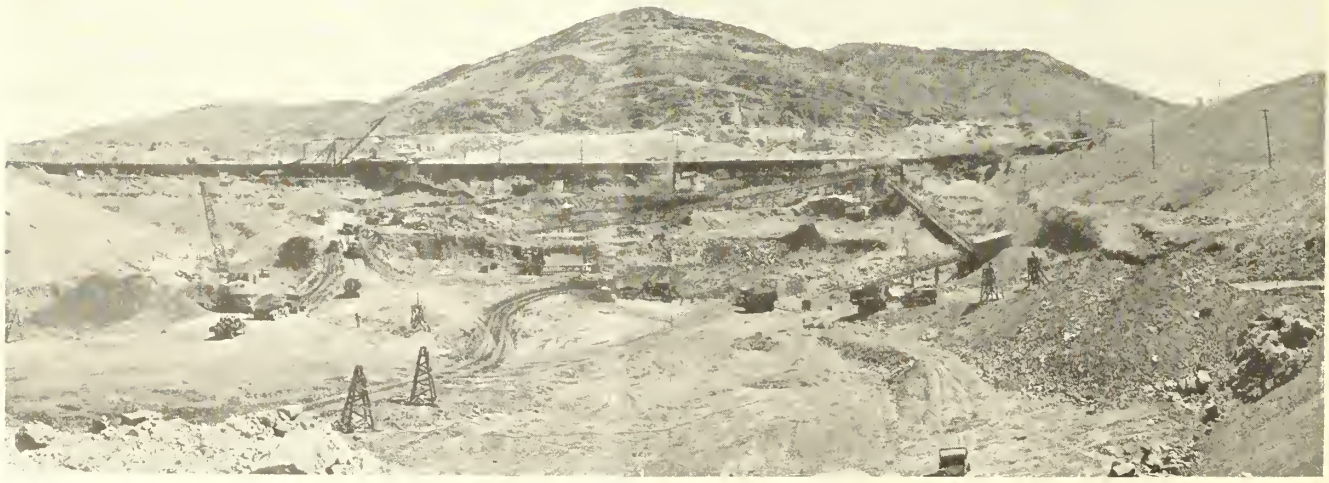
"The ambiguity existing in the act of March 27, 1934, *supra*, must be resolved in such manner as to allow the most complete relief consistent with the provisions of the statute. Consequently, it is my opinion that the deferred payments falling due during 1934 may again be deferred." *Opinion rendered on August 1, 1934, by the Solicitor for the Department of the Interior, and approved by the First Assistant Secretary.*

Appropriation for Boulder Canyon Project in Second Deficiency Act, F. Y. 1935

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums are appropriated, out of any money in the Treasury not otherwise appropriated, to supply deficiencies in certain appropriations for the fiscal year ending June 30, 1935, and for prior fiscal years, to provide supplemental appropriations for the fiscal years ending June 30, 1935, and June 30, 1936, and for other purposes, namely:

* * * * *

(Continued on p. 185)



COLUMBIA BASIN PROJECT, GRAND COULEE DAM, WASH.

Excavation area behind west side cofferdam, with bedrock exposed at foot of slope to left. Three feeder conveyors running to central hub appear in middle foreground.

Silt Surveys—Guernsey Reservoir, North Platte Project, Nebraska-Wyoming

By J. A. Keimig, Assistant Engineer, Bureau of Reclamation

The Guernsey Dam, completed in 1927, forms a reservoir with a total length of approximately 14 miles, about one-half of which is in narrow canyons varying in width from 400 to 800 feet, the remainder being wider, with a maximum of 4,700 feet. The dam is located about 2 miles northwest of Guernsey, Wyo., and it stores flood waters of the North Platte River for diversion at Whalen into project canals. An inspection of the reservoir made after 1 year of operation revealed that considerable silt had been deposited toward the upper end.

At a discussion with Chief Engineer R. F. Walter, it was deemed of sufficient value to establish some system of making a silt survey at regular intervals. After consideration of various methods it was decided to make the survey during the winter months when ice conditions permitted; accordingly, in January and February 1929, after the surface of the reservoir was frozen, a series of stations or ranges were located from which cross sections of the reservoir were to be taken.

Method used.—Twenty-three stations were originally located at intervals of about one-half mile and later two additional stations were added. These were permanently marked at each end with either a large red cedar post or a 1-inch steel reinforcing rod. Alternate bands of red and white were painted on these markers for visibility purposes.

The survey was started at the upper end of the reservoir. It was the intention to establish benchmarks at all the stations, but as the available time was restricted by the condition of the ice and as the levels were checking the stage of the reservoir, it was decided to abandon the level survey and to use the daily reservoir elevation reading, as it was nearly stationary, for the level datum for each day's silt survey.

The permanent markers are used as the starting point on each station. The cross sections are chained on the ice from the starting point and soundings made as closely as required.

The equipment is very simple, consisting of an iron bar sharpened like a chisel and weighing about 15 pounds, for chopping through the ice. A chain is used to measure horizontal distances and another chain, on a reel to which is attached a 15-pound weight, for sounding.

A survey party consisting of an engineer and two helpers usually makes the entire survey in 4 or 5 days.

Surveys were made in either January or February of 1929, 1931, 1933, and 1935. The change is very slight in some portions of the reservoir, hence the complete survey was not made each time.

RESULTS

The entire area of the reservoir shows some deposition of silt with the heavier deposits below the narrow sections of the reservoir. The heaviest deposit is 30 feet in depth and is located about 5½ miles from the upper end of the reservoir. The widest section of the reservoir has a silt deposition varying from 0 to 25 feet in depth. The course of the river has changed about 4,000 feet to the east of its original location through this portion of the reservoir.

The cross section taken at a point about one-quarter mile above the dam shows a silt deposition of 17.5 feet above the old river channel, but is still 23 feet lower than the gate sill of the north spillway.

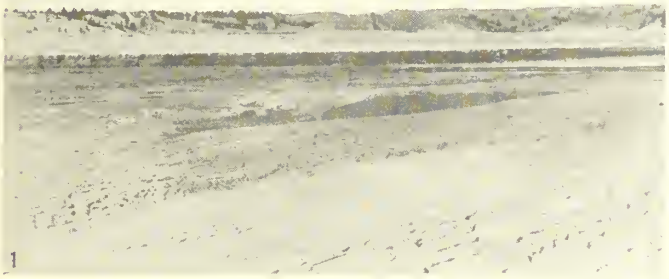
The original storage capacity of the reservoir, between elevations 4,370 and 4,420, was 67,570 acre-feet, and the present capacity is computed at 57,300 acre-feet, which shows a loss of 15 percent in 8 years.

The cross sections are plotted so that the changes can be readily noted. New contours were plotted on a topographic map and planimetered in order to arrive at new storage capacities at the various elevations.

The following tabulation shows the maximum and total inflow each year and the accumulated storage loss after each 2-year period.

Year	Maximum inflow	Total inflow	Storage loss
	Second-feet	*Acre-feet*	*Acre-feet*
1928	14,965	2,051,160	----------
1929	13,777	2,105,600	3,000
1930	6,620	1,485,150	----------
1931	8,392	1,246,000	6,000
1932	5,999	1,503,650	----------
1933	7,137	1,515,540	8,400
1934	6,302	592,610	----------
1935	----------	----------	10,270

The fruit harvest on the Yakima project has absorbed practically all of the local available labor and some transients. Skilled labor continues to be employed by local building improvements.



NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

1, Looking westward from Silt Survey Range 13. Channel was originally on opposite side of reservoir, 4,000 feet; 2, taken from eastern end of Silt Survey Range 13, looking northwest. Channel of river through silt at right.

ENGINEERING

Boulder Canyon Reservoir

(See illustrations on inside of front cover)

By Wesley R. Nelson, Associate Engineer, Boulder Canyon Project

ONE of the most striking transformations brought about by the storage of water in the reservoir back of Boulder Dam is the change in the color and consistency of the Colorado River. Where once it flowed through Black Canyon as a brown turbid stream—"too thick to drink and too thin to plow"—now the lake for a distance of 25 miles or more is a dark emerald green in the canyons and a deep blue in more open country, while downstream from the dam for nearly 10 miles the stream has regained the sparkling clearness it possessed when it left the mountains.

Storage of water in the reservoir was started on February 1, 1935, when the 2,000,000-pound bulkhead at the Arizona outer diversion tunnel inlet was lowered, turning the river flow through the Nevada outer diversion tunnel under control of slide gates in the tunnel plug. The water surface rose slowly until April 4, owing to the inflow and outflow being nearly the same, but after that time, the rise increased to as much as 5 feet a day (when the inflow was 105,000 cubic feet per second), reaching the bases of the intake towers on June 24, the lake depth then being 255 feet in the old river channel.

A month later the water surface had risen another 35 feet, but, as outflow was again approaching inflow, very little further rise was anticipated until fall, when downstream requirements will be reduced. The lake on July 24 was approximately 85 miles in length, only 5 miles from the Lower Granite Gorge, and extended 12 miles up the Virgin Valley. Its surface area was 45,000 acres, and volume more than 4,500,000 acre-feet.

When the reservoir is filled to capacity, it will be 115 miles in length, have a 550-mile shore line, be 589 feet deep, and contain 30,500,000 acre-feet of water. This latter figure has been expressed as sufficient water to supply every person on earth with 5,000 gallons.

The towns of St. Thomas and Kaolin, Nev., in the Moapa Valley, will be covered by the rising waters of the lake, as will a large part of the nearby "Pueblo Grande de Nevada", more commonly termed "Lost City", where aboriginal inhabitants lived 1,200 years ago.

The present exodus from the Moapa Valley is the third occasion on which the recent inhabitants have deserted homes and ranches there. The first time they were called to Salt Lake City by Brigham Young to "resist the invasion" of General Johnson and United States troops. In the second instance the cause was a tax dispute that arose following a survey of State boundaries which placed the valley in Nevada instead of Utah, while taxes previously had been paid to Utah.

SALT DEPOSITS

Some salt deposits in the Virgin Valley will be inundated, and concern was felt at one time in regard to their effect on the reservoir water. An examination and report were made by Geologist F. L. Ransome, of the California Institute of Technology, which indicated that there were only 22 acres of salt exposed and that shortly after the reservoir flowed over the area, these would be covered by caving and silt deposit, thus preventing salt infiltration into the lake waters.

Regulation of the river flow is, of course, the primary purpose of the reservoir, and its capacity will be utilized as follows: 9,500,000 acre-feet for flood control, 5,000,000 to 8,000,000 for silt pocket, and 12,000,000 to 15,000,000 for active and regulation storage. The threatened destruction by flood and drought in the downstream irrigation projects that previously had been ever present has now been practically eliminated, and the load of silt that formerly deposited in canals and ditches, costing millions of dollars for removal, will be lessened in great measure.

Deposition of silt in the reservoir will in several centuries entirely fill it unless other dams are built upstream or soil erosion is retarded by suitable works. However, if upstream development continues as it has in the last 30 years, an estimate has been made that the reservoir capacity will only be reduced by 3,000,000 acre-feet in 50 years.

RECREATIONAL FEATURES

The people living near the lake are appreciating more and more the recreational features that are offered of boating, swimming, and fishing.

More than 50 pleasure crafts now operate on the lake, including several motor boats, speed boats, a sailing cat boat, and a 32-foot cruiser. Exploratory trips are made to Boulder Canyon, the Virgin River, Iceberg Canyon, and numerous side canyons; past Napoleons Tomb and Temple Rock; and into Lower Granite Gorge, which cuts into the plateau that contains Grand Canyon. The latter trip requires 15 hours from the boat landing and return. Principal hazards to the voyager are the barely submerged points of land and the timber that drifts at the whim of the winds.

Temporary permits have been granted to Murl Emery, Inc., and to the Boulder-Grand Canyon Navigation Co. for the operation of pleasure crafts, which make regular trips to the dam every hour of the day, using 40- and 50-passenger launches. Both permittees have floating docks that are anchored where the Hemenway Wash Road meets the water's edge, and moved by truck as the reservoir surface rises. The navigation company will continue to use the ferry for transporting cars between the Boulder City and Kingman, Ariz., highways until the road is opened across the dam. The cable-operated boat that crossed the river 2 miles upstream from the dam site was rebuilt into a side-wheeler barge.

Hot summer days bring scores of Boulder City and Las Vegas bathers to the lake, the most-favored "beaches" being at the boat docks and along the shore to Las Vegas Wash. Aquaplaning—using a board about 6 feet long and 3 feet wide towed by a motor boat—is gaining in popularity.

Fishing has not yet attained any great importance as the fish now found in the lake do not offer any great amount of

sport in their capture. Approximately 15,000 fingerling bass, the first shipment of several that are to be made this year, were hauled by truck from Dexter, N. Mex., and dumped into the lake on July 4.

Plans have been made by interested organizations to stock the lake with several million largemouth bass, crappie, and bream. It is also hoped that the first 18 to 20 miles of the river below the dam may be made into a trout stream, for the water is expected to be always clear and cold, since it will be drawn from the lake 150 to 300 feet below the surface. A half million rainbow trout and some Eastern and Loch Leven are expected to be placed there, while downstream from the cold belt the river may be stocked with black bass, bream, rock bass, and crappie.

The fish are to come from Dexter, N. Mex., and Springville, Utah, until a hatchery is built near the lake. An appropriation of $60,000 will be required to build the hatchery.

Parker Dam authorized

Orders to resume construction of Parker Dam in the Colorado River were issued on August 31 by Secretary of the Interior Harold L. Ickes. Work on the dam has been at a standstill since April 30, when the United States Supreme Court decided that the consent of Congress must be obtained before the dam could be built. Work had been in progress for 3 months when the Supreme Court ruling was made.

The rivers and harbors bill, signed by the President on August 31, carries authorization for construction of Parker Dam across the Colorado River between Arizona and California. Parker Dam, which is located 145 miles downstream from Boulder Dam, is being built by the Bureau of Reclamation under contract with the Metropolitan Water District of Los Angeles at an estimated cost of $13,000,000. The funds for the work are being furnished by that district. Its principal function is to provide a supply of clear water, which is to be pumped from the river into the Los Angeles Aqueduct running about 220 miles to the Metropolitan Water District in Southern California. Under the provisions of the contract about 80,000 horsepower is to be developed at Parker Dam, one-half of which has been allocated, without cost, to the State of Arizona, to be used in connection with irrigation development in the Gila Valley.

Parker Dam will be an arched concrete masonry structure about 320 feet high. The unusual feature of the dam is that about 240 feet of its height will be below the river bed.

Notes for Contractors

Boulder Canyon project, Arizona-Nevada.—On September 9 bids were opened at Denver under Specifications No. 638 for furnishing and installing in the Nevada wing of the Boulder power plant, two 82,500-kilovolt-ampere generators. These are the fifth and sixth units of that capacity, and will be leased to the city of Los Angeles who will operate them for the Metropolitan Water District. Power generated by these units will be transmitted to the aqueduct pumping plants of the district. The first generator must be completed and installed within 700 calendar days and the second generator within 750 calendar days after the date of receipt by the contractor of notice to proceed.

Bids were opened at Denver on September 9 under Specifications No. 639 for furnishing two 115,000-horsepower, vertical-shaft, cast-steel scroll case, single-runner, hydraulic turbines, and two oil-pressure, actuator-type governors for the turbines, for installation in the Boulder power plant. All apparatus will be installed by the Government. Five hundred and thirty days are allowed for shipment of the first turbine and governor, and 590 days for the second unit. Liquidated damages are $100 per day for the turbines and $25 for the governors.

At Denver on August 22, bids were opened under Specifications No. 709-D for furnishing and delivering two power distribution and control cabinets for installation in the downstream tunnel plugs. The apparatus will be installed by the Government.

On August 23 bids were opened at Denver (Specifications No. 710-D) for furnishing and delivering one relay board for installation in the 287.5-kilovolt switch yard at the Boulder power plant.

Bids under Specifications No. 711-D were opened at Denver on August 26 for furnishing and delivering two bulkhead-gate lifting frames, one trash-rack lifting frame and installation equipment for installing cylinder gate hoist stems and stem guides for operation in the intake towers.

Bids received under Specifications No. 693-D for furnishing a towboat for Boulder Reservoir have all been rejected and will be readvertised. The new specifications number is 717 and the date for opening bids is September 9.

Thirteen manufacturers submitted bids, under Specifications No. 627, for furnishing pipe, fittings, and valves for the Boulder power plant, bid opening at Denver July 8. The low bidders were as follows: Schedule 1, iron or steel valves, The Greene-Wolf Co., Inc., Brooklyn, N. Y., $12,230, f. o. b. Reading, Pa.; schedule 2, item 2, bronze valves, Power Piping Co., Pittsburgh, Pa., $2,830, f. o. b. Reading, Pa.; schedule 3, steel and wrought-iron pipe and fittings, Associated Piping & Engineering Co., Ltd., Los Angeles, Calif., $41,190; schedule 5, brass pipe and fittings, Grinnell Co. of the Pacific, Los Angeles, Calif., $14,937.36 f. o. b. Warren, Ohio, and New York City.

Bids opened on July 1 under Specifications No. 691-D for miscellaneous metal work for the Boulder power plant were rejected, and readvertisement was issued as Specifications No. 705-D. Seven manufacturers submitted bids, which were opened July 26 with the following results: Omaha Steel Works, Omaha, Nebr., $7,950, f. o. b. Boulder City; Worden-Allen Co., Milwaukee, Wis., $8,393, f. o. b. Boulder City; Joseph T. Ryerson & Son, Inc., Chicago, Ill., $6,948; California Steel Products Co., San Francisco, Calif., $8,997, f. o. b. Boulder City; The Ornamental Iron Works Co., Akron, Ohio, $12,400; Consolidated Steel Corporation, Ltd., Los Angeles, Calif., $9,860; Midwest Steel & Iron Works Co., Denver, Colo., $8,080 f. o. b. Boulder City. The Midwest bid resulted in lowest delivered cost to the Government and that company was awarded the contract.

The following bids were opened at Denver on August 2 for manufacturing and delivering transmission towers and switchyard structures for circuits nos. 2, 4, and 5, Boulder power plant, under Specifications No. 634: Worden-Allen Co., Milwaukee, Wis., $76,583, f. o. b. Boulder City; American Bridge Co., Pittsburgh, Pa., $69,218, f. o. b. Boulder City; Mississippi Valley Structural Steel Co., Melrose Park, Ill., $60,438; International Stacey Corporation, Columbus, Ohio, $62,735 f. o. b. Torrance, Calif.; McClintic-Marshall Corporation, Bethlehem, Pa., $57,250 f. o. b. Leetsdale, Pa.; Blaw-Knox Co., Pittsburgh, Pa., $62,100 or $75,040 f. o. b. Boulder City; Emsco Derrick & Equipment Co., Los Angeles, Calif., $77,347.13, f. o. b. Boulder City;

Consolidated Steel Corporation, Los Angeles, Calif., $74,321.

Four manufacturers bid on supplying butterfly valves and bulkheads for the Boulder power plant (Specifications No. 629) opening at Denver on August 1. The bids were as follows: Babcock & Wilcox Co., Denver, Colo., item 1, $160,651, and item 2, $9,704, both f. o. b. Barberton, Ohio; Hardie-Tynes Manufacturing Co., Birmingham, Ala., item 1, $144,000, item 2, $10,000, combination bid, $152,000; Baldwin-Southwark Corporation, Philadelphia, Pa., item 1, $170,500, and item 2, $9,500 f. o. b. Boulder City; Erie Forge Co., Erie, Pa., item 2, $8,900 f. o. b. Boulder City. Haidie-Tynes was awarded the contract.

The Schrader Iron Works, Inc., San Francisco, Calif., with a bid of $2,350 f. o. b. San Francisco, has been awarded a contract for manufacturing and delivering a tunnel plug adit car under Specifications No. 700-D.

Under Specifications No. 699-D for furnishing miscellaneous metal work for the Boulder power plant, the Omaha Steel Works, Omaha, Nebr., at its bid of $6,000 has been awarded the contract.

Frenchtown project, Montana.—The first construction work on the Frenchtown project near Missoula is earthwork on the main canal, involving 240,000 cubic yards of all classes of excavation and 11,000 station cubic yards of overhaul. Bids under Specifications No. 706-D were opened on August 21 at Missoula. The successful contractor will have 220 days to complete the work.

Owyhee project, Oregon-Idaho.—Contracts under Specifications No. 696-D, bids opened at Denver on July 12, have been awa ded as follows: Schedule 1, cast-iron gates, Beall Pipe & Tank Corporation, Portland, Oreg., $1,100.55; schedules 2 and 3, radial gates and handrails, hoists, and gear sets, Valley Iron Works, Yakima, Wash., $3,882.

Upper Snake River Storage, Idaho.—Fourteen bids were received at Ashton on August 5 for constructing the Island Park Dam (Specifications No. 632) on North Fork of Snake River, as follows: Max Kuney, Spokane, Wash., $478,838; Morrison-Knudsen Co., Boise, Idaho, $483,738; S. J. Groves & Sons Co., Minneapolis, Minn., $525,991; Utah Construction Co., Ogden, Utah, $531,870; Edward Peterson, Omaha, Nebr., $563,522; Myers & Goulter, Seattle, Wash., $568,291; Bechtel Co., San Francisco, Calif., $574,453; S. S. Magoffin Co., Adrian, Oreg., $583,410; Malcolm & Bell, Portland, Oreg., $586,914; J. A. Terteling & Sons, Boise, Idaho, $594,336; S. Birch & Sons, J. C. Maguire & Lawlor Corporation, Butte, Mont., $616,493; P. L. Crooks & Co., Portland, Oreg., $646,854; Guthrie-McDougall Co., Portland, Oreg., $686,387; Joseph T. Cargo, Dunbar, W. Va., $783,025.

All-American Canal project, Arizona-California.—Dorr Co., Inc., of New York City, has been awarded the contract for supplying mechanical apparatus for desilting basins at the Imperial Dam. The bid under Specifications No. 635 was $564,800 and the Secretary approved award of contract on August 5.

The Imperial Dam and desilting works are ready for advertising, the number of the specifications being no. 644; also the construction of 120, 424, Unnamed and Picacho wash siphons, which is no. 645.

Sun River project, Montana.—Only 1 bid was received for supplying 6,000 barrels of portland cement in cloth bags, opening at Denver on July 30. The Three Forks Portland Cement Co., Denver, Colo., bid $2.50 per barrel f. o. b. Trident, Mont., less discount of 10 cents per barrel and sack allowance of 10 cents.

Bids for work on the Pishkun and Sun River Slope Canals, under Specifications No. 637, were opened at Fairfield on August 5. Seven bids were received, and the three lowest were as follows: Martin Wunderlich, Jefferson City, Mo., $211,085; Morrison-Knudsen Co., Boise, Idaho, $247,031; J. A. Terteling & Sons, Boise, Idaho, $312,330.

Casper-Alcova project, Wyoming.—The Secretary on August 27 approved award of contract to the W. E. Callahan Construction Co., Dallas, Tex., and Gunther & Shirley, Los Angeles, Calif., for construction of the Alcova Dam at their bid of $1,482,651.10.

Award of contract for construction of the Seminoe Dam and power plant at a bid price of $2,194,007 was also approved, the successful bidders being Winston Bros. Co., Minneapolis, Minn.; Utah Construction Co., Ogden, Utah; Bechtel Co., San Francisco, Calif.; Morrison-Knudsen Co., Boise, Idaho; and Henry J. Kaiser Co., Oakland, Calif.

Ogden River project, Utah.—On August 27 the Secretary approved award of contracts for construction of the Ogden-Brigham Canal as follows: Schedule 1, J. A. Terteling & Sons, Boise, Idaho, $156,092; schedule 2, Utah Construction Co., Ogden, Utah, and Morrison-Knudsen Co., Boise, Idaho, $197,430.

Columbia Basin project, Washington.—Bids under Specifications No. 641 for furnishing 720,000 barrels of either modified or standard portland cement and either 3,500,000 barrels of modified portland cement or 650,000 tons of modified portland cement clinker for the Grand Coulee Dam, were opened at Denver on August 20. The Northwestern Portland Cement Co. of Seattle, Superior Portland Cement Co. of Seattle, and the Lehigh Portland Cement Co. of Spokane, all bid $1.3796 per barrel, f. o. b. mills, discount 10 cents; Spokane Portland Cement Co. of Spokane bid $1.53 and the Olympic Portland Cement Co. of Seattle $1.38, all for either modified or standard portland cement. Bids for portland cement clinker from these companies ranged from $6.80 to $7.60 per ton, discount 50 cents. The five companies named were low bidders. The Beaver Portland Cement Co. of Portland, Oreg., bid $1.40 per barrel, f. o. b. mill, discount 10 cents on modified portland cement, and $5.475 per ton, discount 25 cents on modified portland cement clinker. The Pacific Portland Cement Co. of San Francisco, Calif., bid $3.09614 f. o. b. Odair, Wash., $1.15974 f. o. b. Redwood Harbor, Calif., both subject to 10 cents discount, for modified portland cement, and $15.35 f. o. b. destination, and $5.05 f. o. b. mill for clinker. The bids have been taken under advisement.

Milk River Rehabilitation

Rehabilitation on the Milk River project, Montana, has become an established fact. On June 21, 1935, A. L. Johnson, supervisor of district no. 5, Montana Rural Rehabilitation Corporation, delivered the check that purchased an irrigated tract of 739 acres from a valley owner.

The Government has subdivided this acreage into six units according to soil classification, and these units have been allotted to six families from submarginal lands around Malta. Each unit will be fenced and will be complete with house, barn, chicken coop, and well. The corporation will assist each settler in the purchase of food and clothing for the first year, it will help him secure necessary livestock and machinery, and will aid in the leveling of the rougher portions of the land.

Allotments for food and clothing are to be repaid from first crop returns; the amount expended for livestock and machinery is repayable in 3 years, for buildings in 10 years, and for land in 35 years.

The Montana R. R. C. operates under a Federal grant and is under the direct supervision of Robert Clarkson.

The new Tietonview Grange hall on the Yakima project which was completed the latter part of March, was dedicated by State Grange Master King on July 19 before 450 grangers and their friends. The new hall is equipped with stage, full basement, and kitchen. Tietonview Grange is the seventeenth grange in Yakima County to own its own hall.

Excerpts from July Project Reports

Ogden River.—Water supply is good; crops never looked better; crop prices fair.

Newlands.—Other than lands on the upper benches receiving water from the Truckee Canal, the water supply is ample. Crops are in good condition. The first cutting of alfalfa was probably the best for many years and the quality was excellent.

Orland.—The water supply is sufficient. The ladino clover pastures are excellent. Other crops are fair to good on the better lands and where the farmers are following good husbandry.

Yuma.—Watermelons are of fine quality, and more than 20 carloads have been shipped. Nine carloads of livestock were received on the project for fattening, and 17 carloads were shipped to market by rail, in addition to which the equivalent of 16.4 carloads was shipped by truck.

Yuma auxiliary.—The new citrus crop is developing in fine shape. A 20-percent increase over last year is estimated for the current season.

Boise.—Crops generally are looking good. Large crop of apples.

Minidoka.—Sugar beets and potatoes continue to grow exceptionally well. The Minidoka County Lamb Pool purchased 500 yearling ewes for breeding purposes, for farmers of the Gravity division. The ewes are reported to be of a fine type. On July 20 the Minidoka County Lamb Pool shipped 748 lambs and a few ewes and wethers to Denver. The lambs, which had a total weight of 52,466 pounds, brought $7.10 per hundredweight.

Milk River.—In general July was ideal for growing crops. The harvest of early grain crops showed excellent yields. At the end of the month the second crop of alfalfa was being harvested. Sugar beets, potatoes, and other cultivated crops made excellent growth and a record crop was in prospect.

Hyrum.—Satisfactory yields were noted in the harvesting of the second crop of alfalfa. The pea crop, harvesting of which was completed the latter part of July, was the best of record, the average yield being 3,440 pounds per acre. Harvest of beans the last of July promised a yield considerably above average.

Klamath.—Range conditions are the best in years and all livestock is in excellent shape. A few local sales of grass-fed steers at 6 and 6½ cents per pound were reported during the month. Local turkey raisers have 30,000 turkeys out ranging on grasshopper-infested areas.

Yakima.—On the Kittitas division a large crop of peas was harvested. In spite of a lack of vining machines to harvest the crop intended for canning, the local cannery was taxed to the limit of its capacity on a 24-hour-per-day schedule, and some of the crop intended for canning had to be harvested for seed.

Sixty carloads of lambs were shipped to the Chicago market during the month, and sold for 1 cent a pound higher than last year. They are said to be in better condition and weigh 5 to 10 pounds more than a year ago. In 1934 lambs lost weight rapidly at the end of the shipping season because of the dry range. This year there is sufficient feed, and lambs are as fine in quality as have ever been shipped from the project.

Sun River.—Crops were looking well. The first cutting of alfalfa was harvested during July in excellent shape, and was probably the best ever raised on the project. Prospects for the pea and grain crops were good. Livestock prices continued to be favorable.

Rio Grande.—All crops made rapid progress during the month. This was particularly noticeable in the cotton crop, which had a very poor start in the spring owing to cold weather and damage by insects.

The Sego Milk Products Corporation is building a can-manufacturing plant at Richmond, Cache County, Utah, which will be capable of producing 72,000 tin cans per day for its several condensaries in the intermountain territory.

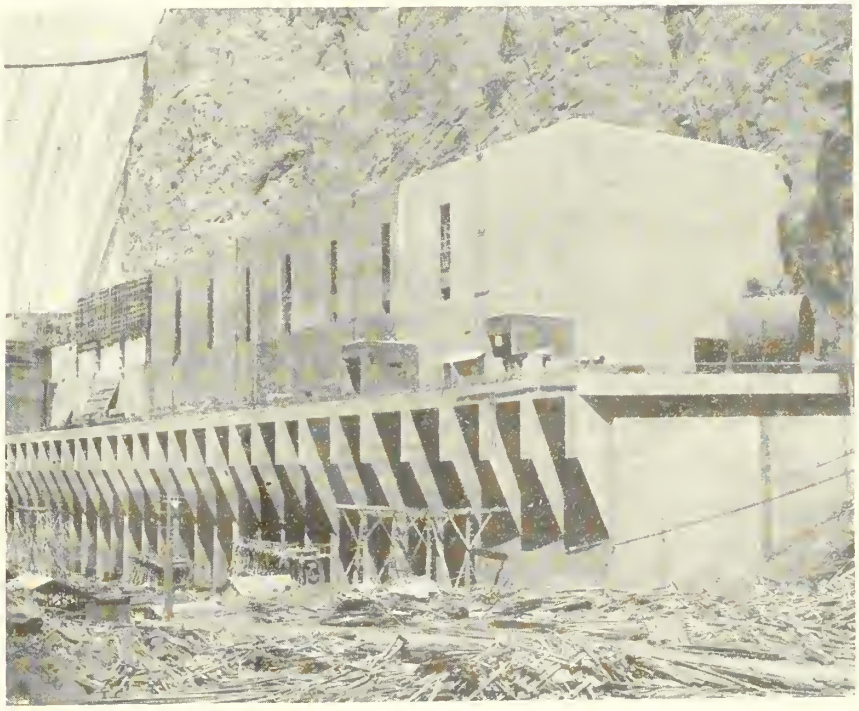
The Rails Reach Out

Gov. Clarence D. Martin, of the State of Washington, held the throttle, July 29, when the age-long silence of the Grand Coulee of the Columbia was broken for the first time by the whistle of a locomotive and the first train on the new Government railroad traveled down the desert wastes of the great Canyon.

The occasion was the formal opening of the line which will transport most of the material to be used in building the Grand Coulee Dam. It was necessary to build the railroad, for the site of the big Federal project, 92 miles west of Spokane, Wash., was some 30 miles from the rails and it would be impossible by any other means, to move much of the heavy materials necessary for the dam construction down into the deep gorge of the Columbia. Even in the West, this descent, where it seems as if the world suddenly drops away, is breath-taking.

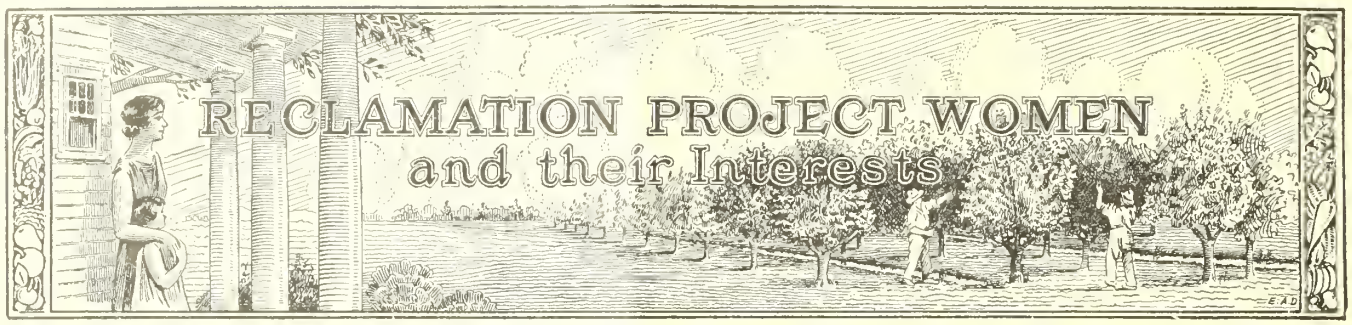
Representatives from many parts of the Northwest rode in the train behind Governor Martin and were guests of the M. W. A. K. contractors for the Grand Coulee Dam, at dinner at Mason City, the world's first all-electric town.—*Spokane Chamber of Commerce News Bureau.*

A single piece of coal, weighing 8,750 pounds, was recently dug from the 6,000-foot level of one of the Roslyn mines on the Yakima project. This is said to be the largest piece of coal ever mined in the Northwest.



BOULDER CANYON PROJECT, ARIZONA-NEVADA.

Arizona power house, rising 20 stories above floor of the river and 130 feet above the water line.



Scouting in Boulder City

By Associate Engineer Lee H. Dana

BOULDER CITY came into being in 1931, and as it grew to a thriving community, it realized its responsibility to the younger generation as part of its duty to society. The American Legion Post No. 31, Robert Skinner as commander, sponsored a troop of Boy Scouts. A call to the boys brought forth a fine response and disclosed the fact that more than 60 youngsters desired training in the movement. Their ages ran from 9 to 18, and to accommodate the little fellows, a pack of Cubs, the junior organization of Scouts designed to take care of boys from 9 to 12 years of age, was organized.

Charters were obtained for the two organizations on May 31, 1932, which now comprise Troops 61 and 67 and Cub Pack No. 8. On the charters were found names of many prominent men outside of those prescribed by the national organization, including Dana, Thaxton, Moser, Sutherland, McDonald, Weaver, and Henderson from the Bureau of Reclamation, and Roderman, Young, Britton, Way, and Harris from the contractor, Six Companies Incorporated. Most of these troop committeemen had no previous experience, and probably made the same mistakes in early organization other men have made, but their enthusiasm and strict attention to the boys' needs made good workmen out of them, to the enlightenment and pleasure of the boys.

Death of Mrs. Ickes

Mrs. Harold L. Ickes, wife of the Secretary of the Interior, was killed in an automobile accident in New Mexico on September 1. Mrs. Ickes' busy useful life enriched the many circles where her interests lay, and her death is indeed a loss to the whole country.

The first meeting place was in the Federal garage, but as smaller quarters were more desirable for purposes of discipline, the engine room became headquarters. Later on the schoolhouse was occupied, and then the Legion Hall, where we now meet.

One of the early problems faced was the fact that the population was transient and the period of residence averaged about 1 year. It was difficult, having an almost entirely new group at the end of each year to institute a program for advancement. Each scoutmaster therefore made a sliding schedule and gave perhaps more attention to his troop than the average troop receives.

SCOUTMASTERS' PROBLEMS

I believe it rather more than fitting to pay a tribute to scoutmasters in general. Few people know of his problems, and the difficulties presented in dealing with other peoples' children. The boys are turned over to him for supervision and instruction and he is expected to accomplish results in the way of discipline that parents themselves often fail to obtain. Let it be known, too, that he does accomplish just that. When he instills into their hearts the love of country, flag, nature in its grandeur and beauty, and the love and simplicity of outdoor life, it is difficult for a youngster to go wrong. The scoutmaster's only compensation is his knowledge that a good deed has been done, and that he has fulfilled his obligation to the parents of these boys and to the Scout mottoes, "Be Prepared" and "Do your Best."

As parents realize more fully the real love he bears the boys, they in turn make an honest effort to cooperate in giving more time and thought to the movement.

SCOUTING ACTIVITIES

The first "hike" was a trip to Searchlight. We stopped at the summit for a nature study and asked the boys to secure the greatest number of desert flora. They were told that there existed 28 varieties. Imagine the embarrassment of the officials when one boy turned in 52 distinct species of flowers!

Boulder City Boy Scout troop and sponsors agree to be photographed

Two amusing incidents occurred on that trip. One was the capture of an enormous turtle which, when freed, had the insignia "B. S. A." engraved on his shell. The other, that the Ladies' Playfield ball team of Searchlight was the victor of a ball game with the cubs and Scouts (for no gentlemen win the first game).

Regular hikes were programmed for the purposes of pleasure, instruction, and test passing. The country being of a desert character makes scouting difficult. Furthermore, nearly everyone on the project works a 7-day week, thus the number of trips had to be limited as the scout-masters were required to lay off and lose a day's pay to accompany the boys. The contractor, Six Companies Incorporated, has been liberal in providing transportation for the majority of these trips and the Scout officials are deeply grateful for the many favors rendered.

Andrew J. Roberts, field executive, has rendered valuable assistance in directing the educational and field activities.

This year probably holds the record in achievement. The foundation laid by previous scoutmasters made it possible for Scoutmaster Albert Rankin and his enthusiastic assistants, Lester Nefsgar, Ed Roush, and Don Norbeck, to capitalize on their efforts. During the month of December, 58 tests were passed by members of the troops. The board of reviews and the personnel of the court of honor found it a delight to recognize the worthwhile effort put out by the boys. Last October a plot of ground on the Administration lawn was dedicated to the Boy Scouts of America, and through courtesy of Bureau of Reclamation officials a tree was planted as a memorial. It is the hope of the Scouts that in years to come it may be their privilege to return to the scene of boyhood endeavors and renew here the enthusiasm of their youth.

Aside from the regular routine work in scouting, Scout officials have endeavored to give individual attention to the vocational needs of the troop. If just one boy has found the proper sphere of work for life's undertaking, the work has been worth while. If one boy has been kept from temptation, scouting is worth while.

Hiking sometimes includes mountain climbing

Department Museum Planned

With plans going forward for completion of the new Interior Department building in 15 months, one wing on the first floor has been set aside as a permanent museum of departmental activity.

The Bureau of Reclamation has been assigned an L-shaped space for its exhibit, and tentative plans have been made for the displays.

The National Park Service will arrange the museum exhibits. Artists, employed by the Public Works Administration, have been assigned to the work. They are gathered at Morristown, Tenn. Miss Mae A. Schnurr, assistant to the Commissioner, was designated contact officer to formulate detailed exhibit plans for the Bureau of Reclamation.

One feature of the Bureau's exhibit will be a series of murals depicting the winning of the West by irrigation. A diorama of Boulder Dam and one of the Columbia Basin project will be important attractions. A number of case displays showing the history and organization of the Bureau, reproductions of crops from Federal Reclamation projects, views of the Bureau's dams, and typical steps in construction of a project will be included.

A large illustrated map of the West, displaying all the Federal projects, will be featured. In addition there will be swinging racks of pictures, a case of historical documents of important Bureau jobs, and other displays.

The museum will provide a complete story of the activities of the Department. It will serve an educational purpose, and undoubtedly will attract large numbers of the tourists and sight-seers who visit Washington each year.

Under the expanded C. C. C. program approved by the President, one of the five camps to be located in Arizona is being built on the Yuma Mesa, about 6 miles southeast of Yuma, near United States Highway 80.

Second Deficiency

(Continued from p. 178)

Boulder Canyon project: For the continuation of construction of the Boulder Canyon Dam and incidental works in the main stream of the Colorado River at Black Canyon, to create a storage reservoir, and of a complete plant and incidental structures suitable for the fullest economic development of electrical energy from the water discharged from such reservoir; to acquire by proceedings in eminent domain or otherwise, all lands, rights-of-way, and other property necessary for such purposes; and for incidental operations, as authorized by the Boulder Canyon Project Act, approved December 21, 1928 (U. S. C., Supp. VII, title 43, ch. 12A): $14,000,000, to remain available until advanced to the Colorado River Dam fund, which amount shall be available for personal services in the District of Columbia and in the field without regard to the civil-service laws and the Classification Act of 1923, as amended, and for all other objects of expenditure that are specified for projects included in the Interior Department Appropriation Act for the fiscal year 1936, under the caption "Bureau of Reclamation": *Provided*, That of this fund not to exceed $35,000, reimbursable, shall be available for investigation and reports as authorized by section 15 of the Boulder Canyon Project Act.

Approved August 12, 1935.

Photographs Exhibited

Photographs made by Ben Glaha of construction scenes at Boulder Dam, and progress pictures of the work at Grand Coulee Dam site, have been loaned to the Public Library at Milwaukee for display September 5 to 27. A similar exhibit may be borrowed upon application to the Commissioner, Bureau of Reclamation.

Boulder Dam Model

An operating model of Boulder Dam, in diorama form with a background showing mountains, canyon and lake, has been installed in the Museum of Science and Industry in Jackson Park, Chicago. The model, at a scale of 1 inch to 30 feet and about 16 feet long, shows the dam and all appurtenant works and runs through a 4-minute cycle of operation showing conditions at various water levels. It was formerly exhibited at the Century of Progress Exposition.

Progress of Investigations of P. W. A. Projects

Silt survey, Colorado River, Ariz.-Calif.—The survey of cross sections of the river at approximately 5-mile intervals was continued and 3 cross sections of the river were completed within the month, making a total of 15 to date.

Northern transmountain diversion, Colorado.—A paper location for triangulation net for the contemplated Grand Lake survey and preliminary hydrographic studies were made to determine the amount of water available for diversion to the eastern slope. Surveys for the Grand Lake-Big Thompson project through the Rocky Mountain National Park are in preparation, and field parties are being organized.

Upper Snake River storage, Idaho.—Preliminary plans and estimates were prepared to determine the cost of raising American Falls Dam, and water supply studies were made to determine the value of an enlargement of American Falls Reservoir plus an upstream regulating reservoir of 300,000 acre-feet in alleviating past shortages on the Snake River. A study was made of possible power output at Eagle Rock Dam site about 10 miles below American Falls Reservoir. Preliminary designs and cost estimates were prepared for a dam and power plant at the Eagle Rock site. A report on the upper Snake River storage investigations covering the Snake River above Idaho Falls, was completed.

Buffalo Rapids project, Mont.—Preparation of designs for the dam at Buffalo Rapids, the power plant at Harris Creek, and the siphons and pumping plants are in progress. A general map is being drawn, cost estimates are being compiled, and the report is nearly completed.

North Platte Valley, Nebr.—A study is being made of the present and future electric power market in the State. A map is being prepared showing the location of the present public utility companies and the areas served by them. The rural electrification opportunity is being investigated under the supervision and cooperation of an official from the University of Nebraska. Water supply studies consisted of analysis on a daily discharge basis of (1) surpluses available for storage or diversion at Belmar, North Platte, and Overton; (2) additional irrigation requirements for full development of present irrigation rights between North Platte and Kearney; and (3) irrigation requirements of new lands under the Central Nebraska Public Power and Irrigation District. Economic surveys of irrigated lands on the Platte and North Platte Rivers were practically completed and tabulated. A detailed study of representative quarter townships was begun. The study consists of a questionnaire for all farms to ascertain crops raised, average yields, suitability for irrigation, etc. Three such areas were chosen in Phelps County, one in Kearney County, and two in

MEMBERS OF ALL-AMERICAN CANAL AND GRAND COULEE DAM BOARDS ATTENDING MEETINGS IN WASHINGTON, D. C., JULY 21-27

Left to right: Dr. Elwood Mead, Commissioner of Reclamation; C. H. Paul, Joseph Jacobs, W. F. Durand, consulting engineers; C. P. Berkey, consulting geologist; R. F. Walter, chief engineer; J. L. Savage, chief designing engineer; L. N. McClellan, chief electrical engineer; John C. Page, senior engineer

Adams County. Three test holes were drilled on the Belmar site. A hole on the north abutment revealed 106 feet of sand and gravel on top of a 46-foot stratum of soft limestone. A hole on the south abutment revealed 190 feet of loose river gravel, sand, and thin strata of soft limestone. A third hole at the foot of the slope on the south side showed 127 feet of river silt, sand and thin limestone and clay seams.

Deschutes project, Oregon.—The topographic extension survey of the Wikiup Reservoir from elevation 4,320 to 4,340 was completed July 29. A center line survey of the south Wikiup dike 2.1 miles long between Wikiup Butte and Davis Mountain was made, and test pit work during the month included 12 pits at dam site no. 4, ranging in depths from 6 to 38 feet. Nine pits along the east dike with depths from 5 to 21 feet, and two on the south dike, 10½ and 18½ feet deep. A survey for the feeder canal into Wikiup Reservoir was started the latter part of June and completed during July to the Crescent Creek crossing. The diversion dam site for this line out of Crescent Creek is at Kemp Bridge, which is about one-fourth mile below the one surveyed last season for a reservoir on the creek. A center line profile was surveyed at Benham Falls Dam site G up to elevation 4,200 on each side. Several reconnaissance trips were made, 3 to the Metolius Dam site and 1 to the Pelton site described in United States Geological Survey Water Supply Paper No. 344. Another trip was made to a site 1½ miles below this, which was partly developed by the Columbia Valley Power Co. and which is now being referred to as the "Lower Pelton site." Associate geologist F. A. Nickell, accompanied the engineer in charge on one of the trips to the Metolius Dam site and to the Wikiup and Grand Prairie sites.

Grande Ronde, Oreg.—A report is in preparation.

Umatilla River flood control, Oregon.—A supplemental report covering preliminary plans and cost estimates for a flood control reservoir of 19,000 acre-feet capacity at the Ryan Creek site was completed.

Southern Nevada.—The plan of work has been completed. It involves 20 miles of levels, 74,000 feet of canal line traverse, 85,000 feet of canal line topography on a scale of 400 feet to the inch, and 36 square miles of topography on a scale of 1,000 feet to the inch. Eight triangulation stations were established and referenced. The traverse line was tied to section lines at seven points. Permanent bench marks were established at frequent intervals by setting rivets on bolts in rock.

Salt Lake Basin, Utah.—Surveys on the Current Creek division were continued during the month and it is anticipated that a report on the Ouray project will be completed as soon as the results of the land classification under section 15 of the Boulder Canyon Project Act are made available.

COLUMBIA BASIN PROJECT, GRAND COULEE DAM

Driving piling for conveyor trestle bridge across Columbia River in 60 feet of water, when river was flowing at the rate of 275,000 cubic feet per second

Colorado River Basin.—Investigations under section 15 of the Boulder Canyon Project Act were continued. A land classification was completed of the Ouray project, Utah. The area totaled approximately 37,120 acres. Land corners were located on 49 square miles. Mapping of irrigated lands along the Uintah and White Rock Rivers was continued during the month. Total area mapped by the end of the month was 82 square miles.

Lower Colorado River Project, Texas

Contracts have been entered into by the Government and the Lower Colorado River Authority clearing the way for construction of the $20,000,000 lower Colorado River project in Texas.

One contract, between P. W. A. and the authority, provides for purchase by the Government of not to exceed $10,500,000 of the revenue bonds of the authority and a grant of 30 percent of the cost of labor and material involved not to exceed $4,500,000.

A second agreement between the Secretary of the Interior and the authority covers an additional $5,000,000 to be expended by the Bureau of Reclamation on the flood control and irrigation phases involved and for construction of the project as determined by general plans approved by the Bureau of Reclamation and the authority.

The lower Colorado River project, embracing completion of the dam near Bluffton, Tex., and a unified system of new dams and reservoirs, will afford flood control, irrigation, and development of hydroelectric power.

It will provide adequate water for the irrigation of about 120,000 acres of rice land along the lower reaches of the river. The cost of the project will be repaid from the sale of water and power at rates which will benefit the users. The authority is planning a cooperative arrangement with public utility companies whereby the latter will purchase a portion of the current generated and pass savings in cost to the consumers.

The lands to be served lie 90 miles downstream from Austin. At present rice irrigators in this region are pumping their water at excessive costs.

The original project was undertaken as a private enterprise, but the contractors have been idle for many months. By a special act of the Texas Legislature the lower Colorado River authority was set up to complete the project for both power and irrigation. The allotment of $15,000,000 to P. W. A. as a loan and grant and $5,000,000 to the Bureau of Reclamation were among the first approved by the President under the new works-relief program.

(Continued on p. 190)

Farm Census Shows Important Changes in Agriculture

By Z. R. Pettet, Chief Statistician for Agriculture, Bureau of the Census

Preliminary figures for the 1935 United States Farm Census are proving of exceptional interest owing to the unusual conditions of the past year. Because of the unprecedented drought of 1934, the entire United States may be said to have become "water conscious" for the first time in our history. While the story of the drought has been carried in the news of the day, the measured effects were not available until the publication of the census returns. The final results of the drought are shown in the census statistics of crop failure and the low yields in the affected area. These basic figures will give the people of the United States a better understanding of the farm situation, the great risks taken, the hardships of farmers, and will indicate the need for sympathetic understanding of farm problems, and of the measures adopted to improve the agricultural conditions.

To those in the irrigated States, where the supply of water was sufficient, great contrasts are offered between the production in the irrigated territory and the section of deficient rainfall. This throws high lights upon the need for water-storage and reclamation projects.

BACK-TO-THE-FARM MOVEMENT

The results of the drought, however, constitute but a small portion of the farm information obtained by the Bureau of the Census. Surpassing it in general interest is the back-to-the-farm movement and the great increase in the number of farms within the past few years. At the time of the previous census, April 1, 1930, when the beginning of this movement was apparent, there were 6,288,648 farms in operation in the United States. On January 1, 1935, there were 6,812,049 farms, an increase of 523,401, or about 8 percent. While the data on farm population have not been tabulated, it is likely that it increased in proportion to the number of farms, or perhaps exceeded it, because the younger generation preferred to remain on farms rather than migrate to cities.

The general decrease in farm values has become more marked, showing the effects of the long depression. It is noted, however, that in some localities an actual increase in value has occurred, owing partly to the increase in acreage in farms and partly to local conditions, which may be explained after a study of the figures. The acreage of crop land harvested has increased in most States outside of the drought area. The explanation of this lies perhaps in the permission extended to signers of governmental rental benefit contracts to plant the land in soil improving and minor feed crops, as well as in the attention given to pasturing and grazing. In the woodland and cut-over areas, there appears to have been a general tendency to fence woodland and idle land for pastures.

It is the desire of the Census Bureau to make the statistics as useful as possible, and this is dependent upon wide distribution and use. Persons who need these data are requested to write to the Bureau of the Census, Department of Commerce, Washington, D. C. for preliminary releases, but to the Superintendent of Documents, Washington, D. C. for the State bulletins for which a charge is made.

C. C. C. Camps on Reclamation Projects

Sixteen C. C. C. camps are now in operation on Federal reclamation projects in far Western States and 29 others are in various stages of preparation.

Where previously only 6 reclamation and 3 State parks camps had been located within these irrigated areas, 7 new camps had been occupied by August 15, 1935. Half a dozen additional new camps were ready for occupancy and many others are nearing completion.

At full strength the camps on the reclamation projects will contain 9,000 young men.

The work projects undertaken by the C. C. C. on reclamation projects include construction and maintenance of canals, construction of levees, and the clearing of river channels to prevent floods; erosion control works to prevent silting of reservoirs; construction of recreational areas around reservoirs; planting of windbreaks; rodent eradication; eradication of noxious weeds; construction of roads; repair of rural telephone and electrical systems, and the like.

Camps on reclamation projects include six old camps as follows: Minatare, Nebr., North Platte reclamation project; Fruitdale, S. Dak., Belle Fourche project; Carlsbad, N. Mex., Carlsbad project; Ysleta, Tex., Rio Grande project; Bridgeland, Utah, Moon Lake project; Huntsville, Utah, Ogden River project.

Three State park projects: Two at Guernsey, Wyo., on the North Platte project, and one at Engle, N. Mex., on the Rio Grande project.

The seven new camps now occupied are located as follows: Lake Tahoe, Calif., on the Newlands reclamation project, Nevada; Grand Junction, Colo., on the Grand Valley project; Montrose, Colo., on the Uncompahgre project; Island Park, Idaho, on the Upper Snake River project; Hyak, Wash., on the Yakima project; Wellington, Nev., on the Walker River project; Mitchell, Nebr., on the North Platte project.

The camps in preparation, all of which are expected to be occupied within the next few weeks, are as follows:

Ephriam, Utah, on the Sanpete Federal reclamation project; [1] Deaver, Wyo., on the Shoshone project; Yuma, Ariz., on the Yuma project; Earp, Calif., Parker Dam (Arizona side); Earp, Calif., Parker Dam (at Topock); Tempe, Ariz., Salt River Valley project; Tulelake, Calif., Klamath project; Huston, Idaho, Boise project; Boise, Idaho, Boise project (Arrowrock Dam); Emmett, Idaho, Boise project, Payette division; Rupert, Idaho, Minidoka project; Sidney, Mont., Lower Yellowstone project; Babb, Mont., Milk River project; Fairfield, Mont., Sun River project; Fallon, Nev., Newlands project; Carson River, Nev., Newlands project; Lovelock, Nev., Humboldt project; Reno, Nev., Truckee River storage project; Las Cruces, N. Mex., Rio Grande project; Merrill, Oreg., Klamath project; Ontario, Oreg., Owyhee project; Nyssa, Oreg., Owyhee project; Stanfield, Oreg., Umatilla project; Beulah, Oreg., Vale project; Osborne, Wash., Grand Coulee dam; Goose Prairie, Wash., Yakima project; Engle, N. Mex., Elephant Butte reservoir; [2] Ballantine, Mont., Huntley project; Palisade, Colo., Grand Valley project.

[1] Ephriam camp will be reoccupation of old camp.

[2] Engle, N. Mex., camp at Elephant Butte Reservoir will be under jurisdiction of the State parks department.

A new variety of early peach, called the Mikado, is being tried out in some sections of the Yakima Valley. Trees located below Union Gap matured peaches by the middle of July, and matured peaches of the same variety from trees in the vicinity of Yakima were picked a week later.

Water Resources Committee

The chairman of the National Resources Committee, Honorable Harold L. Ickes, has announced the organization of a Water Resources Committee, consisting of representatives from Government agencies dealing with water problems and four other experts in this field. The new coordinating committee consists of the following members:

Abel Wolman, chairman, of the American Waterworks Association, and chairman of the Maryland State Planning Board.

Thorndike Saville, of the American Society of Civil Engineers and associate dean of the College of Engineering, New York University.

N. C. Grover, chief hydraulic engineer, Water Resources Branch United States Geological Survey.

Elwood Mead, Director Bureau of Reclamation, Department of the Interior.

Jay N. Darling, Chief Biological Survey.

H. H. Bennett, Chief Soil Conservation Service, Department of Agriculture.

R. E. Tarbett, sanitary engineer, Public Health Service.

Maj. Gen. Edward M. Markham, Chief United States Army Engineers.

Thomas R. Tate, Director National Power Survey, Federal Power Commission.

H. H. Barrows, professor of geography, University of Chicago, formerly member of the Mississippi Valley Committee and the Water Planning Committee of the National Resources Committee.

Edward Hyatt, State engineer of California.

The former Water Planning Committee and the consultants working with the National Resources Committee have been retained in an advisory capacity for the work of the new committee. Mr. Brent S. Drane has been appointed secretary to the new committee, and will serve with Gilbert White as members of the regular staff of the National Resources Committee under its executive officer, Charles W. Eliot, 2d.

At the first meeting of the committee on July 29 various water projects now pending before the Works Progress Administration were discussed both in connection with construction proposals and for collection of basic data. The committee is engaged in outlining a long-range plan for the more effective use of all the water resources of the Nation and for continuance and application of the policies set forth in the report of the Mississippi Valley Committee and the December 1934 Report of the National Resources Committee.

Progress has been made toward the construction of buildings at the Civilian Conservation Corps camp at Minidoka Dam, Minidoka project, Idaho, and several of them are nearing completion.

During the month of July 34,942 tourists, traveling in 10,567 cars, visited Boulder Dam. Of these, 2,486 in 863 cars entered the reservation from Kingman, Ariz., via the Black Canyon Ferry.

ALL-AMERICAN CANAL PROJECT EMPLOYEES

Front row, left to right: L. S. Kennicott, Robert Nesalhous, Flave C. Kemp, George Galiher, T. A. Clark, J. K. Rohrer, Mack Cantrell, Harry Prouse, John W. Dodson, John W. Cowin, C. A. Pugh, Alfred Ellerman, M. G. McCleery, A. J. Rolle. Second row: Miss Lorena Jackson, Mrs. Mae Moy, H. R. Voris, Miss Inez Mahoney, A. W. Chedister, D. W. Anderson, Louis Perez, Albert Rankin, Joe Morrell, Darrell Donovan, Leroy Arnold, John S. King, Enos I. Rhoads, Larry Wilson, Edward Heiser, Frank Maupin, Victor Kosman, James D. Church, Grady Boaz, Grant Bloodgood. Third row: Ocie Akers, Donald Dennis, Edgar Jackson, Max Wilson, Harry Cooke, James Bandy, Arthur Davis, Robert Kelso, Joseph E. Horne, E. C. Dennis, Carl H. Kadie, Wesley Holtz, M. Van Reed, P. M. Noble, John Perko, A. N. Edmiston, J. P. Jones. Standing: Lee D. Purdin, Roy A. McNeill, James R. Granger, Dean W. Davis, C. M. Jackson, D. Wallace Lutes, James L. Atkinson, James B. Robinson, Clyde Shields, James Lyons, J. C. Thrailkill, J. L. Wood, J. W. Hendrickson, James Klohr, L. A. Todd, Hardy McDowell, J. R. Zenisek, E. B. Fisher, Horace Johnson, Carroll Dunn, Glen D. Waggoner, Harry M. Lansdowne, Emil Eger.

Comparative Storage in Reclamation Reservoirs

[Figures given to nearest thousand acre-feet]

Project	Reservoir	July 1934	July 1935	Decrease	Increase
Salt River	Roosevelt, etc	314,000	630,000		316,000
Orland	East Park, etc	54,000	62,000		8,000
Boise	Arrowrock	77,000	171,000		94,000
	Deer Flat	21,000	67,000		46,000
	Deadwood	117,000	114,000	3,000	
Minidoka	Jackson Lake	158,000	531,000		373,000
	American Falls	254,000	406,000		152,000
	Lake Walcott	31,000	94,000		63,000
Milk River	Sherburne	35,000	42,000		7,000
	Nelson	32,000	38,000		6,000
Sun River	Gibson, etc	81,000	85,000		4,000
North Platte	Guernsey	31,000	41,000		10,000
	Pathfinder	75,000	256,000		181,000
Newlands	Lahontan	16,000	134,000		118,000
Carlshad	McMillan, etc		20,000		20,000
Rio Grande	Elephant Butte	640,000	586,000	54,000	
Umatilla	Cold Springs	15,000	18,000		3,000
	McKay	13,000	16,000		3,000
Vale	Warm Springs	9,000	5,000	4,000	
Klamath	Upper Klamath	260,000	338,000		78,000
	Clear Lake		34,000		34,000
	Gerber	12,000	42,000		30,000
Owyhee	Owyhee	135,000	381,000		246,000
Belle Fourche	Belle Fourche	47,000	59,000		12,000
Okanogan	Conconully, etc	6,000	10,000		4,000
Yakima	Tieton, etc	613,000	826,000		213,000
Shoshone	Shoshone	414,000	456,000		42,000
Total		3,400,000	5,462,000	61,000	2,063,000
Less decrease					61,000
					2,002,000

Additional reservoirs since 1934:	
Boulder Canyon Reservoir	4,578,000
Hyrum Reservoir	3,000
Grand total *increase* over July 1934	6,583,000

Lower Colorado River

(Continued from p. 187)

Certain property necessary for the accomplishment of the project formerly belonging to the Central Texas Hydroelectric Co. will be acquired through a bargain made by the Administrator at approximately $2,150,000 less than the appraisal and $2,050,000 less than the actual cost.

The allotment resolution set forth that the total number of men employed on the project at any one time will be 4,400.

The contracts were signed on behalf of the Government by Secretary Ickes as Public Works Administrator and Secretary of the Interior and for the authority by Roy Fry, chairman, and S. Raymond Brooks, secretary.

Upon completion of the work by the Bureau of Reclamation, the authority will assume the care, operation, and maintenance of the project.

Labor on the Belle Furche project, South Dakota, is well employed and relief rolls are still absent.

Public Lands Available

By public notice dated June 18, 8 public land farm units on the Willwood division of the Shoshone project, Wyoming, were opened to entry. These units range in size from 60 to 100 acres of irrigable land.

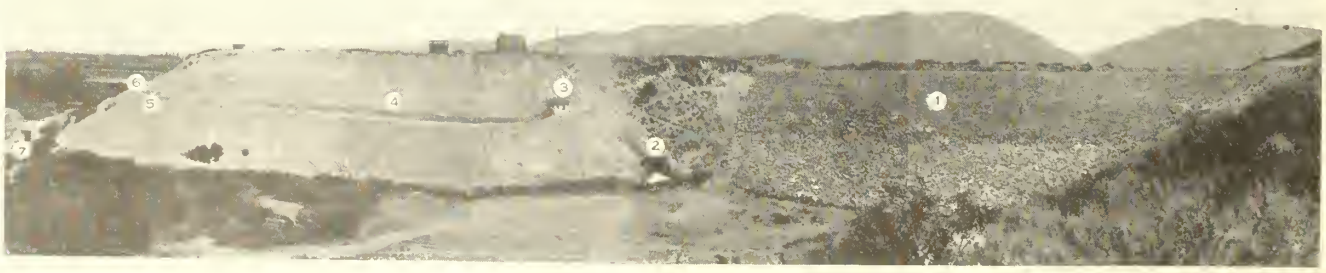
By public notice dated August 7, 1 public land farm unit was opened to entry on the Belle Fourche project, South Dakota, having an irrigable area of approximately 160 acres.

At each of these openings ex-service men were accorded the usual 90-day prior right of entry, at the expiration of which any remaining units will be available to other duly qualified entrymen. Under this provision any remaining unentered units on the Shoshone project may be applied for by other citizens on and after September 26, and on the Belle Fourche project on and after November 22.

Copies of public notice, farm application blank, and descriptive matter may be obtained by addressing the Commissioner, Bureau of Reclamation, Washington, or the respective project superintendents at Powell, Wyo., and Newell, S. Dak.

Thirty-one tracts of farm land in the Sunnyside Valley Irrigation District, Yakima project, lost through delinquent assessments, have been redeemed or sold recently, bringing the number of tracts restored to private ownership this year to nearly 150. A few tracts were purchased by outside residents coming to the valley to farm. The Yakima Chamber of Commerce still receives numerous inquiries from the Middle West and East concerning farm lands and opportunities in the Yakima Valley.

A star mail route serving the greater part of the Riverton project was begun on July 1. This route starts from Riverton at noon three times a week, going through Paradise Valley and the central part of the project. It will be of great benefit to the settlers.



HYRUM DAM AND OUTLET WORKS, HYRUM PROJECT, UTAH.

1, Downstream face of dam; 2, outlet of diversion tunnel; 3, control house of outlet works; 4, outlet flume; 5, division works; 6, Hyrum feeder flume; 7, Wellsville pumping plant.

Reclamation Reservoirs, Bird and Game Refuges

Water fowl and wildlife throughout the West will find new refuges when the Bureau of Reclamation has completed 11 dams now under construction.

Dr. Elwood Mead, Reclamation Commissioner, said on a recent date, the reservoirs to be created by construction of the dams would be set aside as bird and game refuges. During the 33 years of its operation the Bureau has constructed 48 dams creating reservoirs reserved as bird sanctuaries.

"In the arid west", Dr. Mead said, "these lakes are of particular value in the water-fowl conservation program, since in many localities they are the only bodies of water to be found."

The chain of preserves created by reclamation construction extend from the Mexican border to the Canadian border through 12 Western States. Since 1908, when the value of these reservoirs as bird refuges was recognized by President Theodore Roosevelt, it has been an unchanging custom to set all reclamation storage lakes aside as wild-fowl sanctuaries.

Irrigationists, in the early days, drained a few shallow lakes and sumps that had previously been frequented by wild water fowl. The Tule Lake in northern California, partially drained 25 years ago in the establishment of the Klamath project, was among these.

Dr. Mead, said the Bureau had taken the position that Tule Lake and its surrounding sump area should never be diminished further. Proposals have been made to irrigate a portion of the old lake bed, now dry, but the Bureau has not approved them.

"The Bureau recognized the value of wildlife conservation", Dr. Mead said, "and I could never see any conflict between the Federal reclamation program and the national program looking toward the conservation of wildlife. It has been a source of gratification to me personally that the Bureau's lakes have proved so valuable in wildlife conservation."

Virtually all of the Bureau's lakes, in addition to serving as bird preserves, are important recreational areas for surrounding communities. They have been stocked with fish, and in season, provide entertainment for many sportsmen.

The Crater Lake Mountain Turkey Co., on the Klamath project, has purchased 200 breeding hens and 250 toms and is installing 40,000 egg capacity incubator equipment. The company also plans on producing baby chicks next year.

Recreation for Project Families

Like moles upthrust from the face of the plains, two small mountain ranges parallel the Montana Milk River project for 100 miles. They lie some 50 miles south of the Milk River and are about equi-distant from the Milk and the Missouri. Legend has it that they were "Paul Bunyon's" dumping ground when he dug the Missouri River.

Graded roads, which are constantly being improved, lead to these mountains from Roosevelt Highway No. 2 at Havre, Chinook, Harlem, Fort Belknap Agency, Dodson, and Malta; and it is merely a matter of 2 or 3 hours for any project family to find surcease from the heat of the valley and enjoy the clear coolness of the pine-filtered air that sweeps down from their stately crags.

The mining camps of Zortman and Landusky, situated in the Little Rockies south of Malta, bring back to the old-timers memories of the clank of spurs, the clink of glasses, the thump of stamp mills, the quick draw and smoke of the "forty-five", and gold, gold, gold! It is estimated that the gold taken from these hills runs into the millions and, no doubt, the West's preference for the dollar made of silver finds its ancestry in the heavy pouch of gold-dust days.

Just across the mountains from Zortman and Landusky, at the mouth of a gorgeous canyon which bears its name, nestled St. Paul's Mission, and while men worked and fought and gambled and drank in Ruby Gulch, the gentle padres of the Mission taught their Indian wards the art of irrigation and the godliness of peaceful pursuits.

And so, today, when settler or tourist follows the old bullwhackers' trail and drives his car over the crest of Bear Gulch hill, he looks down upon the camp of Zortman, huddled in the limestone pocket of Ruby Gulch, and beholds a living picture of Bret Harte's west. If he follows a trail that circles the mountains to the south, from various heights along the way, he sees the everchanging colors of the breaks of the Missouri and the little snowy mountains scores of miles beyond. Continuing the circle, he comes suddenly upon the peaceful settlement of St. Paul's Mission, with its grey stone walls and its evergreened background, its alfalfa fields and irrigation ditches, moccasined Indians on pinto ponies, and a pervading air of blissful contentment.—*Seth H. Dibble, Milk River Project, Malta, Mont.*

Recent Publications of Interest

Boulder Dam: Boulder Dam and the Los Angeles Region, illus., Eng. News-Record, July 25, 1935. V. 115, No. 4, pp. 125–127.

Christiansen, J. E.: Measuring water for irrigation, illus., Bulletin No. 588, Agr. Exp. Sta., Univ. of California, March 1935, 96 pages.

Columbia Basin: Grand Coulee Dam Number, illus., Eng. News-Record, August 1, 1935, V. 115, No. 5, pp. 139–160. (Staff articles and by K. B. Keener, Francis Donaldson, and Stanley M. Mercier, Editorial p. 164.) (Reprints of the articles have been ordered.)

Golze, A. R., and R. T. Cass: Design of valve houses at Boulder Dam, illus., Civil Engineering, Aug. 1935, V. 5, No. 8, pp. 473–477.

Henny, D. C.: Obituary with portrait. Eng. News-Record, July 18, 1935. Vol. 115, p. 102.

Ickes, Harold L.: Pork Barrel or P. W. A. The future of the New Deal Public Works Policy depends upon the public's confidence in the honesty, ability, and impartiality of its administration. Review of Reviews, June 1935, V. 91, No. 6, pp. 17–18.

Mead, Elwood: Boulder Dam Lake Biggest in World, illus., N. Y. Times, July 28, 1935, Sec. 4, page E 11.

Mulholland, William: Obituary with portrait, Eng. News-Record, July 25, 1935, V. 115, No. 4, p. 136. Editorial p. 130 "Vision."

Seminoe Dam: Plans for Seminoe Dam in Wyoming provide 260 ft. concrete arch, illus., Western Construction News, July 1935, V. 10, pp. 198–200.

UNITED STATES DEPARTMENT OF AGRICULTURE

Farmers' Bulletins (on sale by Superintendent of Documents, Government Printing Office, Washington, D. C., price 5 cents each)—

- No. 835, How to detect outbreaks of insects and save the grain crops, by W. R. Walton, Bureau of Entomology and Plant Quarantine, 21 pp., 1935 (revised).
- No. 1031, Fig growing in the South Atlantic and Gulf States, by H. P. Gould, Bureau of Plant Industry, 34 pp., 1935 (revised).
- No. 1088, Selecting a farm, by E. H. Thompson, Office of Farm Management, 22 pp., 1935 (revised).

Organization Activities and Project Visitors

Dr. Elwood Mead, Reclamation Commissioner, left Washington for the West on August 20 for the purpose of inspecting the projects of the Bureau of Reclamation and to hold a series of conferences with reference to the Bureau's new construction program. In addition, Dr. Mead will make a special study of methods by which distressed farmers in the arid regions may be relocated on land under irrigation canals. He will be accompanied by his secretary, Miss Mary E. Gallagher, and by Mr. E. Warner of the Division of Public Relations of the Bureau.

The Bureau recently separated its operation and maintenance work from its construction activities in order to provide a closer contact between the Washington office and the water users on the various projects. This has indicated the need for establishment of new policies, and conferences will be held toward that end with field representatives on operating projects.

Recent approval of allotments of Emergency Relief funds for 26 projects throughout the West will provide the greatest single construction program the Bureau has had. The Commissioner will inspect the sites of many of these projects.

Dr. Mead will go direct to Spokane, for a 3-day inspection of Grand Coulee Dam construction. He will spend 1 day at the Yakima project, 1 day in Seattle for a conference with officials there, and 2 days in Portland.

A conference has been arranged at Bend, Oreg., on September 2 with proponents of a water conservation and storage project in that area. The Klamath project will next be visited and the party will arrive at San Francisco on September 4. A series of conferences have been planned with California officials.

Dr. Mead will inspect the All-American Canal project in the Imperial Valley, Boulder Dam on the Colorado River, and the Utah, Idaho, and Wyoming projects. He will return to Washington about October 1.

The itinerary of the trip from Washington to San Francisco is as follows:

Leave Washington August 20 and arrive at Spokane August 23 at 9:30 p. m.; leave Spokane August 26 and arrive at Yakima, Wash., the next morning. One day will be spent in Seattle and 2 days at Portland, Oreg., in conferences. Dr. Mead will leave Portland September 1, spend the next day at Bend, Oreg., and September 3 at Klamath Falls, Oreg. Tentatively, Dr. Mead expects to spend about a week in San Francisco.

Miss Mae A. Schnurr, Assistant to the Commissioner, was designated Acting Commissioner during Dr. Mead's absence.

Miss Mae A. Schnurr, Assistant to the Commissioner and Chief of the Public Relations Division, has been designated by the Commissioner as his representative to assist in formulating detailed exhibit plans for the new Interior museum.

Prof. Frank L. Adams, of the University of California, consulting engineer of the Bureau has been detailed to complete the report of O. V. P. Stout, deceased, who was in charge of the investigation of water rights and water conservation, North Platte River, Nebr.

Miss Schnurr to Serve on Important Committee

At the suggestion of the President a committee of 8, 4 designated by the Secretary of Agriculture, and 4 by the Secretary of the Interior, has been appointed to consider and develop a national policy with reference to taking out of cultivation marginal lands of a productive potentiality equal to new lands brought into cultivation through irrigation. This committee is known as the Submarginal Land Committee, and is subsidiary to the Allotment Board. The personnel of this committee is as follows:

Department of the Interior:

- *Harry Slattery, Assistant to the Secretary, chairman;*
- *Miss Mae A. Schnurr, Assistant to the Commissioner, Bureau of Reclamation, secretary;*
- *Thomas C. Havell, General Land Office;*
- *John F. Deeds, Geological Survey.*

Department of Agriculture:

- *Dr. M. L. Wilson, Assistant Secretary;*
- *Dr. Mordecai Ezekiel, economic adviser;*
- *Dr. L. C. Gray, Land Economics Division, Bureau of Agricultural Economics;*
- *H. R. Tolley, Director of Program Planning, Agricultural Adjustment Administration.*

Frederick A. Delano, chairman of the advisory committee of the National Resources Committee, visited the Columbia Basin project and Grand Coulee Dam during July.

O. V. P. Stout, 1865-1935

Oscar Van Pelt Stout, consulting engineer, died in Denver, Colo., on August 4, 1935, following an operation for appendicitis. Mr. Stout was connected with the engineering departments of the Chicago, Burlington & Quincy and Missouri Pacific Railroads, 1886–90; he served in various grades from instructor to head professor of civil engineering, 1891–1920, and was dean of the College of Engineering, University of Nebraska, 1912–20. He was employed at intervals by the Departments of the Interior and Agriculture in an irrigation-engineering capacity. At the time of his death Professor Stout was in charge of the investigation of water rights and water conservation, North Platte River, Nebr.

L. H. Mitchell, supervisor of the operating projects in district no. 4, included in his July itinerary the Orland, Humboldt, Klamath, and Owyhee projects.

Among the visitors to the Boulder Canyon project were the following: Capt. W. F. Halsey, United States Navy; Arthur N. Talbot, professor emeritus, College of Engineering, University of Illinois; Barry Dibble, consulting engineer, Los Angeles; Robert Ridgway, consulting engineer, New York; and Frederick A. Delano, vice chairman, Marshall E. Dimock, research consultant, and Frank S. Carroll, National Resources Board.

Alfred R. Golze, assistant engineer in the Denver office, has been transferred to the Washington office, where on August 22 he entered upon his new duties as assistant to Supervising Engineer D. S. Stuver.

Celebration on Ogden River Project

On July 21–24 the Second Annual Pioneer Day and Rodeo celebration were held in Ogden. Street parades with numerous floats depicting the historical events in the lives of the early settlers were given on the 22d, 23d, and 24th. A pageant held at Lorin Farr, municipal park, on the evening of the 21st was attended by about 13,000 people. The pageant represented the coming of the early settlers into the Salt Lake Valley. It is estimated that the attendance at the four rodeo performances was in excess of 60,000 people. The rodeo performances were high class.

ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead**, Commissioner, Bureau of Reclamation

iss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; George O. Sanford, Chief Engineering Division and General Supervisor of Operation and Maintenance; Deane S. Stuver, Supervising Engineer. E. C. W. Division; Wm. F. Kubach, Chief Accountant; Charles N. McCulloch, Chief Clerk; Jesse W. Myer, Chief Mails and Files Division; Miss Mary E. Gallagher, Secretary to the Commissioner.

Denver, Colo., United States Customhouse

. F. Walter, Chief Eng.; S. O. Harper, Asst Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H. Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies; Spencer L. Baird, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
elle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
oise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
oulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
l-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
arlsbad	Carlsbad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
asper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen	E. M. Bean	W. J. Burke	Billings, Mont.
olumbia Basin, Grand Coulee Dam.	Coulee Dam, Wash	F. A. Banks	do	C. B. Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
renchtown	Missoula, Mont	J. W. Taylor	Resident engr		Denver	W. J. Burke	Billings, Mont.
rand Valley	Grand Junction, Colo	W. J. Chiesman	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
umboldt	Lovelock, Nev	L. J. Foster	Constr. engr	George B. Snow	Denver	do	Do.
yrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
lamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent		C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
ilk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
inidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
oon Lake	Duchesne, Utah	E. J. Westerhouse	Constr. engr	Francis J. Farrell	Denver	J. R. Alexander	Salt Lake City, Utah.
orth Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
gden River	Ogden, Utah	J. R. Iakisch	Constr. engr	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
rland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
wyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
arker Dam [2]	Earp, Calif	E. A. Moritz [1]	do	George H. Bolt	Denver	R. J. Coffey	Los Angeles, Calif.
ovo River	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell	do	J. R. Alexander	Salt Lake City, Utah.
io Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
iverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wentzel [1]	C. B. Wentzel	W. J. Burke	Billings, Mont.
npete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell	Denver	J. R. Alexander	Salt Lake City, Utah.
oshone	Powell, Wyo	L. J. Windle [1]	Superintendent	L. J. Windle [1]	do	W. J. Burke	Billings, Mont.
anfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
n River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Denver	W. J. Burke	Billings, Mont.
ruckee River Storage	Lovelock, Nev	L. J. Foster	Constr. engr		Denver	J. R. Alexander	Salt Lake City, Utah.
matilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		do	B. E. Stoutemyer	Portland, Oreg.
ncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Constr. engr	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo	C. B. Elliott	Engineer	do	do	do	Do.
pper Snake River Storage [3]	Ashton, Idaho	H. A. Parker	Constr. engr	Emmanuel V. Hillius	Denver	B. E. Stoutemyer	Portland, Oreg.
ale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
akima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
uma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
aker (Thief Valley division)	Lower Powder River irrigation dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating.
itter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
oise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
rand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	W. E. Stout	President	H. B. Smith	Palisade.
untley	Huntley irrigation district	Ballantine, Mont	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
lamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
lamath, Horsefly	Horsefly irrigation district	do	Jerome Smith	do	Dorothy Eyers	Do.
ower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
ilk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	Amos Thompson	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
inidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
ewlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
orth Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	Flora K. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo.	Bert L. Adams	do	Nelle Armitage	Torrington.
Northport division	Northport irrigation district	Northport, Nebr	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
kanogan	Okanogan irrigation district	Okanogan, Wash	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
lt Lake Basin (Echo Reservoir).	Weber River Water Users' Association	Ogden, Utah	D. D. Harris	do	D. D. Harris	Ogden.
lt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Superintendent	F. C. Henshaw	Phoenix.
oshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	do	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
rawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
n River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigation district	Fairfield, Mont	A. W. Walker	do	H. P. Wangen	Fairfield.
matilla:						
East division	Hermiston irrigation district	Hermiston, Oreg	E. D. Martin	do	Enos D. Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
ncompahgre	Uncompahgre Valley W. U. A	Montrose, Colo	Jesse R. Tompson	Acting supt	J. Frank Anderson	Montrose.
akima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	Manager	R. E. Rudolph	Ellensburg.

Important Investigations in Progress

Project	Office	In charge of—	Title
uffalo Rapids	Denver, Colo	R. R. Robertson	Assistant engineer.
olorado River Basin, sec. 15	do	P. J. Preston	Senior engineer.
olorado River Indian	do	do	Do.
eschutes	Bend, Oreg	C. C. Fisher	Engineer.
ila Valley	Denver, Colo	P. J. Preston	Senior engineer.
an Luis Valley	do	R. F. Walter	Chief engineer.
rand Lake-Big Thompson Transmountain Diversion	do	P. J. Preston	Senior engineer.
orth Platte Valley	do	Frank L. Adams	Consulting engineer.

SALLIE A. B. COE, *Editor.*

ARMY INDUSTRIAL COLLEGE, 1935 GRADUATING CLASS. 82,500 KILOVOLT-AMPERE GENERATOR FOR BOULDER POWER PLANT ON FLOOR OF WESTINGHOUSE PLANT AT EAST PITTSBURGH

U. S. GOVERNMENT PRINTING OFFICE: 1935

THE RECLAMATION ERA

VOL. 25, NO. 10 OCTOBER 1935

PRESIDENT ROOSEVELT ADDRESSES AN ASSEMBLAGE OF APPROXIMATELY 10,000 PERSONS AS HE DEDICATES BOULDER DAM ON SEPTEMBER 30, 1935

BOULDER DAM COMMEMORATIVE POSTAGE STAMP

The new Boulder Dam commemorative postage stamp was placed on first-day sale at Boulder City, Nev., September 30, and at post offices throughout the country the following day.

Attending the ceremonies at the Bureau as the first sheet of the new issue rolled off the flat-bed presses were Secretary of the Interior Harold L. Ickes; Acting Postmaster General Harllee Branch; Senator Key Pittman, of Nevada; Clinton B. Eilenberger, Third Assistant Postmaster General; Smith W. Purdum, Fourth Assistant Postmaster General; L. W. Robert, Assistant Secretary of the Treasury; Roy North, Deputy Third Assistant Postmaster General; Frank Buckley, Deputy Fourth Assistant Postmaster General; Owen A. Keen, Chief Clerk, Post Office Department; Robert E. Fellers, Superintendent, Division of Stamps; Elwood Mead, Commissioner of the Bureau of Reclamation, Interior Department; Miss Mae A. Schnurr, Assistant to the Commissioner of Reclamation; and Alvin W. Hall, Director of the Bureau of Engraving and Printing.

The new stamp is the same size as the current Special Delivery issue ($^{84}/_{100}$ by $1^{44}/_{100}$ inches) and is arranged vertically. Enclosed within a double-line border, the new stamp is being printed in purple ink, and has as its central subject a view of the Boulder Dam reproduced from an airplane picture taken at a low altitude, showing the Colorado River gorge both above and below the construction line. Across the bottom of the stamp in a white panel is the denomination designation "3¢" at each end. Along the base of the stamp are the words "U. S. Postage" in dark roman lettering. Immediately above this inscription within a narrow panel with white edges and dark background is the inscription: "Boulder Dam—1935" in white gothic lettering.

The new Boulder Dam stamps were printed in sheets of 50 on the flat-bed presses exclusively and perforated throughout, and the Post Office Department requisitioned 50,000,000 on the initial printing. The plate numbers on the plates that went to press at the Bureau on September 23 are: 21455, 21456, 21457, 21458.

Stamp collectors desiring first-day cancelations on September 30 were notified through the press to send a limited number of addressed covers, not to exceed 10, with a cash or postal money-order remittance payable to the Postmaster, Boulder City, Nev., covering the value of the stamps required for affixing. Owing to the delay in the decision to issue the stamp, packages of covers bearing the postmark of the sender's post office to and including September 30 were accepted by the postmaster at Boulder City.

The Boulder Dam stamp was placed on sale at the Philatelic Agency of the Post Office Department in Washington on October 1, but the Agency did not prepare covers for mailing on that date.

THE
RECLAMATION ERA

Issued monthly by the DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C.
Price 75 cents a year

HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 10 OCTOBER 1935

President Roosevelt Dedicates Boulder Dam, September 30, 1935
Text of Dedicatory Address

SENATOR PITTMAN, Secretary Ickes, Governors of the Colorado River States, and you especially who have built Boulder Dam, this morning I came, I saw, and I was conquered as everyone would be who sees for the first time this great feat of mankind.

Ten years ago the place where we are gathered was an unpeopled, forbidding desert. In the bottom of a gloomy canyon, whose precipitous walls rose to a height of more than 1,000 feet, flowed a turbulent, dangerous river. The mountains on either side of the canyon were difficult of access, with neither road nor trail, and their rocks were protected by neither trees nor grass from the blazing heat of the sun. The site of Boulder City was a cactus-covered waste. The transformation wrought here is a twentieth-century marvel.

We are here to celebrate the completion of the greatest dam in the world, rising 726 feet above the bedrock of the river and altering the geography of a whole region; to see the creation of the largest artificial lake in the world 115 miles long, holding enough water to cover the State of Connecticut to a depth of 10 feet, and to see nearing completion a power house which will contain the largest generators and turbines yet installed in this country, machinery which can continuously supply 1,835,000 horsepower of electric energy. All these dimensions are superlative.

They represent and embody the accumulated engineering knowledge and experience of centuries, and when we behold them it is fitting that we pay tribute to the genius of their designers. We recognize also the energy, resourcefulness and zeal of the builders, who, under the greatest physical obstacles, have pushed this work forward to completion 2 years in advance of the contract requirements. But especially we express our gratitude to the thousands of workers who gave brain and brawn to the work of construction.

Secretary Ickes Presides at Dedication

BOULDER DAM was dedicated September 30, 1935, in a ceremony at the dam in which the President made the principal address.

Secretary of Interior Harold L. Ickes was master of ceremonies and introduced the honored guests. Senator Key Pittman, of Nevada, in an introductory speech, presented Mr. Roosevelt to the crowd, which included many of those who had worked on the dam.

Mrs. Roosevelt, Governors of 6 of the 7 Colorado River Basin States—Arizona, California, Nevada, New Mexico, Wyoming, and Utah; Senator Pat McCarran, of Nevada; Dr. Elwood Mead, Reclamation Commissioner; R. F. Walter, Chief Engineer; Jack Savage, designing engineer; L. N. McClellan, electrical engineer; Walker R. Young, construction engineer; and other Bureau officials were among those honored with seats on the speaker's platform.

Secretary Ickes, in his opening address, called attention to the conservation features of Boulder Dam and lauded the President as the leading conservationist. He paid tribute to Senator Hiram Johnson, who because of illness was unable to attend the ceremony, and others for their yeoman service in the long fight to conquer the Colorado River, which dedication of the dam closed.

The entire ceremony was broadcast nationally and was heard by millions.

SOUTHWEST DIRECTLY BENEFITED

Beautiful and great as this structure is, it must also be considered in its relationship to the agricultural and industrial development and in its contribution to the health and comfort of the people who live in the Southwest.

To divert and distribute the waters of an arid region, so that there shall be security of rights and efficiency in service, is one of the greatest problems of law and of administration to be found in any government. The farms, the cities, and the people who live along the many thousands of miles of this river and its tributaries all depend for their permanence in value upon the conservation, the regulation, and the equitable division of its ever-changing water supply.

What has been accomplished on the Colorado in working out such a scheme of distribution is inspiring. Through the cooperation of the States whose people depend upon this river, and of the Federal Government which is concerned in the general welfare, there is being constructed a system of distributive works of laws and practices, which will insure to the millions of people who now dwell in this basin and the millions of others who will come to dwell here in future generations, a just, safe, and permanent system of water rights. In devising these policies and the means of putting them into practice the Bureau of Reclamation has taken, and is destined to take in the future, a leading and helpful part. The Bureau has been the instrument which gave effect to the legislation introduced in Congress by Senator Hiram Johnson and Congressman Phil Swing.

UNREGULATED RIVER DISASTROUS

As an unregulated river, the Colorado added little of value to the region this dam serves. When in flood the river was a threatening torrent. In the dry months of the year it shrank to a trickling stream.

For a generation the people of Imperial Valley had lived in the shadow of disaster from the river which provided their livelihood, and which is the foundation of their hopes for themselves and their children. Every spring they waited with dread the coming of a flood, and nearly every autumn they feared a shortage of water would destroy their crops.

The gates of the diversion tunnels were closed here at Boulder Dam last February. In June a great flood came down the river. It came roaring down the canyons of the Colorado, through Grand Canyon, Iceberg, and Boulder Canyons, but it was caught and safely held behind Boulder Dam.

Last year a drought of unprecedented severity was visited upon the West. The watershed of the Colorado River did not escape. In July the canals of the Imperial Valley went dry. Crop losses in that valley alone totaled $10,000,000. Had Boulder Dam been completed 1 year earlier, this loss would have been prevented, because the spring flood could have been stored to furnish a steady water supply for the long dry summer and fall.

Across the San Jacinto Mountains southwest of Boulder Dam the cities of southern California are constructing an aqueduct to cost $220,000,000, which they have raised, for the purpose of carrying the regulated waters of the Colorado to the Pacific coast, 259 miles away.

NAVIGATION AND RECREATION

Across the desert and mountains to the west and south run great electric transmission lines by which factory motors, street and household lights and irrigation pumps will be operated in southern Arizona and California. Part of this power will be used in pumping the water through the aqueduct to supplement the domestic supplies of Los Angeles and surrounding cities.

Navigation of the river from Boulder Dam to the Grand Canyon has been made possible, a 115-mile stretch that has been traversed less than half a dozen times in history. An immense new park has been created for the enjoyment of all our people.

COST WILL BE REPAID

At what cost was this done? Boulder Dam and the power houses together cost a total of $108,000,000, all of which will be repaid with interest in 50 years under the contracts for sale of the power. Under these contracts, already completed, not only will the cost be repaid, but the way is opened for the provision of needed light and power to the consumer at reduced rates. In the expenditure of the price of Boulder Dam during the depression years, work was provided for 4,000 men, most of them heads of families, and many thousands more were enabled to earn a livelihood through manufacture of materials and machinery.

And this is true in regard to the thousands of projects undertaken by the Federal Government, by the States, and by the municipalities in recent years. The overwhelming majority of them are of definite and permanent usefulness.

Throughout our national history we have had a great program of public improvements, and in these past 2 years all that we have done has been to accelerate that program. We know, too, that the reason for this speeding up was the need of giving relief to several million men and women whose earning capacity had been destroyed by the complexities and lack of thought of the economic system of the past generation.

PROJECTS BENEFIT UNEMPLOYED AND ADD TO NATION'S WEALTH

No sensible person is foolish enough to draw hard-and-fast classifications as to usefulness or need. Obviously, for instance, this great Boulder Dam warrants universal approval because it will prevent floods and flood damage, because it will irrigate thousands of acres of tillable land and because it will generate electricity to turn the wheels of many factories and illuminate countless homes.

But can we say that a 5-foot brushwood dam across the headwaters of an arroyo, and costing only a millionth part of Boulder Dam, is an undesirable project or a waste of money? Can we say that the great brick high school, costing $2,000,000, is a useful expenditure, but that a little wooden schoolhouse project, costing $10,000, is a wasteful extravagance? Is it fair to approve a huge city boulevard and, at the same time, to disapprove the improvement of a muddy farm-to-market road?

While we do all of this, we give actual work to the unemployed and at the same time we add to the wealth and assets of the Nation. These efforts meet with the approval of the people of the Nation.

In a little over 2 years this work has accomplished much. We have helped mankind by the works themselves and, at the same time, we have created the necessary purchasing power to throw in the clutch to start the wheels of what we call private industry. Such expenditures on all of these works, great and small, flow out to many beneficiaries. They revive other and more remote industries and businesses, money is put in circulation, credit is expanded, and the financial and industrial mechanism of America is stimulated to more and more activity.

Labor makes wealth. The use of materials makes wealth. To employ workers and materials when private employment has failed is to translate into great national possessions the energy that otherwise would be wasted. Boulder Dam is a splendid symbol. The mighty waters of the Colorado were running unused to the sea. Today we translate them into a great national possession.

USE BEGETS USE

I might go further and suggest to you that use begets use. Such works as this serve as a means of making useful other national possessions. Vast deposits of precious metals are scattered within a short distance of where we stand today. They await the development of cheap power.

These great Government power projects will affect not only the development of agriculture and industry and mining in this section they serve, but they will also prove useful yardsticks to measure the cost of power throughout the United States. It is my belief that the Government should proceed to lay down the first yardsticks from this great power plant in the form of a State power line, assisted in its financing by the Government, and tapping the wonderful natural resources of southern Nevada. Doubtless the same policy of financial assistance to State authorities can be followed in the development of Nevada's sister State, Arizona, on the other side of the river.

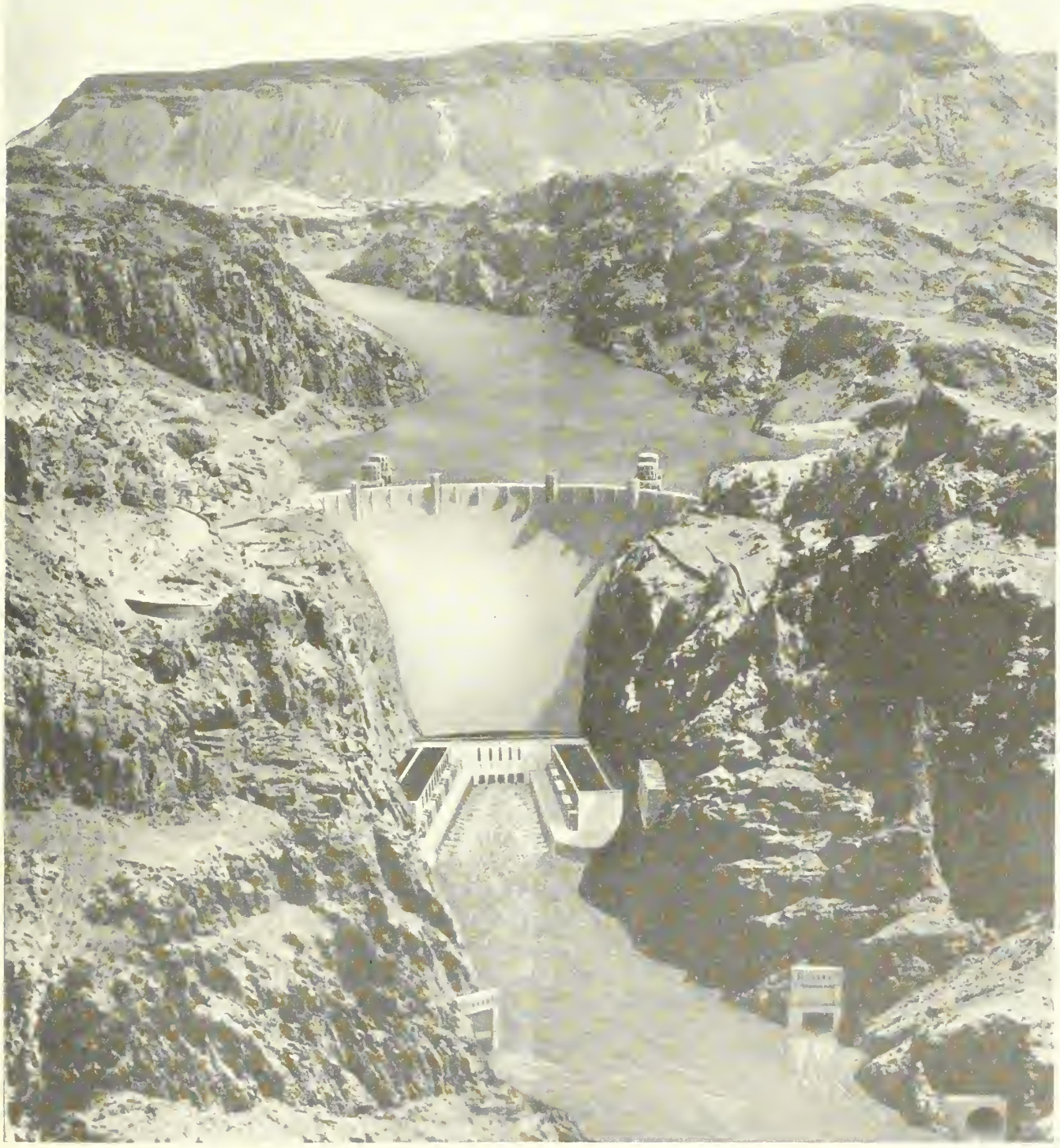
With it all, with work proceeding in every one of the more than 3,000 counties in the United States and of a vastly greater number of local divisions of Government, the actual credit of Government agencies is on a stronger and safer basis than at any time in the past 6 years. Many States have actually improved their financial position in the past 2 years. Municipal tax receipts are being paid when the taxes fall due and tax arrearages are steadily declining.

NATIONAL PRIDE IN BOULDER DAM

It is a simple fact that Government spending is already beginning to show definite signs of its effect on consumer spending; that the putting of people to work by the Government has put other people to work through private employment, and that in 2½ years we have come to the point where private industry must bear the principal responsibility of keeping the processes of greater employment moving forward with accelerated speed.

The people of the United States are proud of Boulder Dam. With the exception of the few who are narrow visioned, the people on the Atlantic seaboard, the

(Continued on p. 196)



PICTURE OF BOULDER DAM SIMILAR TO ONE APPEARING ON COMMEMORATIVE STAMP

Commissioner Mead Addresses Luncheon Guests at Portland Chamber of Commerce, August 29, 1935

"The location of the city of Portland, where the commerce of the ocean meets the commerce of the greatest river of the arid region, gives it a vital interest in irrigation and the work of the Bureau of Reclamation. The irrigated farms in the valleys of the Snake and the Columbia have in Portland one of the natural outlets for their products to the markets of the world. The intimate relation of this city with the interior valleys is illustrated by the fact that my longest stay at any one place on this trip is at Portland. That is due in part to the fact that our office here looks after the legal business of 3 States and parts of 2 others. Yesterday I had a telephone inquiry from Boise as to when I would be at American Falls. When told that it would be the latter part of September, the inquirer said 'I will come to Portland.'

"The relation of irrigation development to the growth of Portland is destined to be more intimate in the future than in the past. The products of the irrigated farms are taking the place of the products of the range, the forests and the mines. The greatest asset of the Northwest is the water of the Columbia River and what it will do in irrigation.

"This year the Bureau will complete the Owyhee and Vale projects, begun 10 years ago. Together, they will add about 150,000 acres of irrigated area. Connected with them is a power development which will cheapen the cost of water and together add 150,000 people to the back country of Portland. This year funds have been provided to give a better water supply to the valley of Burnt River by building a reservoir to improve the water supply of the farmers on the Deschutes. Money has been provided to make betterments on the Klamath project. In all, about $8,000,000 has been made available for irrigation development within the borders of this State. Doing that work will give employment to a good many thousand more, and so not only add to the permanent wealth and population of this region but furnish immediate relief from unemployment.

"The Owyhee project was the most expensive irrigation undertaking when it was started. It is due very largely to the efforts of Senator McNary and the late Congressman Sinnott, both men of vision who saw what were the immediate needs and the pathway to the future growth of the arid West. The irrigation is to benefit Portland, but the dams and canals being built on Snake River are factors in your trade and commerce and all forms of business in this city.

"One of the ablest and most influential backers of the Columbia Basin project is Senator McNary. That is because he is one of the keenest and most far-seeing statesmen of the country. He knows, as does everyone who studies trade routes must know, that down the river to Portland is the readiest route to the markets of the world for the southern half of the Columbia Basin project. That project when built will add half a million people to the population of the State of Washington and will add a million to the population of the Northwest.

"Last year the Columbia carried more water than all the rivers of the arid region combined. In the valley of the Snake and of the Columbia are great stretches of exceptionally fertile land. They are composed of volcanic ash blown by the winds from the great lava beds of this region. What can be done is shown by what has been done in the Yakima Valley and in the country around Boise City in Idaho."

PINE VIEW DAM SITE ON THE OGDEN RIVER PROJECT, UTAH; RESERVOIR SITE IN BACKGROUND

The annual sugar-beet tour on the Milk River project, sponsored by the Utah-Idaho Sugar Co. and the State Extension Service, was held the latter part of August. The attendance this year exceeded any previous tour, the maximum being approximately 200. The interest in these tours increases each year, and they are becoming a material factor in the development of the sugar-beet production.

Beginning September 16, 1935, the Department of the Interior and the Public Works Administration resumed the 9 o'clock opening schedule by order of the Secretary.

Boulder Dam Dedicated

(Continued from p. 194)

people in the Middle West, and the people in the South must surely recognize that the national benefits which will be derived from the completion of this project will make themselves felt in every State. They know that poverty or distress in a community 2,000 miles away may affect them, and that prosperity and higher standards of living across a whole continent will help them back home.

Today marks the official completion and dedication of Boulder Dam, the first of four great Government regional units. This is an engineering victory of the first order—another great achievement of American resourcefulness, skill, and determination.

That is why I have the right once more to congratulate you who have created Boulder Dam and on behalf of the Nation to say to you, "Well done."

Boulder Dam's Oldest Visitor

By Rupert B. Spearman, Junior Engineer

On August 3, 1935, George P. Lyman, of Tucson, Ariz., realized his sole remaining ambition by visiting Boulder Dam. Mr. Lyman is not sure of his exact age, but believes it to be either 92 or 95. He is 5 feet 4 inches in height and weighs only 58 pounds. He traveled by train from Tucson to Kingman, Ariz.; thence to Boulder City by bus, remaining there a few days to see the project and rest before returning to his home.

Of the thousands who have visited Boulder Dam, it is believed that Mr. Lyman may boast that he holds the record of being the oldest person to see the construction of the world's highest dam. Visitors to the Boulder Canyon project, not including those from local communities, numbered 711,007 to August 1, 1935, or an average of 570 persons per day since March 1, 1932. Since January 1, 1935, an average of over 1,000 people per day have visited the works.

GEORGE P. LYMAN

Ground has been broken for the erection of a 500-locker cold storage plant at Ontario, Oreg., on the Owyhee project.

Recent Publications

Averill, Walter A.: Building the construction highway at Grand Coulee Dam, illus., Pacific Builder and Engineer, Sept. 7, 1935, vol. 41, pp. 34–36.

Boulder Dam: Ten-lens camera and Boulder Lake, illus., Eng. News-Record, Sept. 5, 1935, vol. 115, no. 10, p. 342.

Carter, Chas. H.: Change in plan for Grand Coulee Dam explained by Engineer, drawing, Southwest Builder and Contractor, Aug. 23, 1935, vol. 86, no. 8, page 15. (Reprint from article in Rec. Era, July 1935.)

Island Park Dam: Island Park Dam in Idaho will be earth and rockfill, Western Construction News, Aug. 1935, v. X, no. 8, page 235.

Metropolitan Water District: Manual of instructions for concrete inspectors, issued by the Metropolitan Water District of Southern California in connection with construction of Colorado River aqueduct, 1935, 56 pages.

Nelson, W. R.: Intake towers at Boulder Dam high as 34-story building, plans, Southwest Builder and Contractor, Sept. 6, 1935, vol. 86, no. 10, pages 10–11.

President Franklin Delano Roosevelt Visits Boulder Dam, a 12-page illustrated booklet issued primarily for distribution on September 30 at the dedication ceremonies at Boulder Dam, containing facts and figures regarding this great irrigation project from the year 1540 to the present time. Individual copies, as long as the supply lasts, may be obtained by addressing the Commissioner, Bureau of Reclamation, Washington, D. C., or the Construction Engineer, Bureau of Reclamation, Boulder City, Nev.

Punjab Irrigation Research Institute: Research Publication No. 5, vol. 1, Statistical examination of the uplift pressure data obtained from model experiments by Jai Krishan Malhotia, Jan. 1935, 31 pages, Lahore, India.

Research Publication No. 8, vol. 2, Protection below Khanki Weir, by J. P. Gunn, Nov. 1934, 9 pages, 8 plates.

Technical Memoranda, Index: Author index of the nearly 500 Technical Memoranda issued by Denver Office, received Sept. 9, 1935.

Union of South Africa: Report of the Settlers' Relief Commission, 1934, 64 pages.

Williams, R. B.: Construction of All-American Canal making rapid progress, illus., Southwest Builder and Contractor, Aug. 30, 1935, v. 89, no. 9, pages 12–14.

Year Book—Agriculture: Year Book of the Department of Agriculture for 1935, Milton S. Eisenhower, Editor, 762 pages price $1.00, Supt. of Documents.

Excerpts from August Progress Reports

Yuma.—Cotton made good growth during the month. Early reports indicated a fair yield. A large acreage of lettuce land is being prepared for seeding this fall. "Honeydew" melons sold for $1.10 to $1.30 per crate, f. o. b. Chicago, which netted the grower about $30 to $40 per carload. The new citrus crop on the Yuma Auxiliary project is developing in fine shape. A 20 percent increase over last year is estimated for the current season. The quality appears somewhat above normal.

Orland.—Alfalfa advanced $1.50 per ton to $10 for baled hay, and wheat and barley both showed gains. Almond harvesting commenced on August 20, and a fourth cutting of alfalfa was cut.

Minidoka.—Some fields of barley report yields of 90 to 120 bushels per acre; oats produced 80 bushels per acre, and wheat 60 bushels or more. A final survey of the sugar-beet crop shows a total area of 7,560 acres of beets, with an estimated total yield of 90,000 tons. The two Twin Falls projects have about 3,000 acres of beets, with an estimated yield of 38,000 tons. The total beet tonnage expected from this area, therefore, is 128,000.

Milk River.—Two hundred seventy-one cars of farm products were shipped from the project during August.

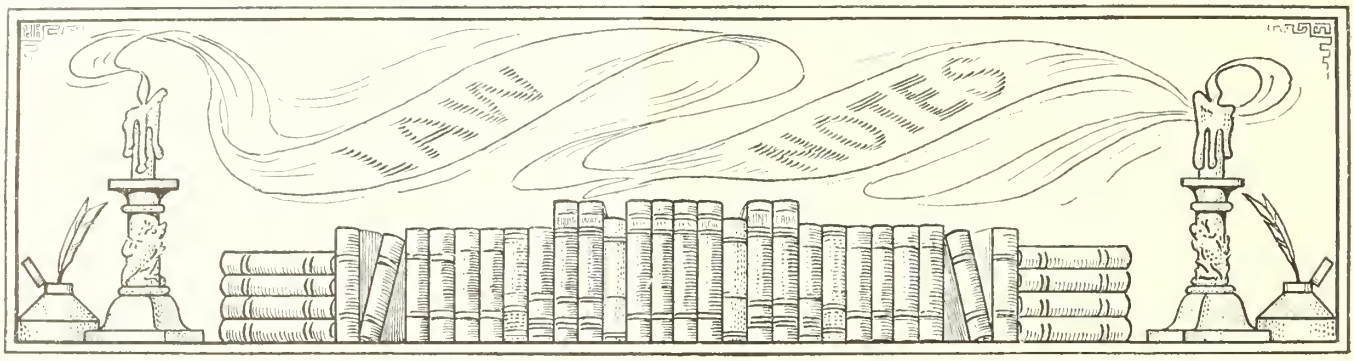
Owyhee.—The season has been particularly favorable for small grains, with excellent yields of wheat, oats, and barley being reported.

Rio Grande.—Two hundred nineteen cars of farm products, including 178 cars of melons, were shipped from the project.

Klamath.—Active harvesting of small seeds began about August 15 and excellent yields of alsike clover, bent, and blue grass have been reported. It is believed the yield of small seeds grown in this vicinity will approximate 250,000 pounds of alsike clover, 60,000 pounds of blue grass, and 120,000 pounds of bent grass, in addition to small amounts of red and sweet clover.

Belle Fourche.—Range stock had a good season with feed plentiful and the water situation better than for some past years. Lambs are practically all contracted for sale and many local feeders are finding it difficult to buy even at the higher prices offered. Prices of commodities are encouraging to farmers, and livestock men now realize good profits.

Yakima.—Harvesting of Bartlett pears and peaches was completed, and 26 machines were engaged in threshing grain and peas on the Kittitas division. Two of the canneries in the Yakima Valley are employing nearly 2,500 persons.



Recent Legislation

Authorization, Parker and Grand Coulee Dams

Authorizing the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes.

* * * * *

SEC. 2. That for the purpose of controlling floods, improving navigation, regulating the flow of the streams of the United States, providing for storage and for the delivery of the stored waters thereof, for the reclamation of public lands and Indian reservations, and other beneficial uses, and for the generation of electric energy as a means of financially aiding and assisting such undertakings, the projects known as "Parker Dam" on the Colorado River and "Grand Coulee Dam" on the Columbia River, are hereby authorized and adopted, and all contracts and agreements which have been executed in connection therewith are hereby validated and ratified, and the President, acting through such agents as he may designate, is hereby authorized to construct, operate, and maintain dams, structures, canals, and incidental works necessary to such projects, and in connection therewith to make and enter into any and all necessary contracts including contracts amendatory of or supplemental to those hereby validated and ratified. The construction by the Secretary of the Interior of a dam in and across the Colorado River at or near Head Gate Rock, Arizona, and structures, canals, and incidental works necessary in connection therewith is hereby authorized, and none of the waters, conserved, used, or appropriated under the works hereby authorized shall be charged against the waters allocated to the upper basin by the Colorado River compact, nor shall any priority be established against such upper basin by reason of such conservation, use, or appropriation; nor shall said dam, structures, canals, and works, or any of them, be used as the basis of making any such charge, or establishing any such priority or right, and all contracts between the United States and the users of said water from or by means of said instrumentalities shall provide against the making of any such charge or claim or the establishment of any priority right or claim to any part or share of the water of the Colorado River allocated to the Upper Basin by the Colorado River compact, and all use of said instrumentalities shall be in compliance with the conditions and provisions of said Colorado River compact and the Boulder Canyon Project Act.

* * * * *

Approved, August 30, 1935.

Bids Subject to Codes

To authorize the acceptance of bids for Government contracts made subject to codes of fair competition

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That no bid submitted prior to the enactment of this joint resolution in response to the invitation of any executive department, independent establishment, or other agency or instrumentality of the United States, the District of Columbia, or any corporation all the stock of which is owned by the United States (all of the foregoing being hereinafter designated as "agencies of the United States"), if otherwise valid and acceptable, shall be rejected because made subject to the provisions of any code or codes of fair competition, or any related requirements (as provided in Executive Order Numbered 6646 of March 14, 1934), if the bidder, with the assent of his surety, shall agree in writing that the contract, if entered into, shall, in lieu of such code provisions or other related requirements, be subject to all Acts of Congress, enacted after the date of enactment of this joint resolution, requiring the observance of minimum wages, maximum hours, or limitations as to age of employees in the performance of contracts with agencies of the United States. In such cases the compensation provided for in the contract shall be reduced from that stated in the bid by the amount that the contracting officer, subject to the approval of the Comptroller General, shall find the cost of performing the contract is reduced solely by reason of the contractor not complying with the provisions of such code or codes or related requirements; and the compensation for the performance of the contract shall be increased from that fixed in the contract by the amount that the contracting officer, subject to the approval of the Comptroller General, shall find the cost of performing the contract has been increased solely by reason of compliance with such subsequent Acts of Congress, if any, relating to the performance of contracts with agencies of the United States.

Approved August 29, 1935.

Bitter Root District Act

To amend sections 3 and 4 of the act of July 3, 1930, entitled "An Act for the rehabilitation of the Bitter Root irrigation project, Montana."

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 and directed to negotiate and execute a contract with the Bitter Root Irrigation District, amending as provided herein articles 3 and 6 of the contract dated August 24, 1931, between the United States of America and said irrigation district. The amended contract shall segregate the district's obligation into two components: (1) All money advanced to the district under section 2, subsection (1) of the Act of July 3, 1930, for liquidating bonded and other outstanding indebtedness of said district; and (2) all money advanced or used under section 2, subsections (2) and (3) of said Act for construction, betterment, and repair work. All money advanced under component (1) shall be repaid to the United States within the period fixed in said contract, with interest at 4 per centum per annum until paid: *Provided*, That all interest now due and unpaid on component (1) shall be added to and merged with the principal

sum advanced under that component. Nothing herein contained shall be construed as authorizing a modification in said amendatory contract of the interest charges heretofore paid by the district under the contract of August 24, 1931.

SEC. 2. The amended contract shall provide also that all money advanced or used under section 2, subsections (2) and (3) of the Act of July 3, 1930, shall be repaid to the United States without interest within the period fixed in said contract, and in the case of default in the payment when due of any installment fixed by the Secretary for repayment of money advanced or used under said section 2, subsections (2) and (3), there shall be added to the payment unpaid a penalty of one-half of 1 per centum of the amount unpaid on the 1st day of each month thereafter so long as such default shall continue.

Approved, August 26, 1935.

Rio Grande Canalization

Authorizing construction, operation, and maintenance of Rio Grande canalization project and authorizing appropriation for that purpose

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That upon the completion of the engineering investigation, study, and report to the Secretary of State, as heretofore authorized by Public Resolution Numbered 4, Seventy-fourth Congress, approved February 13, 1935, the Secretary of State, acting through the American Section, International Boundary Commission, United States and Mexico, in order to facilitate compliance with the convention between the United States and Mexico concluded May 21, 1906, providing for the equitable division of the waters of the Rio Grande, and to properly regulate and control, to the fullest extent possible, the water supply for use in the two countries as provided by treaty, is authorized to construct, operate, and maintain, in substantial accordance with the engineering plan contained in said report, a diversion dam in the Rio Grande wholly in the United States, with appurtenant connections to existing irrigation systems, and to acquire by donation, condemnation, or purchase such real and personal property as may be necessary therefor.

SEC. 2. There is authorized to be appropriated the sum of $1,000,000 for the purposes of carrying out the provisions of section 1 hereof, other than for operation and maintenance, including salaries and wages, fees for professional services; rents, travel expenses; per diem in lieu of actual subsistence; printing and binding, law books and books of reference: *Provided,* That the provisions of section 3709 of the Revised Statutes (U. S. C., title 41, sec. 5) shall not apply to any purchase made or service procured when the aggregate amount involved is $100 or less; purchase, exchange, maintenance, repair and operation of motor-propelled passenger- and freight-carrying vehicles; hire with or without personal services, of work animals and animal-drawn and motor-propelled vehicles and equipment; acquisition by donation, condemnation, or purchase of real and personal property, transportation (including drayage) of personal effects of employees upon change of station; telephone, telegraphic, and air-mail communications; rubber boots for official use by employees; ice; equipment, services, supplies, and materials and other such miscellaneous expenses as the Secretary of State may deem necessary properly to carry out the provisions of the Act: *Provided,* That any part of any appropriation made hereunder may be transferred to, for direct expenditure by, the Department of the Interior pursuant to such arrangements therefor as may be from time to time effected between the Secretary of State and the Secretary of the Interior, or as directed by the President of the United States.

Approved, August 29, 1935.

Bonds on United States Contracts

Requiring contracts for the construction, alteration, and repair of any public building or public work of the United States to be accompanied by a performance bond protecting the United States and by an additional bond for the protection of persons furnishing material and labor for the construction, alteration, or repair of said public buildings or public work.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) before any contract, exceeding $2,000 in amount, for the construction, alteration, or repair of any public building or public work of the United States is awarded to any person, such person shall furnish to the United States the following bonds, which shall become binding upon the award of the contract to such person, who is hereinafter designated as "contractor":

(1) A performance bond with a surety or sureties satisfactory to the officer awarding such contract, and in such amount as he shall deem adequate, for the protection of the United States.

(2) A payment bond with a surety or sureties satisfactory to such officer for the protection of all persons supplying labor and material in the prosecution of the work provided for in said contract for the use of each such person. Whenever the total amount payable by the terms of the contract shall be not more than $1,000,000 the said payment bond shall be in a sum of one-half the total amount payable by the terms of the contract. Whenever the total amount payable by the terms of the contract shall be more than $1,000,000 and not more than $5,000,000, the said payment bond shall be in a sum of 40 per centum of the total amount payable by the terms of the contract. Whenever the total amount payable by the terms of the contract shall be more than $5,000,000 the said payment bond shall be in the sum of $2,500,000.

(b) The contracting officer in respect of any contract is authorized to waive the requirement of a performance bond and payment bond for so much of the work under such contract as is to be performed in a foreign country if he finds that it is impracticable for the contractor to furnish such bonds.

(c) Nothing in this section shall be construed to limit the authority of any contracting officer to require a performance bond or other security in addition to those, or in cases other than the cases specified in subsection (a) of this section.

SEC. 2. (a) Every person who has furnished labor or material in the prosecution of the work provided for in such contract, in respect of which a payment bond is furnished under this Act and who has not been paid in full therefor before the expiration of a period of ninety days after the day on which the last of the labor was done or performed by him or material was furnished or supplied by him for which such claim is made, shall have the right to sue on such payment bond for the amount, or the balance thereof, unpaid at the time of institution of such suit and to prosecute said action to final execution and judgment for the sum or sums justly due him: *Provided, however,* That any person having direct contractual relationship with a subcontractor but no contractual relationship express or implied with the contractor furnishing said payment bond shall have a right of action upon the said payment bond upon giving written notice to said contractor within ninety days from the date on which such person did or performed the last of the labor or furnished or supplied the last of the material for which such claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the material was furnished or supplied or for whom the labor was done or performed. Such notice shall be served by mailing the same by registered mail, postage prepaid, in an envelop addressed to the contractor at any place he maintains an office or conducts his business, or his residence, or in any manner in which the United States marshal of the district in which the public improvement is situated is authorized by law to serve summons.

(Continued on p. 200)

The Reclamation Era

Issued monthly by the Bureau of Reclamation, Department of the Interior.

Subscription 75 cents a year to other than water users, payable in advance by check or postal money order drawn in favor of the Bureau of Reclamation.

Special reduced rates are given individual water-user owners or water-users, organizations for mass subscriptions on Federal irrigation projects.

OCTOBER 1935

Colorado Flows Below Lake

Muddy water is issuing from a crystal clear lake at Boulder Dam.

This phenomenon is exciting the curiosity of many of the Bureau of Reclamation's experienced engineers.

Water is being passed around Boulder Dam through one of the diversion tunnels on the Nevada side. The tunnel taps the lake at its bottom. Apparently the stubborn old Colorado River has refused, with a fine disdain for man-made wonders, to leave its old bed, and is flowing down its natural course despite the fact that for 80 miles a lake stands above it.

For several months after the lake began to form, the water passing Boulder Dam was as clear as the lake itself. Recently, however, it began to carry a heavy burden of silt.

While this amazed engineers, it caused them no concern.

They suggest two explanations for the phenomenon of a river flowing 80 miles, under a lake 310 feet deep. One is that the silt laden waters entering the lake many leagues above the dam is heavier than the clear lake water from which the muddy burden has been precipitated and consequently slips along the bottom until it finds the outlet at the dam. The other is that silt has been deposited in the lake until it has reached an unstable level and now is eroding away. This latter explanation also assumes that the river still is flowing at the bottom.

The lake never became cloudy, nor are any currents to be detected at the surface.

In any case when diversion is begun by way of the diversion towers, which are located more than 200 feet above the old river floor, the water will have to clear and remain clear. The river cannot lift the silt off the bottom of the lake, and is able to carry it along now only because the diversion is from the bottom.

Bonds on Contracts

(Continued from p. 199)

(b) Every suit instituted under this section shall be brought in the name of the United States for the use of the person suing, in the United States District Court for any district in which the contract was to be performed and executed, and not elsewhere, irrespective of the amount in controversy in such suit, but no such suit shall be commenced after the expiration of one year after the date of final settlement of such contract. The United States shall not be liable for the payment of any costs or expenses of any such suit.

Sec. 3. The Comptroller General is authorized and directed to furnish to any person making application therefor who submits an affidavit that he has supplied labor or materials for such work and payment therefor has not been made or that he is being sued on any such bond, a certified copy of such bond and the contract for which it was given, which copy shall be prima facie evidence of the contents, execution, and delivery of the original, and, in case final settlement of such contract has been made, a certified statement of the date of such settlement, which shall be conclusive as to such date upon the parties. Applicants shall pay for such certified copies and certified statements such fees as the Comptroller General fixes to cover the cost of preparation thereof.

Sec. 4. The term "person" and the masculine pronoun as used throughout this Act shall include all persons whether individuals, associations, copartnerships, or corporations.

Sec. 5. This act shall take effect upon the expiration of sixty days after the date of its enactment, but shall not apply to any contract awarded pursuant to any invitation for bids issued on or before the date it takes effect, or to any persons or bonds in respect of any such contract. The Act entitled "An Act for the protection of persons furnishing materials and labor for the construction of public works", approved August 13, 1894, as amended (U. S. C., title 40, sec. 270), is repealed, except that such Act shall remain in force with respect to contracts for which invitations for bids have been issued on or before the date this Act takes effect, and to persons or bonds in respect of such contracts.

Approved August 24, 1935.

North Montana Fair

The North Montana Fair which was held at Great Falls during the early days of August, was a financial success. This fair has developed into one of the biggest and best in the entire Northwest. About 167,000 persons paid admission to the grounds. The stock and poultry exhibits were outstanding. The National Hereford show was a prominent feature. The agricultural exhibits were good, but the early date of the fair was a serious handicap in this department.

Visitors to the Boulder Canyon project during the month of August numbered 34,218, traveling in 10,283 cars.

(Cut along this line)

Commissioner,
Bureau of Reclamation,
Washington, D. C.

(Date)_____

Sir: I am enclosing my check [1] (or money order) for 75 cents to pay for a year's subscription to The Reclamation Era.

Very truly yours,

(Name)_____

(Address)_____

_____

Note.—30 cents postal charges should be added for foreign subscriptions.

[1] Do not send stamps.

ENGINEERING

Central Valley Project Approved

The major feature of the $100,000,000 program of work which the Bureau of Reclamation is undertaking under the Works Progress Administration relief plans is the Central Valley project of California. On September 7 the President approved an allocation of $20,000,000, recommended by the Allotment Advisory Board, to start construction of this $170,000,000 project.

The Central Valley project, planned after many years of exhaustive investigations by both Government and State agencies, provides for the orderly development by conservation of the water resources of the Sacramento and San Joaquin Rivers, for the benefit of lands having an insufficient supply. An unequal geographical distribution of the water resources of this semiarid State constitutes the water problem. Storage is contemplated in the Kennett Reservoir, on the upper Sacramento River near Redding, and delivery of part of the surplus water in the Sacramento to the San Joaquin River will be accomplished by a cross canal. Areas along the lower reaches of the San Joaquin now short of water and drying up will be furnished a supplemental supply of irrigation water by pumping. Storage on the San Joaquin will be provided in the Friant Reservoir. The area of new lands to be brought into cultivation by the ultimate project will not exceed 50,000 acres.

The ultimate Central Valley project, as outlined in a report of August 1, 1934, by the Water Project Authority of the State of California, comprises the following construction features: Kennett Dam and Reservoir, Kennett power plant, Kennett power transmission line and substation, Keswick afterbay Dam and Reservoir, Keswick power plant, Sacramento-San Joaquin delta cross channel, Contra Costa conduit, Friant Dam and Reservoir, Friant power plant, Madera Canal, Friant-Kern Canal, and San Joaquin pumping system.

PROCEDURE UNCERTAIN

Reclamation Bureau officials and engineers now are studying the best method of procedure in construction of the project. No conclusions have been reached as to the features to be first undertaken. One proposal made would entail development of the project by units. Under this plan the Friant Dam, which would cost $14,000,000, and possibly other features would be begun first. Among other features being considered under this proposal are the Madera Canal, $1,500,000; Friant-Kern Canal, $4,500,000; Contra Costa Conduit, $2,500,000; steam plant and transmission lines, $3,500,000. Other methods have been proposed and are being considered.

WALKER R. YOUNG, supervising engineer during the construction of Boulder Dam, has been designated by Secretary of the Interior Harold L. Ickes, and Dr. Elwood Mead, Reclamation Commissioner, as engineer in charge of the Bureau of Reclamation's great Central Valley project, California, for which an allotment of $20,000,000 has been made.

Mr. Young will leave Boulder City for California to make plans for getting construction of the project under way as soon as he can dispose of matters on his desk and turn his office over to Ralph Lowry, field engineer, who will complete the job at Boulder.

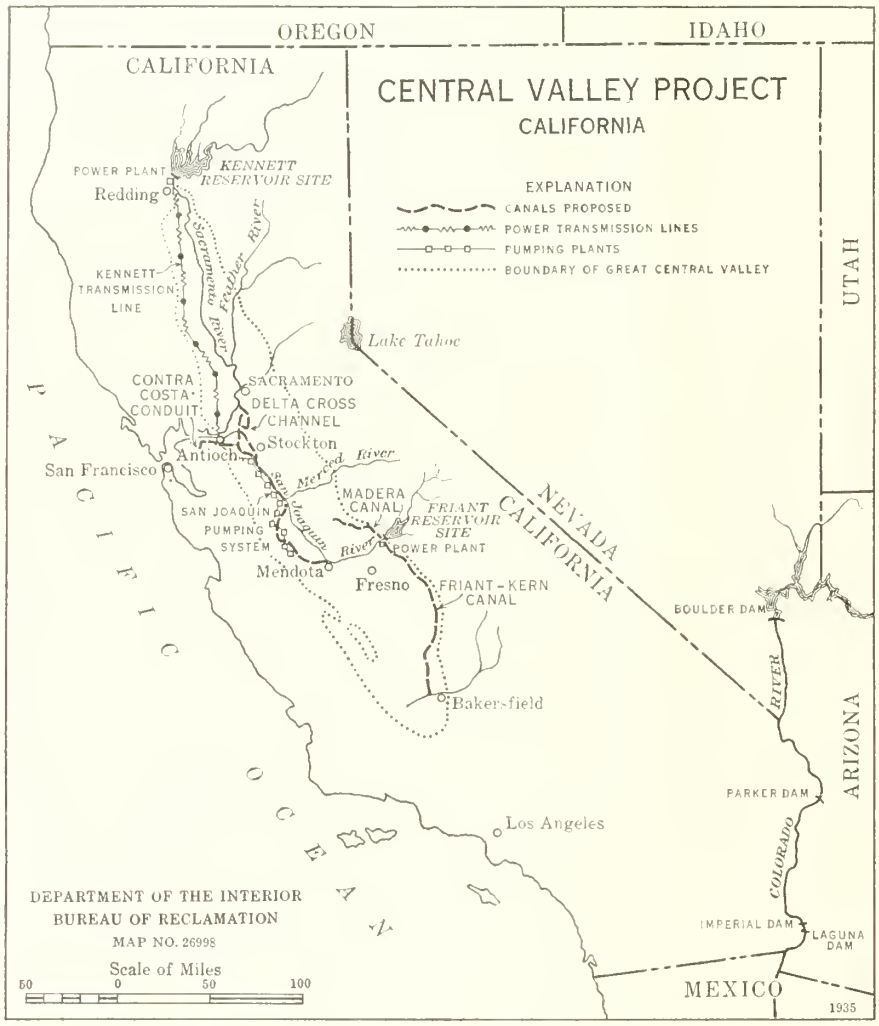
The first preliminary work to be undertaken will be the signing of the necessary repayment contract and obtaining rights-of-way. The features to be constructed will be decided after inspection on the field by the Bureau of Reclamation.

Friant Reservoir on the San Joaquin River in Madera and Fresno Counties, in accordance with preliminary plans, calls for a 252-foot concrete gravity-type structure about 1 mile above the town of Friant. The dam will have a crest length of 3,800 feet, a thickness of 190 feet at the base, and contain 1,328,000 cubic yards of concrete. The capacity of the reservoir will be 400,000 acre-feet (270,000 acre-feet effective storage) and the lake formed by the dam will be 14 miles in length and cover 4,200 acres. A 2-unit power plant of 30,000 kilovolt-ampere capacity is planned. The Madera Canal will be 35 miles in length, extending from Friant Dam to the Chowchilla River, with capacities ranging from 1,500 to 500 cubic feet per second. This canal will deliver gravity water to lands now irrigated but requiring additional water supply.

The Friant-Kern Canal in Fresno, Tulare, and Kern Counties will be 157 miles in length and extend from the Friant Dam to Kern River. Its capacity will vary from 3,000 to 1,500 cubic feet per second. Approximately 12,000,000 cubic yards of excavation will be necessary. The Contra Costa conduit will provide a supply of fresh water from the San Joaquin Delta to cities in the Suisun Bay area which have been damaged by the encroachment of salt water.

The Central Valley of California is 500 miles long and 40 miles wide. It is entirely surrounded by mountains, except for the break in the wall through which the Sacramento River empties into San Francisco Bay. Within this inland valley lie a high percentage of the agriculture lands of the State. The valley is highly developed. In it approximately 90 percent of the grape crop of the United States is produced. From it comes virtually all the Nation's raisins and a large part of its wines. Citrus fruits, early vegetables and melons, and dairy products produced for the San Francisco metropolitan area form other important agricultural industries within the valley.

When development began in the San Joaquin Valley, farmers believed the underground water supply was inexhaustible. A falling water table in recent years demonstrated that the underground reservoir could be, and, in fact, was being drained. In some sections wells have failed entirely, and in other sections the lift has become so great that to pump water has been uneconomical. The section most desperately in need of the supplemental water, that can be provided through construction of Friant Dam, encompasses many of the most highly developed vineyards and groves in the State.



Benefits from construction and operation of the project are many. Navigability of the Sacramento River will be restored from its mouth to Red Bluff, a distance of 250 miles. Irrigable lands along the Sacramento River will receive an assured water supply, and also additional flood protection. Maintenance of higher levels will mean a reduction of pumping charges for irrigation water. Dependable water supplies will be assured municipalities in the Sacramento Valley. The Sacramento-San Joaquin delta will be freed from the salt water menace and its 400,000 acres of producing lands will have ample water. Manufacturing industries and agricultural areas in Contra Costa County will obtain adequate supplies of fresh water. Navigation on the San Joaquin River can be restored for 86 miles above Stockton by incorporating locks in the dams proposed for the San Joaquin pumping system. Lands now irrigated from the San Joaquin will benefit by reduced pumping charges resulting from higher water levels. The 400,000 acres of highly developed lands in the upper San Joaquin Valley now suffering from water shortage will receive an adequate supplemental supply. Water released in the Sacramento River for irrigation, navigation, and salinity control will be utilized for the development of power to be distributed to agricultural, domestic, industrial, and municipal consumers.

The Central Valley project will rank along with Boulder Canyon and Columbia Basin as one of the most important conservation projects undertaken by the Government.

Notes For Contractors

Columbia Basin project, Washington.—The Secretary on September 5 approved awards of contracts for furnishing 4,220,000 barrels of cement for the Grand Coulee dam under Specifications No. 641, for which bids were opened at Denver on August 20. This is said to be the largest single purchase of cement ever made by the Government. Bids were requested on supplying 720,000 barrels of either modified portland cement or standard portland cement (Schedule 1, items 1 and 2, alternate); and either 3,500,000 barrels of modified portland cement or 650,000 tons of portland cement clinker (schedule 2, items 3 and 4, alternate). Awards were made on September 5 as follows: Schedule 1, item 1, Northwestern Portland Cement Co., Seattle, Wash., 75,000 barrels, $1.3796 f. o. b. Grotto; Superior Portland Cement Co., Inc., Seattle, Wash., 350,000 barrels, $1.3796 f. o. b. Concrete or Seattle; Spokane Portland Cement Co., Spokane, Wash., 70,000 barrels, $1.53 f. o. b. Irvin; Lehigh Portland Cement Co., Spokane, Wash., 100,000 barrels, $1.3796 f. o. b. Metaline Falls; Olympic Portland Cement Co., Ltd., Seattle, Wash., 125,000 barrels, $1.38 f. o. b. Bellingham, Wash. Under Schedule 2, item 3, the following awards were made: Northwestern Portland Cement Co., 375,000 barrels at $1.3796; Superior Portland Cement Co., Inc., 1,650,000 barrels, at $1.3796; Spokane Portland Cement Co., 330,000 barrels at $1.53; Lehigh Portland Cement Co., 500,000 barrels at $1.3796; and Olympic Portland Cement Co., Ltd., 645,000 barrels at $1.38. All bids are subject to a discount of 10 cents per barrel. The cement will cost the Government at destination approximately $8,000,000.

All-American Canal project, Arizona-California.—Twenty-five manufacturers submitted bids on furnishing miscellaneous electrical equipment for the substation at the Imperial dam site (Specifications No. 704–D). Awards of contracts have been made to the following: Item No. 1, three 667 kilovolt-ampere, 33,000/2,400 volt transformers, The Standard Transformer Co., Warren, Ohio, $7,203.85 f. o. b. Warren; item No. 2, one 34.5 kilovolt., 3-phase lightn ng arrester, General Electric Co., Schenectady, N. Y., $966.15 f. o. b. Yuma, Ariz.; item No. 3, two 34.5 kilovolt, 3 pole, air break switches, Delta-Star Electric Co., Chicago, Ill., $460.00 f. o. b. Yuma, Ariz.; item No. 4, three 34.5 kilovolt expulsion fuses, Bowie Switch Co., San Francisco, Calif., $131.00 f. o. b. Yuma, Ariz.; item No. 5, one outdoor switching and metering unit, no award. Bids were opened at Denver on August 14.

On August 29 the Secretary approved award of contract to the Dravo Contracting Co. of Pittsburgh, Pa., for furnishing four roller gates, 75 by 23 feet, under Specifications No. 631, for the Imperial dam at their bid of $101,400.

Uncompahgre project, Colorado.—A contract was awarded on September 6 to Fredrickson and Watson Construction Co. and Fredrickson Bros. of Oakland, Calif., for construction of canal lining and structures on the South and West canals (Specifications No. 636) at their bid of $88,772.50. They were the second low bidder, Henry Shore of Grand Junction, Colo., with a bid of $59,998 being unable to qualify. Other bids received were Barnard-Curtis Co. and Dan Teters & Co., Ogden, Utah, $99,460; J. B. Claybaugh, Grand Junction, Colo., $103,348; and Platt Rogers Inc., Pueblo, Colo., $129,192.50.

Boulder Canyon project, Arizona-Nevada.—The following bids were received on August 22 for furnishing distribution cabinets for downstream tunnel plugs under Specifications No. 709–D; Wolfe & Mann Mfg. Co., Baltimore, Md., $4,272 f. o. b. Boulder City, Nev.; Laganke Electric Co., Cleveland, Ohio, $4,480 f. o. b. Cleveland, Ohio, discount 1 percent; Westinghouse Electric & Mfg. Co., Denver, Colo., $7,812 f. o. b. Boulder City; The Mine & Smelter Supply Co., Denver, Colo., $7,812 f. o. b. Boulder City; General Electric Supply Co., Los Angeles, Calif., $7,842 f. o. b. Boulder City, discount 2 percent. Contract was awarded on September 16 to the Wolfe & Mann Mfg. Co.

As a result of a recent Comptroller General's decision, Cutler Hammer Inc., Milwaukee, Wis., on September 4 was awarded the contract for furnishing 460-volt and 115-volt alternating current control equipment under schedule 4, Specifications No. 601. Their bid was $126,686 f. o. b. Milwaukee.

Wolfe & Mann Mfg. Co. of Baltimore, Md., submitted low bid of $2,213 for furnishing a relay board for the 287.5 kilovolt switch yard at the Boulder power plant (Specifications No. 710–D). Other bids were as follows: Westinghouse Electric & Mfg. Co., Denver, Colo., $4,200; Mine & Smelter Supply Co., Denver, Colo., $4,200; and General Electric Co., Schenectady, N. Y., $4,315. Contract was awarded to the Baltimore concern on September 16.

Twenty-seven manufacturers submitted bids on furnishing structural steel supports, gratings and handrails for the power house (Specifications No. 640) opening at Denver on August 29. Low bids under each item were as follows: item 1, supports, Arthur J. O'Leary & Son Co., Chicago, Ill., $11,100; John W. Beam, Denver, Colo., $11,275 f. o. b. Peotone, Ill.; Reliance Steel Products Co., Rankin, Pa., $14,265 f. o. b. Boulder City; item 2, gratings, Gary Structural Steel Co., Gary, Ind., $12,624; Arthur J. O'Leary & Son Co., Chicago, Ill., $13,225 f. o. b. Boulder City; items 1 and 2, Reliance Steel Products Co., Rankin, Pa., $26,460 f. o. b. Boulder City; item 3, handrails, Crane O'Fallon Co., Denver, Colo., $3,427.15 f. o. b. Boulder City; Pennsylvania Iron & Steel Co., Los Angeles, Calif., $3,706 f. o. b. Boulder City. The lowest bids considering net delivered cost to the Government, were those of the Reliance Steel Products Co. on items 1 and 2, and Crane O'Fallon Co. on item 3.

The Secretary on September 4 approved award of contract to the American Bridge Co., Pittsburgh, Pa. for furnishing and delivering transmission towers and switchyard structures for circuits 2, 4, and 5 at the power plant (Specifications No. 634). The bid was $69,218. Erection of structures will be done by the Government.

Contracts for supplying porcelain insulators for the power plant, under Invitation No. A–23034–A, were awarded on September 4 to the following: Porcelain Products, Inc., Parkersburg, W. Va., items 1 and 2, $13,430; Jeffery–De Witt Insulator Co., Kenova, W. Va., item 3, $1,397.40.

Joshua Hendy Iron Works, San Francisco, Calif., has been awarded the contract for furnishing cylinder-gate-hoist motors for intake towers at their bid of $2,217.60 f. o. b. Boulder City on item 2, Specifications No. 707–D, bids opened August 19. Other bidders were the General Electric Co. and the Graybar Electric Co.

Bids received at Denver on August 26 for supplying lifting frames and hoist installation equipment (Specifications No. 711–D) were as follows: John W. Beam, Denver, Colo., $2,000; Steacy-Schmidt Mfg. Co., York, Pa., $2,400; California Steel Products Co., San Francisco, Calif., $2,780; Minneapolis-Moline Power Implement Co., Minneapolis, Minn., $2,450; Consolidated Steel Corporation, Ltd., Los Angeles, Calif., $2,000; Schrader Iron Works, Inc., San Francisco, Calif., $2,911; Long Beach Iron Works, Long Beach, Calif., $2,433.50. The Consolidated Steel Corporation has been awarded the contract.

Five bids were opened at Denver on September 9, under Specifications No. 639, for furnishing and delivering two 115,000-horsepower hydraulic turbines and governors for units N–5 and N–6 of the Boulder power plant. The bids, with shipment by rail or water respectively, were as follows: Schedule 1, turbines, Pelton Water Wheel Co., San Francisco, Calif., $551,000 or $556,000 f. o. b. Eddystone, Pa.; Newport News Shipbuilding Co., New York, N. Y., $568,675 or 573,845 f. o. b. Newport News, Va.; S. Morgan Smith Co., York, Pa., $736,175 or $740,-175; Allis-Chalmers Mfg. Co., Milwaukee, Wis., $739,800 or $744,495; schedule 2, governors, Woodward Governor Co., Rockford, Ill., $30,800 or $31,840, spare parts $500. The Pelton Co., low bidder, offers to supply spare parts for an additional $27,399.50. The two turbines will weigh 2,600,000 pounds.

The General Electric Co., Schenectady, N. Y., was the low bidder on furnishing and installing two 82,500 kilovolt-ampere generators for units N–5 and N–6 of the Boulder power plant, bids opened at Denver on September 9, under Specifications No. 638. Three bids received were as follows: General Electric Co., $1,342,000; Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., $1,389,000; Allis-Chalmers Mfg. Co., Milwaukee, Wis., $1,423,880. The General Electric Co., low bidder, will supply spare parts for an additional $52,195. Weight of the two generating units is 4,300,000 pounds. Of the 4 main generating units now being installed in the power plant, General Electric is supplying 2 and Westinghouse 2.

Bids were opened at Denver on September 9 for furnishing a Diesel-engine-powered towboat (Specifications No. 717–D) for the Boulder reservoir. The following were received: Harbor Boat Building Co., Terminal Island, Calif., $17,975; Tregoning Boat Co., Seattle, Wash., $17,250, alternate $17,770; William M. Whiting, Long Beach, Calif., $21,985; Boat Service Co., Inc., New Orleans, La., $18,840, alternate $19,340; S. E. Sagstad Boat Works, Seattle, Wash., $17,055. Based on delivered cost, the Tregoning Boat Co. is low bidder.

Owyhee project, Oregon-Idaho.—J. A. Terteling & Sons, Boise, Idaho, submitted the low bid of $1,132.50 for constructing an operating bridge at the Owyhee River siphon (Specifications No. 519–0) and was awarded the contract. Other bids were: Geo. B. Henly, Nyssa, Oreg., $1,800 and Morrison-Knudsen Co. Inc., Boise, Idaho, $2,280.

The following bids were opened at Ontario on August 21 under Specifications No. 708–D for building structures on North Canal laterals: H. J. Adler Co., Tacoma, Wash., $14,293.50; John Gardner, Klamath Falls, Oreg., $14,579; David A. Richardson, Nyssa, Oreg., $16,101; Fife & Co., Adrian, Oreg., $16,652.50; J. A. Terteling & Sons, Boise, Idaho, $17,124; Geo. B. Henly, Nyssa, Oreg., $20,642. The Adler company was awarded the contract on September 9.

Frenchtown project, Montana.—The first construction job on the Frenchtown project, earthwork on Main Canal (Specifications No. 706–D) attracted 19 bidders at the opening on August 21, with the following bids: Nick Burggraf, Inc., Idaho Falls, Idaho, $19,796.30; Dan Teters Co., Ogden, Utah, $23,254.50; J. A. Terteling & Sons, Inc., Boise, Idaho, $24,990; E. C. Powell, Missoula, Mont., $25,802.49; Barnard-Curtiss Co., Philipsburg, Mont., $26,952.30; Tomlinson-Arkwright Construction Co., Great Falls, Mont., $28,540; The Lawler Corporation, Butte, Mont., $30,702; T. G. Rowland, Salt Lake City, Utah, $30,713.10; Morrison & Knudson Co. Boise, Idaho, $33,567; Threet Bros. Construction Co., Lovell, Wyo., $35,-768.50; S. J. Groves & Sons Co., Minneapolis, Minn., $37,735; N. A. Begerstrom, Spokane, Wash., $39,424; Poston Bros., Kalispell, Mont., $39,542; Clifton & Applegate, Spokane, Wash., $41,240.20; P. L. Crooks & Co., Inc., Portland, Oreg., $41,694; Jerome C. Boespflug, Miles City, Mont., $44,353.50; Basil Hunt, Butte,

Mont., $44,815; Connolly Construction Co., St. Paul, Minn., $45,813.70; Siems-Spokane Co., Spokane, Wash., $49,115. Contract was awarded to the low bidder, Nick Burggraf Inc.

Ogden River project, Utah.—Fifteen manufacturers bid on supplying radial gates and miscellaneous metal work for the spillway and outlet works at Pine View Dam, under Specifications No. 712–D, bids opened at Denver on August 26. The Worden-Allen Co., Milwaukee, Wis., was low on item 1 with a bid of $2,220 f. o. b. Ogden and the Roanoke Iron Works, Inc., Roanoke, Va., submitted low bid of $1,200 f. o. b. Roanoke on item 2. Contracts were awarded to the successful bidders.

Bids opened August 29 for radial gate hoists and high-pressure gates for spillway and outlet works at Pine View Dam (Specifications No. 714–D), were as follows: Item 1, hoists, Commercial Iron Works, Portland, Oreg., $2,695; Thomas Spacing Machine Co., Glenshaw, Pa., $3,320; Long Beach Iron Works, Long Beach, Calif., $2,850; John W. Beam, Denver, Colo., $3,500; Beall Pipe & Tank Corporation, Portland, Oreg., $3,033; Lake Shore Engine Works, Marquette, Mich., $4,650; Western Foundry Co., Portland, Oreg., $2,679; Rosedale Foundry & Machine Co., Pittsburgh, Pa., $3,250; Baxter Foundry & Machine Works, Boise, Idaho, $3,244.04 f. o. b. Ogden; Ogden Iron Works Co., Ogden, Utah, $3,555.50; item 2, gates, Hardie-Tynes Mfg. Co., Birmingham, Ala., $17,995; Joshua Hendy Iron Works, Sunnyvale, Calif., $20,029; Thomas Spacing Machine Co., Glenshaw, Pa., $20,980; Rosedale Foundry & Machine Co., Pittsburgh, Pa., $19,100; Steacy-Schmidt Mfg. Co., York, Pa., $19,730. Low bids were those of the Western Foundry Co. on Item 1 and Hardie-Tynes Mfg. Co. on Item 2. Contracts were awarded on September 17 and 24, respectively.

Four companies submitted bids on furnishing precast reinforced concrete pipe, as called for in Specifications No. 716–D, bids opened at Denver on September 3, schedule 1, Utah Concrete Products Corporation, Salt Lake City, Utah, $15,162.87; Collins Concrete & Steel Pipe Co., Portland, Oreg., $18,621.62; schedule 3, Utah Concrete Products Co., Salt Lake City, Utah, $19,872.05; schedule 4, Lock Joint Pipe Co., Denver, Colo., $28,213.70. The Utah and Collins bids did not conform to specification requirements, and it is proposed to reject all bids and readvertise.

Humboldt project, Nevada.—Bids were received from 25 manufacturers on August 15 for furnishing radial gates, outlet pipes and miscellaneous metal work for spillway and outlet works at Rye Patch Dam, under Specifications No. 703–D. The three low bidders under each item were as follows: Item 1, radial gates, Pacific Car & Foundry Co., Seattle, Wash., $4,050 f. o. b. Renton; Mississippi Valley Structural Steel Co., Decatur, Ill., $3,942; American Bridge Co., Denver, Colo., $5,247 f. o. b. Rye Patch; item 2, outlet pipes, Minneapolis-Moline Power Implement Co., Minneapolis, Minn., $3,135; McClintic-Marshall Corporation, Bethlehem, Pa., $3,366 f. o. b. Chicago; Consolidated Steel Corporation Ltd., Los Angeles, Calif., $3,991; item 3, miscellaneous materials, John W. Beam, Denver, Colo., $1,145; California Steel Products Co., San Francisco, Calif., $1,400; Mississippi Valley Structural Steel Co., Decatur, Ill., $1,180. Contracts were awarded as follows: Item 1, Pacific Car and Foundry Co.; item 2, McClintic-Marshall Corporation; item 3, John W. Beam.

On September 4 bids were opened at Denver for furnishing radial gate hoists and high-pressure gates for spillway and outlet works at Rye Patch Dam (Specifications No. 713–D). The following bids were submitted for items 1 (gate hoists) and 2 (gates) respectively: Rosedale Foundry & Machine Co., Pittsburgh, Pa., $5,700 and $14,100; Ottumwa Iron Works, Ottumwa, Iowa, no bid and $11,200; Ogden Iron Works Co., Ogden, Utah, $6,788 and no bid; Commercial Iron Works, Portland, Oreg., $5,352 and $10,723, combination bid $15,673; Western Foundry Co., Portland, Oreg., $4,297 and $11,025; Hardie-Tynes Mfg. Co., Birmingham, Ala., no bid and $16,890; Joshua Hendy Iron Works, San Francisco, Calif., no bid and $16,400 f. o.b. Sunnyvale; Lake Shore Engine Works, Marquette, Mich., $8,100 and no bid; Baxter Foundry & Machine Works, Boise, Idaho, $6,204.27 f. o. b. Rye Patch and no bid; Long Beach Iron Works, Long Beach, Calif., $6,425 and $13,488, combination bid $19,600; Thomas Spacing Machine Co., Pittsburgh, Pa., $6,260 and $15,250, combination bid $21,200, all f. o. b. Glenshaw. Contracts were awarded to the Western Foundry Co. (item 1) and Commercial Iron Works (item 2) on September 13 and 21, respectively.

Yakima project, Washington.—Bids were opened at Yakima on September 5 for constructing parapet wall and curb and finishing crest of embankment at Cle Elum Dam (Specifications No. 702–D). The three low bidders were the following: Newton Construction Co., Seattle, Wash., $6,169; Hallstrom & Hallstrom, Seattle, Wash., $6,667; Yakima Cement Products Co., Yakima, Wash., $7,231.

Casper-Alcova project, Wyoming.—Two bids were received at Casper on September 17, under Specifications No. 719–D, for constructing a warehouse building at the Seminoe Dam site, as follows: Dutton, Kendall & Hunt, Inc., Denver, Colo., $12,435.50; the Jos. Sebacher Construction Co., Garden City, Kans., $17,828.80. The bids have been taken under advisement.

The following bids were received at Denver on September 16, under Specifications No. 718–D, for furnishing materials for a steel warehouse at the Government camp at Seminoe Dam site: Mississippi Valley Structural Steel Co., Melrose Park, Ill., $7,095; Omaha Steel Works, Omaha, Nebr., $9,200 f. o. b. Parco; Midwest Steel & Iron Works Co., Denver, Colo., $9,247 f. o. b. Parco; McClintic-Marshall Corporation, Chicago, Ill., $7,995; Ingalls Iron Works Co., Birmingham, Ala., $9,400 f. o. b. Parco; Pittsburgh-Des Moines Steel Co., Des Moines, Iowa, $9,643 f. o. b. Parco; Wisconsin Bridge & Iron Co., Milwaukee, Wis., $8,650; Lakeside Bridge & Steel Co., Milwaukee, Wis., $9,759, f. o. b. Parco; Belmont Iron Works, Philadelphia, Pa., $10,474 f. o. b. Parco; John W. Beam, Denver, Colo., $9,100 f. o. b. Peotone, Ill.; Minneapolis-Moline Power Implement Co., $9,490; American Bridge Co., Denver, Colo., $11,689 f. o. b Parco.

New Maps Available

The Bureau of Reclamation has just issued several maps which may be obtained upon application to the Bureau free or at the price indicated, payment to be made in advance by check or money order drawn to the Bureau of Reclamation. The maps are as follows:

Map No. 26170, Boulder Canyon Reservoir and vicinity, size 8 by 10½ inches, price 5 cents (1935).

Map No. 26288, Uncompahgre Project, Taylor Park Reservoir, Colo., size 8 by 10½ inches, free (1935).

Map No. 25190, All American Canal System (colors), size 10 by 14¾ inches, price 10 cents (1935).

Map No. 25190–A, All American Canal System (colors) size 21 by 29 inches, price 25 cents (1935).

Belle Fourche Fairs

Sugar Day at Vale, S. Dak., Belle Fourche project, on August 23, attracted a large crowd of local farmers who listened to speakers of prominence as they discussed the agricultural problems and political topics of the day. The Butte County Fair was held at Nisland during the closing days of the month and the usual exhibits along the lines of school work, home economics, vegetables, livestock, and other products were displayed attractively, as an aid to prospective better farming. A project bect tour was held on August 26, when many growers took advantage of the opportunity to study the methods employed on different farms and to hear the explanations from authorities on the results achieved.

Progress of Engineering Investigations of Projects

Silt survey, Colorado River, Ariz.-Calif.—The work during the month consisted of making cross-sections of the Colorado River below the Parker dam site at approximately 5-mile intervals. Three cross-sections were completed during the month, making a total of 18 to date. Data on the existing intake for the Palo Verde project were assembled and some office work was performed in plotting up the completed river sections.

Northern transmountain diversion, Colo.—Five triangulation parties are in the field. Tripods have been erected on United States Geological Survey and United States Coast and Geodetic Survey stations. The points selected for primary stations have been occupied. Location of several secondary traverse points have been determined for use on the plane-table sheets. Areas on which topography is to be taken have been selected and laid out for plane-table sheets. A topography party has started on the Granby Reservoir site. Two level parties are working in the Estes Park area. An associate geologist and an assistant have begun work examining the surface geology at each portal and along the line of prospective tunnel sites.

Upper Snake River storage, Idaho.—A report on the enlargement of American Falls Reservoir is in preparation and preliminary designs and estimates for the Eagle Rock power development were completed.

Buffalo Rapids, Mont.—A field party made a transit and stadia traverse for a canal to furnish a supplemental supply to the Tongue-Yellowstone irrigation district, near Miles City, by pumping from the Yellowstone River. Preliminary designs and cost estimates for the diversion dam, Harris Creek power plant, main canal, pumping plants and main laterals were prepared and maps and drawings reproduced for inclusion in the report. A study was made of the prospective power market in the vicinity of the project to determine the rate of growth of the power load and the probable value of the surplus energy at the Harris Creek power site.

North Platte Valley, Nebr.—A field reconnaissance trip was made of the Platte Valley in Nebraska to obtain data on irrigable area and possible extensions of present irrigation systems. Data on electrical output in eastern Nebraska were assembled and studies made to determine the probable power market and rates at which the electrical energy to be generated by the proposed Tri-County project could be sold. A preliminary report and review of the general irrigation situation in Nebraska and of the Tri-County project was prepared. A geological inspection of the Belmar, Paxton, and Lemoyne sites and adjacent territory was made. Drilling at various dam sites continued. Hole no. 3, at the Belmar site, was extended from 75 to 154 feet, revealing Brule clay at 110 feet. Hole no. 4, at the foot of the slope, was 111 feet deep and showed Brule clay at 70 feet. Drilling at the Lemoyne site was begun and hole no. 1, located on the north bank of the river, was 126 feet deep and revealed Brule clay at 77 feet. Hole no. 2, located about 1 mile north of the river, was 145 feet deep and showed Brule clay at 100 feet. The Paxton site was drilled with two holes which revealed Brule clay at 95 to 100 feet.

Deschutes, Oreg.—Surveys were made on the feeder canal to Wikiup Reservoir, the Crescent Creek diversion, the Little Deschutes diversion, the Wikiup dam site, Benham Falls dam site "G", and the Metolius dam site. Alignment and profile on the feeder canal amounted to 4.12 miles in August, and a total to date since May of 25 miles. Canal topography amounted to 17.32 miles. Test pits along the canal line totaled 47 in number to date and averaged 12 to 15 feet in depth and usually to bedrock. Detailed topographic sheets were completed of Wikiup dam site no. 4 extension, East Wikiup dike, Crescent Creek and Little Deschutes diversions. Benham Falls survey consisted of 20 test pits at dam site "G." Bedrock was found in 14 of them at about 5 to 8 feet. Fourteen holes at 14- to 16-foot depth at a point 0.3 mile above dam site "G" yielded water at 4 to 6 feet and did not reach bedrock. A survey was made of the Metolius dam site to obtain a profile. A closed circuit level line was carried in from a B. M. at the mouth of the Metolius River 1.5 miles distant. The canyon walls are about 1,000 feet high and very steep.

Grande Ronde, Oreg.—The field work on these investigations was discontinued, and a progress report is in course of preparation.

Southern Nevada, Nev.—Field work on these investigations was completed during the month and the preparation of soil and land classification maps is in progress.

Salt Lake Basin, Utah.—Work on the Currant Creek investigations consisted of extending and interpolating fragmentary discharge records for Currant Creek to determine the water available for the Strawberry Reservoir with the proposed lower Currant Creek feeder canal.

North Platte River, Wyo.—A study was made of the operation of the Seminoe Reservoir with a revised tailwater elevation and a firm power output of 15,000 kilowatts for the period beginning May 1905 and extending into the future to March 1936. In this study due allowance was made for storage drafts, for downstream irrigation purposes, on the Seminoe and Pathfinder Reservoirs.

Colorado River Basin.—Land classification surveys were continued and work was started in the vicinity of Hot Sulphur Springs, Kremmling and Granby, Colo. Approximately 10 sections have been covered by land classification and some 8 sections have been included in the irrigated area survey. Corners have been flagged on about 12 square miles.

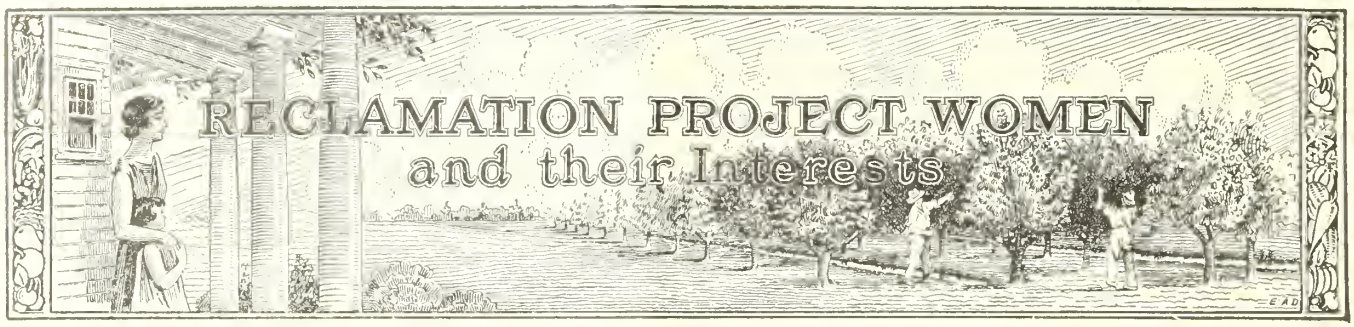
Shipments from Yakima Valley

The Yakima Valley shipped during the 1934–35 season ending June 30, a total of 25,199 carloads of fruit and vegetables, composed of 18,428 cars of fruit and 6,771 cars of vegetables. Of the fruit shipments, 12,476 cars were apples, an increase of 2,560 cars over the 1933 season. During the same period the export from the Yakima Valley through the port of Seattle amounted to 1,645,660 boxes of apples as compared with 2,402,191 boxes the previous season.

The cherry harvest was practically completed by the middle of the month, and the crop amounted to 279 cars for the season. Only 32 cars of apricots were handled by shippers this season at an average price of $40 a ton, as compared with 204 cars a year ago at a price of $30 a ton. The balance of this season's crop was taken by cannery interests at an average price of $40 per ton. Late in the month, cannery interests were offering $40 per ton for Elberta peaches. Peaches not canned locally were shipped to outside plants for processing. The crop is estimated at double last year's. The first car of Bartlett pears from the valley was shipped to Canada near the end of the month. Prices on pears for canning have been announced by the California Pear Growers Protective League at $40 a ton for no. 1 and $25 a ton for the no. 2 grade.

An average-sized crop of new potatoes has been produced, netting growers around Sunnyside about $6 a ton and sacks. A total of 210 cars of potatoes had been shipped by the end of the month. Shipments of asparagus continued into July. This crop brought growers an aggregate of $100,000 for a tonnage of more than 2,000,000 pounds.

A community fair was held at Pavillion, Wyo., Riverton project, on August 31, at which some very credible exhibits were shown.



The Horse Comes Back

By Mrs. Frankie B. Priest [1]

IF 14 MEN and a boy, working in a white heat of enthusiasm, can accomplish what 1 good woman has at Avon, N. Y., Yuma Valley is started in a fair way toward becoming the Genesee Valley of the West. The above figures are not an actual count but are made large enough to take in the members of three polo teams—the Whites, the Blues, and McDaniel's Gold Nugget team, a few interested backers, and the boy may be a different one every hour; for practically every boy in Yuma Valley who can get his hands on a horse is standing by at all times to see if there is some bit he can do for his polo-playing heroes.

The Yuma Valley Polo Association is the outcome of a group of neighbor farmers and cattle men, who used to ride their horses each Sunday morning to a field adjoining a slaughter pen near Somerton and spend several hours practicing on what was probably some of the poorest polo that was ever turned out by expert horsemen. From this group was organized our first team, the Yuma Whites, which for several years has been one of the outstanding teams of the Southwest, both for its polo and sportsmanship. A year ago the players near Yuma organized the Yuma Blues. This furnished competition and incentive, and improved the class of our polo by leaps and bounds. Our newest team is composed of the 4 sons of one or our largest produce growers, who, by their enthusiastic sportsmanship and high class of polo ponies, are doing much to spur the enthusiasm of every one connected with polo. During the last season, out of a total of 14 games played with the best teams in this section, we won 10, lost 3, and tied 1.

A BIT OF ACTION

POLO PONY AND COLT

ARMY OFFICERS ASSIST

Added to this local army, the standard of our horses and horsemanship is rapidly being improved by the friendship, advice, and assistance of such men as Col. Pierre Lorillard, Jr., president of American

(Continued on p. 207)

[1] Widow of the late Ray M. Priest, who at the time of his death in July 1934 was construction engineer, All-American Canal, and prior to that, superintendent of the Yuma project, where he began his work with the Reclamation Bureau in 1903, serving continuously until his death in 1934.

Horse Comes Back

(Continued from p. 206)

Remount Association; Capt. E. M. Daniels, officer in charge of War Department Remount Purchasing and Breeding at Colorado Springs, Colo.; Col. John A. Barry, United States Army; and Major O. I. Holman.

Two years ago the Remount Association of the United States War Department sent us Frehand, a chestnut stallion, sire High Time, dam Amanuensis. From this horse and another thoroughbred stallion, Paul Hirkensteen, locally owned, Yuma Valley now boasts of approximately 75 colts out of cold-blooded mares. This September, the Remount Association has sent us another stallion, The Bohemian, sire Jim Goffney, dam Kittenish (imported). This stallion has been run in the United States, England, and France. By breeding our little half-breeds to him, we are soon going to have a class of saddle stock that is second to none. I only wish I could show you a movie of six of these baby colts that I saw recently, grazing and frisking beside their mothers in the field of one modest Yuma citizen.

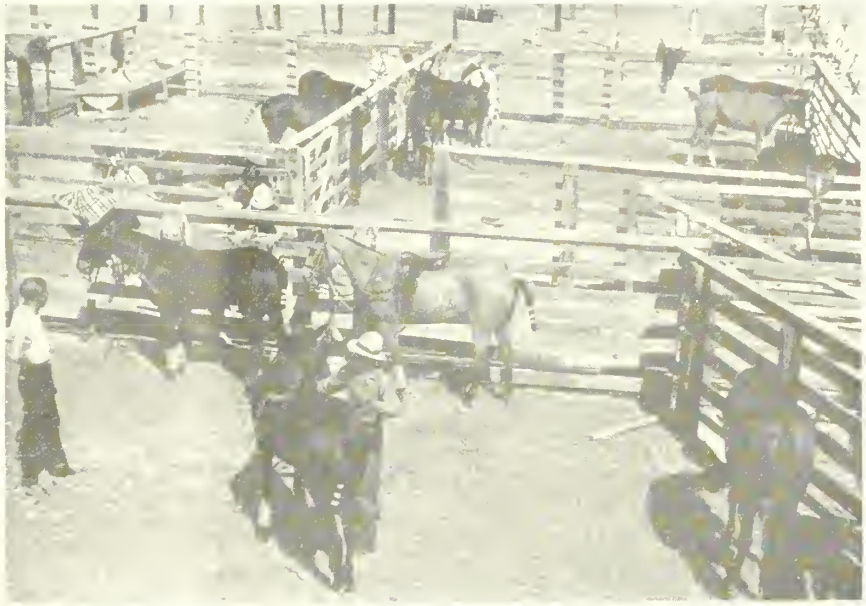
Besides giving a high grade of polo, and furthering the interest in breeding and training horses, the Yuma Valley Polo Association has sponsored two annual horse shows, and has definite plans for a 1936 race meet. The first horse show had 232 entries, only 4 of which were foreigners, and 256 entries with 6 foreigners in the second. Col. John A Barry, recognized as one of the best horse-show judges in the United States, was in charge of each show. Even more interesting than our horses to Colonel Barry was the class of young horsemen and horsewomen, ranging in age from 6 to 16, who are being so steeped in horse lore that they will know how to appreciate and derive the greatest enjoyment from their heritage of fine horses.

A Problem for the West

"I didn't understand", said Representative Dietrich, of Pennsylvania, "what irrigation and reclamation meant to the West until I came here and saw this country."

C. Elmer Dietrich is a farmer in Wyoming County, Pa., and was elected to Congress in 1934. He was in eastern Washington visiting friends while en route from Alaska to his home and had taken advantage of the opportunity to inspect the Grand Coulee dam on the Columbia River.

The quotation reported above is taken from a little speech he made at a dinner at the contractor's camp. He went on to say that without actually seeing he had not been able to visualize what the arid West was like; could not imagine desert as thirsty fertile land; had not understood that with water it could be transformed into beautiful homes and farms; had had no idea how valuable water could be.



ARISTOCRATS

"I traveled over the dry wastes to my friend's ranch", the Congressman related. "He had about 100 acres under irrigation from pumps. A more beautiful and productive place I have never seen. The contrast the ranch made with the surrounding desert gave me my first idea of the value of water in the West. Anyone who sees will believe in the development of the West's water resources."

Mr. Dietrich left, saying he planned to see more irrigation.

"I'm sold on it", he said.

At the same dinner an engineer employed by the contractor on the dam made a similar statement. He was in the West for the first time. Irrigation and reclamation, he said, were vague terms to him when he arrived.

The engineer said he could picture in his mind a desert before he had seen one. It was a hopeless, desolate expanse. He had not thought much about it, but it always had been his supposition that desert soil was poor and its irrigation impractical.

His greatest surprise came, too, when he saw what irrigation could do. He altered all his notions concerning reclamation and professed to be its strongest booster.

These two men are intelligent, practical citizens. Both had seen the effects of irrigation for the first time. Each had been unprepared for what he saw. One was an engineer, whose attention had been directed for many years toward construction designed to conserve western water; the other a Congressman, interested in farming and in national affairs, who had heard many debates in the House of Representatives on conservation of water resources.

How did it happen that these men, curious as they were about this subject, were unable to understand even the rudiments of the West's fundamental problem without seeing with their own eyes?

Has the West complacently assumed that because the primary necessity of water conservation and utilization is perfectly obvious to anyone in the West that it is also clear to everyone else?

It is doubtful whether a boy, reared under an irrigation canal, can create in his own mind a true picture of the meadows and streams of Pennsylvania. It is rather difficult for one familiar with the green hills of Virginia, after living in the West, to recreate them in his imagination. How, then, can one who has never seen the West imagine its arid valleys that have been made to bloom as gardens by irrigation? How can such a one catch the full force of the statement that without irrigation no crops could grow over a vast sweep of the Nation?

For a full development of western water resources the support of the entire Nation will be needed. To gain that support the West will have to state its case in terms that will bring its problems home to those unfamiliar with them.

That surprising contrast between the irrigated field and the neighboring desert must be seen and its importance understood by all. Those cities that have risen from the sand with the aid of an irrigation canal and a storage dam must be shown to be the miracles they are. The national importance of the wealth created by water in the deserts must be recognized or the continued extension of the irrigation canal and the continued growth of the western cities dependent upon them will be jeopardized.

Organization Activities and Project Visitors

Hon. Harold L. Ickes, Secretary of the Interior, and Dr. Elwood Mead, Commissioner of Reclamation, left Washington on the evening of September 26 on the special Presidential train en route with the President and his party to Boulder Dam for the dedication ceremonies.

During the Commissioner's absence from Washington Miss Mae A. Schnurr, Assistant to the Commissioner, was Acting Commissioner.

R. F. Walter, chief engineer; J. L. Savage, chief designing engineer; and L. N. McClellan, chief electrical engineer, were present at the Boulder Dam dedicatory ceremonies on September 30.

Dr. and Mrs. Mead recently became the proud grandparents of two baby girls, one born to Mr. and Mrs. Edgar F. Kaiser at Bonneville, Oreg.; and one to Lt. and Mrs. John Mead at Plattsburgh, N. Y.

John C. Page, Chief of the Engineering Division, Bureau of Reclamation, gave an illustrated address on Unusual Construction Operations, United States Reclamation Projects, at an informal dinner given on September 11 by the District of Columbia Section of the American Society of Civil Engineers in the patio of the United States Chamber of Commerce Building. The dinner was given in honor of Hon. J. M. Johnson, Assistant Secretary of Commerce.

Mr. Page also delivered illustrated addresses on October 8 and 9, respectively, before the Washington Section of the American Institute of Electrical Engineers and the faculty and student body of the George Washington section of the Institute, his subject on both occasions being "Power Developments on Reclamation Projects."

LeRoy J. Snyder, assistant engineer on the Boulder Canyon project, has been transferred to the Denver office of the Bureau.

Among recent visitors to the Boulder Canyon project were the following: W. L. Chadwick, engineer Metropolitan Water District; Dr. Conrad L. Wirth and Hebert Evison, of the National Park Service, Washington, D. C.; R. F. Walter, chief engineer, Bureau of Reclamation; Niklos Hetenyi, civil engineer, Hungarian Railroads, Budapest, Hungary; Dr. J. Koster and R. G. Knickerbocker, Bureau of Mines; and C. A. Dykstra, city manager, Cincinnati, Ohio.

John C. Page Becomes Chief of Engineering Division

George O. Sanford, Chief of the Engineering Division of the Bureau of Reclamation, who was recently appointed general supervisor of operation and maintenance when those duties were taken over by the Washington office, has continued to administer the affairs of the Engineering Division pending the selection of a successor.

The appointment of John C. Page, as Mr. Sanford's successor as Chief of the Engineering Division has been announced, with October 1 as the effective date. Mr. Page is a native of Syracuse, Nebr. and a graduate of the University of Nebraska, with some post-graduate work at Cornell to his credit. He comes to the Washington office by transfer from the position of Office Engineer on the Boulder Canyon project.

Mr. Page was employed almost continuously on the Grand Valley project from 1909 to 1931, serving in various engineering capacities. From 1925 to 1931 he occupied the position of superintendent of the project.

Dr. Charles P. Berkey, consulting geologist, and J. L. Savage, chief designing engineer, inspected the Island Park, Grassy Lake, and Teton River dam sites during a recent visit to the Upper Snake River project, Idaho.

Miss Kathryn M. Firth and Joseph I. Menchan have recently been appointed to positions in the E. C. W. and accounting divisions, respectively, in the Washington office.

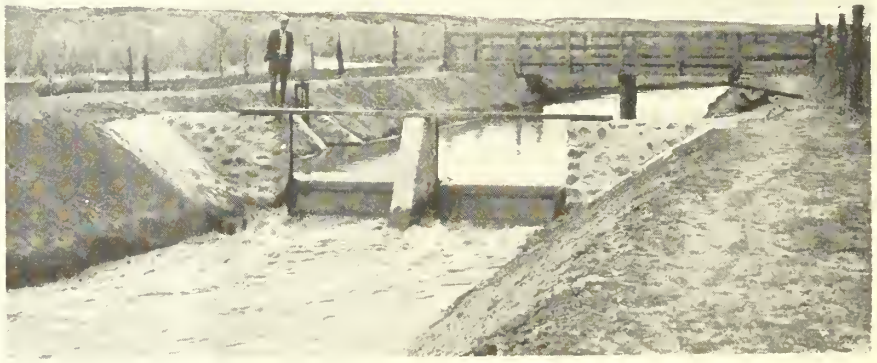
Spencer L. Baird, formerly associate district counsel at Portland, Oreg., has been made district counsel at Denver, Colo.

Darwin G. Tyree has been reinstated and is now associate district counsel at Portland, Oreg.

L. H. Mitchell, supervisor of irrigation, called officially at the Truckee River storage project, discussed matters relating to the Truckee storage and Newlands projects, and visited Boca dam site on August 31.

Micky Connor, former engineer in the Bureau of Reclamation, and now employed by Six Companies Inc., spent several days at Taylor Park reservoir, Uncompahgre project.

Oliver J. Todd, chief engineer, China International Famine Relief Commission, of Peiping, visited the Owyhee project recently.



MOON LAKE CANAL BUILT BY BRIDGELAND CAMP

ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead,** Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; George O. Sanford, General Supervisor of Operation and Maintenance; John C. Page, Chief, Engineering Division; Deane S. Stuver, Supervising Engineer, E. C. W. Division; Wm. F. Kubach, Chief Accountant; Charles N. McCulloch, Chief Clerk; Jesse W. Myer, Chief, Mails and Files Division; Miss Mary E. Gallagher, Secretary to the Commissioner

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H. Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies; Spencer L. Baird, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	Fiscal agent	District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills	C. F. Weinkauf	R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill	L. S. Kennicott	do	Do.
Carlsbad	Carlsbad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen	E. M. Bean	W. J. Burke	Billings, Mont.
Columbia Basin, Grand Coulee Dam.	Coulee Dam, Wash	F. A. Banks	do	C. B. Funk	Alex S. Harker	B. E. Stoutemyer	Portland, Oreg.
Frenchtown	Missoula, Mont	J. W. Taylor	Resident engr		Denver	W. J. Burke	Billings, Mont.
Grand Valley	Grand Junction, Colo	W. J. Chiesman	Superintendent	E. A. Peek	E. A. Peek	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Constr. engr	George B. Snow	Denver	do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent		C. J. Ralston	B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chabot	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Constr. engr	Francis J. Farrell	Denver	J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	A. T. Stimpfig	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Constr. engr	H. W. Johnson	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif	E. A. Moritz [1]	do	George H. Bolt	Denver	R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell	do	J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill	C. L. Harris	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wentzel [1]	C. B. Wentzel	W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell	Denver	J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo	L. J. Windle [1]	Superintendent	L. J. Windle [1]	do	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith	F. C. Bohlson	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent		Denver	W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Constr. engr		Denver	J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt		do	B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Constr. engr	W. F. Sha	W. F. Sha	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo	C. B. Elliott	Engineer	do	do	do	Do.
Upper Snake River Storage [3]	Ashton, Idaho	H. A. Parker	Constr. engr	Emmanuel V. Hillius	Denver	B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent		F. C. Bohlson	do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham	C. J. Ralston	do	Do.
Yuma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson	J. T. Davenport	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrigation dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	W. E. Stout	President	H. B. Smith	Palisade.
Huntley	Huntley irrigation district	Ballantine, Mont	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Jerome Smith	do	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	Amos Thompson	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	Flora K. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo.	Bert L. Adams	do	Nelle Armitage	Torrington.
Northport division	Northport irrigation district	Northport, Nebr	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
Salt Lake Basin (Echo Reservoir).	Weber River Water Users' Association	Ogden, Utah	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Superintendent	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	do	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigation district	Fairfield, Mont	A. W. Walker	do	H. P. Wangen	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg	E. D. Martin	do	Enos D. Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley W. U. A	Montrose, Colo	Jesse R. Tompson	Acting supt	J. Frank Anderson	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	Manager	R. E. Rudolph	Ellensburg.

Important Investigations in Progress

Project	Office	In charge of—	Title
Buffalo Rapids	Denver, Colo	R. R. Robertson	Assistant engineer.
Colorado River Basin, sec. 15	do	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes	Bend, Oreg	C. C. Fisher	Engineer.
Gila Valley	Denver, Colo	P. J. Preston	Senior engineer.
San Luis Valley	do	R. F. Walter	Chief engineer.
Grand Lake-Big Thompson Transmountain Diversion	do	P. J. Preston	Senior engineer.
North Platte Valley	do	Frank L. Adams	Consulting engineer.

SALLIE A. B. COE, *Editor.*

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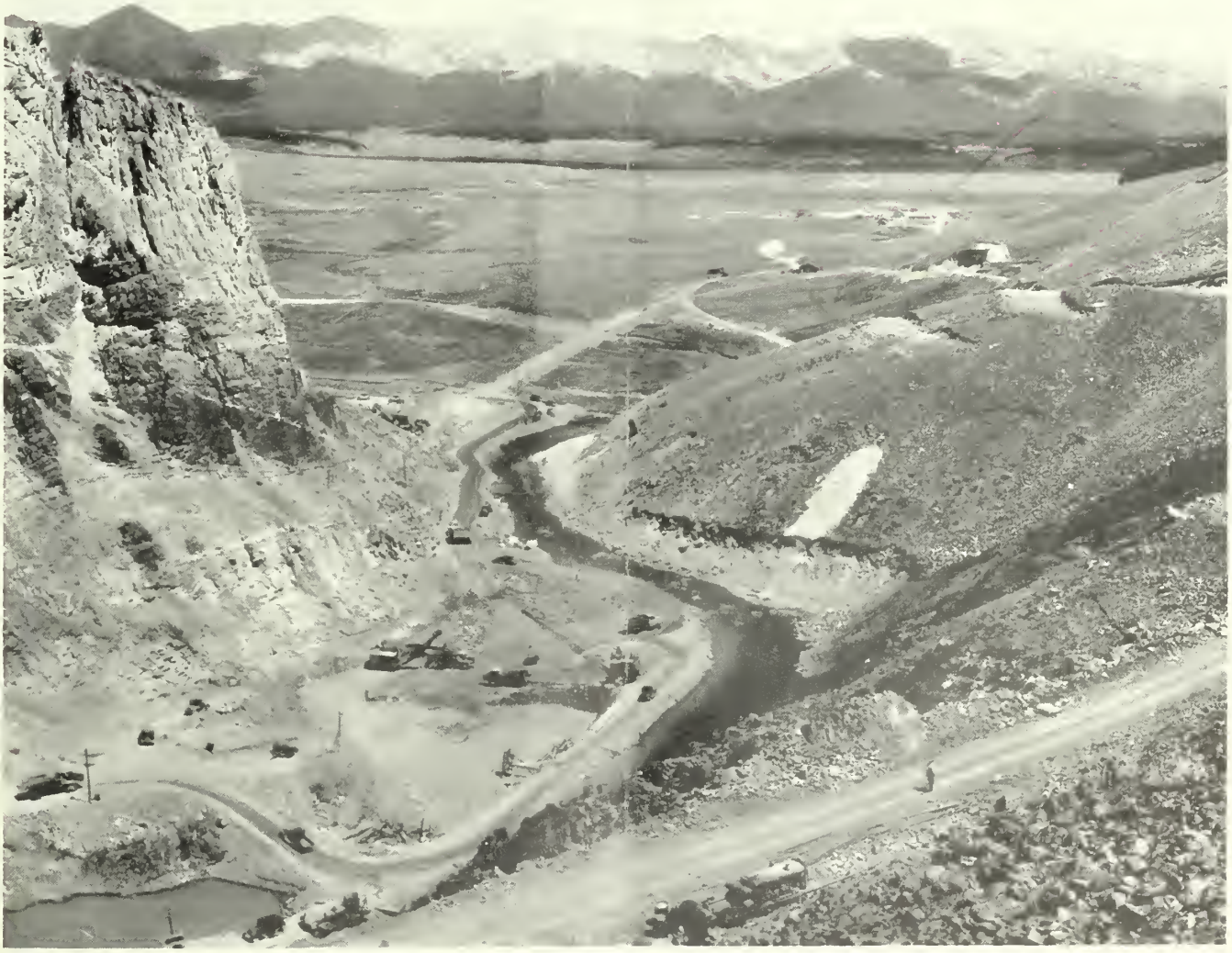
DEDICATION OF BOULDER DAM, SEPTEMBER 30, 1935

Secretary Ickes delivering an address; 2, U. S. Senator Key Pittman, of Nevada, presenting President Roosevelt; 3, special force of clerks handling initial mailing of Boulder Dam stamps through Boulder City post office. More than 200,000 first-day covers were mailed out. Every country on the globe was represented in the mailing with envelops addressed to hundreds of notables, including President Roosevelt, King George of England, King Faud of Egypt, and many others. At the extreme left of the back row, left to right, are Robert E. Fellers, Superintendent of Stamps; Harry Crane, appraiser for the Casper-Alcova project; and James I. Lee, postmaster of Boulder City; 4, a portion of the initial-date mailing of special Boulder Dam stamps; 5, canceling the initial-date mailing of stamps at Boulder City post office; 6, sorting the initial-date mailing of stamps at Boulder City.

U. S. GOVERNMENT PRINTING OFFICE: 1935

THE RECLAMATION ERA

VOL. 25, NO. 11 NOVEMBER 1935



TAYLOR PARK DAM SITE, UNCOMPAHGRE PROJECT, COLORADO, NEAR GUNNISON

For construction of an earthfill dam at this point to supplement the water supply of the Uncompahgre project, $2,000,000 has been allotted by the Public Works Administration

The present threat to our American institutions does not rest upon economic or political fallacies that are bred on alien soil. These will evaporate into thin air when exposed to the clear light of truth. The threat, and it is a real one, comes from within. It comes from those influences that would circumscribe, or even deny, those fundamental Constitutional guaranties of a free press, free speech, and the right of free assemblage. The attack on these basic liberties is a stroke aimed at the very heart of our American system of government. Deprive us of these rights, and we will have no weapons left in our hands with which to resist the onslaught of error or fallacy, either from abroad or from within our own borders. Leave us these three essential weapons, without which a free democracy cannot hope to exist, and we will be able to resist any attack of poisonous propaganda or insidious doctrine.

HON. HAROLD L. ICKES,
Secretary of the Interior.

THE
RECLAMATION ERA

Issued monthly by the DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C.
Price 75 cents a year

HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 11 NOVEMBER 1935

Honorable Harold L. Ickes, Secretary of the Interior

Delivers Address at Dedication of Boulder Dam

PRIDEFULLY, man acclaims his conquest over nature. We have taught ourselves to believe that with our wit and our might we have wrested from earth, sea, and sky the necessities, the comforts and the luxuries of a complicated human civilization. To a limited degree it is true that we have made a vassal of nature, but in a very real sense it is true and always will be true that man has not conquered nature, nor ever will be strong and resourceful enough to do so. So long as nature can hurl the devastating thunderbolt, topple, to the ground great structures wrought by the cunning hand of man, pull down into the depths of the ocean mighty ships, destroy our handiwork by fire or flood, and unleash from the caverns of the winds mighty hurricanes to toss about in their rage all objects, animate and inanimate, that are exposed to them, nature will continue to be unconquerable.

Just as nature, untamed and invincible, in her fitful moods or by her sullen immobility, has destroyed not only the works of man but man himself, so has man in his turn wreaked his vengence upon nature. He has ruthlessly obliterated vast expanses of forest lands. By destroying the protective coverage of the soil, he has made it possible for wind and water to carry away the fertility provided by nature in a beneficent mood for the growing of abundant crops and the grazing of countless herds of sheep and cattle. Mercilessly, he has slaughtered the birds of the air and the wildlife of forest and plain, while polluting lakes and rivers and even large sections of the vast oceans, to the destruction of fish life. By reason of his wanton devastation of the forests and his intemperate use of the soil, he has been responsible for pitiless droughts which have alternated with raging floods, which in their turn have destroyed both property and life and have laid a foundation for even more severe droughts and more destructive floods to follow.

But gradually man has come to realize that in destroying nature he is destroying himself. The harm that man has done to himself indirectly through his ruthless exploitation of nature is vastly greater than all the damage that nature has inflicted directly upon him by fire and flood and tornado and earthquake. Through bitter experience we are learning the lesson that it is not through the destruction of nature or even through its complete subjugation that we will be able to serve our own greatest good; that if we would avoid the tragic mistakes of the past and assure for ourselves and for the generations that are to follow us the material and spiritual benefits which will flow from a wise and prudent use of the rich resources of nature, our approach must be in a spirit of cooperation.

We must realize that nature is neither a wanton, carelessly flinging her favors to any chance passerby, nor one who may be ravished of her treasures unless we are willing to pay a price that in the end will mean bankruptcy of our natural resources. Nature, if she really is to serve mankind to the top of her bent, must be wooed and won. Between man and nature there must be mutual forbearance, a willingness to live and let live, complete understanding and understanding cooperation.

STRUCTURE FITTINGLY NAMED BOULDER DAM

No better example of understanding cooperation between man and nature can be found anywhere than this imagination-stirring project that, in grandeur of conception and in skill and speed of execution, ranks as one of the greatest engineering undertakings in the history of the world. And what more characteristic and appropriate name could be chosen for this monumental enterprise than the one with which it has been christened. As the eye encompasses the majesty of this work and comprehends the bold and rugged setting chosen for the taming of the waters of the turbulent Colorado, the mind appreciates that this setting and this accomplishment of what at first must have been regarded as the conception of a fevered imagination would not be worthily and fittingly named by any less bold and striking designation than that of Boulder Dam.

I venture to hope that this dam, with its great storage of health and wealth and happiness for thousands of people, will stand as the definite opening of a new era with respect to the natural resources of America—an era of conservation which means the prudent use of all natural resources for the greatest good to the greatest number of our people; an era that will recognize the principle that the riches of forest and mine and water were not bestowed by God to be ruthlessly exploited in order to enhance the wealth of a small group of rugged individualists, but were beneficently given to us as an endowment to be carefully used for the benefit of all the people. On no other theory would the Federal Government be justified in so generously opening the doors of its treasure house for the building of this and other similar projects that will turn large sections of this breathtaking western country into rich homesteads where a happy and contented people will find it possible to live those comfortable and worth-while lives that we covet for every man, woman, and child in this United States.

It is a fortunate circumstance that the dedication of this outstanding result of a sound conservation policy should come during an administration that is dedicated to the well-being of the average American. It is more than a mere coincidence that the greatest conservationist who has ever presided over the affairs of our country should be present on an occasion that rejoices the heart of every conservationist in America. Here behind this massive dam is slowly accumulating a rich deposit of greater wealth than all the mines of the West have ever produced—wealth to be drawn upon for all time to come for the renewed life and the continued benefit

of generations of Americans. And as personifying what must be the future policy of the United States if we are not utter dolts, a policy of husbanding and wisely using all of our natural resources, there has come from Washington to do honor to this occasion that President of the United States during whose administration already more has been done for genuine conservation than during all preceding administrations.

While this great undertaking, as I have said, speaks in striking terms of what can be accomplished by an understanding cooperation between man and nature, I hope that I am not out of order in suggesting that a genuinely cordial spirit of cooperation between the States that are to profit from it would be encouraging to the Federal Government and an incentive to undertake projects of a similar nature in this great western country that is so potentially rich in resources. It is to be hoped that the peoples of the Colorado compact States, through their Governors, will be able without further undue delay to agree upon an apportionment of the benefits that will flow from Boulder Dam that will be fair and equitable to all.

It is now my privilege to present to you, each for a bow, the Governors of the seven interested States who are present, and I hope that they will carry away with them what I believe to be your unuttered wish—that no further time be lost in adjusting all differences of opinion that may now exist between any of these States with respect to the respective advantages that each State is to enjoy from this great undertaking that has been carried out for your benefit by the Federal Government.

I will now introduce these Governors in the order in which the States represented by them were admitted to the Federal Union—

The Honorable Frank F. Merriam, Governor of California.

The Honorable Richard Kirman, Sr., Governor of Nevada.

The Honorable Leslie A. Miller, Governor of Wyoming.

The Honorable Henry H. Blood, Governor of Utah.

The Honorable Clyde Tingley, Governor of New Mexico.

The Honorable B. B. Moeur, Governor of Arizona.

ARTHUR P. DAVIS FIRST VISIONS GREAT DAM

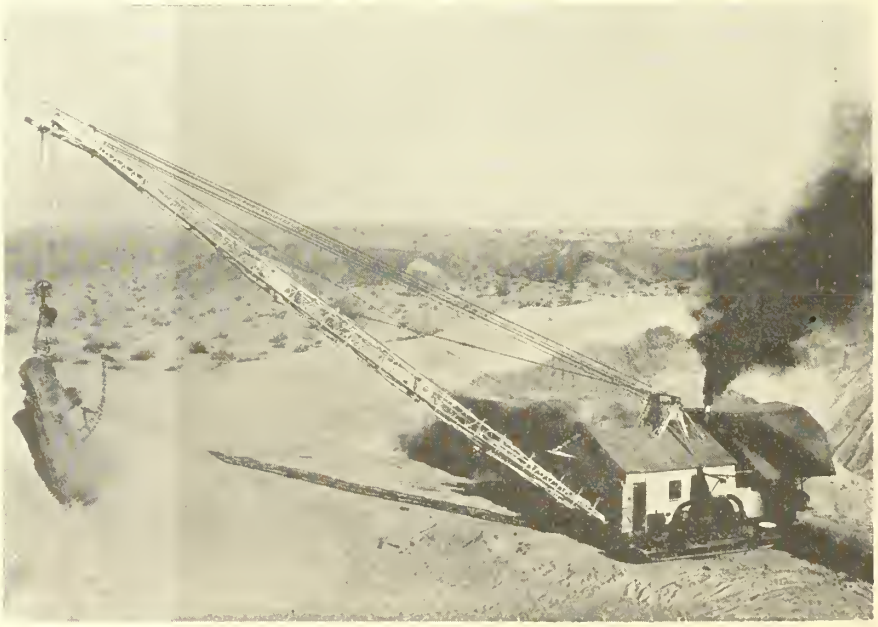
All of you will share my particular disappointment that on this notable occasion the senior Senator from California, the Honorable Hiram W. Johnson, could not be present on account of the state of his health. *Arthur P. Davis, the engineer, first caught the vision of this great dam.* Converts to the cause that he advocated gradually grew in numbers so that in the aggregate many have made their contribution toward the result that we celebrate today. Former Congressman Philip Swing, of Los Angeles, performed valuable services toward its accomplishment, and many other members of the House of Representatives and the Senate were active supporters of the law that made it possible. Nor should we forget the engineering talent, the devotion to duty of the workers, the offerings of life itself that have been generously sacrificed on this altar of devotion to the good of humanity.

BOULDER DAM SENATOR JOHNSON'S GREATEST ACHIEVEMENT

Yet the name of Hiram Johnson is probably more intimately associated with Boulder Dam than that of any other man. It has often been said that if it had not been for Hiram Johnson there would be no Boulder Dam, and certainly no one would begrudge him his meed of praise for his devotion to the cause of Boulder Dam. This dam has been erected upon the solid rock substructure of Black Canyon, but it has also been built on 7 years of the hardest kind of legislative work on the part of Senator Hiram W. Johnson—work that at times was against overwhelming odds that would have discouraged a less indominatable spirit. With the aid of those who saw with him the social and economic results that would flow through the spillway of Boulder Dam, he overcame difficulties that appeared to be insurmountable. Well may he regard Boulder Dam as the greatest achievement in his productive life as a statesman. It has been well said that if this dam should bear the name of any living person, then it should be christened Johnson Dam. I may say, however, that Senator Johnson shares the belief that this great engineering achievement should not carry the name of any living man but, on the contrary, should be baptized with a designation as bold and characteristic and imagination stirring as the dam itself.

Although we have been denied the pleasure of testifying personally to Senator Johnson our appreciation of his contribution towards the result that we celebrate today, I had hoped to have the pleasure to introduce to you those distinguished legislators from the seven compact States who have contributed so much to the success of this project—Senators Ashurst and Hayden of Arizona, King and Thomas of Utah, Carey and O'Mahoney of Wyoming, Hatch and Chavez of New Mexico, McAdoo of California, Costigan and Adams of Colorado. However, I have the pleasure of presenting for a bow the Honorable Pat McCarran, United States Senator from Nevada.

Nevada has a double occasion for rejoicing today. Supported in part by Nevada soil stands one of the greatest and most beneficent engineering enterprises ever conceived by the mind of man or builded by his diligent fingers. And upon this platform there is present one of the ablest and most distinguished Senators of the United States. Persevering in his support of legislation for the benefit of the people, wise in counsel, a true and forthright representative of a great section in which dwell free and clear-thinking people of the West—I have the pleasure to introduce the Honorable Key Pittman, who will have the honor to present to you the President of the United States.



This 175-foot boom of a 650-ton dragline swings a 12-yard bucket of sand to the bank of the All-American Canal. This excavator, one of the largest ever used in canal work, is building a new river in California's Imperial Valley. Completed, it will have a capacity of 15,000 second feet of water and will extend from the Colorado River 80 miles to the western edge of irrigated Imperial Valley. It will replace a canal now running through Mexico and supplying water to 500,000 acres in California.

Yuma Agricultural Conditions Improve

By C. W. Ingham, Secretary, Yuma County Farm Bureau

IMPROVEMENT in agricultural conditions on the Yuma project since the fall of 1933 is marked, and this improvement reflects benefit to the entire community. More land has been sold during the past 18 months than in any similar period in the project's history, and in practically every instance the land has been purchased by actual farmers for homes and places to make a living.

The rates of interest paid by project farmers are materially lower than ever before. Previously interest rates of western farmers were much higher than those of their eastern friends, but the low rates now prevailing on the Yuma project have eased the burden, and men are permitted to secure advantageous long-term loans to finance the purchase of land and its operation.

Crop returns for 1934 were more gratifying than for several years past, which permitted the payment of debts during the summer, fall, and winter. Delinquencies on Federal land-bank loans in Yuma Valley were reduced in number in excess of 50 percent between May 1 and December 31, 1934.

The Agricultural Adjustment Administration has been a boon to Yuma farmers, has brought in more cotton, and promises the same benefits during the present year. The Mesa citrus growers are doing better than ever before. They have bought a splendid warehouse, equipped it, obtained money from the Crop Production loan organization at Berkeley at approximately 3 percent to finance their operations, and their conditions and prospects are brighter than ever before.

Grapefruit orchard on Yuma Mesa, Yuma project, Arizona-California

The vegetable and melon industry has become an immense affair on the project. Growers pay $20 per acre rent on 3-year leases. They are giving employment to hundreds of men, are bringing in hundreds of thousands of dollars each year, and the industry continues to grow.

The Yuma farmers' cooperative ginning organization has reopened its gins and will operate every one of them this year in the Yuma and Bard districts and the Gila Valley.

Rates for operation and maintenance water charges have been reduced from $5 to $2 per acre.

Prospects for the Yuma country are fine; things are looking up; permanent prosperity is shaking hands with the farmer in the Yuma country.—*Yuma Morning Sun.*

Reclamation headquarters grounds on the Yuma project, Arizona-California. Nopal cactus between maguey plants

Charles L. Raum 1901–35

Charles L. Raum, a former employee of the drafting section of the Washington office, died on September 30 from tuberculosis. He was 34 years of age.

Mr. Raum was reinstated in the Government service and assigned to duty in this Bureau on December 17, 1930. He was employed continuously until March 31, 1935, when he was compelled to resign his position on account of ill health.

Prior to entering the Bureau he had been connected with the Department of Agriculture for about 6 years.

Mr. Raum was a capable draftsman with a pleasing personality, and will be missed by his many friends.

The Malheur County Fair at Ontario, Oreg., on September 12–14 was one of the most successful ever held. The quality of exhibits of crops and livestock was very high.

The Reclamation Era

Issued monthly by the Bureau of Reclamation Department of the Interior.

Subscription 75 cents a year to other than water users, payable in advance by check or postal money order drawn in favor of the Bureau of Reclamation.

Special reduced rates are given individual water-user owners or water-users organizations for mass subscriptions on Federal irrigation projects.

NOVEMBER 1935

Conservation is the Object

On September 30 the Nation turned its eyes upon Boulder Dam and listened while the President spoke at its dedication. To many of the millions whose attention was caught it was the first time the objectives of the Boulder Canyon project had been explained.

Spectacular Boulder Dam ceased to be simply "the world's biggest job" on September 30, and to millions who may not have thought of it in that light before it became a benefactor of mankind.

Boulder Dam has served to illustrate the place of Federal reclamation in the comprehensive program for conservation of the Nation's resources. It has served to dramatize the dull topic of the West's need for water.

Water is the number 1 resource of the West. All growth and development there are dependent first upon provision of a water supply. In the face of these facts water conservation generally has touched an unresponsive chord in other sections of the country, even among staunch friends of the principles of conservation. The reason has been a general inability to understand the problem.

Boulder Dam has dramatized the problem. Its gigantic size and the feverish speed of its construction has impressed the Nation with the idea that behind Boulder Dam stands something of great importance.

The President cataloged the benefits arising from control of the surly Colorado River flood protection, regulation of the river's flow so as to provide safe sources for irrigation and domestic water supplies, improvement of navigation, production of power, and the creation of a lake and a playground. "The wealth created by construction of Boulder Dam," he said, "is a national asset."

And there we have the picture. The water is a western asset; its use creates a national asset; its conservation, therefore, is more than a regional problem.

Natural resources, such as oil, the timber of wooded areas, the grasses of the public domain, birds, game, and fish, are easily recognized by everybody. Devotees to their conservation spring up on every hand. But those who live in regions where the wells never run dry sometimes find it difficult to classify water as a natural resource, which, in a very large arid section of their country, must be saved, guarded jealously, used with care, and conserved at all times against a future need.

The Congress created an agency in 1902 for the conservation of the West's primary asset, its water. That agency is the Bureau of Reclamation. Its long service, it may safely be said, has been valued by the West. In other sections it may be known principally by its reputation as worlds' premier builder of dams.

Just pride in construction of a great dam is not improper, but it does not overshadow the satisfaction of having regulated a river and conserved a valuable water supply.

Let us hope that the dedication of Boulder Dam, and the things said there, will turn attention from the means of reclamation to its ends, which are conservation.

First Call

DECEMBER may mean Christmas to you, or the month when your insurance is due, or something else. To those responsible for The Reclamation Era it marks an anniversary—the first of the reissued magazine. If a mounting subscription list may be considered an index we have reason to believe that the magazine is realizing its aim of publishing material of interest to all its readers.

Through the year the Era has recorded the swift sure work of completion of Boulder Dam, the steps by which the Bureau's program has been expanded to cover important conservation and construction projects, and information of various types we hoped might be valuable to the majority of our subscribers, the water users on Federal reclamation projects. Next year, 1936, promises material equally interesting.

Renewal of your subscription, if it expires with the December issue, is earnestly solicited. Fill out the blank below so that there may be no lapse in the regular receipt of your copies.

A Yuma date-processing plant, which will be one of the finest in the Southwest when finally completed, is being developed by John Ehrlich in Yuma. The plant will process a ton of dates a day when in operation and will consist of a process room, together with a cooling and packing department.

A new cheese factory at Rupert, Idaho, Minidoka project, has been erected by the Kraft Cheese Company and is now in use. It has a capacity of 30,000 pounds of milk daily. All cheese manufactured is sent to the Company's plant at Pocatello for final processing.

(Cut along this line)

COMMISSIONER,
Bureau of Reclamation,
Washington, D. C.

(Date)_____

SIR: I am enclosing my check[1] (or money order) for 75 cents to pay for a year's subscription to THE RECLAMATION ERA.

Very truly yours,

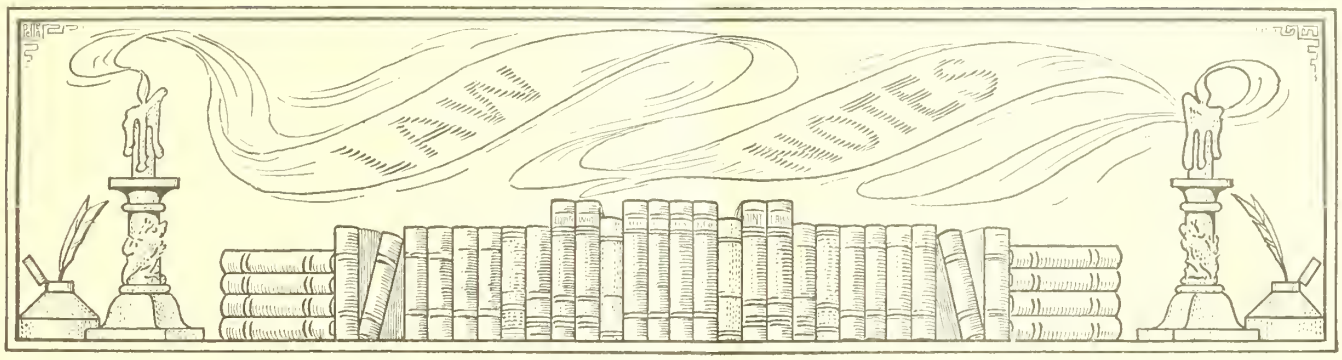
(Name)_____

(Address)_____

_____

[1] Do not send stamps.

NOTE.—30 cents postal charges should be added for foreign subscriptions.



The Legal Status of Water Rights in the Pacific Northwest

By B. E. Stoutemyer, District Counsel

IN the case of *Wyoming* v. *Colorado*, 259 U. S. 419, 66 L. ed. 999, the Supreme Court of the United States said with reference to water rights on interstate streams where both States recognize the prior appropriation doctrine as the basis of water rights:

"We are thus brought to the question of the basis on which the relative rights of these States in the waters of this interstate stream should be determined. Should the doctrine of appropriation, which each recognizes and enforces within her borders, be applied? Or is there another basis which is more consonant with right and equity?

"The lands in both States are naturally arid, and the need for irrigation is the same in one as in the other. The lands were settled under the same public-land laws, and their settlement was induced largely by the prevailing right to divert and use water for irrigation, without which the lands were of little value. Many of the lands were acquired under the Desert Land Act, which made reclamation by irrigation a condition to the acquisition. The first settlers located along the streams where water could be diverted and applied at small cost. Others with more means followed and reclaimed lands farther away. Then companies with large capital constructed extensive canals and occasional tunnels whereby water was carried to lands remote from the stream and supplied, for hire, to settlers who were not prepared to engage in such large undertakings. Ultimately, the demand for water being in excess of the dependable flow of the streams during the irrigation season, reservoirs were constructed wherein water was impounded when not needed and released when needed, thereby measurably equalizing the natural flow. Such was the course of irrigation development in both States. It began in Territorial days, continued without change after statehood, and was the basis for the large respect always shown for water rights. These constituted the foundation of all rural home building and agricultural development, and, if they were rejected now, the lands would return to their naturally arid condition, the efforts of the settlers and the expenditures of others would go for naught, and values mounting into large figures would be lost.

"In neither State was the right to appropriate water from this interstate stream denied. On the contrary, it was permitted and recognized in both. The rule was the same on both sides of the line. Some of the appropriations were made as much as 50 years ago and many as much as 25. In the circumstances we have stated, why should not appropriations from this stream be respected, as between the two States, according to their several priorities, as would be done if the stream lay wholly within either State? By what principle of right or equity may either State proceed in disregard of prior appropriations in the other?" (*Wyoming* v. *Colorado*, 66 L. ed. 1014–1015.)

The court then answered its own question as follows:

"We conclude that Colorado's objections to the doctrine of appropriation as a basis of decision are not well taken, and that it furnishes the only basis which is constant with the principles of right and equity applicable to such a controversy as this is. The cardinal rule of the doctrine is that priority of appropriation gives superiority of right. Each of these States applies and enforces this rule in her own territory, and it is the one to which intending appropriators naturally would turn for guidance. The principle on which it proceeds it not less applicable to interstate streams and controversies than to others. Both States pronounce the rule just and reasonable as applied to the natural conditions in that region; and to prevent any departure from it, the people of both incorporated it into their constitutions. It originated in the customs and usages of the people before either State came into existence, and the courts of both held that their constitutional provisions are to be taken as recognizing the prior usage rather than as creating a new rule. These considerations persuade us that its application to such a controversy as is here presented cannot be other than eminently just and equitable to all concerned.

"In suits between appropriators from the same stream, but in different States, recognizing the doctrine of appropriation, the question whether rights under such appropriations should be judged by the rule of priority has been considered by several courts, State and Federal, and has been uniformly answered in the affirmative. *Conant* v. *Deep Creek & O. Valley Irrig. Co.*, 23 Utah, 627, 631, 90 Am. St. Rep. 721, 66 Pac. 188; *Willey* v. *Decker*, 11 Wyo. 496, 534, 535, 100 Am. St. Rep. 939, 73 Pac. 210; *Taylor* v. *Hulett*, 15 Idaho, 265, 271, 19 L. R. A. (N. S.) 535, 97 Pac. 37; *Howell* v. *Johnson*, 89 Fed. 556; *Hoge* v. *Eaton*, 135 Fed. 411; *Morris* v. *Bean*, 146 Fed. 423; *Bean* v. *Morris*, 86 C. C. A. 519, 159 Fed. 651. One of the cases came to this court and the judgment below was affirmed. *Bean* v. *Morris*, 221 U. S. 485, 55 L. Ed. 821, 31 Sup. Ct. Rep. 703. These decisions, although given in suits between individuals, tend strongly to support our conclusion, for they show that by common usage, as also by judicial pronouncement, the rule of priority is regarded in such States as having the same application to a stream flowing from one of them to another that it has to streams wholly within one of them." (*Wyoming* v. *Colorado*, 66 L. ed. 1015–1016.)

If the States of the Colorado Basin (Oregon, Washington, Idaho, and Montana), like Colorado and Wyoming, all recognize the doctrine of prior appropriation as the basis of water rights within the State, it is plain that the same rule applies with equal force to water appropriations

in different States of the Columbia Basin drainage area from interstate streams and that the water appropriator who is first in time on the interstate stream or tributaries thereof is first in right regardless of State lines.

In determining the legal status of water rights on interstate streams of the Columbia Basin region it will be necessary to examine the laws of the States of Oregon, Washington, Idaho, and Montana to determine whether all of these States, like the States of Colorado and Wyoming, have adopted the doctrine of prior appropriation—in which case the rule announced in the case of *Wyoming* v. *Colorado* would apply with full force to the Columbia River and its tributaries—or whether there is a different system of water-right law in effect in some or all of the Columbia Basin States. The remainder of this article will be taken up with a discussion of that question.

But before proceeding with that part of this discussion, it may be interesting to note another question of considerable importance which has been determined by the Supreme Court in the case of *Wyoming* v. *Colorado*, supra. That is the question of the right to divert water from one watershed into another watershed. On this subject the Supreme Court stated:

"The objection of Wyoming to the proposed diversion on the ground that it is to another watershed, from which she can receive no benefits, is also untenable. The fact that the diversion is to such a watershed has a bearing in another connection, but does not in itself constitute a ground for condemning it. In neither State does the right of appropriation depend on the place of use being within the same watershed. Diversions from one watershed to another are commonly made in both States, and the practice is recognized by the decisions of their courts. *Coffin* v. *Left Hand Ditch Co.*, 6 Colo. 443, 449; *Thomas* v. *Guiraud*, 6 Colo. 530; *Hammond* v. *Rose*, 11 Colo. 524, 7 Am. St. Rep. 258, 19 Pac. 466; *Oppenlander* v. *Left Hand Ditch Co.*, 18 Colo. 142, 144, 31 Pac. 854; *Moyer* v. *Preston*, 6 Wyo. 308, 321, 71 Am. St. Rep. 914, 44 Pac. 845; *Willey* v. *Decker*, 11 Wyo. 496, 529–531, 100 Am. St. Rep. 939, 73 Pac. 210. And the evidence shows that diversions are made and recognized in both States which in principle are not distinguishable from this; that is, where water is taken in one State from a watershed leading into the other State, and conducted into a different watershed, leading away from that State, and from which she never can receive any benefit. The principle of such diversions being recognized in both States, its application to this interstate stream does not, in itself, afford a ground for complaint, unless the practice in both be rejected in determining what, as between them, is reasonable and admissible as to this stream, which we think should not be done." (*Wyoming* v. *Colorado*, 66 L. ed. 1014.)

The principle just stated may be of great interest in connection with such projects as the proposed diversion from the headwaters of the Madison River (which drains into the Missouri) into Henry's Lake (on the headwaters of the Snake) for the purpose of relieving a water shortage in the Upper Snake River Valley in Idaho (project now under investigation).

There are two great systems of water-right law—the prior appropriation doctrine which has been already referred to in connection with the discussion of the case of *Wyoming* v. *Colorado* and the riparian rights doctrine which is the antithesis of the prior appropriation doctrine.

The riparian rights doctrine is a part of the common law of England and was imported into the United States along with the Magna Charta and the other principles of the common law and is still the prevailing doctrine in the rainfall sections of the United States. It is well adapted to the rainfall sections where it originated and where it still prevails but has been found unfitted to the conditions in the arid regions where irrigation is a matter of vital concern. It has been entirely displaced by the doctrine of prior appropriation in practically all of the arid land States, except the States of California and Washington in which it has been retained to a limited extent and in a modified form which is hardly to be recognized as the original riparian rights doctrine of the common law.

The Supreme Court of the United States in the very recent case of *California Oregon Power Co.* v. *Beaver Portland Cement Co.* (79 L. ed. advance sheets, p. 757) describes the riparian rights doctrine in the following language:

"The court below held (1) that the homestead patent of 1885 carried with it the common-law right to have the stream continue to flow in its accustomed channel, without substantial diminution."

The common law in the form in which it was brought to this country from Great Britain gave to the owner of lands bordering on a flowing stream the right to have the water of the stream continue to flow past his land for his use and benefit, and as a part of his property rights in the land itself, practically undiminished in quantity and unimpaired in quality. Obviously such a doctrine if enforced in its original form would prevent irrigation altogether. As such a doctrine would be wholly impracticable in the arid regions, it was soon modified in California, and in the other States which followed the California rule, to permit a reasonable use and diminution of the flow of the stream by each and every riparian owner in like proportion with every other riparian owner upon the basis of a reasonable division of the flow of the stream among the several riparian owners in proportion to their ownership of riparian lands and subject to a number of other limitations which will be referred to later.

The doctrine of prior appropriation, on the contrary, has as its cardinal rule the principle that the first in time is the first in right. It is a rule which grew out of the custom of miners and the necessities of the people of any arid region where irrigation is a matter of prime necessity. Under the prior appropriation doctrine, the first comer who expends his labor, energy, and capital in diverting water and applying it to beneficial use in irrigating and reclaiming arid and semiarid lands has the first right to the use of the water even to the extent of the entire flow of the stream if he needs and has beneficially used the entire flow. The second appropriator takes his right subject to the superior right already established by the first comer and therefore has to take his chances on whatever water may remain after the first right has been fully supplied. Obviously the prior appropriation doctrine gives more protection and encouragement to the appropriation, diversion, and beneficial use of the available water supply of the natural streams of the arid region than does the common-law rule. Without such protection the settler—an investor who expends his labor and money and in many cases the best years of his life in building the irrigation works and reclaiming the desert—might find himself at the mercy of any later comer who might divert the available water supply above him or demand its continued flow to riparian land below and thus destroy the entire investment of the original appropriator.

Those States in the arid and semiarid region which have clung to the riparian rights' doctrine, even in the modified form maintained in California, have found it a serious handicap and have been trying to get away from it as much as possible but have found it difficult to do so because riparian rights where they have become vested property rights cannot be easily modified or changed.

One of the objections to the riparian rights doctrine even in the form retained in California is that it enables landowners to hold the water resources of the State out of use and discourages development. There may be more land bordering on a stream than can be irrigated with the natural flow of the stream. Under the riparian rights doctrine as it exists in California, the owner of the riparian lands may hold a right to a proportionate share of such water supply without making any use of the water. So the available water

may be allowed to go to waste indefinitely because the riparian right can be held without use of the water while the settler or investor, who might be willing to expend the necessary labor and money in building irrigation canals, reservoirs, and other works for utilizing the water and in leveling and improving the arid lands and putting them into cultivation, is discouraged from doing so on account of the risk that most of the water may be taken away from him at a later date by other riparian owners who may hold a right to a large part of the water without ever having made any use of it. These are the considerations which have led to the abandonment of the riparian rights doctrine in most of the arid-land States except California and Washington and to the modification and limitation of the riparian rights doctrine even in those States where it is still retained.

The prior appropriation doctrine which has been discussed by the Supreme Court in connection with the case of *Wyoming* v. *Colorado, supra,* and also in the more recent case of *California Oregon Power Co.* v. *Beaver Portland Cement Co., supra,* has sometimes been referred to as a rule adopted from the law of the barber shop and has as its cardinal principle the rule that the first in time is the first in right.

In the early days the modified form of riparian-rights doctrine which prevailed in California was copied in Oregon and Washington but, as stated by the Supreme Court in the case of *California Oregon Power Co.* v. *Beaver Portland Cement Co.:*

"In 1909 the Water Code was adopted by the State legislature. Or. Laws, 1909, chap. 216. The act provides that all water within the State shall be subject to appropriation for beneficial use; but nothing therein is to be construed to take away or impair any vested right. In respect of a riparian proprietor, a vested right is defined 'as an actual application of water to beneficial use prior to the passage of this act * * * to the extent of the actual application to beneficial use.' "

(*C. O. P. Co.* v. *B. P. Cement Co.*, 79 L. ed. adv. sheets 756) the State of Oregon has succeeded in getting away from the riparian-rights doctrine by means of the statute there referred to.

The riparian rights doctrine seems to be recognized as a serious handicap in the other irrigation States which originally adopted it and is being more and more restricted by recent acts of the legislatures and constitutional amendments both in California and Washington. For instance, the recent District Court decision in the case of *United States* v. *Walker River Irrigation District* (11 F. Suppl., advance sheets, p. 158) makes the following reference to recent changes in the water law of California:

"What was known as the California riparian doctrine has been changed by adoption of section 3 of article 14, of the constitution of California, which became effective in November 1928. In *Tulare Irrigation District et al.* v. *Linsday-Strathmore Irrigation District, supra,* Chief Justice Waste, of the California Supreme Court, stated that the effect of the amendment has been to modify the long-standing riparian doctrine heretofore announced by the court in several leading cases, and to apply by constitutional mandate the doctrine of reasonable use between riparian owners and appropriators. The effect of the amendment is fully discussed by Justice Shenk, speaking for the State court, in the case of *Peabody* v. *City of Vallejo* (Cal. Sup.) 40 P. (2d) 486, 490." (*U. S.* v. *Walker River I. D.*, 11 F. Suppl. adv. sh. 170.)

[Continued in December issue]

North Platte Turkey Industry Profitable

According to the Scottsbluff Daily Star-Herald, one North Platte farm operated by County Agent H. L. Gibson and Glen Dyrland near Torrington, Wyo., is fattening 2,060 turkeys for the holiday market. This is the largest turkey farm among the members of the North Platte Valley Cooperative Poultry Marketing Association, and the largest in eastern Wyoming and western Nebraska.

Last year the association shipped 23 carloads of gobblers to eastern markets, and although this year's shipment will probably be smaller in volume, the grade of birds and prices will be much higher. A price of 35 to 40 cents per pound for prime young toms is not considered unlikely, compared with 23½ cents per pound received last year.

TURKEY RAISING

Mr. Dyrland pointed out several interesting phases incident to turkey raising. These special birds were received in Torrington when they were 3 days old. Mr. Dyrland stated that turkeys seem more contented under bright lights, so a string of electric lights was placed from one end of the bleachers to the other. The bleachers birds were covered to protect the from rain.

For 5 or 6 weeks, depending upon the weather, they are kept in a heated brooder house. During the day they are permitted to strut around on a special outside veranda, built up on a wire mesh floor so that the turkeys keep free of the ground. They enter the veranda directly from the brooder house through a small entrance. "There is nothing quite so bad for turkeys as moisture", Mr. Dyrland said, "so until they are 6 weeks old their feet never touch the ground. They tread on cement floors in the brooder house or the wire mesh screen outside."

Oil stoves keep the temperature in the brooder house even, with electric lights, of course to keep the gobblers contented. For several weeks thereafter they are kept and fed in the feeding yards until they become accustomed to their surroundings. Afterward they are allowed to graze in the fields, where oats or barley provide scratch food.

FEEDING PROBLEM

The matter of feeding 2,060 growing Christmas dinners gets to be a task in the fall, when the gobblers consume 900 pounds of prepared food each day, in addition to the "scratch" variety, a crushed brand of oyster shell, and milk which is added to the mash to make a "wet feed" for the afternoon meal. Add to this some 400 gallons of water each day, and it is not surprising that the birds put on weight. About the middle of September the flock averaged 9¼ pounds, and before Christmas—when it is marketed—it is hoped the hens will average 13 and the young toms 18 pounds.

The prepared feed is made up of 200 pounds of wheat, 200 pounds of oats, 200 pounds of barley, 200 pounds of mash, 100 pounds of alfalfa, 50 pounds of soy beans, and 50 pounds of meat scraps.

Mr. Dyrland said that last year—the first year he and Mr. Gibson engaged in turkey feeding—despite some bad luck they cleared $1,000 profit. This year they expect to do much better. Exceptional care is taken to keep the birds in clean yards. During the 2 years, Mr. Dyrland said, they have never had a diseased bird. Their loss last year was only 9 percent of the entire crop of poults.

Other large turkey growers in the vicinity include Jay Em, owner of 1,800 birds, and Orville Thrasher, 5 miles southwest of Henry, who has 1,000 birds.

Subsistence Homestead Unit on Milk River Project

The purchase of the area known as the "South Wagner Subsistence Homestead Unit", which has been pending for almost 2 years, was completed during the month. Plans are now being formulated for the subdivision and development of the tract and the establishment of about 20 families before the 1936 irrigation season. Construction of farm buildings was also started on the North Malta unit, where six families were established during the past spring by the Rural Rehabilitation section of the A. A. A.

Resolutions Adopted by Oregon Reclamation Congress

THE following resolutions in behalf of western reclamation were passed on August 30, 1935, by the Oregon Reclamation Congress:

Resolution VI.—The saving of reclamation from erasure as a national policy has been made possible not only because of the united effort of the West but of the sympathetic responsiveness of the President of the United States, the Secretary of the Interior, the Commissioner of Reclamation, and very recently of the Works Progress Administrator. To these gentlemen, as to our Senators and Representatives, and others at the head of important Federal activities related to reclamation, the Oregon Reclamation Congress desires to make its acknowledgment of gratitude the more cordial and earnest because of the realization that at the critical hour of reclamation, its earnestness had made it a cause difficult both to interpret and to support. For their courage and their far vision, and for executive and legislative acts, we make for reclamation and Oregon's interest in it this statement of appreciation, and this acknowledgment of lasting indebtedness for which we may make no better return than a pledge of good faith, self-reliance, and energy in fitting the irrigated agriculture in Oregon to that of the West and thus in turn to the established agricultural prosperity of the nation as a whole.

Adopted in open session by the Oregon Reclamation Congress this 20th day of August 1935, with the further injunction that copies of this statement with the action by the Congress be sent each of the officials above mentioned.

Resolution XI.—Whereas there have been heretofore appropriated by the Federal Government substantial sums for the purpose of completing the authorized reclamation program and for the construction of works for the conservation of water and the utilization of the land resources; and

Whereas the policy of the Federal reclamation projects is an important part of the recovery program in creating new and better opportunities for industrious, self-supporting, high-minded citizens now living in congested areas and areas blighted by drought conditions; and

Whereas the recent and present policy of the Bureau of Reclamation has had the tendency to stabilize Federal reclamation; and

Whereas experience has shown that the average first settler on reclamation projects is a person of small means; and

Whereas the cost of preparing the soil for the application of water and the production of crops consumes the cash capital of the average settler on such projects; and

Whereas the completion of present projects and the bringing of large acreages of land under cultivation and production is of great importance and of material benefit to the State and Nation; and

Whereas it is essential that the cost of construction of Federal irrigation projects be repaid to the Federal government by the owners of land within such projects; and

Whereas, as the result of investigation by the Bureau of Reclamation, Department of Interior, it was determined that the most feasible and equitable system of repayment is a system based on production, and

Whereas it appears that the system of level annual payments has resulted in frequent requests for moratorium; and

Whereas it is the desire of settlers on Federal reclamation projects to recognize and honor their contracts for repayment of construction costs and to discontinue the practice of asking moratorium on payment of construction cost;

Now, therefore, be it resolved, That in addition to the present level payment plan of repayment of construction cost, we advocate and recommend the adoption by the Federal Government of a plan of repayment based on the annual production of the land within such project.

Be it further resolved, That we recommend and support the adoption of an optional plan providing repayment of construction cost through the annual payment of 5 percent of the value of the crop produced on the several tracts of land within each of said projects and that such value be determined by the average value of such produce of such a period of years as the Bureau of Reclamation, or the department having charge thereof, shall prescribe; and

Be it further resolved, That the officers and members of this Congress use their best efforts to have enacted in the next Federal Congress legislation providing an optional means of payment of a 5 percent payment plan for the repayment of construction charges on reclamation projects, and that such option may be exercised by the district or districts involved; and

Be it further resolved, That we extend to the Congress of the United States and to the Department of the Interior, our sincere thanks for granting to the settlers on Federal Reclamation projects a moratorium on the repayment of construction charges; and

Be it further resolved, That the Oregon Reclamation Congress goes on record as opposing a further extension of the moratorium period, provided the 5 percent plan for repayment of construction charges is adopted; and

Be it further resolved, That a copy of this resolution be sent to each of the members of the Oregon delegation in Congress and copies thereof to the president and secretary of the National Reclamation Congress.

Resolution XIII.—Whereas in the arid region water is the key to land use, and is important for long-range planning that adequate basic data be available as to water resources; and

Whereas irrigation construction under present economic conditions should be aimed primarily toward supplying supplemental water where needed to lands already under irrigation, and adequate appropriation should be secured for these surveys: *Now, therefore, be it*

Resolved, That sustained studies be secured of water resources, including—

(*a*) Ground-water conditions.

(*b*) Stream flow and its possible utilization.

(*c*) Precipitation trends as indicated by sustained historical records and tree-ring studies.

(*d*) Snow surveys.

(*e*) Readjustment of water rights to secure a more efficient use of water.

(*f*) Adjustment of crop acreage.

(*g*) Use of water on individual crops and lands from the standpoint of greatest returns to the district.

Resolution XIV.—Whereas the soil survey gives a scientific basis for a sound program of land classification and use and permits selection of the better land for intensive use; and

Whereas lands in present irrigation districts should be taken out of such districts promptly where they are marginal or submarginal, or when they become so, which requires a soil survey; and

Whereas before new areas are brought under irrigation, through soil, engineering and economic surveys should be made with particular emphasis upon soil survey and classification and market outlets; and

Whereas to complete the detailed soil survey and classification of the agricultural areas of the United States in the next 10 years, according to estimates secured by request made to official agencies, and with allowance for economic and chemical studies, would require approximately 2 million dollars a year for a 10-year period: *Now, therefore, be it*

Resolved, That an appropriation in this amount be provided, 40 percent to be allocated to the State agricultural experiment stations on the basis of unsoil-surveyed agricultural acerage and for cooperation in the soil survey work, so that the results may be available to those now living in the conservation and use of our soil resources.

ENGINEERING

Diversion and Care of the River

By O. G. F. Markhus, Assistant Engineer, Columbia Basin Project

THE west cofferdam at Grand Coulee is being constructed where the dam and power plant for the Columbia Basin project of the Bureau of Reclamation are now being built by the Mason-Walsh-Atkinson-Kier Co.

The control of river flow in dam construction is always a major item and particularly so when there is a large volume of water involved. The Columbia is the second largest river in North America, with an estimated maximum discharge of 725,000 cubic feet per second at the damsite. This was the historic flood of 1894, caused by a combination of melting snows and heavy precipitation, together with approximate coincidence of flood peaks in tributary streams. The average of 10 floods of more than 400,000 cubic feet a second in the past 22 years is 445,000 cubic feet a second, equivalent to a rise in river level of 45 feet above normal low water. The minimum low water flow is 17,500 cubic feet a second and the mean yearly flow, 109,000 cubic feet a second. The water surface elevations applying are: 17,500 cubic feet a second, 932 feet minimum; 109,000 cubic feet a second, 949 feet average yearly mean; 355,000 cubic feet a second, 972 feet 1935 maximum; 445,000 cubic feet a second, 978 feet average maximum, 10 high floods; 725,000 cubic feet a second, 1,003 feet flood of June 1894.

Although the bids for Grand Coulee Dam and power plant were opened June 17, 1934, it was more than 3 months later before the contractor was notified to proceed with the work—3 months of precious time if the schedule of placing concrete in the dam by October 1935 was to be realized, and this meant that the west cofferdam must be in place before the seasonal high water stage of the river. Therefore, the element of time became the essence of all operations—tentative plans were completed, options exercised, orders placed, organization assembled, and construction of the contractor's camp rushed. By the end of the first month more than 1,300 men were at work, a trestle bridge had been built across the Columbia, and construction equipment was converging from all points of the compass; the "camp" took on the busy hum of men, of hammers and saws, the "put-put" of Diesels, the steady dumping of electric shovels, and everywhere there was a hustle, as the race with "Old Man River" (Swaswa Netgua)[1] was on. The last week in December saw several hundred feet of timber-crib breakwater built upstream, behind which were located stiff legs with their long booms, whirleys, skid derricks and other equipment, ready to drive steel piling in the world's largest cofferdam. Pile driving was started New Year's Day.

DIVERSION OF RIVER

The diversion of the river will be accomplished by three stages of cofferdamming—first, the big west coffer, 3,000 feet long; next, a low one on the east side for operations during the low water stage of 1935–36, after which the cross-channel cofferdams will be built and the river diverted through low sections in the dam constructed behind the first cofferdam.

The west side cofferdam is of the cellular type and is by a good margin the world's largest—the nearest rival is the one built in the Hudson River for construction of piers for the steamships *Queen Mary* and *Normandy*, 2,100 feet in length, compared with the 3,000-foot structure at Grand Coulee. Comparisons of width, height above bedrock, and tons of steel used, carry about the same ratio.

The cofferdam, which has an average height of 110 feet above bedrock, a width of 36 to 90 feet, and two abutment cell clusters, 190 feet wide, required 13,000 tons of steel sheet piling. The area enclosed measures 66 acres. It is comprised of 10 different sections and includes 4 types of construction.

Sections B and I[2] consist of a single line of the interlocking steel piling and a rear wall of timber, 37 feet back, attached to the front face by tierods.

Sections C, E, and H are complete steel cells up to elevation 965, with the front wall carried up to 990—the top 25 feet of the rear wall being timber, also 37 feet back from the face and attached by tierods, as in the B and I sections. The cells C and E are 50 feet deep and in section H, 90 feet deep—the extra width to provide stability as the space in this section of the tailrace area does not permit a berm.

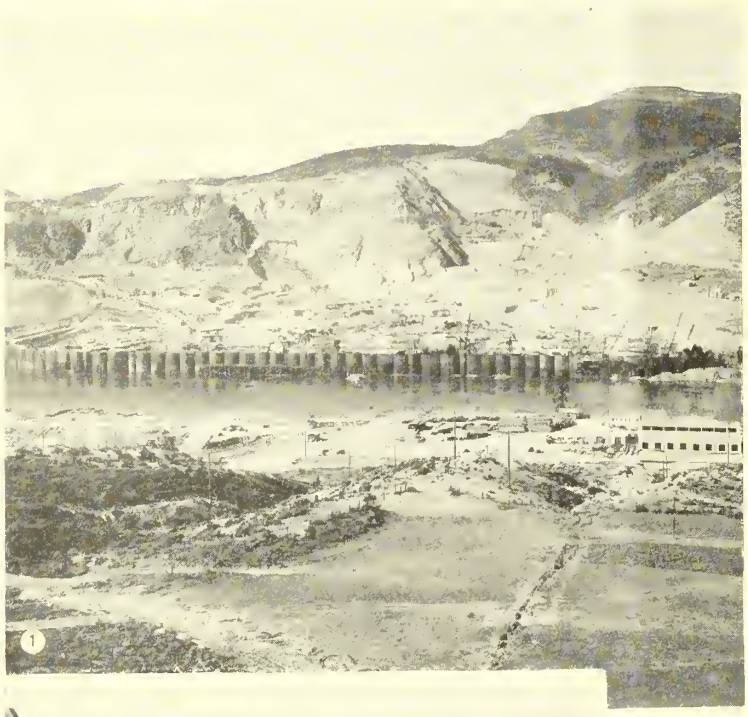
Sections D and G are made up of a cluster of 8 cells each, all with a radius of 40 feet and carried to elevation 990, except that tierods are used above elevation 965 in place of the interlocking steel diaphragms that serve as tiewalls in all cells below that elevation. These clusters will serve as closures to "block 40" of the big dam, as shown on the sketch plan of the cofferdams, and later as the junction tie to the cross-channel cofferdams.

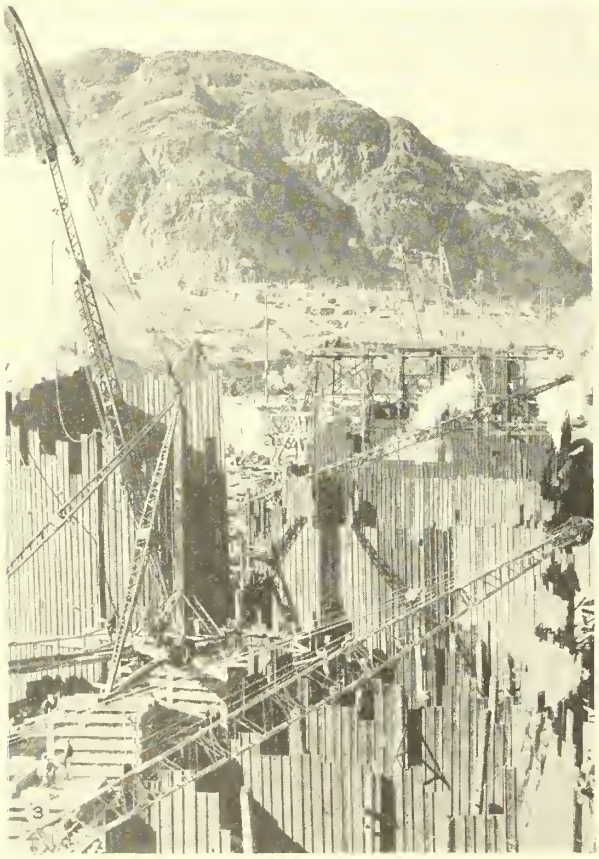
Section F is a single line of the interlocking steel piles connecting with the rear cells of D and G, 140 feet from the inner wall of section E, and serving as a retaining wall for the berm behind E, and later as the west wall of the steel "box" enclosing block 40.

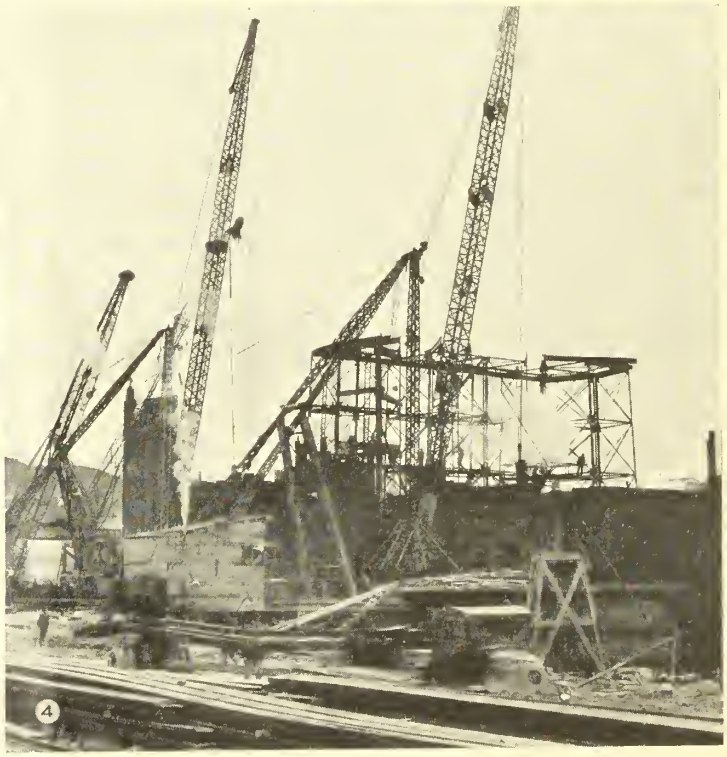
The steel piles are of the standard interlocking type (Inland Steel Co., sec. I–31–S), 15 inches wide and weighing 38.8 pounds per foot, of open-hearth steel having a minimum tensile strength of 70,000 pounds per square inch, and an interlock strength of 12,000 pounds per inch. In addition to the 7,053 lengths of flat sections used, there were also numerous special Y and cross sections with weights up to 118 pounds per foot. The shipment was in 35, 40, 75, and 80-foot lengths, hauled by trucks from the railhead, 32 miles distant. The long lengths of the standard sections weighed 1½ tons each, and truck loads were therefore limited to 7 or 8 pieces, and of the specials to 3 or 4 pieces, as these weighed nearly 5 tons each. A fleet of 12 to 15 trucks was used to haul the 13,000 tons of steel, moving day and night, at an average speed of 5 miles per hour, loaded. To possibly picture what this huge amount of steel means, if the lengths were laid end to end, it would cover a distance of 127 miles—would build 10 highway bridges of the cantilever type spanning the Columbia be-

[1] Pronounced Swa-Nekt-ghu; the early Indian name of Columbia River.

[2] Lettered sections are indicated on the accompanying diagram "Grand Coulee cofferdams", referred to from time to time in this article.







WORK GETS UNDERWAY ON GRAND COULEE DAM, COLUMBIA BASIN PROJECT, WASH.

1. The cofferdam nearing completion the latter part of March, 1935; 2, a rigger spotting one of the big hammers over a pair of steel piles. Note the fishtail guides; 3, building the cells in cluster G of the cofferdam; 4, the 6-hammer tower set-up over cell cluster G. One of the stiffleg booms is 145 feet long.

tween Coulee Dam and Mason City, 950 feet long, with a river span of 550 feet.

The first operation in building the cofferdam was the clearing of the overburden of boulders by excavating a trench to clay with clamshells, blasting large boulders, often under water and at times up to 500 cubic yards in size. Wood piling was then driven to hold in place guide frames of laminated wood, or of 6-inch I-beams, curved to the arc of the cell. The steel piles were next strung, or threaded in place, and each cell completely interlocked before driving. A rigger in a boatswain seat guided the pieces of piling in place in the threading process and later spotted the steam hammers. A special fishtail guide, de-

signed by the contractor, was attached to the hammers for driving two piles at the same time.

The 40-foot thick clay bed covering bedrock offered a greater resistance to penetration than had been anticipated and with only 16 of the hammers out of the 26 on hand in constant use, it was apparent after about 3 weeks' driving that there was no certainty of completing the coffer in advance of high water, due in May or June. Therefore, a 4-hammer gantry was built, running on trestles on either side of section E, with tracks 70 feet apart, and so arranged that the hammers could be spotted over any pile in a cell. A stationary hammer tower was also constructed, for driving the cells in cluster G, with a capacity of six hammers. With these additions the speed of driving was increased at least 50 percent and as a consequence of being able to operate all of the steam hammers, the entire cofferdam was completed in the remarkably short period of 90 days.

The clay was a very dense and hard sedimentary deposit and with an average depth of 40 feet to be penetrated by the seven-thousand-odd strips, meant a total penetration of 48 miles. It required an average of 35 of the 6½-foot-ton blows per inch of penetration—more than 20,000 blows per pile. The skin friction in this compact clay offered such resistance that it was found impractical to drive all the piles to bedrock and a "refusal" point was adopted of plus 50 blows for 1 inch of penetration—probably a more effective seal than steel on rock.

The filling of the cells with 275,000 cubic yards of selected sand was by means of the specially constructed "shuttle" conveyors, described in the article on the Conveyor System in RECLAMATION ERA for June 1935.

The structure proved to be practically a perfect seal against the river. Excavation under way at the river flood stage was, in places, at an elevation 90 feet below water surface, and the total seepage throughout its entire length, as measured in a series of sumps dug to bedrock, was less than 500 gallons per minute—a testimony to design and care during construction.

LABOR AND MATERIAL USED

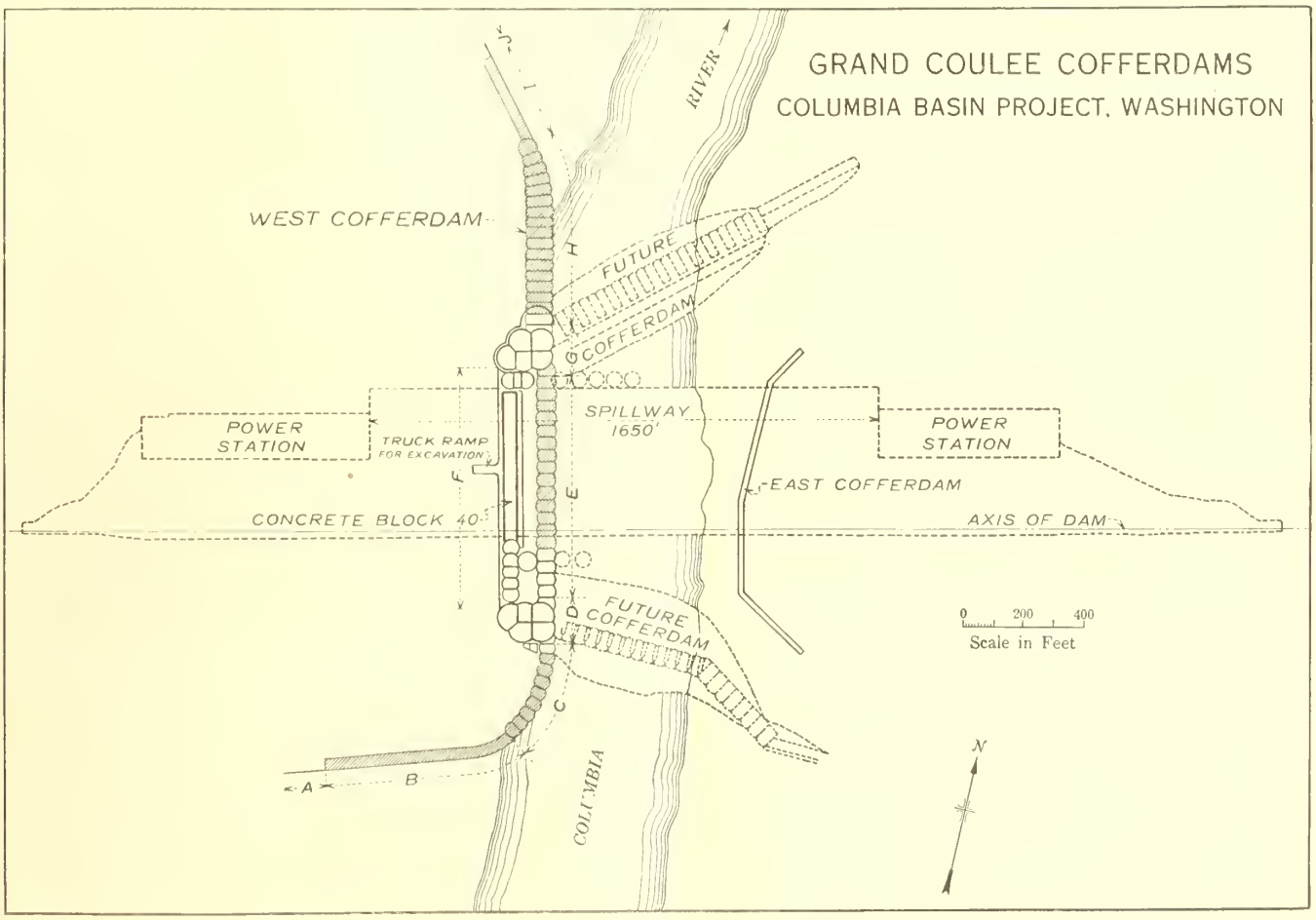
In the construction of the cofferdam the labor amounted to 550,000 man-hours, about 60 percent of the total cost.

A total of 6,100 tanks of oxygen and acetylene gas was used for cutting; and 125 burners and 5 electric welding rigs were in use. Timber used amounted to 3,000,000 board-feet; wood piling, 120,000 feet, and tierods, bolts, and heavy hardware, more than 1,000 tons. Fuel oil for the 1,200-horsepower boilers used for supplying steam to the hammers, amounted to 249,000 barrels.

A low cofferdam (elevation 965) was completed on the east side in October 1935, built of Wakefield piling, using 4- by 12-inch timber, 20 feet deep. This is driven into clay about 15 feet and will serve as the coffer for excavation and possible placing of concrete during the present low-water period.

Construction of the cross-channel coffers will begin after the 1936 high-water stage, when the river will be diverted over the west portion of the dam at elevation approximately 935. On the sketch map is shown one of the tentative plans under consideration for this major work that should be well under way a year from now.

A new plant for the production of olive oil is being erected on the Orland project by one of its water users. This man has a fair-sized olive grove, and will be able to obtain better prices for his fruit in this manner. There are several plants producing olive oil in the vicinity of Orland and the oil produced is of a very superior quality.



Notes for Contractors

Casper-Alcova project, Wyoming.—On September 21 at Casper, the following bids were received for constructing office building, dormitory, combined garage and shop, four 4-room and three 5-room residences at the Government camp at Seminoe Dam site, and one 5-room residence at Alcova Dam site (Specifications No. 643): Dutton, Kendall & Hunt, Inc., Denver, Colo., all schedules, $77,214; S. A. Roberts, Salt Lake City, Utah, all schedules, $84,570; McDonald Construction Co., St. Louis, Mo., $87,547.20; Green Bro. Hastings, Nebr., $104,010.05; W. E. Callahan Construction Co. and Gunther & Shirley, Alcova, Wyo., schedule 5, $7,792.50. The Secretary on October 7 approved award of contract to Dutton, Kendall, & Hunt, Inc.

Boulder Canyon project, Arizona-Nevada.—On October 2 the Secretary approved award of contract to the Reliance Steel Products Co., of Rankin, Pa., for furnishing items 1 and 2, under Specifications No. 640, which call for structural steel and open gratings for walkways, stairs, and ladders. Crane O'Fallon Co., Denver, Colo., received the contract for item 3 which covers handrails.

The Secretary has rendered a decision that the Thomas Spacing Machine Co., Pittsburgh, Pa., is low bidder on furnishing twelve 72-inch needle valves, as called for under Specifications No. 628, bids opened at Denver on June 5. The bid was $214,000. Contract was formally awarded on October 16.

Bids were received at Boulder City on October 28 under Specifications No. 642 for the construction of terrazzo work for Boulder Dam and power plant. The items of work and estimated quantities are as follows: 47,920 square feet of unbonded field terrazzo 3½ inches thick; 6,675 square feet of terrazzo border for unbonded field terrazzo; 3,490 linear feet of terrazzo base for unbonded field terrazzo; 1,180 linear feet of terrazzo curb for unbonded field terrazzo; 145 linear feet of terrazzo strip and base around stair walls; 48 linear feet of terrazzo shelf and base around stair walls; 31,145 square feet of bonded field terrazzo 1 to 2 inches thick; 3,398 square feet of terrazzo border for bonded field terrazzo; 2,551 linear feet of terrazzo base for bonded field terrazzo; 800 linear feet of terrazzo cove; 3,280 square feet of terrazzo traffic strip; 4,569 square feet of terrazzo treads and landings; 107 square feet of terrazzo risers and base; and constructing several special terrazzo floor designs.

On October 10 the Secretary approved award of contract to the General Cable Corporation, Chicago, Ill., for schedules 1 to 4, inclusive, Specifications No. 687–D, the bids f. o. b. Boulder City, being as follows: Schedule no. 1, 5,000-volt varnish-cambric-insulated cable, $15,029.06; schedule no. 2, rubber-insulated cable, $55,340.16; schedule no. 3, vertical cable, $8,302.39; schedule no. 4, telephone wire, $373.18. Schedule 1 will be shipped from St. Louis, Mo., or Bayonne, N. J., 2 and 3 from Perth Amboy, N. J., and 4 from Rome, N. Y. Schedule 5, asbestos-covered fixture wire, goes to Hendrie & Bolthoff Manufacturing Co., Denver, Colo., whose bid was $129.76.

At Denver on October 17, the following bids were received for furnishing miscellaneous metal work for the Boulder power plant, under specifications no. 727–D; Worden-Allen Co., Milwaukee, Wis., $6,778, f. o. b. Boulder City, ½ percent discount; Hansel-Elcock Co., Chicago, Ill., $7,263 f. o. b. Boulder City, ½ percent discount, delivery 60 days; Midwest Steel & Iron Works, Denver, Colo., $7,386 f. o. b. Boulder City, ½ percent discount; Schrader Iron Works, Inc., San Francisco, Calif., $7,585; Silver-Roberts Iron Works, Inc., Denver, Colo., $8,250 f. o. b. Boulder City; Buehler Tank & Welding Works, Los Angeles, Calif., $7,880; the Ornamental Iron Works Co., Akron, Ohio, $7,492, ½ percent discount, delivery 90 days; California Steel Products Co., San Francisco, Calif., $8,588; John W. Beam, Denver, Colo., $7,895 f. o. b. Peotone, Ill., ½ percent discount; A. J. Bayer Co., Los Angeles, Calif., $8,324, ½ percent discount; Omaha Steel Works, Omaha, Nebr., $8,300; ½ percent discount; McClintic-Marshall Co., Bethlehem, Pa., $8,385 f. o. b. Leetsdale, Pa.; B. Ketchen Iron Works, Irvington, N. J., $9,226, ½ percent discount.

On October 15 the Secretary approved award of contract to the Tregoming Boat Co. of Seattle, Wash., for furnishing a Diesel-engine-powered towboat (specifications no. 717-D) at their bid of $17,250 f. o. b. Seattle.

All-American Canal project, Arizona-California.—On September 26 the following bids were received at Denver, under specifications no. 721–D, for furnishing materials, for a water tower at the Government camp at the Imperial Dam site: Chicago Bridge & Iron Works, Los Angeles, Calif., item 1, $4,165, item 2, $3,635, f. o. b. Chicago; Consolidated Steel Corporation, Los Angeles, Calif., item 1, $4,690, item 2, $4,470; Pittsburgh-Des Moines Steel Co., San Francisco, Calif., item 1, $4,833, item 2, $4,265, f. o. b. Pittsburgh; W. E. Caldwell Co., Louisville, Ky., item 1, $5,176, item 2, $4,640; Omaha Steel Works, Omaha, Nebr., item 1, $5,510, item 2, $5,281; Minneapolis-Moline Power Implement Co., Minneapolis, Minn., item 1, $5,935. The bids have been taken under advisement. Items 1 and 2 were for shipment of materials on commercial and Government bills of lading, respectively. A contract for item 2 was awarded to the Chicago Bridge and Iron Works on October 16.

Bids will be received at Yuma, Ariz., until November 21 for constructing the Imperial Dam and desilting works (specifications no. 644). The principal items of work and estimated quantities involved are as follows: 572,000 cubic yards of all classes of excavation for dam; 791,000 cubic yards of all classes of excavation for desilting works; 16,000 cubic yards of all classes of excavation for roads; 1,079,300 cubic yards of excavation from borrow pits; 91,500 square yards of preparing earth foundations for concrete; 60,000 cubic yards of back fill; 1,065,000 cubic yards of compacting embankments; 182,550 square yards of dry-rock paving; 45,900 cubic yards of riprap; 38,000 cubic yards of gravel fills and blankets; 47,300 cubic yards of rock fills on canal embankments; 10,000 cubic yards of concrete in concrete piles; 65,200 cubic yards of concrete in dam; 55,100 cubic yards of concrete in aprons and paving; 34,700 cubic yards of concrete in desilting works; 400 cubic feet of pressure grouting; fabricating and driving 1,710 M ft. b. m. of untreated timber sheet-piling; driving 950 M ft. b. m. of treated timber sheet-piling; driving 5,203,000 pounds of steel sheet-piling; placing 182,500 pounds of steel sheet-piling in concrete in trenches; driving 13,300 linear feet of timber foundation piles; driving 113,400 linear feet of concrete piles; drilling 1,600 linear feet of grout holes; placing 18,255,000 pounds of reinforcement bars; placing 419,300 pounds of jet pipe in concrete piles; installing 19,300 linear feet of flexible joint-seals; installing 6,600 linear feet of metal water stops; placing 10,900 linear feet of mastic filler at tops of sheet-piling; laying 2,300 linear feet of 4-inch and 12-inch clay sewer pipe; installing 4,650 linear feet of timber crests on effluent weirs; installing 2,450 square feet of roofing on building; erecting 379,000 pounds of structural steel in bridges; installing 1,184,000 pounds of roller gates and hoists; installing 1,169,000 pounds of radial gates and hoists; installing 813,000 pounds of trash-rack metalwork; installing 200,000 pounds of metal handrails; installing 2,054,000 pounds of revolving scrapers and drives; installing 353,000 pounds of metal lining in slots of effluent weirs; installing 1,400,000 pounds of metal pipe, fittings, and valves; installing

94,500 pounds of miscellaneous metalwork; installing 1,400 square feet of metal doors and windows; installing 71,300 linear feet of electrical metal conduit; laying 13,500 linear feet of 4-way and 6-way multiple-duct conduit; laying 10,000 linear feet of parkway cable; and installing electrical conductors, and apparatus. The work is located on the Colorado River about 18 miles northeast of Yuma, Ariz., and must be completed within 800 days from the date of receipt of notice to proceed. Liquidated damages for delay will be $500 per day.

Columbia Basin project, Washington.—Two bids were received at the Coulee Dam project office on September 26 for furnishing and installing a steam-heating system for the garage and fire station at the Government camp at Grand Coulee Dam site (specifications no. 720-D). Item 1 called for shipment of materials on commercial bills of lading and item 2 on Government bills of lading. The bids were as follows: A. G. Rushlight & Co., Portland, Oreg., $3,147 and $2,970; Advance Plumbing & Heating Co., Tacoma, Wash., $3,559 and $3,559. Award was made to A. G. Rushlight & Co. on October 8 for item 2.

Owyhee project, Oregon-Idaho.—The following bids were opened at Ontario, Oreg., on October 7 for building structures on North Canal laterals, under specifications no. 520-0: C. E. Winters, $7,235.20; David A. Richardson, $7,477; Fife & Co., $7,712.70; John Klug, $8,318, Henry L. Horn, $8,465.30. All bidders are residents of Nyssa, Oreg.

Fife & Co., Nyssa, Oreg., submitted low bid of $7,687.50 under specifications no. 521-0, North Canal laterals, bids opened at Ontario on Oct. 9. Other bids were as follows: Henry L. Horn, Nyssa, Oreg., $8,110; David A. Richardson, Nyssa, Oreg., $8,205; John Gardner, Klamath Falls, Oreg., $9,081.

Upper Snake River project, Idaho.—Six contractors submitted bids on October 10, at Ashton, for furnishing concrete aggregates under specifications no. 731-D, as follows: Max J. Kuney Co., Spokane, Wash., $18,550; Nick Burggraf, Inc., and J. B. Brennan, Pocatello, Idaho, $19,875; Western Construction Co., Pocatello, Idaho, $20,750; W. C. Burns, Idaho Falls, Idaho, $22,150; Wheeler & England, Ashton, Idaho, $25,125; Olaf Nelson, Logan, Utah, $41,250.

Ogden River project, Utah.—The following bids were received on October 10 at Denver for furnishing precast reinforced concrete pipe under specifications no. 722-D (readvertisement of 716-D): Schedule 1, Utah Concrete Products Corporation, Salt Lake City, Utah, $18,730.03, schedule 3, $26,197.36; American Concrete & Steel Pipe Co., Los Angeles, Calif., schedule 2, $17,497.62, schedule 4, $22,724.42; Collins Concrete & Steel Pipe Co., Portland, Oreg., schedule 2, $17,529.12, schedule 4, $21,951.35; Lock Joint Pipe Co., Denver, Colo., schedule 4, $24,604.40.

Eight manufacturers bid on furnishing steel bridge and 75-inch diameter steel pipe bend and appurtenances for Ogden Canyon conduit (specifications no. 734-D) opened at Denver on October 18. The bids were as follows: Kansas City Structural Steel Co., Denver, Colo., item 1, $949, item 2, $1,594, f. o. b. Kansas City; Ogden Iron Works, Ogden, Utah, item 1, $1,560; California Steel Products Co., San Francisco, Calif., item 1, $1,192, item 2, $1,380; John W. Beam, Denver, Colo., item 1, $1,185 f. o. b. Peotone, Ill.; Midwest Steel & Iron Works Co., Denver, Colo., item 1, $1,186 f. o. b. Ogden, Utah; Consolidated Steel Corporation, Ltd., Los Angeles, Calif., item 1, $1,292, item 2, $1,348, items 1 and 2, $2,508; Western Pipe & Steel Co., San Francisco, Calif., item 2, $1,641; Pittsburgh-Des Moines Steel Co., Des Moines, Iowa, item 1, $1,259.

Water Utilization in the Snake River Basin

Transformation of 2,700,000 western acres of sagebrush land in the Snake River Basin into productive farmland during the past 100 years has made pioneering history, and the story of it is told in a report entitled "Water Utilization in the Snake River Basin", published by the Geological Survey, Department of the Interior.

The area covered in the report includes about 109,000 square miles in Wyoming, Utah, Nevada, Idaho, Oregon, and Washington, an area approaching in size all of New England and New York.

Formerly an arid region, irrigation had its inception in the pioneer days and has reached its present development largely through the collective efforts and enthusiasm of the early homesteaders. Today, 80 reservoirs having a combined capacity of nearly 6,000,000 acre-feet irrigate the land and make possible successful crop production.

Demands for power, in the absence of large mining or manufacturing centers, have come largely from the homes and farms in this region. An interconnected power system of nearly 70 hydroelectric plants and more than 3,000 miles of transmission lines has grown from a series of isolated plants to meet the demands of a progressive consumer public educated to realize the advantages of home and farm electrification.

The irrigation, power, and storage features of this progressive program are described in detail in the Geological Survey report. The report indicates that in the economic growth of the basin there has been little exploitation of resources or over-expansion in either land or water development, with the result that there has been remarkable stability in the welfare of the people.

In addition to the discussion of the past development, the report describes nearly 100 undeveloped storage sites in which nearly 8,000,000 acre-feet of water could be stored; it discusses the relation of the storage of water to the possible future irrigation of 1,300,000 acres of semidesert land; and it describes 200 undeveloped power sites at which 5,000,000 horsepower could be developed for half of the time, with storage.

Although the present and possible future uses of water are discussed, no definite plan of future development or operation is suggested. The report, known as Water-Supply Paper 657, represents nearly ten field seasons of land classification and mapping activities, contains 367 pages of text and illustration and may be obtained from the Superintendent of Documents, Government Printing Office, for $1.

Grand Valley Peaches

The Grand Junction, Colo., Chamber of Commerce paper of September carries a few letters illustrating the fame of that section's peaches.

From Marvin H. McIntyre, at the White House:

"Your friendly letter has been received and the President has noted it with much interest. He asks me to convey to you and to the members of your chamber his cordial thanks for those delicious Grand Valley peaches."

From Secretary Ickes:

"It was very generous of you to send me another box of those Grand Valley tree-ripened peaches. These have just reached me and I know I am going to find them as delicious as I did on a former occasion."

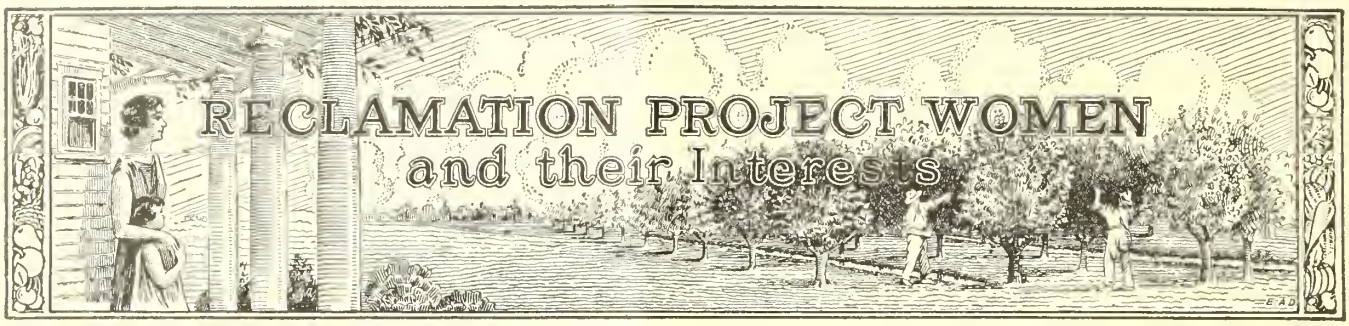
From Postmaster General Farley:

"The peaches have been received, and I know we shall enjoy them very much."

From Senator Alva B. Adams:

"The box of peaches which you advised had been sent to me arrived this morning. They arrived in perfect condition and are of a delightful flavor. My family and I are enjoying them immensely."

Several bona fide sales of project property on the Orland project were made during a recent month and 4 or 5 prospective purchasers called at the project office for information. A healthy interest in farm lands seems to be developing. Sprucing up of farm buildings continued all summer and the results are noticeable.



Mrs. Crews Honored for Boys' Club Work

MRS. MARGARET CREWS, of Tieton, pushed her snowy white hair back from her sunburned forehead, cast a furtive glance at the cherry pickers she had been "superintending" and reminisced about the founding of the 4-H clubs.

And if anyone should know the history of the now Nation-wide 4-H club movement, it's this Tieton Valley woman. Back in 1912 Mrs. Crews founded the Tieton Boys Club, progenitor of the present day 4-H clubs.

RECALLS FOUNDING

Seated in the cool front room of her ranch home, the very house she and her husband built when they homesteaded in the Tieton back in 1905, Mrs. Crews recalled with pride the enthusiasm of the 18 young boys, charter members of the Tieton Boys' Club.

Mrs. Margaret Crews.

"It was right in this very room we had our first meeting", Mrs. Crews recalls. "I had three teen-age boys of my own and here we lived so far away from schools and similar advantages for my children I realized they'd either choose the wrong road or the right one for their lives and I wanted to help them all I could.

"Now boys, I thought to myself, like gangs, and they like to make their own spending money independently of their folks, so why not combine the two in a sort of agricultural club?"

MEETINGS DIFFICULT

The Tieton Boys' Club had evening meetings every 2 weeks at the homes of members.

"Back in 1912 the roads out here in the Tieton were pretty sketchy affairs", Mrs. Crews declares. "I went to the meetings in my horse-drawn buggy. Fred Franklin—the boys elected him president—rode with me. Sometimes we'd come right smack up against an irrigation ditch and Fred would get out and lead the mare across while I sat in the buggy and shivered. My boys rode their own horses to the meetings."

Mrs. Crews besieged Washington, D. C., for bulletins on agriculture. During the summer the Federal authorities referred her to the newly formed Department of Agriculture at Pullman and from this source she garnered much valuable information for the club.

The 18 boys chose their own agricultural pursuits. Most popular were raising of livestock, grains, vegetables, berries, and other small fruits.

Names on the original attendance roll and their occupations at the present time are:

Marvin Allyn, manager of the baby chick department of the Washington State Egg and Poultry Association, living in Bellingham; Fred Franklin, Tieton orchardist; C. B. Jones, Union Gap merchant; Bob Crews a veterinary surgeon, living in Tieton; Harold Hatten, a baker in Coupville; Edward and Nick Schuller, hop ranchers in the Tieton; Ralph Gil-

bert, guard at McNeills Island Penitentiary; Ben French, forester with the Government service in California; LeRoy Erb, Tieton rancher; Ed Linse, Tieton rancher; George Bartch, mechanic in Seattle; Ed Donnelly, Tieton rancher; Thompson Crews, Grandview orchardist; Alfred Ward, rancher (Mrs. Crews doesn't remember where); Bill Whitesides, Naches rancher; Allen McCoy, Tieton rancher.

MOTHERS DID PART

Franklin was president; McCoy, vice president; and Thompson Crews, secretary for the Tieton Boys' Club.

"The mothers of the 18 boys were delighted", Mrs. Crews recalls, "and the food they used to fix for the boys and me to eat after the meetings—great stacks of it. And maybe you think 18 young husky fellow can't eat!"

When the club had been going for a short time, the late S. S. Busch, county school superintendent, and Harry B. Averill, then secretary to the Washington State fair, attended the club's first public meeting. Mr. Averill was so enthusiastic about the project that he asked the group to enter an exhibit at the fair. Mr. Averill is now a Mount Vernon newspaper publisher.

EDUCATORS LEAD

The Tieton Boys' Club scored a real victory when Harold Hatten carried off the $25 gold piece, first prize, for his potatoes. With it he bought his first long-pants suit, and had his picture taken in his new finery.

Henry B. Dewey, then State school superintendent, was delighted with the project and put it in all schoo's throughout the State. The school teachers were to be the directors, but, Mrs. Crews explains, this failed because the teachers were not particularly educated in agriculture and because they did not have time to spend on it. Then Josephine Preston became State school superintendent and tried to take the boys' and girls' exhibit, which had become a part of the Washington State fair here, to Spokane. Mrs. Crews and her helpers put the matter before the Agricultural Department at Pullman, which vetoed the idea of moving the exhibit.

MOVEMENT NATIONAL

After the Tieton Boys' Club had been in existence for 2 years the Smith-Lever bill was passed, making the movement a national one for young boys and girls.

"We called it 4–H", Mrs. Crews points out, "for Head, Hands, Heart, and Health."

And that is the history of the 4–H clubs, from the 18 members of the Tieton Boys' Club to the thousands of members throughout the United States today.

Mrs. Crews' "castles in the air" have firm foundations. She has shown the road to happiness to thousands of boys and girls.—*Yakima Republic.*

EDITOR'S NOTE.—The local agent of the Agricultural Extension Service advised the superintendent of the Yakima project that clubs similar to the Tieton Boys' Club, organized by Mrs. Crews in 1912, had previously been organized in the East.

Tieton Mothers' Club

By Margaret Crews and Nell Tapp

On April 16, 1935, at the Tieton church was held the twenty-fifth anniversary of the Tieton Mothers' Club, the first rural woman's club recorded in the Yakima Valley and organized before the Tieton project was completed. At this luncheon, 12 of the 18 charter members were present, and Mrs. Margaret Crews, the founder and first president, read an interesting history of the club.

Through all these years the club has been foremost in the promotion of civil, religious, and social projects. In 1910, the club became affiliated with the National Congress of Mothers, which later became the General Federation of Women's Clubs. In 1915 the first parent-teacher work east of the Cascades in Washington was organized in Tieton. Through the efforts of the Tieton Mothers' Club, the first 4-H club in Washington was organized. Temperance, child welfare, traveling library, and civic improvements were only a few of the many projects these pioneer women fostered; but the greatest benefit of this club work came from the community spirit built up through the many wonderful social events held during these years. Clever Christmas parties, gypsy carnivals, spelling bees, and ice-cream socials are all remembered as high lights in the lives of the pioneers.

The club, with 65 active members and Mrs. R. R. Rosinbum as president, is realizing some of the dreams of those pioneer members and creating others. The school system now has 13 teachers, 3 buildings, 3 acres of lawn and shrubs, and 5 acres of playground. The little church is still the community center, and contains a room and musical instruments purchased by the club. On May 21, 1935, the Tieton library, which was sponsored by the club and school, was formally opened. A $25 scholarship is presented each year to the best "citizen" graduating. Red Cross work in the Tieton district is all done through this club. The club sponsored the tuberculosis test in the schools, and Tieton schools are the first in the State to require a tuberculosis health certificate in teachers' contracts.

We are most proud of our pioneer members, and at the anniversary luncheon pledged ourselves to uphold their ideals, for, after all, a beautiful country is only beautiful as the people in it grow more beautiful in body, mind, and soul.

Clubs Use Hyrum Reservoir

The Ladies Literary Club and the Lions Club of Hyrum, Utah, sponsored swimming and life-saving classes at the Hyrum Reservoir during the summer. Through the courtesy of the superintendent of schools of Cache County and the American Red Cross the sponsors were enabled to obtain the services of John T. Hawkins, examiner and instructor of the latter organization, as supervisor of the classes. Certificates were awarded to 2 beginners, 9 swimmers, 10 junior life savers, and 4 senior life savers.

The Homemakers Camp at Payette Lakes provided a week's vacation for 38 farm women of Malheur County during the month. The camp was under the direction of a home demonstration agent of the Extension Department of the Oregon State College and was considered highly successful. Leisure, entertainment, and instruction were provided.

Films in Los Angeles

A report has been received from the visual education section of the Los Angeles City school district, that through a 4-month period in 1935 the 7 project films loaned to the district were shown before 271 assemblies, with a grand total in attendance of 14,647 high-school boys and girls.

The road construction between Sidney and Fairview on the Lower Yellowstone project is about completed. This is one of the best constructed roads in the State of Montana at the present time. The contract for oiling which has been completed was of the asphalt type and the road has been opened for traffic.

During the month of September about 25 potato cellars with a total storage capacity of 450 cars were constructed on the Klamath project. Most of these cellars are in the Tule Lake division.

Progress of Field Engineering Investigations of Projects

Silt Survey, Colorado River, Ariz.-Calif.—Two additional cross sections were completed during the month to determine the effect of desilted water released from the Parker Reservoir on the river channel, making 20 sections to date, at approximately 5-mile intervals, along the Colorado River between Parker and Imperial Dam sites.

Northern transmountain diversion, Colorado.—Field work at Grand Lake was carried on during the month by 4 plane-table parties, 1 level party, and 1 triangulation party of 2 men. Seven plane-table sheets of the Granby Reservoir site were completed and four partially completed. Numerous horizontal and vertical control points were located. One plane-table and one level party are located in Estes Park. One plane-table sheet covering the tunnel outlet at Big Thompson River has been completed. Geological examination of the area over the proposed tunnel line was continued. An examination of the Moffat Tunnel was made for comparative data.

Upper Snake River storage, Idaho.—An investigation is being made of a proposed tunnel diversion from Hebgen Lake on the Madison River in Montana to Henrys Lake in Idaho, a distance of 8.5 miles. The preliminary field survey for a rough profile and relative elevation of the two lakes is about complete. Data are also being assembled for a study of the available water supply.

Buffalo Rapids project, Montana.—The report on this project was completed and submitted to the Commissioner for review.

Gallatin Valley, Mont.—The engineer in charge arrived at Bozeman on September 12, 1935, and spent the balance of the month getting acquainted with the project, pending a decision from Washington concerning employment of labor and rates of pay.

Butter Creek, Oreg.—A field inspection was made of the Teel Irrigation District project for diverting water from Comos Creek, a tributary of the John Day River, through the summit into Butter Creek, a tributary of the Umatilla River.

Deschutes project, Oregon.—The location of a feeder canal from Crescent Creek to Wikiup Reservoir was laid out and a yardage estimate computed. Eight additional test pits for borrow pit material were dug in the vicinity of Wikiup Dam site no. 4, and samples sent to Denver. A test pit was also dug at the proposed outlet canal from South Twin Lake to Wikiup, to reveal any rock excavation. None was found to a depth of 19 feet, which is the probable depth of the cut. Two concrete bench marks with brass plates were set on the control line for Wikiup Dam site no. 4, and the elevation of one obtained before the field party was disbanded. An investigation of a tunnel site from Crooked Creek into Ochoco Reservoir revealed prohibitive costs. For an alternate plan, a dam 70 feet high was investigated with a brief plane-table survey completed September 26, 1935. Meetings were held with various interested parties on September 2, 9, and 25, relative to a contract for Wikiup storage.

Grande Ronde, Oreg.—Some office work was done in assembling the field data for a progress report.

Southern Nevada.—Surveys of irrigation possibilities in the Las Vegas and Moapa Valley areas by pumping from the Boulder Canyon Reservoir were in progress and land classification maps for the Las Vegas pumping project are being prepared.

Salt Lake Basin, Utah.—Cost estimates were prepared for four alternative locations of a feeder canal from Currant Creek to Strawberry Reservoir to aid in the selection of a line for construction. The selected canal line, which passes through Co-op Pass, a distance of 4.8 miles from Currant Creek, is now under construction.

North Platte River power, Wyo.—A study was made of the possible power output at the Seminole Reservoir for two turbine installations, one for a 170-foot head and another for a 200-foot head.

Colorado River Basin.—Land classification work in Colorado consisted of surveys in the vicinity of Fraser and Tabernash, on the Fraser River; Hot Sulphur Springs and Troublesome and areas tributary to Williams Creek and Kremmling on the Blue River and its tributaries. Approximately 99 square miles were covered during the month with either land classification or irrigated area survey. Some 400 acres of irrigated lands in widely scattered farms were also estimated on field inspection. Land classification in Utah during the month consisted of 38½ square miles on the Green and White Rivers. The work on the White River extended eastward from the junction with the Green River to the bad lands, a distance of 14 miles. In the Uintah Basin mapping of irrigated lands continued on the Duchesne, Lake Fork, and Yellowstone Rivers. A total of 115 square miles was covered.

Articles on Irrigation and Related Subjects

Boulder Dam:

A Work of Human Service (editorial on dedication), Eng. News-Record, Oct. 3, 1935, v. 115, p. 477.

Boulder Dam stamp, view, Eng. News-Record, Sept. 26, 1935, v. 115, no. 13, p. 447.

California Valley Project: Reclamation Bureau gets allotment for central valley work (map) and estimate of total cost, Eng. News-Record, Sept. 19, 1935, vol. 115, no. 12, p. 413.

Casper - Alcova Project: Tunnel - canal-siphon outlet of Casper-Alcova Reservoir, illus., Eng. News-Record, Sept. 19, 1935, v. 115, no. 12, pp. 385–388.

Columbia Basin Project:

Coulee cofferdam, illus., Construction Methods, Sept. 1935, v. 17, no. 9, pp. 42–44.

In the Right Direction (editorial favoring Dr. Mead's plan for purchase of land), Eng. News-Record, Sept. 12, 1935, v. 115, pp. 378–379.

Coyle, Joseph C.: Draglines speed progress on All-American Canal, illus., Excavating Engineer, Aug. 1935, v. 29, no. 8, pp. 369–374, 396–399.

Grand Coulee Dam: Progress on Grand Coulee Dam, illus. Reprint from Eng. News-Record, Aug. 1, 1935, 23 pages reprint, series of articles.

Hedberg, John: Some experiments on laminated dam models, illus., Civil Engineer, vol. 5, no. 7, pp. 413–415.

Hoyt, W. G.: Water utilization in the Snake River Basin, Water Supply Paper 657, Geological Survey; 367 pages, including maps and illustrations. On sale by Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of $1 per copy.

Mead, Elwood: Boulder Dam, World's largest artificial lake. Excavating Engineer, Sept. 1935, v. 29, p. 432.

Pine View Dam: Pine View Dam preliminaries include variety of features, illus., Western Construction News, Sept. 1935, vol. 10, no. 9, pp. 243–245.

Roosevelt, Franklin D.: A defense of New Deal, The President Speaks (speech in part at dedication of Boulder Dam). U. S. News, Oct. 7, 1935, vol. 3, no. 40, p. 14–16.

Vivian, C. H.: Developing the mighty Columbia, illus. Compressed Air Magazine, Sept. 1935, vol. 40, no. 9, pp. 4815–4821.

White, W. M.: Construction of 115,000-h. p. Boulder Dam turbines. Mechanical Engineering Sept. 1935, v. 57, no. 9, pp. 539–546.

Both Black and White Alkali Soils Reclaimed

EXPERIMENTS conducted by W. P. Kelley, agricultural chemist of the University of California Experiment Station, and S. M. Brown, assistant chemist, have demonstrated that soils of either black or white alkali nature can be reclaimed.

A report of their work in Hilgardia, a journal of agriculture science published by the California Agricultural Experiment Station, University of California, Berkeley, described in technical detail the nature of the experiments.

These two scientists used black alkali land in the Fresno area of California and white alkali land in the Imperial Valley in their experiments. They proved that either type could be reclaimed by leaching, but found that black alkali leached out of the soil only very slowly. This treatment proved satisfactory on white alkali soil, however.

Since the chemicals causing the black alkali condition in soils are much less soluble than those in white alkali soils, Kelley and Brown experimented with the application of chemicals, designed to replace in the salts in black alkali soil the less soluble elements.

They applied to one plot 15 tons of gypsum per acre, to another 3,600 pounds of elemental sulphur and applied no chemicals to a third plot. They then flooded the plots. After 2 periods of 3 weeks each of flooding for all plots and another flooding a year later, the 3 plots were treated only by irrigation.

After a few years the gypsum and sulphur plots were found to contain no alkali in the top 48 inches of soil. In 4 years the sulphur plot was producing good yields of alfalfa. The gypsum plot was producing well a year later. The control plot, treated only with water, gradually was reclaimed. For years spots remained unproductive in it, and it was not until 8 years had passed that these spots were entirely covered by growing alfalfa. After 10 years its production was raised to almost the total reached by the sulphur plot in 4 years.

GOOD DRAINAGE ESSENTIAL

Kelley and Brown observed that good drainage was essential to any successful attempt to reclaim alkali soil. They said further that the chemical make-up of the water used in irrigation had an effect. Black alkali leached much more rapidly in experiments carried on in Utah because of certain chemicals carried by the water there.

Regarding the experiment on white alkali soil in the Imperial Valley, Kelley and Brown said: "In 1929 a series of plots were prepared for irrigation on a barren area of this soil near El Centro. Certain of these plots were treated with gypsum, others with sulphur, and still others with gypsum or sulphur and barnyard manure. Three plots were left untreated as checks. All of these plots were flooded with water from the Colorado River for three successive periods between December 1929 and May 1930. Alfalfa was sown in October 1930. In 1931 and 1932 good yields of alfalfa were obtained from all the plots. It was found that leaching without other treatment produced as good results as the application of gypsum or sulphur."

Presented here is a discussion of the experiments carried on by two prominent California soil chemists, who have demonstrated methods of reclaiming both black and white alkali soils. It is presented here for the information of readers of THE RECLAMATION ERA, *who are farmers or are interested in farmers' problems. The importance of these experiments by Mr. Kelley and Mr. Brown will be proved in the future.*

In a general discussion of their work, Kelley and Brown said:

"There seems to be good reason for the belief that either one or the other of the above-named methods of reclamation, that is, the application of a soluble calcium salt, or some substance which will increase the solubility of the calcium minerals in the soil, or leaching without applying any soil amendment, is applicable to alkali soils everywhere, with the possible exception of the so-called degraded types of alkali soils. In connection with these investigations soil samples have been studied from many alkali areas of California and other States. In certain localities both farmers and scientific workers have been able to secure complete reclamation of important areas of alkali soil by applying the principles of one or the other of the above-named methods. Many of these soils contain considerable water-soluble calcium salts, and wherever this is the case leaching has proved to be a successful method of reclamation.

"Black alkali soils may or may not require the application of some substance, such as gypsum or sulphur. As shown already, the Fresno type of black-alkali soil can be reclaimed by mere leaching with water, but this soil responds to the leaching process too slowly to justify placing complete reliance on leaching as a practical method of reclamation. Certain other types of black-alkali soil, however (for example, east and north of Great Salt Lake, Utah), respond to leaching readily. In this case the effectiveness of leaching is probably due to a combination of two fortunate circumstances, namely: (1) The composition of the irrigation water which is relatively rich in calcium and magnesium salts and (2) the occurrence of precipitated $CaCO_3$ and calcium silicate, which are thoroughly disseminated throughout the profile of this soil.

"The difficulty that must be overcome in the reclamation of alkali soils in general lies in their content of soluble salts and replaceable sodium, but alkali soils are usually not deficient in total calcium. Rather, replaceable forms of calcium may have been converted into other forms through base exchange and precipitation. Both $CaCO_3$ and calcium silicates may be caused to play an important role in the reclamation process. Any agency which will increase the solubility of these calcium minerals of the soil will promote the replacement of absorbed sodium by calcium and thus convert Na-clays and Na-humates into normal Ca-clays and Ca-humates. Among such agencies are elemental sulphur, CO_2 formed by plant roots and the decomposition of organic manures, iron sulphate, and soluble aluminum salts. Obviously the absorbed sodium can also be replaced by applying a soluble calcium salt either as a constituent of the irrigation water or as a soil amendment.

"From the foregoing it follows that the important properties of alkali soils are dependent on not only the soluble salts, * * * and the replaceable sodium, * * * but also on the calcium minerals of the soil other than the base-exchange constituents. Furthermore, $CaCO_3$ of the soil and the calcium and magnesium salts of the irrigation water may play imporant parts in the reclamation process.

"Other conditions being equal the facility of reclamation will be inversely proportional to the clay content of the soil. Heavy types of alkali soil may prove to be extremely difficult to reclaim, expecially if the clay is largely saturated with sodium * * *. With alkali soils of this type the application of a calcium salt of high solubility should, on theoretical grounds, produce the best results.

"The removal of the soluble salts and the complete replacement of sodium by calcium from the base-exchange complex of the soil are dependent on the possibility of leaching the soil, and it is obviously impossible to effect leaching if the groundwater level remains near the surface, or if the soil is impenetrable to water.

(Continued on p. 226)

Eight farmers from South Dakota make a personally conducted inspection of Yakima Valley.

Farmers Inspect Yakima Valley

Settlers are still coming into Yakima Valley from the East. The accompanying photograph shows eight farmers from Timber Lake, Trail City, and Glencross, S. Dak., who made a recent inspection of the country. These men have an average of 10 children—one has 16—making 96 persons in the 8 families.

The man on the extreme right is Charlie Fox, who went to Timber Lake from Illinois some years ago and farmed there for 15 years. Last fall he came to Sunnyside and rented one of the best farms. He has proven to be as good as any farmer in the district, although this was his first attempt at irrigation. All South Dakota people, upon arrival in the valley, are taken to the Fox farm where they are shown an example of what can be accomplished under irrigation, and the impression is at once favorable.

The members of the Fox family swear by this country and many of their friends continue to come to the district. Last year there were more than 200 farms sold within a 20-mile radius of Sunnyside, and a big percentage of the buyers were from South Dakota.

Fight on Noxious Weeds Willwood Division

L. H. Mitchell, field supervisor of district no. 4, held a meeting on September 18 with the Willwood settlers on the Shoshone project. The meeting, which was well attended, was held at the community house. Mr. Mitchell gave a very interesting talk on weed problems on other projects and urged the settlers to begin the fight on noxious weeds before they have become firmly established on the division. A weed committee was appointed to take charge of weed control. Herbert Jensen, who is in charge of weed control work in Park County, also gave a talk on the work now being done toward the eradication of noxious weeds on the Shoshone project. Specimens of all noxious weeds common to the project were shown to the settlers in order that they may be easily identified in case they make their appearance on the new farms.

Dr. Frederick L. Ransome 1868–1935

Word has been received of the death on October 6 of Dr. Frederick Leslie Ransome, who was born on December 2, 1868, in Greenwich, England. Dr. Ransome has rendered valuable intermittent service in the Bureau of Reclamation since 1927 as consulting engineer and geologist, and held an appointment as consulting geologist at the time of his death. He was a member of the Boulder Dam Consulting Board. He made geological examinations and reports of the Owyhee Reservoir and Dam site, the Avalon Reservoir, Carlsbad project, and the Deer Creek Dam site, Provo, Utah, in connection with the Salt Lake Basin project investigations. He also made a field inspection of and report on certain gravel deposits in the vicinity of the Boulder Dam prior to its construction.

Dr. Ransome was employed also in a consulting capacity in the War Department.

Sand Dunes on All-American Canal

The menace of the presence of a great system of sand dunes to the All-American Canal has been minimized by the discovery that they are underlain with gravel.

The sand on the banks of the canal is easily covered with a sheathing of this heavy gravel, which reduced almost to zero the chances of the banks blowing into the canal on one side and blowing away on the other.

It had been demonstrated by the construction of a highway across the sand hills that these threatening hills were not impassible. The discovery of the gravel layer under the sand is apt to prove a considerable advantage in the construction of the canal, however.

Since the gradient of the canal demands that the bottom be beneath the mesa floor, it is necessary to excavate down into the gravel. This makes it a very simple process to cover the embankments with a heavy gravel coating. All that is required is a little care on the part of the drag-line operators in spreading their last few buckets of material over the sand mounds they already have built.

Alkali Soils Reclaimed

(Continued from p. 225)

The drainage conditions are therefore exceedingly important in alkali soil reclamation."

Kelley and Brown did not discuss the drainage problem further, and, other than to observe that methods and management of cropping and irrigation also were important factors, did not discuss other phases of their experiments.

Dr. F. L. Ransome.

Excerpts from September Project Reports

Yuma.—Cotton picking is well under way with excellent yields reported; 4,586 bales were ginned during the month. Carrots are up and growing nicely. An excellent yield of pecan nuts is forecast.

Yuma Auxiliary.—The new citrus crop is developing satisfactorily. The shape of the fruit appears more uniform than in previous years, with indications of an increased yield over that of the past year.

Orland.—Prices received for almonds were about 50 percent higher than those of the past year, with a crop about 40 percent of normal.

Grand Valley.—The tomato canneries were operating heavily, and if the frost holds off well this crop should show a heavy yield. All other crops are normal. The harvest of the Palisade peach crop was completed during the early part of the month with a normal yield and an unusually good quality.

Uncompahgre.—Crops are good. The third cutting of alfalfa is being harvested. Weather conditions are fine for balance of harvest. The project's irrigation water supply for the month was above normal. This year's September supply was one of the very few in the history of the project when it was not necessary to make any rotation of water.

Minidoka.—Reports of high crop yields include a field of oats that produced 125 bushels per acre, wheat 85 bushels, and clover seed 10 bushels. In the early fall 253 head of lambs were shipped by the Minidoka County Lamb Pool, weighing 21,910 pounds, for which a price of $6.75 per hundredweight was received. The Cassia County Lamb Pool shipped 284 head of lambs on September 6. These lambs had a weight of 23,760 pounds and sold at $6.75 per hundredweight.

Owyhee.—Harvesting of crops is in progress with good yields generally being reported. Red clover seed, onions, and apple crops are running exceptionally heavy. Red clover seed is averaging about 6 bushels per acre and onions about 450 sacks, with some yields of 650 sacks per acre. The apple crop, both as to quality and yield, is the best in years.

There is a heavy demand for feeders, both cattle and sheep, for shipment to the Middle Western States. The county is being scoured for this class of livestock. Arrangements are being made for the shipment of 23,000 lambs into the county for pasture feeding. In the event of an early winter, the hay market should benefit greatly by this importation.

Riverton.—Grain yields are generally excellent. Yields of beans are satisfactory. Some excellent yields of alfalfa seed have been obtained. The potato harvest was begun with very satisfactory yields in prospect. Livestock on the project are in good condition.

Resistant Sugar-Beet Seed

The resistant sugar-beet seed is proving to be a great success on the Minidoka and Twin Falls projects, Idaho, and on experimental tracts in the Yakima Valley. It will no doubt prove a major factor in the development and prosperity of many of the principal valleys of the irrigated Western States and is likely to result in the revival of the sugar-beet industry in the Yakima and Boise Valleys and in a considerable extension of the industry in the Snake River Valley, as well as in all parts of the country where the leafhopper or white fly has been such a serious menace.

In the accompanying illustration the center strip shows how the white fly ruins a crop grown from European seed. The other strips were grown from resistant seed grown in the West. The Utah & Idaho Sugar Co. is growing enough resistant seed to plant all acreage next year where there is any danger of white-fly invasion. This is the greatest advance ever made in seed breeding in the United States. Visits made on a number of fields where both varieties of seed were used demonstrated results similar to that shown in the illustration.

The Amalgamated Sugar Co. began operations on the Frenchtown project, Montana, on September 26, employing about 300 men. It was expected that the plant would run at this capacity for 100 days.

The 500-locker cold storage plant in Ontario, Oreg. (Owyhee project), has been practically completed.

Organization Activities and Project Visitors

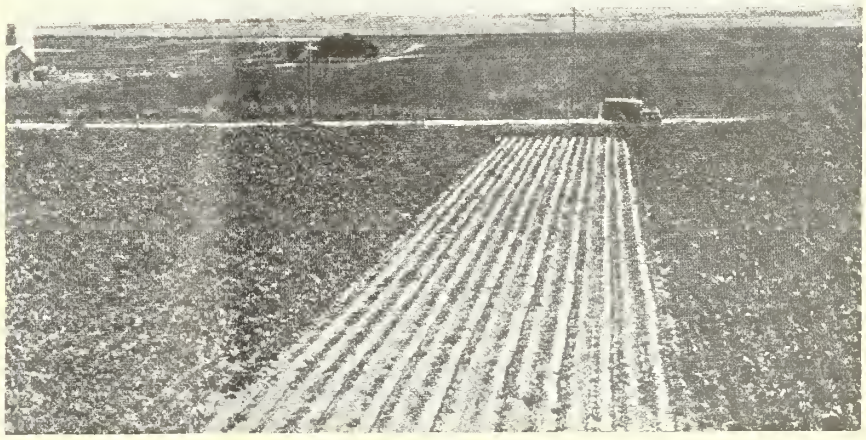
Commissioner Mead, who left Washington with the Presidential party on the evening of September 26 to attend the dedication of Boulder Dam, returned to the office October 10.

During the absence of the Commissioner from Washington, Miss M. A. Schnurr was acting commissioner.

Chief Designing Engineer Savage, Chief Electrical Engineer McClellan, and Walker R. Young, construction engineer, Central Valley project, met in Sacramento the early part of October to lay plans for a study of the features of the Central Valley project to be constructed with the recent allotment of funds for that project.

Under an Executive order dated September 26, 1935, Charles West, Under Secretary of the Interior, is authorized and directed by the President of the United States to perform the duties of the Secretary of the Interior during the latter's absence or sickness.

Dana Noyes Merrill, son of Maj. Gen. Dana Merrill, commandant of Fort Sheridan, retired, and son-in-law of Chief Engineer R. F. Walter, was killed on October 5, 1935, by explosion in the plant of the Glidden Soya Products Co. at Chicago, Ill. Mr. Merrill was employed as chemical engineer in the development of paint products from soybeans. He is survived by his widow and two children.



Seed breeding.

Chief Accountant Kubach spent 10 days in the Denver office the early part of October in connection with setting up the accounts under the allotments made for reclamation by the Emergency Relief Administration.

Prof. C. M. Sexton, of the department of civil engineering, University of Melbourne, Australia, was among the recent prominent visitors to the Boulder Canyon project.

Darwin G. Tyree was reinstated in the Government service, effective September 27, and assigned to duty as associate district counsel in the Portland legal office, vice Spencer L. Baird, recently transferred to the Denver office. Mr. Tyree was formerly employed in the Bureau, first in a clerical capacity and later as district counsel in the Portland office, being associated for several years with District Counsel Holgate.

Dr. Mirko Lamer, from Zagreb, Yugoslavia, who is studying some of the Public Works projects in the United States, was a recent visitor on the Uncompahgre and Columbia Basin projects.

D. W. Cole, formerly an engineer in the Bureau, who is now supervising repairs to the power dam of the Utah Power & Light Co. at Ashton, inspected the Island Park Dam site, Upper Snake River project, Idaho, on September 12.

Maj. Gen. W. L. Sibert, 1860-1935.

Maj. Gen. William L. Sibert 1860–1935

Maj. Gen. William Luther Sibert, whose brilliant career as an engineer included construction of the Atlantic sector of the Panama Canal and chairmanship of the Colorado River Board during the construction of Boulder Dam, died October 16, 1935, at Bowling Green, Ky. He was 75 years old.

General Sibert was born October 12, 1860, at Gadsden, Ala., and was commissioned in the Engineer Corps upon graduation from the United States Military Academy at West Point in 1884.

During his long service in the Army, General Sibert organized the Chemical Warfare Service, served as a captain in the Philippine jungles in 1899, and was selected in 1907 as one of three officers making up the Isthmian Canal Commission. He had charge of the Atlantic sector where Gatun Locks and Dam were constructed.

When the United States entered the World War, he was commissioned major general and was sent overseas in command of the First Division. He shortly was detached from his command, however, to organize the Chemical Warfare Service.

Major General Sibert was retired in 1920. As chairman of the Alabama State Docks Commission, he constructed the State docks at Mobile.

In 1928, General Sibert was appointed chairman of the Colorado River Board, other members of which were Charles P. Berkey, Daniel W. Mead, Warren J. Mead, and Robert Ridgway. The commission's report to the House of Representatives Committee on Irrigation and Reclamation made December 3, 1928, on their investigation recommended the Black Canyon site, recommended the type of dam, and found the Boulder Canyon project feasible. This report had an important bearing on the passage of the Boulder Canyon Project Act and the work of the board on the design and construction of Boulder Dam itself.

General Sibert served on the board until 1932, when he retired altogether from active practice of his profession. He is survived by his widow, Mrs. Evelyn Bairnsfather Sibert, of Bowling Green, and several children, among them Lt. Col. Franklin C. Sibert, of Fort Benning, Ga., and Capt. Edwin L. Sibert, of the Command and General Staff School, Fort Leavenworth, Kans. He was buried at Arlington National Cemetery.

L. H. Mitchell, field supervisor of district no. 4, paid two visits to the Orland project in connection with the problems developed by the soil survey of the gravel lands of the project. Mr. Mitchell also visited the Riverton and Shoshone projects.

Ray B. Dame, for some years employed by the Bureau of Reclamation in the photographic laboratory, from which position he resigned in August, 1928 to engage in private work, has been reinstated in the Bureau to the position of chief photographer in charge of the photographic laboratory in Washington.

Harry Conradi, senior executive engineer, State Rivers and Water Supply Commission, Melbourne, Victoria, Australia, was a fall visitor on the Owyhee project.

Parker dam site, 12 miles above Parker, Arizona. The 340-foot concrete archdam, to be built by the Bureau of Reclamation, will divert the Colorado River through the aqueduct of the Metropolitan Water District to supplement the domestic water supply of Los Angeles and vicinity.

ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead,** Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; George O. Sanford, General Supervisor of Operation and Maintenance; John C. Page, Chief Engineering Division; Deane S. Stuver, Supervising Engineer, E. C. W. Division; Wm. F. Kubach, Chief Acconntant; Charles N. McCulloch, Chief Clerk; Jesse W. Myer, Chief Mails and Files Division; Miss Mary E. Gallagher, Secretary to the Commissioner

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H. Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer; Technical Studies; Speucer L. Baird, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk		District counsel	
		Name	Title			Name	Address
Belle Fourche	Newell, S. Dak	F. C. Youngblutt	Superintendent	J. P. Sieheneicher		W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg	R. J. Newell	Constr. engr			B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev	W. R. Young	do	E. R. Mills		R. J. Coffey	Los Angeles, Calif.
All-American Canal	Yuma, Ariz	R. B. Williams	do	J. C. Thrailkill		do	Do.
Carlshad	Carlshad, N. Mex	L. E. Foster	Superintendent	E. W. Shepard		H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo	H. W. Bashore	Constr. engr	C. M. Voyen		W. J. Burke	Billings, Mont.
Colorado River	Austin, Tex	H. P. Bunger	do	William F. Sha			El Paso, Tex.
Columbia Basin, Grand Coulee Dam.	Coulee Dam, Wash	F. A. Banks	do	C. B. Funk		B. E. Stoutemyer	Portland, Oreg.
Frenchtown	Missoula, Mont	J. W. Taylor	Resident engr			W. J. Burke	Billings, Mont.
Gila Valley	Yuma, Ariz	R. B. Williams	Constr. engr			R. J. Coffey	Los Angeles, Calif.
Grand Valley	Grand Junction, Colo.	W. J. Chiesman	Superintendent	E. A. Peek		J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev	L. J. Foster	Constr. engr	George B. Snow		do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr	H. W. Johnson		do	Do.
Klamath	Klamath Falls, Oreg	B. E. Hayden	Superintendent			B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont	H. H. Johnson	do	E. E. Chahot		W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do		do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson		B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Constr. engr	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]		W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Constr. engr	H. W. Johnson		J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif	D. L. Carmody	Superintendent	W. D. Funk		R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith		B. E. Stoutemyer	Portland, Oreg.
Parker Dam [3]	Earp, Calif	E. A. Moritz [1]	do	George H. Bolt		R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex	L. R. Fiock	Superintendent	H. H. Berryhill		H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo	H. D. Comstock	do	C. B. Wentzel [1]		W. J. Burke	Billings, Mont.
Sanpete	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell		J. R. Alexander	Salt Lake City, Utah.
Shoshone	Powell, Wyo	L. J. Windle [1]	Superintendent	L. J. Windle [1]		W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg	R. J. Newell	Constr. engr	Robert B. Smith		B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields division.	Fairfield, Mont	A. W. Walker	Superintendent			W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev	L. J. Foster	Constr. engr			J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg	C. L. Tice	Reservoir supt			B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo	A. A. Whitmore	Constr. engr	Ewalt P. Anderson		J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo	C. B. Elliott	Engineer	do		do	Do.
Upper Snake River Storage [2]	Ashton, Idaho	H. A. Parker	Constr. engr	Emmanuel V. Hillius		B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg	C. C. Ketchum	Superintendent			do	Do.
Yakima	Yakima, Wash	J. S. Moore	do	R. K. Cunningham		do	Do.
Yuma	Yuma, Ariz	R. C. E. Weber	do	Noble O. Anderson		R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrigation dist	Baker, Oreg	A. J. Ritter	President	F. A. Phillips	Keating.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo	W. E. Stout	President	H. B. Smith	Palisade.
Huntley	Huntley irrigation district	Ballantine, Mont	E. E. Lewis	Manager	H. S. Elliott	Ballantine.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Jerome Smith	do	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonehright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont	Amos Thompson	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr	T. W. Parry	Manager	Flora K. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation district	Gering, Nebr	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo	Bert L. Adams	do	Nelle Armitage	Torrington.
Northport division	Northport irrigation district	Northport, Nebr	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
Salt Lake Basin (Echo Reservoir).	Weber River Water Users' Association	Ogden, Utah	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A	Phoenix, Ariz	H. J. Lawson	Superintendent	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo	J. O. Roach	do	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Payson.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigation district	Fairfield, Mont	A. W. Walker	do	H. P. Wangen	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermiston, Oreg	E. D. Martin	do	Enos D. Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg	A. C. Houghton	do	A. C. Houghton	Irrigon.
Uncompahgre	Uncompahgre Valley W. U. A	Montrose, Colo	Jesse R. Tompson	Acting supt	J. Frank Anderson	Montrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash	V. W. Russell	Manager	R. E. Rudolph	Ellensburg.

Important Investigations in Progress

Project	Office	In charge of—	Title
Colorado River Basin, sec. 15	Denver, Colo	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Deschutes	Bend, Oreg	C. C. Fisher	Engineer.
Gallatin Valley	Bozeman, Mont	R. R. Robertson	Do.
Grand Lake-Big Thompson Transmonntain Diversion	do	P. J. Preston	Senior engineer.

SALLIE A. B. COE, *Editor.*

UPSTREAM SLOPE OF HYRUM DAM, HYRUM PROJECT, UTAH

This 90-foot earthfill structure is one of three storage dams in Utah under construction by the Bureau of Reclamation to supplement the inadequate water supply of the irrigation projects in that State

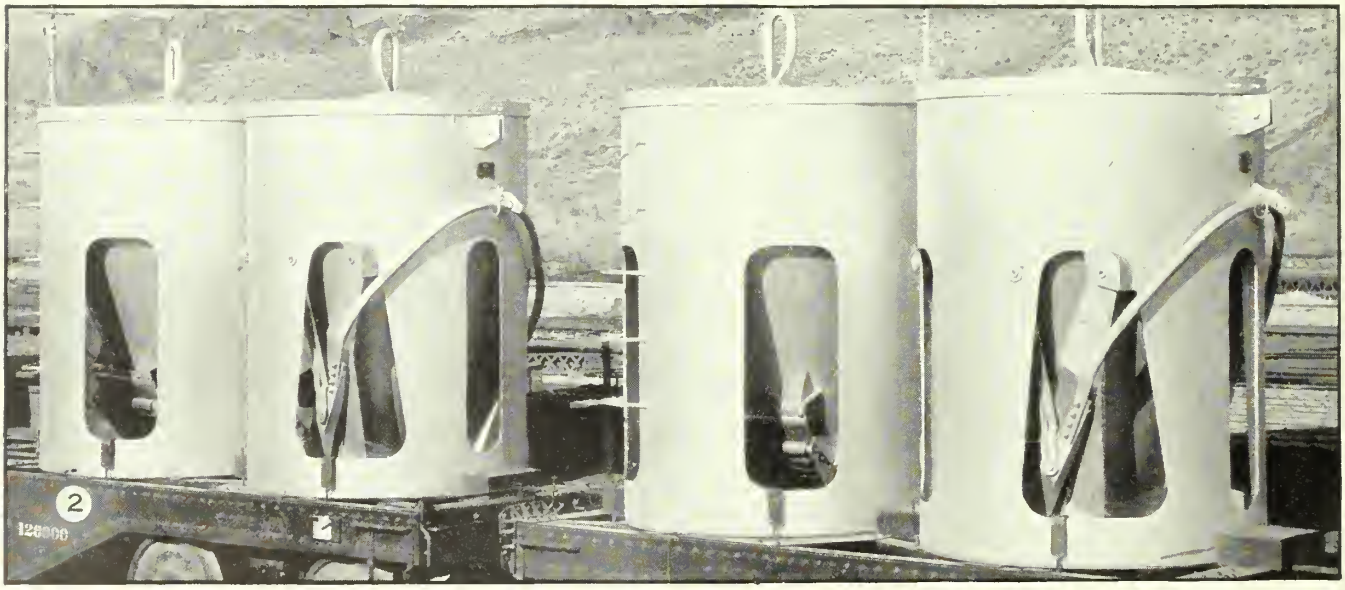
U. S. GOVERNMENT PRINTING OFFICE. 1935

THE RECLAMATION ERA

VOL. 25, NO. 12 DECEMBER 1935

COLUMBIA BASIN PROJECT, WASHINGTON

GRAND COULEE WORKINGS ALIGHT, WITH ELECTRIFIED MASON CITY IN BACKGROUND



COLUMBIA BASIN PROJECT, WASHINGTON—GRAND COULEE DAM

1, Excavation area on east side, including conveyor carrying the spoil across Columbia River to the main line going to the waste pile in Rattlesnake Canyon. 2, Some of the forty 4-yard concrete buckets. 3, Jackhammers on west bedrock.

THE
RECLAMATION ERA

Issued monthly by the DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C.
Price 75 cents a year

HAROLD L. ICKES
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 25, No. 12 December 1935

Land Planning in Relation to Western Reclamation

Address Delivered on October 24, 1935, Over Station KDYL, Salt Lake City, Utah, on Farm and Home Hour [1]

PLANNING for wise use of land in the arid West presents a problem that does not exist in any other section of the country. It arises from the fact that the natural rainfall in this region is not enough to sustain a stable and intensive agriculture. The natural water supply must be supplemented by irrigation.

Land is plentiful in the 11 Western States, but water is scarce. As a consequence, the title to the use of water has become more valuable than the land itself. The individual farmer, whether he operates under an irrigation canal or otherwise, is deeply concerned with the proper method of tilling his soil, of rotating his crops and of caring for his livestock, but the welfare of the whole western community is dependent upon intelligent application of its meager water supply.

The welfare of the entire West is bound up with sound, long-range planning for the most advantageous use of its water on its best lands. Without such planning the economy of the area never can reach its most efficient stage.

If a stream carries enough water to irrigate only 100,000 acres, and 1,000,000 acres are available along its course, grave consequences depend upon the choice of the tract to which the water shall be applied. It would be wasteful in such case to turn the water onto poor or mediocre land when excellent soil thus would be consigned forever to the desert. If the quality of all the land were the same, it would be improvident to irrigate a section far removed from markets when a site for a development might be found nearer at hand.

The western problem is not generally understood in sections where all good land is tillable and the farmer thinks about his water supply only when rain fails his growing corn.

All the implications of this problem were not recognized at once by the western pioneers. Early irrigation developments sprang up in the flats wherever water could be found close to mining camps and villages. Little thought was given to a planned development of the limited and extremely valuable water supply.

BUREAU OF RECLAMATION ESTABLISHED

It was not until 1902 that Congress recognized the necessity of sponsoring western reclamation development and of bringing some semblance of order out of the conditions that arose from haphazard appropriation of water for irrigation.

In that year the Bureau of Reclamation was established. Funds from the sale of public lands in the Western States were set aside for the irrigation of their valleys. The need was apparent for a Federal agency to correlate the diverse interests that were pulling and hauling at their water resources. Local jealousies and petty differences were delaying desirable developments.

Interstate streams especially needed attention. A higher authority was required to mediate differences among those with a claim to their waters. The solution was found in interstate compacts that have permitted orderly development. Of these the Colorado River Compact, ratified by 6 of the 7 States in the Colorado Basin, is the most important. Without the compact, Boulder Dam never could have been constructed and the Colorado River today would remain the outlaw it once was, ready to destroy those who dared try to use it.

Officials of the Bureau of Reclamation quickly realized that an uncontrolled river provided an insecure water source for the irrigators, who had found to their sorrow that many of the western streams carried an overabundance of water in the spring but were nearly dry soon after the floods had passed. Storage dams provided the only means of regulating the rivers, and of these the Bureau has built 68 and now has 11 more under construction. Most of these dams were built to rescue existing irrigation districts from floods and drought. Established communities were thus assured an adequate water supply throughout the year.

The Bureau has, however, undertaken a few new developments, and in these cases an earnest attempt has been made to plan them so that they will return maximum benefits to the West.

The Bureau believes firmly that experience has shown that best results are obtained from irrigation when farms are of a size that can be managed by one farm family. It has discovered that one family cannot manage as large an area of intensively cultivated irrigated land as the same family might crop in an area where irrigation is not required. At the same time, it has been shown conclusively that the fertile lands of the irrigated West will produce more, acre for acre, than will the lands of other regions. Thus, while the reclamation farmer is generally limited to 40 acres, this 40, through its fertility and the long growing season, will give him a return comparable to that of farmers anywhere.

INTELLIGENT WATER PLANNING ESSENTIAL TO WESTERN DEVELOPMENT

The West is destined to have a large population. Its growth will be limited only by its water supply. Any waste of water makes more restricted the limitations already fixed by nature. In an area where water is the principal natural resource, failure to use any that can be

[1] Paper read by E. O. Larson, engineer, Salt Lake City, in the absence of Walker R. Young, formerly supervising engineer in charge of the Boulder Canyon project, and now construction engineer in charge of the Central Valley project, Calif.

utilized is waste just as surely as is its misapplication.

It is evident that an exact knowledge of the potential resources of the streams in the arid regions is necessary for their well-planned use. Probably nowhere in the world has the water supply been studied as carefully as in the West. A great city like Los Angeles, for example, could not have developed without intelligent water planning. Just as the people of Los Angeles have proved themselves to be farsighted in the utilization of their available water resources, so must all of the West, whether urban or rural, plan today for what tomorrow may bring.

The western cities need farm areas from which to draw their food supplies. It is as important to the urban centers that their back country be developed wisely as it is to the farmers themselves. Inability to find provisions within the radius of cheap transportation will retard the growth of cities as effectively as nature has restricted western agriculture through her niggardly water supply.

Already the western cities are finding it necessary to reach beyond the Rocky Mountains for certain of their staple foods. During the past 5 years it has been evident to students of traffic that the point of division between west- and east-bound shipments of the great staple food crops on western railroads is being pushed farther east as Pacific coast demands expand. Western cities now are reaching into the Mississippi Valley for pork and pork products, butter, wheat, and potatoes. This means an increase in price to the consumer due to long and expensive hauls. It places the western city at a disadvantage that can be overcome only through the development of agriculture near at hand.

Few streams in the West remain wholly undeveloped. Fortunately, there still remains surplus water in many of them. The use to which their waters will be put is of paramount importance to city and farm folk, to the counties, the States, and the Nation, for the welfare of all is involved.

Major Jobs Are Put on Market by Bureau

Bids were called late in October and early in November on thirteen major jobs as the Bureau of Reclamation swung into action on its new construction program.

Cooperating with the President, who desired that work on projects financed by allocations from the 1935 relief funds be begun as soon as possible, in order that men could be transferred from relief rolls to pay rolls, the Bureau bent every effort to put its work on the market at the earliest possible date.

Only long experience and careful planning made it possible for the smooth-working machine that is the Denver engineering, designing, and drafting sections to prepare the necessary specifications. Seemingly an endless number of obstacles arose from the necessity of establishing rules and regulations which will govern the construction of these projects, but they were overcome.

The 13 jobs put on the block signalize the commencement of construction on virtually the entire program. Together with work already begun, they represent the Bureau's largest undertaking.

Under these advertisements, bids were opened at Yuma, Ariz., November 21 for the Imperial Dam and desilting works; on November 23, at Yuma, for a section, from station 50 to 245, of the All-American Canal; on November 25, at Yuma for construction of 4 siphons on the All-American Canal; at Casper, Wyo., for construction of 4 tunnels on the Alcova Canal; and at Phoenix for construction of the Stewart Mountain Dam spillway; on November 26, at Casper, for construction of the Seminoe Dam of the Casper-Alcova project; on November 30, at Vale, Oreg., for construction of the Unity Dam on the Burnt River project; and on December 2, at Ontario, Oreg., for construction of 4 tunnels on the Black Canyon Canal to serve the Payette division of the Boise project; on December 3, at Yakima, Wash., for 3 tunnels on Yakima Ridge Canal to serve Roza division of Yakima project; on December 4, at Yuma for construction of gravity main canal of Gila project; on December 5, at Cody, Wyo., for 3 tunnels on the Shoshone Conduit Canal, Heart Mountain division, Shoshone project; on December 7, at Riverton, Wyo., for Bull Lake Dam; and at Fairfield, Mont., for construction of wasteways and laterals on the Sun River project.

Thus, a great program gets under way and records are established. Additional specifications were nearing completion at the time this article was written, and other jobs will be on the block before it is published, but this recapitulation serves to illustrate the efforts of the Bureau to put thousands in the West to work on projects which are of enduring worth.

Report of Special Committee on Reclamation Policy

At the conference in Yakima, Wash., on October 12 of the National Reclamation Association, the following report was made by the Special Committee on Reclamation Policy:

1. The committee commends the work done by the officers and directors of the National Reclamation Association since its organization.

2. We believe the time has now arrived when the cause of arid land reclamation must be put on a more vigorous and aggressive basis. In order to accomplish this, increased finances must be provided.

3. We recommend that the National Reclamation Association formulate and promulgate all general reclamation policies and that each project's program and activities be conducted in harmony with the policies of the national association.

4. We recommend that the national association, by means of bulletins, letters, or other methods, keep in touch frequently with State, local, and commercial organizations, advising as to methods and plans in successful use in other areas and suggesting ways and means of carrying on educational work in the general interest of reclamation.

5. We recommend that a general campaign of education be inaugurated and vigorously pursued in eastern and mid-central States, and within the western States directly affected.

6. We commend the activity of the National Reclamation Association in its efforts to maintain reclamation as a self-liquidating and solvent instituion. We recommend the continuance of such policy through most energetic effort of every community where reclamation development is in progress or contemplated. It is the opinion of the committee that if the reclamation of arid lands by the Federal Government is to be continued to its fullest fruition this end can be accomplished only by meeting obligations when they fall due. The sanctity of contract performance is a vital feature in reclamation's future. It is the belief of the committee that in order to meet the present conditions that are now confronting us and to assure the future of further reclamation development, each State and each community should form active local organizations to be affiliated with and cooperate in carrying out its policies.

7. The committee is firmly convinced that a careful budget of proposed expenditures should be worked out. This budget must then be allocated to the several western States according to their interest in the program and their ability to contribute, and that State or local affiliates must actively assume the required responsibility.

John Haw, *Chairman*,
James A. Ford
J. J. Underwood
W. D. B. Dodson
Thomas B. Hill
Charles Hebberd
F. O. Hagie
For the committee.

Project Town Booms

Ontario, Oreg., is booming as a result of construction of the Owyhee and Vale projects nearby.

W. J. Pinney, secretary of the Commercial Club of Ontario, set forth the extent of the boom in a letter to R. J. Newell, Bureau of Reclamation construction engineer at Ontario.

"From January 1 to October 1, 1935", Pinney wrote, "the building permits issued by the city of Ontario totaled $70,637. The actual cost of these buildings would be from 20 to 30 percent more, as many of the parties asking for a permit put in the cost less, thinking this would have an influence on the assessed value used in taxation.

"The Federal building carries an appropriation of $76,000. The site will be announced in a short time.

"The Ontario School District has secured from the P. W. A. $65,000 for a grammar school, 45 percent of this being a grant.

"Both the Federal and grammar-school buildings are planned to be under construction this year.

"There is not a house, shack, or an auto cabin for rent, many families doubling up or boarding at hotels or boarding houses.

"Business last year was 30 percent better than in 1933 and so far this year the same or a better increase has obtained. All this is the result of the Reclamation work in this district and the settlement of the lands under the two Government projects."

C. C. C. forces for Ontario Camp BR-42 and Nyssa Camp BR-43 arrived on the Owyhee project on October 19, and graveling of camp grounds and roads leading to camps was carried on during the remainder of the month.

C. E. Crownover Appointed Roza Construction Engineer

Charles E. Crownover, of Yakima, Wash., has been appointed construction engineer of the Roza division of the Yakima Federal reclamation project. Mr. Crownover formerly was a member of the Bureau's engineering staff. He served the Bureau for about 15 years, leaving it to become city engineer of Yakima. While employed by the Bureau, he was in charge of construction of Keechelus Dam, one of the storage dams serving the Yakima project.

North Platte Red Triumphs Produce Heavy Yield

Red Triumph Potatoes grown on North Platte project.

E. J. Tilden, a farmer living 5 miles southwest of Torrington, in the Cherry Creek community, recently completed the harvesting of 9 acres of Red Triumph seed potatoes, which exceeded his fondest expectations. Preliminary estimates by him indicate the yield will be in excess of 600 bushels per acre, a highly unusual record for this type of potato.

The potatoes—dry-land seed—were planted on May 7. The field, manured and phosphated last year, formerly planted to sugar beets, was irrigated three times. He used whole potatoes for seed, known as "one-drop" planting.

Mr. Tilden weighed 61 potatoes from the field and found they totaled an even hundred pounds. The largest "spud" weighed 3 pounds and 11 ounces. He will place them in a pit in his field, covering them with straw and dirt.

Mr. Tilden has another 5-acre plot of Red Triumphs which he expects will make about the same yield. These were planted June 5. While not as large as the first field, it is believed the potatoes will be more plentiful in number.

Other crops on this farm are yielding equally as well. He has 21 acres planted to beets with an estimated yield of 18 to 19 tons per acre, 10 acres planted to barley with an estimated yield of 91 bushels per acre, and 3½ acres of land planted to onions, doing especially well.

Mr. Tilden is milking 20 cows on his farm, and this winter expects to feed sheep.—*Scottsbluff Daily Star Herald.*

Scheduled Board Meetings

According to schedule changes Reclamation and Tennessee Valley boards will meet on the dates indicated as follows:

Nov. 23, 24, 25.—C. P. Berkey, C. H. Paul, and J. L. Savage, at Chickamauga and Coles Bend Dam sites (for T. V. A.).

Dec. 9–13.—C. P. Berkey, W. F. Durand, Joseph Jacobs, C. H. Paul, and J. L. Savage, at Grand Coulee Dam.

Dec. 14–15.—C. P. Berkey, W. F. Durand, C. H. Paul, and J. L. Savage, en route to Central Valley project (Sacramento, Calif.).

Dec. 16–20.—C. P. Berkey, W. F. Durand, C. H. Paul, one new member, and J. L. Savage, at Friant, Kennett, and Kesswick Dam sites.

Dec. 21–22.—C. H. Paul and J. L. Savage, en route and at Arrowrock Dam, Boise, Idaho.

The Boulder City schools, Boulder Canyon project, now have an enrollment of 690. The high attendance is due, partly, to the fact that the ninth grade and a kindergarten system were added to the school this year. There are 72 children enrolled in the kindergarten and 49 in the ninth grade.

On October 14, H. H. Smith of Reno, drove the first horses across the top of the newly completed Boulder Dam. Mr. Smith was driving from the northern Nevada metropolis to Phoenix, Ariz., for his health, and had been on the road since early in August.

The demand for labor on the Minidoka project at present exceeds the available supply, so there are few idle men who are willing to work.

E. R. A. Allotments to Bureau Reduced by $20,000,000

AFTER allocations had been made, the sum of $20,000,000 was cut from the total allotment to the Bureau of Reclamation from Emergency Relief funds in order that this money might be used in another quarter.

At the time the reduction was made the Bureau had been allotted a total of $101,150,000 for its new program. After the cut there remained $81,150,000.

The reduction was made by trimming the allotments made for various individual projects. For instance, the $23,000,000 allotment for continuing the work on Grand Coulee Dam this year was reduced by $3,000,000, and the $20,000,000 allotted for commencement of the Central Valley project in California was reduced to $15,000,000. The table accompanying this article will show the amounts of the Emergency Relief allocations as they stood on November 1, 1935.

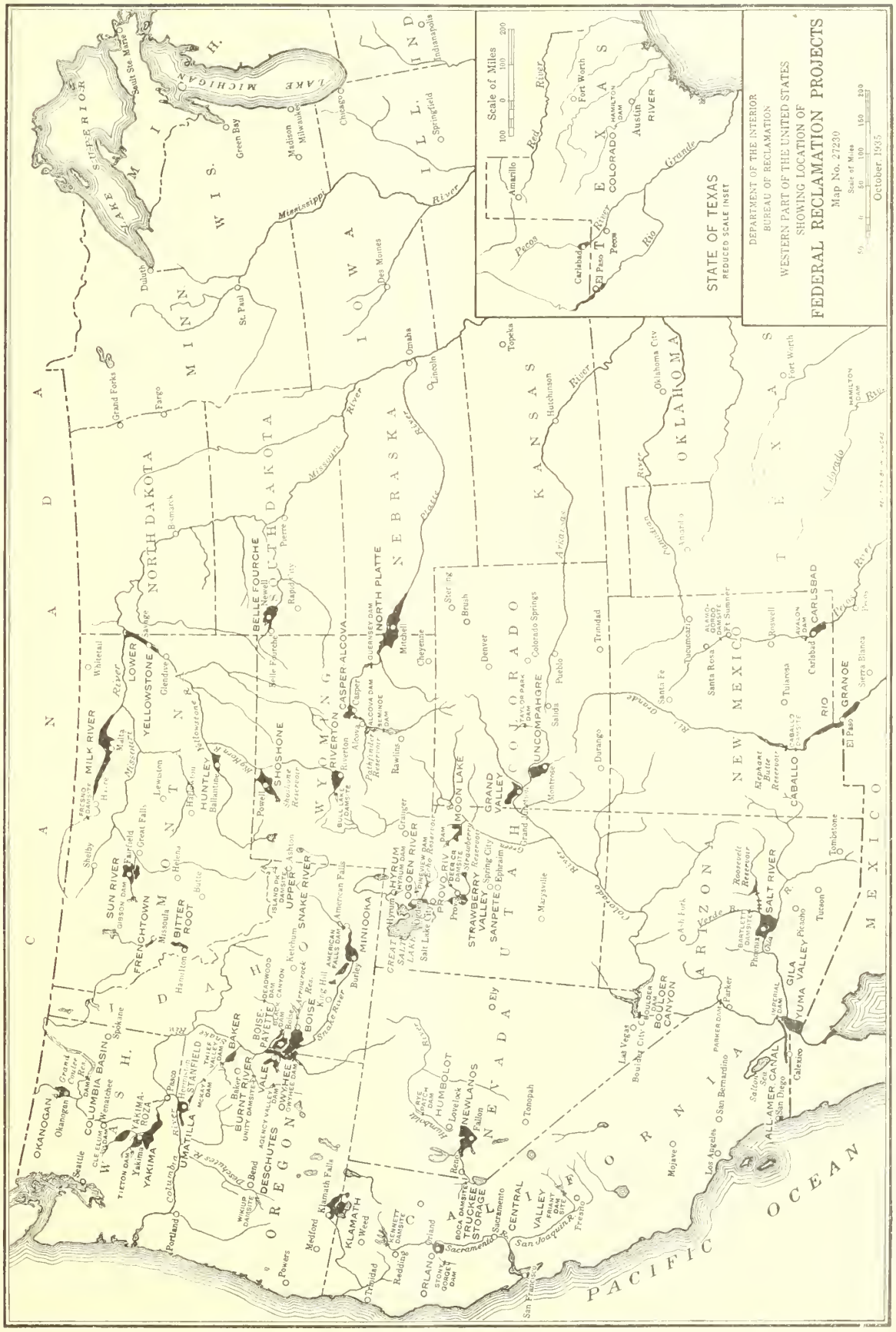
Two small projects were eliminated from the original list. They were $200,000 for drainage on the Grand Valley project in Colorado and $180,000 for drainage on the Boise project in Idaho. The work originally contemplated under these allocations will be done from time to time in the future from regular appropriations from the Reclamation fund.

The table also will show Public Works allotments made prior to this year for Bureau of Reclamation projects. These allotments totaled $93,576,000. Thus, all told, the Bureau has been assigned a total of $174,726,000 since the Congress appropriated its first emergency fund in 1933.

The map on the opposite page will mark the locations of both old and new reclamation projects. It marks dam sites, reservoirs, and areas now under irrigation as a result of projects constructed by the Bureau of Reclamation and now in operation.

Texas has been inset in the map at the right-hand side in order to show the location of the Colorado River at Texas project, which the Bureau is undertaking to build in cooperation with the Lower Colorado River Authority, a Texas body. The Lower Colorado River Authority received a repayable loan from the Emergency Relief Administration covering the larger part of the cost of the project. The money made available to the Bureau represented a Federal contribution for flood-control benefits to be received from the completed project.

State and project	Public Works	E. R. A.
Arizona: Gila	$75,000	$2,000,000
Parker	25,000	
Salt River		3,500,000
Yuma	120,000	
Verde	150,000	
California: All-American	9,000,000	13,000,000
Central Valley		15,000,000
Klamath, Tule Lake	25,000	135,000
Colorado: Uncompahgre	2,725,000	
Grand Lake, Big Thompson Diversion	150,000	
San Luis Drain	50,000	
Denver Quarters	20,000	
Idaho: Boise, Drainage	40,000	
Boise, Arrowrock		600,000
Boise, Payette		1,000,000
Minidoka, Gooding	30,000	
Upper Snake River storage	2,000,000	
Montana: Bitter Root	100,000	200,000
Buffalo Rapids	20,000	
Chain Lakes storage	2,000,000	
Frenchtown	180,000	60,000
Milk River	65,000	
Sun River	600,000	715,000
Nebraska: North Platte Valley survey	50,000	
Nevada: Humboldt	2,000,000	
Truckee River storage	1,000,000	
New Mexico: Carlsbad		1,000,000
Caballo Dam	100,000	
Rio Grande	200,000	
Oregon: Burnt River		500,000
Deschutes	50,000	500,000
Grande Ronde	10,000	
Klamath	36,000	
Owyhee	5,000,000	500,000
Stanfield	100,000	
Umatilla surveys	10,000	
Vale	1,000,000	340,000
Texas: Colorado River		2,000,000
South Dakota: Belle Fourche		70,000
Utah: Hyrum	930,000	
Moon Lake	1,200,000	240,000
Ogden	3,000,000	500,000
Provo River	1,000,000	2,260,000
Sanpete	375,000	
Washington: Columbia Basin surveys		250,000
Grand Coulee Dam (Columbia Basin)	15,000,000	20,000,000
Yakima, Kittitas	60,000	
Yakima, Roza		4,000,000
Yakima, storage		280,000
Wyoming: Casper-Alcova	7,000,000	8,000,000
Riverton		1,000,000
Shoshone, Willwood	30,000	
Shoshone, Heart Mountain		1,500,000
Hawaii: Water-supply surveys	25,000	
Arizona, California, Nevada: Boulder Canyon	38,025,000	
Sec. 15, surveys		250,000
Secondary investigations		250,000
Administrative expenses		1,500,000
	93,576,000	81,150,000


DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
WESTERN PART OF THE UNITED STATES
SHOWING LOCATION OF
FEDERAL RECLAMATION PROJECTS
Map No. 27230
October 1935
Scale of Miles
STATE OF TEXAS
REDUCED SCALE INSET
PACIFIC OCEAN
LAKE MICHIGAN
LAKE SUPERIOR
OKANOGAN
COLUMBIA BASIN
YAKIMA
ROZA
MILK RIVER
LOWER YELLOWSTONE
SUN RIVER
FRENCHTOWN
BITTER ROOT
HUNTLEY
BELLE FOURCHE
SHOSHONE
RIVERTON
CASPER ALCOVA
NORTH PLATTE
MOON LAKE
GRAND VALLEY
UNCOMPAHGRE
UPPER SNAKE RIVER
MINIDOKA
BOISE
PAYETTE
VALE
BAKER
BURNT RIVER
OWYHEE
UMATILLA
DESCHUTES
KLAMATH
GREEN RIVER
HYRUM
PROVO RIV
STRAWBERRY VALLEY
SANPETE
HUMBOLOT
NEWLANDS
TRUCKEE STORAGE
CENTRAL VALLEY
ORLAND
BOULDER CANYON
YUMA
GILA VALLEY
SALT RIVER
CABALLO
RIO GRANDE
CARLSBAD
ALLAMERICAN CANAL

The Reclamation Era

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Special reduced rates are given individual water-user owners or water users, organizations for mass subscriptions on Federal irrigation projects.

DECEMBER 1935

No Conflict Exists

"WHY", asks the uninformed accusingly, "provide more land when the Government is buying up surplus land?"

This question is asked repeatedly in connection with first one and then another of the projects of the Bureau of Reclamation. It originates out of a misconception not only of the reclamation program but also of the agricultural program. Let it appear here that no conflict exists between the two.

The Department of Agriculture instituted crop control as a means of meeting an emergency arising from the depression. It was designed to coordinate production with consumption and has been applied only to basic crops in which surpluses exist. These crops are grown only sparingly on irrigated lands.

That Department also instituted a program under which submarginal lands would be taken out of production and held by the Government. This land was bought primarily as a means of paroling the farmers who had been sentenced to dire poverty through attempts to make such lands support them.

Let us consider one specific reclamation project and see whether it is a logical development, conflicting with no other program. The example will be the Casper-Alcova project in Wyoming.

The purpose of the project is to provide water for the irrigation of lands which otherwise would remain nonproductive. It is only through this means that the city of Casper can be provided with a needed additional agricultural area. It is only through the construction of such projects that the State of Wyoming can make a stable growth.

Second Call

The Bureau of Reclamation welcomes each subscription that is received as an evidence of interest in its activities and sympathy toward the important goals of its program. It considers THE RECLAMATION ERA *an opportunity to make that program understood.*

The majority of subscriptions expire with the calendar year. The Bureau's work, of course, goes on. We are anxious that your file of copies of this magazine shall not be interrupted. If your renewal has not already been forwarded, will you please fill out the blank form below so that your subscription may not be canceled.

The Casper-Alcova project is planned primarily for the production of hay crops for winter feed for the range stock in the vast area of grazing lands of which it is the center. Through the production of alfalfa hay under irrigation, the livestock industry of the whole section of Wyoming will be stabilized. The grasses of the public lands in the Mountain States support the Nation's livestock industry, an important food source and an industry in which there is at present no surplus, but indeed a deficiency. The acute drought of 1934 reduced the number of beef cattle on the ranges sharply. Overgrazing of the public domain, which has resulted in part from lack of hay for feeding purposes, has resulted in the stripping of all the cover in some areas and serious damage to a great national resource, the ranges. The Casper-Alcova project is an integrated unit in the plan for range rehabilitation. One has only to consider the importance of the livestock industry to Wyoming to understand the importance of its rehabilitation to that State.

This project will be located in Natrona and Carbon Counties. When Congress established the Bureau of Reclamation in 1902, it set aside funds from the sale of public lands in the arid States and from royalties obtained from the exploitation of oil and minerals on public lands for use in the reclamation of arid lands. Natrona County, Wyo., has produced a large share of the money accruing to the reclamation fund through oil royalties, something over $30,000,000 and more than any other county. This is the first Federal project in that vicinity. While the money for construction of the Casper-Alcova project is not coming from the reclamation fund, it will be repaid by the water users to the United States Treasury exactly as though it had. Water users are obliged to contract for the repayment of reclamation costs without interest over a period of years.

There is no conflict whatsoever between the present agricultural policy of the United States Government and the objectives of the Casper-Alcova project.

The two phases of agricultural policy which often are cited in this question "If the Government is buying up the surplus of land, why provide more?" have come into existence during the economic emergency as a means of coordinating pro-

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COMMISSIONER,
Bureau of Reclamation,
Washington, D. C.

(Date)_____

SIR: I am enclosing my check [1] (or money order) for 75 cents to pay for a year's subscription to THE RECLAMATION ERA.

Very truly yours,

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No Conflict Exists

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duction with consumption and as a means of rehabilitating farmers on submarginal land, which never has and never can provide them with a living of American standards.

Crop control has been applied only to crops in which there has been a surplus. Never has there been a surplus of alfalfa hay, and indeed there has been a marked deficiency in this commodity in Wyoming and other arid States. Tens of thousands of beef cattle died or were slaughtered during the 1934 drought because there was not enough hay to feed them. In some areas there was insufficient hay to maintain even the nucleus of a new herd. Even in normal years there is insufficient in the vicinity of Casper, Wyo., to feed the stock there. Without irrigation, alfalfa will not grow in arid climates. Even if this were not true, crop reduction is an expedient to meet a temporary emergency, which everyone hopes and believes will pass. It is not meant to interfere with plans for sound future development. The emergency undoubtedly will have passed prior to the time the new acreage is in production in Wyoming. All growth of the arid West, whether agricultural or industrial, is dependent upon rendering useful new water resources.

The land on the Casper-Alcova project will be productive when it is watered. It is in no sense submarginal land. Scrabble land in humid sections and dry farming land in the arid region situated so it is impossible ever in the future to water it, may be classed as submarginal. Its productivity is so low that it will not support a family. It is this type of land which the Government is purchasing to take out of cultivation. The primary object of this program is the rehabilitation of a section of the farm population which was without hope. This land will be held by the Government and never be permitted to return to cultivation. This program does not conflict with irrigation development. Indeed the provision of new land upon which to relocate the victims of submarginal land may become an important phase of the rehabilitation program in the future. The removal of submarginal land from cultivation is designed as a part of the farm rehabilitation program. Its purpose is not a reduction of surplus lands, but the elimination of farming on nonproductive land. It is upon the misuse of the term "surplus land" that what appears to be a conflict between the agricultural program and the reclamation program arises.

Reclamation and Emergency Conservation Work

By Alfred R. Golzé, Assistant to Supervising Engineer, E. C. W.

THE Emergency Conservation Work created by an act of Congress approved by the President on March 28, 1933, is being accomplished through the medium of the Civilian Conservation Corps encamped throughout the United States and its possessions. Confined at first to conservation work in the national forests and parks and to the Soil Erosion Service, the activities of E. C. W. have spread to practically every technical agency of the Government, including the Army and Navy, that has an interest in the development of Federal, State, or municipal lands.

The increase in E. C. W. has been immensely accelerated by the Emergency Relief Act of 1935 (Work Relief Act) which permitted an expansion of the C. C. C. to double its original strength. The Bureau of Reclamation was allotted 37 of the expanded program C. C. C. camps, which, with the nine camps previously assigned, raised to 46 the total of camps available for E. C. W. on Reclamation projects. The distribution of the expanded program C. C. C. camps appeared in the June issue of this publication.

RECLAMATION CAMPS

Beginning early in May construction of the newly authorized camps proceeded rapidly. Eight camps designated "summer camps" because of their location high in the mountains, were occupied by enrollees and at work by midsummer. The other camps known as the "all-year" type were occupied more slowly, but by the end of September a total of 28 reclamation camps were in full operation. A few of the camps located in the warmer regions of Arizona were purposely left unoccupied until the fall of this year. The other approved Bureau of Reclamation C. C. C. camps not occupied before October could not be filled on account of a shortage of enrollees.

Coincident with his approval of the Emergency Relief Act, the President announced that the Civilian Conservation Corps would be expanded from some 350,000 to 600,000 enrollees. Shortly thereafter, the President decided that the intent of Congress as set forth in this act was to put people on relief to work, and, therefore, enrollment in the C. C. C. must be limited to young men whose families were on the relief rolls. The result of the application of this policy has been that instead of enrolling 600,000 in the C. C. C. by August 31, 1935, as originally contemplated, only 502,000 young men could be secured from families on relief. The effect of this has been that some 500 camps and

1. Clear Creek Reservoir showing conditions before commencement of C. C. C. work. Photo taken July 25, 1935.

Clear Creek Reservoir, Yakima project, Wash. C. C. C. men at work—reservoir area partly cleared. Same location as No. 1, taken September 25, 1935.

their related work programs must be indefinitely suspended because there are not sufficient men available. It had been expected that the Bureau would have 51 camps this winter by the addition of 5 new camps to the summer total of 46. However, included in the 500 suspended camps were 14 Reclamation camps, leaving only 37 camps approved for work on Reclamation projects this winter.

The Reclamation camps now in operation are scattered over 14 Western States on 23 different projects. These camps are accomplishing a tremendous amount of useful work which is pertinent to the conservation of the Government's interest in its Reclamation projects. The May issue of the ERA cited the more common types of work on the program of the Reclamation camps, and of these the two principal features are the cleaning and improvement of canals, laterals, ditches, etc., and the clearing of reservoir sites. On these items alone an average of 12 camps working the 6-month period from April 1 to October 1 cleaned 3,460,100 square yards of waterways and cleared 1,133 acres of reservoir sites. The value of all classes of work accomplished by all the Reclamation E. C. W. camps for this same 6-month period has been conservatively estimated at approximately $600,000, which, considering the average of 2,400 men employed for this period, is indicative of the worth of E. C. W. to Reclamation, and its consequent benefits to water users on irrigation projects where camps have been established.

CAMP SUPERVISION

The E. C. W. camps are under the dual control of the Army and the technical agency concerned. The technical agency is responsible for the 40 hours per week that the C. C. C. men spend on the work program, with the Army being responsible for the men the remainder of the time. To properly direct the work on the projects the Bureau of Reclamation has furnished each camp with a supervisory personnel, consisting of a camp superintendent and a sufficient number of foremen (not exceeding eight) to carry out the program. The camp superintendent is under the general direction of a regional director who in turn is responsible to the Washington and Denver offices. In nearly every case the regional directors are the project superintendents for the projects upon which the camps are located, and the number of camps under any one regional director varies from 1 to 6. This winter 19 regional directors are supervising the work of 7,400 C. C. C. men quartered in the Reclamation E. C. W. camps.

General supervision of the Reclamation E. C. W. activities is maintained from both the office of the chief engineer at Denver and by the supervising engineer, E. C. W., in the Commissioner's office at Washington. The chief engineer is responsible for the purchase of necessary supplies and equipment and for the work programs of the camps, other administrative matters being referred to the supervising engineer, E. C. W. Important matters of policy are decided by the Commissioner and by Hon. Robert Fechner, Director Emergency Conservation Work.

With the growth of E. C. W. on the reclamation projects many requests have been received for the establishment of new C. C. C. camps at various locations. Because of the limitations regarding further expansion of E. C. W. activities it has been impossible to grant any request received since last spring. All applications which contain a suitable work program are filed for future reference in the Washington office. It is an established form of procedure that a work program for any camp, existing or proposed, must be submitted to the chief engineer for his approval and subsequent transmittal to the supervising engineer, E. C. W., for his endorsement, before work can proceed or the camp be recommended for later establishment. It is hoped that in the future it will be possible to eventually operate camps at all desirable locations.

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Reclamation C. C. C. summer camp BR-21, at Lake Tahoe, California

An Agricultural Engineer Looks at the Farmer's Future—and Sees There Great Promise

WHAT lies ahead of the farmer? The answer to this question has been sought by many, since it has been realized that bound up with the welfare of the man who tills the soil is the welfare of the entire Nation.

The future of the farming industry seen by a prominent agricultural engineer, therefore, assumes importance. Larry F. Livingston, president of the American Society of Agricultural Engineers, described a new and hopeful vision in an address made on October 8 at Cornell University, Ithaca, N. Y., at a meeting of the North Atlantic section of the society.

Industrial uses of farm byproducts and even farm crops Mr. Livingston saw multiplying rapidly in the future until a new organic chemistry industry will have developed with a hunger greater than that of the entire population of the United States, which, at present, is practically the only market of the American farmer.

Mr. Livingston is manager of the agricultural extension section of the explosives department of E. I. du Pont de Nemours & Co. Prior to joining that company 7 years ago he was with the Michigan State College section of agricultural engineering. His address follows in full:

"The primary interest of those of us here is the farm. The farmer's job and the farmer's problem is essentially our job and our problem. It is altogether pertinent, therefore, to ask what is ahead for the farmer, because in attempting to answer that question we also answer what is in prospect for the agricultural engineer.

"Five years ago it might have been said that agriculture was at the crossroads, and all roads ahead looked bleak indeed. The golden era of farming seemed behind. As the gloom of general depression settled over the world, in penalty for its past misdeeds, economic and otherwise, an even deeper pall darkened the agricultural landscape. The farmer was told that his ancient creed of plentiful yields spelled his ruin. The hungry cried for food, yet the farmer heard incredulously that his own salvation lay in producing less. Lean days and strange ways were upon the agriculturist—and apparently they had come to stay, paradoxically, because his cows supplied too much milk, because his acres yielded too abundantly and his hogs multiplied faster than the dollars needed to buy them. For the first time in American history the vast basic industry of agriculture came under governmental control. It was a situation without precedent, yet such was the emergency that something of the sort was mandatory to check the economic collapse of one-half of our people.

NEW AGRICULTURAL ERA

"Today, such has been the change in the national consciousness toward agriculture, that even a casual review of developments presents a totally altered picture. We still have a farm problem, so-called, but factors that point to the permanent and satisfactory solution of that problem are now at work on a widely flung front. We still have crop control by governmental agency, and it may well be that some form of regulation will enter permanently into all farm production and use of land; but the future augurs not a control to curtail but a control to augment. The nature of this control may continue to be political to the extent that its source continues in the State, but, by and large, the most important agencies to the farmer in the not distant future are going to be those represented by the industrial purchasing agent, the research chemist, and the agricultural engineer. And it will be the task of the engineer, no small one either, to see that the farm acreage of the land produces handsomely. We are in the early dawn of a new golden era in agriculture. The first signs of that dawn are already streaking the agricultural sky.

"Do not misunderstand me. I am not essaying the role of a prophet. My sole purpose is to call attention to an array of developments of very recent years—developments that are facts and not fancies—and, by putting those facts together, make the simple addition that two plus two equals four. We have become accustomed to pessimism in thinking of agriculture—the nostrums of the politically self-seeking medicine men have been almost the only optimistic notes in our discussions of farm problems. Nevertheless, time and progress alike have been moving on, and the situation of yesterday is no longer that of the present. Substantial and definitely constructive changes have been under way. If, in our distraction, we have let them pass unnoticed, it does not alter the fact that these changes have occurred. Considered in connection with certain other facts that long have been established, that, indeed, are the warp and woof of the American character, they can point but to a single conclusion, granting that we have any confidence at all in the future of the Nation and in ourselves.

"Industries rise and in their wake others decline and perish, but it is almost a law that the new is greater than the old. Horse-drawn vehicles nowadays represent only a trivial fraction in the industry of transportation, but motor cars have become so common that even beggars may ride. There is in the making a new and a radically altered agricultural industry, the birth throes of which may be painful for the time, but which should not be mistaken for other than what they are. By every precedent this new industry should, in scope and importance, far exceed the old. It will be definitely allied with manufacturing, and the scientist and the engineer will be the chief lieutenants of both.

ORGANIC CHEMICAL INDUSTRY

"First, and by far the most significant of the recent changes bearing upon the future of American agriculture has been the rise in this country of an organic chemical industry. This development, dating from the war, has been prodigious. In buildings and equipment for the training of chemists our schools and colleges alone have invested more than 300 millions of dollars. Chemical manufactories have forged to the forefront of American business, hundreds of laboratories have been established throughout industry dedicated to the improving of the old and the creation of the new. And, simultaneously, inorganic chemistry has gained a new importance, with the result that chemicals and allied products now rank third among all industries in dollar value, being led only by foods and metals and metal products. Our corporate chemical investment is in excess of eleven and one-half billions of dollars.

"Organic chemistry, as it is being practiced today, is a science of revolution. The chemist has learned how to create, not by accidental discovery or black magic, but by cold scientific calculation based on experience and accumulated knowledge. His objective, let me make clear, is no longer imitation or duplication of natural products, if it ever was that, but is the creation of materials nonexistent in nature. For example, rayon is not an artificial silk but a new fabric with properties of its own. 'DuPrene' is not a synthetic rubber but a material of totally different chemical composition that in many ways is superior to the natural product. But what is most to the

point here, the chief raw materials of the organic chemist, the main tools of his trade so to speak, are organic things that grow from the soil. The organic chemical march toward change is over a road paved in large part by the products of American forests and farms.

"The seeds of cotton were once a waste and a nuisance. Today, thanks to the organic chemist, the seeds in a billion-and-a-half-dollar cotton crop have a value of over $200,000,000 to the farmers. Cottonseed oil goes into soaps, candles, lamp oil, cooking, and other uses. Cotton linters, another farm waste, are now an initial material in the manufacture of rayon and in coated fabrics that go into hand bags, wall coverings, and automobile upholstery. Billiard and golf balls, hair bushes and combs, electric insulators, photographic films, and the unseen binder that makes safety glass safe, all contribute their tithe to the Southern cotton farmer. At the same time, more than a hundred commercial uses have been developed by the chemist for corn, ranging from glycerines used in explosives to carbon dioxide used in making 'dry' ice. More than one-tenth of the corn crop now has as its market the factory Wheat straw is being made into corrugated paper boxes; furfural produced from oat hulls is being sold in tank-car lots. The new wall board industry, which is revolutionizing building practices, is based on the chemical conversion of farm byproducts that only a decade ago were deemed next to worthless.

"I might go on indefinitely, for already the list of chemical conversions of farm products is long, although the chemist is relatively a newcomer on the agricultural scene. The fact that he has such solid accomplishments so early to his credit is an augury of the future that we, as engineers, need most seriously to consider.

"'The chemistry of the utilization of agricultural products and byproducts or wastes is still in its infancy', says Dr. C. M. A. Stine, one of our foremost industrial chemists. Other observers, far more competent to detect the trend than I, see ahead a 'factory stomach' that will consume far more from our farms than all of our hungry human stomachs together. Development of a new outlet for cotton in road building, which forecasts an annual demand of two to three million bales, was only recently announced at Peabody University. Uses for corn are being urged that, if adopted, would consume the entire present crop without leaving one ear over for one Iowa hog. An eminent scientist has suggested that the day may not be far off when the farm will grow the bulk of our fuels, and the burning of coal and oil, with its chemical wastes, will be a civil offense. Such speculations sound fantastic, perhaps some of them are, but the straws that point major change are even now drifting in the wind.

PROBLEM OF FARM WASTES AND LOSSES

"And in the meantime a second development is taking place, which is an outgrowth of this first and only slightly less in significance to the farmer. Big business, by which I mean our very largest and most influential corporations, is becoming increasingly interested in the agricultural puzzle. Of course, the manufacturer has always been concerned over the farmer as a market, but a new note is now evident. An unstable farm situation is a constant threat to business stability. Moreover, the manufacturer likewise has a production problem no less acute than that of his rural neighbors. The factory capacity to produce is also beyond the existing market to consume, and one big reason is that the farmer has not the means to buy his share, due in large part to wastes and losses.

"The annual waste in agriculture, or, to put it another way, the loss suffered by farmers yearly for which there is no return, mounts to almost unbelievable figures. More than 6,000 known species of insects are costing growers each year something like $2,000,000,000. Thirty-four insect species alone cause a known damage of $924,440,000. Losses traceable to weeds are estimated at $3,000,000,000. Add to these figures another billion and a half chargeable to plant diseases, and the total of $6,500,000,000 is staggering. This is apart from the loss, equally staggering, that piles up yearly in the wastage of now unmarketable byproducts.

"Almost, may it be said, that for every dollar the farmer earns, he has another dollar taken from him by enemies against which he must wage ceaseless war. Any substantial reduction in that loss could mean two things—a greater return to the grower for his labor, and a lower price to the consumer. Lower prices on farm products, in turn, should lead to greater consumption both by factory and the human stomach. In the prosperous year of 1929, according to studies made for the Brookings Institution, an impartial scientific fact-finding agency, almost three-fourths of our nonfarm population lacked the means to provide itself with an adequate diet at minimum cost, and 90 percent of those not living on farms were unable to afford the food they would have liked, classed as a liberal diet. Twelve percent of these families were merely subsisting on enough food to keep them alive.

"By no means are we producing all the food we need. There is merely an overproduction of food that consumers can buy at existing price levels. At the same time price is a prohibiting barrier to the industrial use of many farm byproducts. The quantity of cornstalks and straws annually produced in this country is several times that required to make all the paper and paper board now manufactured here, and there is no particular technological difficulty in making paper of various kinds from any of these materials. However, it is now cheaper to

Sand hill along the western side of the Colorado River through which the All-American Canal will be cut.

buy Canadian wood pulp and rags from Japan.

"American industry wants to buy from the American farmer because it knows that the farmer, with money, will buy more from industry. But if farm products and by-products are to be consumed to the maximum they must become cheaper. If they are to become cheaper, farming must become more efficient and be relieved of at least a portion of its tremendous losses. So, taking this long-range view, such great corporations as Standard Oil, Ford, du Pont, International Harvester, and others are today making the farmers' problems their own. And again, perhaps the most important new factor in the situation is the industrial research chemist, backed by all the resources of almost unlimited capital, working with equipment superior to any before available, and with a half-lifetime of successful experience with similar problems in his own industry. New insecticides, new fertilizers, new methods of combating plant disease, more economical methods of production on farms, all designed to cut huge farm loss, are today the subject of intensive inquiry in the vast laboratories of industry in Wilmington, Cleveland, New York, Detroit, Chicago, and elsewhere. The shocktroops of industry have been sent to the farm front, and standing elbow to elbow with them there is an army, an enormous army, judged by the weight of its talent, an army of skilled and practically experienced men such as has never before been assembled for the scientific assault upon a problem in the Nation's history. Entirely apart from what is being spent by industrial corporations on agricultural and kindred research, an amount that is considerable in itself, the States and the Federal Government are now spending in excess of $25,000,000 yearly. In addition to this, a huge sum is being expended by our colleges and private research foundations. Projects for soil-erosion prevention, flood control, drainage and irrigation, land clearance, and what not have become gargantuan in size. The effort has become that of a major national war, with even the man on the street discussing with more or less intelligence the 'farm problem.'

"Onto our farms, too, has been moving a new type of farmer—college trained, fully alive to the difficulties inherent in his job and confident of his own ability and resourcefulness to cope with them. He is not wedded to tradition—on the contrary he is itching to blaze new trails. The 'hick' is vanishing from the farm—the very stringencies that make the farmer's lot economically unpleasant are weeding out the incompetent and the unfit. It is a slow and a painful process, many are being hurt by it and more will be, but each year the brain efficiency of the American farmer is being pushed up a notch to a higher level.

"These, then, are the factors of change. A new and all-embracing organic chemical industry has been established with one foot in industry and the other in agriculture. The research laboratories of big business have been joined with an unparalleled array of scientific talent from State, college, and private agencies. New pioneers have come to the land, and Government, backed by the resources of the Nation, is making the farm its problem no. 1. If these new factors do not spell a new agricultural industry within the next generation, then the past is no longer of any significance in charting the future.

"This new agriculture may be something vastly different to the agriculture we have known. The crops of today may not be those of tomorrow. For example, sugar that is said to be far superior to cane and beet sugar can be produced from the common dahlia and the readily grown Jerusalem artichoke. We are only beginning to learn about proper diet; what is now a common weed may be tomorrow's wheat crop; initial phases of the processing of certain raw materials that go into manufacturing may be transferred to the farm and further mechanize it beyond present dreams.

"But whatever the nature of the new farming, all the signs point conclusively to the augmented importance and influence of the agricultural engineer. More than ever he will be the emissary carrying change from factory and laboratory to the managers and workers of the land. It will be his job to see that as the factory demands, the farm produces. Large-scale use of farm products in manufacturing may even mean the concentration of certain crops in certain areas, not only best adapted to the growing of those crops but to simplify their orderly assembly and transportation to the factory. Some of the most formidable problems involved in the industrial use of crops are engineering problems, purely and simply. No; the golden era of agriculture is not behind. Already the rooster of change is crowing in another and a better day."

The Vale-Owyhee Government Projects Land Settlement Association, with headquarters at Nyssa, Oreg., has been active on the Owyhee project. Several units have been sold on the Willow Creek unit of the Vale project.

E. C. W. Work

(Continued from p. 236)

The C. C. C. camps have been very favorably received wherever they have been established on the projects. At many of the camps the men have been the subject of much attention from the appreciative residents of the community who go out of their way to provide entertainment and help for the men. As camp life is not all work for the C. C. C. men, they are often taken on trips of inspection over the projects and otherwise introduced to the field of reclamation, which to a considerable number is a new experience. It is expected that many of the C. C. C. men from the East will become permanent residents of the West when their terms of enrollment are up, and those who do return to the East will carry with them a first-hand knowledge of the accomplishments of reclamation.

Notes for Contractors

All-American Canal project, Ariz.-Calif.—Bids were opened at Yuma, Ariz., on November 21 for constructing the Imperial Dam and desilting works (Specifications No. 644) on the Colorado River about 18 miles northeast of Yuma, the nearest railroad point being Potholes, Calif. The work must be completed within 800 days. Liquidated damages for delay will be $500 per day. The Denver office will purchase for this construction job the following materials: 5,385,000 pounds of steel sheet piling, 18,255,000 pounds of reinforcement bars, 419,300 pounds of jet pipe, 19,300 linear feet of flexible joint-seals, 6,600 linear feet of metal water stops, 10,900 linear feet of mastic filler, 2,300 linear feet of 4- and 12-inch clay sewer pipe, 379,000 pounds of structural steel, 1,184,000 pounds of roller gates and hoists, 1,169,700 pounds of radial gates and hoists, 813,000 pounds of trash-rack metal work, 200,000 pounds of metal handrails, 353,000 pounds of metal lining, 1,400,000 pounds of pipe fittings and valves, 94,500 pounds of miscellaneous metalwork, 1,400 square feet of metal doors and windows, 71,300 linear feet of electrical metal conduit, 13,500 linear feet of 4- and 6-way multiple-duct conduit, and 10,000 linear feet of parkway cable.

The three low bids were as follows: Winston Bros. Co., Minneapolis, Minn., Utah Construction Co., Ogden, Utah; Morrison-Knudsen Co., Boise, Idaho, $4,374,240; W. E. Callahan Construction Co., St. Louis, Mo., $4,526,961; J. F. Shea Co., Portland, Oreg., $4,640,058. Seven bids were received.

On November 23 bids were opened at Yuma for constructing 3.7 miles of the All-American Canal, station 50 to 245 (Specifications No. 647). Schedule 1 comprises 931,000 cubic yards of common excavation. Schedule 2 has the following quantities: 141,000 cubic yards canal excavation, common; 542,000 cubic yards canal excavation, rocks; 97,000 cubic yards stripping for embankments; 25,200 cubic yards excavation of cut-off trench and toe trench; 961,000 cubic yards of compacted embankment; 8,000,000 station cubic yards of hauling and placing rock fill; 17,400 cubic yards of gravel blanket; and fabricating and driving 1,440 M feet board measure of timber sheet piling. The work must be completed within 780 and 600 days respectively.

Bids for building four large concrete wash-siphon structures on the All-American Canal (Specifications No. 645) were opened at Yuma on November 25. The work is located from 5 to 12 miles northeast of Yuma and must be completed within 600 days. The principal items of work and estimated quantities are as follows: 370,000 cubic yards of all classes of excavation, 4,700 cubic yards of compacted embankment, 6,850 cubic yards of back fill, 32,380 cubic yards of concrete, 2,200 square yards of dry-rock paving, 14,000 cubic yards of riprap, placing 6,482,000 pounds of reinforcement bars, installing 116,400 pounds of metal and rubber in side wall expansion joints, manufacturing and driving 270 23-foot reinforced concrete piles, driving 341,100 pounds of steel sheet piling, constructing 820 linear feet of timber railing, installing 53,400 pounds of metal handrails, and installing 16,800 pounds of miscellaneous metalwork. Purchases of reinforcement bars and metalwork will be made by the Denver office. The construction job has four schedules, each of which must be completed within 600 days, and liquidated damages for delay are $200 per day.

On November 22 bids were opened at Denver under Specifications No. 648 for furnishing 300,000 barrels of modified portland cement and 40,000 barrels of sulphate-resistant portland cement, both in cloth sacks, to be delivered as required from December 1935 to June 1937.

Columbia Basin project, Washington.—At Coulee Dam, Washington, on December 2, bids were opened under Specifications No. 655 for the construction of one 5-room and eleven 4-room residences at the Government camp.

Casper-Alcova project, Wyoming.—Under a readvertisement of Specifications No. 630, bids were opened at Casper Wyo., on November 26 for construction of the Seminoe dam and power plant. The Bureau will purchase and furnish to the contractor for installation the following materials: 2,550,000 pounds of reinforcement bars and fabric; 397,000 pounds of metal pipe, tubing, and fittings; 365,000 pounds of power penstocks and outlet pipes; 1,535,000 pounds of needle valves and miscellaneous metalwork; 1,002,000 pounds of gates and appurtenances; 180,000 pounds of structural bridge steel; 11,600 linear feet of metal sealing strips; 8,400 square feet of asphalt-saturated-felt roofing; 25,700 linear feet of electrical conduit; and 10,000 linear feet of electrical cable.

The following bids were received on October 22, under Specifications No. 730–D, for furnishing a 10-ton traveling crane for the Government warehouse at Seminoe Dam; Maris Bros., Inc., Philadelphia, Pa., $2,710 discount 1 percent; Bedford Foundry & Machine Co., Bedford, Ind., $3,266 discount ½ percent; Cyclops Iron Works, San Francisco, Calif., $3,663; Shaw-Box Crane & Hoist Co., Inc., Muskegon, Mich., $3 792; Union Machine Co., San Francisco, Calif., $4,200; Euclid-Armington Corporation, Euclid, Ohio, $4,400; Shepard-Niles Crane & Hoist Corporation, Montour Falls, N. Y., $4,496 discount ½ percent; Whiting Corporation, Harvey, Ill., $5,165; Harnischfeger Sales Corporation, Milwaukee, Wis., $5,770; The Morgan Engineering Co., Alliance, Ohio, $7,090; Alliance Machine Co., Alliance, Ohio, $8,370. Maris Bros. was awarded the contract on November 2.

Four cement companies submitted bids on furnishing 20,000 barrels of standard portland cement under Invitation No. 22,186–A, opening at Denver on October 24. The Colorado Portland Cement Co. and the United States Portland Cement Co., both of Boettcher, Colo., and the Monolith Portland Midwest Co. of Laramie, Wyo., all bid $2.75 per barrel f.o.b., Casper, with discount and sack allowance of 50 cents. The Ash Grove Lime & Portland Cement Co. of Louisville, Nebr., bid $2.76 per barrel f.o.b., Casper, with discount and sack allowance of 50 cents. The Colorado Portland Cement Co. was successful in the drawing and was awarded the contract.

Three bids were received at Denver on October 28 for furnishing hydraulic testing machines for the Casper-Alcova and Upper Snake River storage projects (Specifications No. 732–D) as follows: Baldwin-Southwark Corporation, Philadelphia, Pa., $3,300 f. o. b. Eddystone, Pa.; Tinius Olsen Testing Machinery Co., Philadelphia, Pa., $4,350; American Machine & Metal Manufacturing Co., East Moline, Ill., $3,876 f. o. b. Parco, Wyo., and Ashton, Idaho. Baldwin-Southwark was awarded the contract.

Bids were received at Casper on November 25 for the construction of tunnels nos. 3, 4, 5, and 6, Casper Canal (Specifications No. 649). The work is located 13 to 36 miles southwest of Casper and must be completed within 750 days. Principal items of work and estimated quantities are as follows: 166,000 cubic yards of all classes of open-cut excavation, 81,500 cubic yards of tunnel excavation, 900 cubic yards of backfill, 1,096 cubic yards of concrete in portal structures and transitions, 17,750 cubic yards of concrete in tunnels, 3,400 cubic feet of pressure grouting, 800 cubic yards of dry-rock paving, furnishing and installing 132 M feet board measure of timber lagging and sills for steel tunnel supports, furnishing and installing 390,000 pounds of steel tunnel supports, furnishing and installing 415,000 pounds of steel tunnel liner plates, constructing 11,000 linear feet of 6- to 10-inch diameter tunnel drains, placing 110,000 pounds of reinforcement bars, drilling 1,600 linear feet of grout holes, and installing 2,300 pounds of metalwork. Purchases of cement, reinforcement bars, clay sewer pipe, structural steel will be made by the Denver office.

Ogden River project, Utah.—Awards under Specifications No. 734–D were made by the Denver office on October 25, as follows: Items 1, steel bridge, Midwest Steel & Iron Works Co., Denver, Colo., $1,186 f. o. b. Ogden, Utah; item 2, pipe bend and appurtenances, Consolidated Steel Corporation, Ltd., Los Angeles, Calif., $1,348.

Boulder Canyon project, Arizona-Nevada.—The Worden-Allen Co., of Milwaukee, Wis., was successfull among 13 bidders in obtaining the contract for furnishing miscellaneous metalwork for the Boulder power plant under Specifications No. 727–D. Their bid was $6,778 f. o. b. Boulder City, and contract was awarded by Denver on October 25.

Under Specifications No. 728–D for supplying line hardware and conductor fittings for the 287.5 kilovolt switchyard at Boulder power plant, the following bids were received at Denver on October 25: Schedule no. 1, insulator hardware, General Electric Supply Corporation, Los Angeles, Calif., $4,922.11, alternate $4,737.11; schedule no. 2, special hardware, General Electric Supply Corporation, Los Angeles, Calif., $3,294.85, alternate $3,014.17; Jeffery DeWitt Insulator Co., Kenova, W. Va., $2,184.90; schedule no. 3, conductor fittings, General Electric Supply Corporation, Los Angeles, Calif., $985.30; Pacific Electric Manu-

facturing Co., San Francisco, Calif., $985.30; Burndy Engineering Co., New York, N. Y., $1,299.14; General Electric Co., Denver, Colo., $1,096.80; General Electric Supply Corporation, Denver, Colo., $1,096.80. All bids were f. o. b. Boulder City except that of the Jeffery DeWitt Insulator Co., which was f. o. b. Kenova.

The following bids were opened at Denver on November 12 under Specifications No. 740–D for furnishing electrical apparatus for drag-line substations. Item 1, twelve 100-kilovolt-ampere transformers, or alternate item 1, transformers with full capacity taps: General Electric Co., Schenectady, N. Y., $22,773.61, $23,736.24; General Electric Supply Corporation, Denver, Colo., $22,773.60, $23,736.24; Graybar Electric Co., Denver, Colo., $22,773.60, $23,736.24; Hendrie & Bolthoff Manufacturing Co., Denver, Colo., $23,773.60, $23,736.24; Westinghouse Electric & Manufacturing Co., Denver, Colo., $23,773.60, $23,736.24; Moloney Transformer Co., St. Louis, Mo., $20,848, $21,618; Standard Transformer Co., Warren, Ohio, $21,600, $22,221 f o. b. Warren; Kuhlman Electric Co., Bay City, Mich., $20,847, $21,809; R. E. Uptegraff Manufacturing Co., Pittsburgh, Pa., $22,220, $22,271.75; Wagner Electric Co., St. Louis, Mo., $20,106, $21,006; Pennsylvania Transformer Co., Pittsburgh, Pa., $18,774, $19,386; Allis-Chalmers Manufacturing Co., Milwaukee, Wis., $22,773.60, $24,121.32; American Transformer Co., Newark, N. J., $20,847.84, $21,447.84. All bids except that of Standard were f. o. b. Casper, Wyo. Under item 2, four 69-kilovolt lightning arresters, General Electric, General Electric Supply, Graybar, Hendrie & Bolthoff, and Westinghouse, all bid $7,496.64 f. o. b. Casper. In item 3, twelve 4-kilovolt lightning arresters, the same concerns and the Electric Service Supplies Co. of Philadelphia, all bid $68.88 f. o. b. Casper. In item 4, four 69-kilovolt air-break switches, General Electric, General Electric Supply, Graybar, Hendrie & Bolthoff, Westinghouse, Pacific Electric Manufacturing Co. of San Francisco, Delta Star Electric Co. of Chicago, Electric Power & Equipment Co. of Philadelphia, Bowie Switch Co. of San Francisco, Schweitzer & Conrad of Chicago, Southern States Equipment Co. of Birmingham, Railway & Industrial Equipment Co. of Greensburg, Pa., Electric Engineers Equipment Co. of Melrose Park, Ill., and Hi-Voltage Equipment Co. of Cleveland, all bid $3,004 f. o. b. Casper. Johnson Manufacturing Co., Atlanta, Ga., bid $1,750.16, alternate $1,664.60 f. o. b. Atlanta. The Royal Electric Manufacturing Co., Chicago, Ill., bid $1,588, discount 1 percent, f. o. b. Chicago. In item 5, one 69-kilovolt air-break switch, all concerns bidding $3,004 on item 4, submitted identical bids of $971. Johnson bid $437.54 and $416.20, and Royal bid $405 f. o. b. Chicago, discount 1 percent. In item 6, twelve 69-kilovolt expulsion fuses, General Electric, General Electric Supply, Graybar, Hendrie & Bolthoff, Pacific Electric, Delta Star, Electric P. & E., Bowie, and Railway & Industrial Equipment, all bid $1,320 f. o. b. Casper. Other bids were: Schweitzer & Conrad $1,860.30, f. o. b. Casper; Johnson $1,144.56 or $1,100.76 f. o. b. Casper; Royal $1,056 f. o. b. Chicago, discount 1 percent; Southern States Equipment $2,054 f. o. b. Casper. Bids under item 7, four outdoor switching and metering units (f. o. b. Casper, unless otherwise noted), were as follows: General Electric, $7,315 or $8,261; General Electric Supply, $7,315 or $8,261; Westinghouse, $7,280; Pacific Electric, $5,536 f. o. b. San Francisco; Delta Star, $7,244; Automatic Switch Co., Detroit, Mich., $4,640 f. o. b. Detroit: Condit Electric Manufacturing Corporation, Boston, Mass., $6,420 or $8,360 f. o. b. Boston; Kelman Electric & Manufacturing Co., Los Angeles, Calif., $4,575. The Johnson Manufacturing Co. offered a combination bid of $3,300 or $3,149 f. o. b. Casper for items 4, 5, and 6.

On October 21 bids were opened at Denver for furnishing pipe, fittings and valves (item 1), utility cars and miscellaneous metal work (item 2) for tunnel plug outlet works, as called for in Specifications No. 729–D. Fifteen manufacturers bid as follows: Mine & Smelter Supply Co., Denver, Colo., item 1, $21,984 f. o. b. Boulder City; Associated Piping & Engineering Co., Ltd., Los Angeles, Calif., item 1, $17,800, item 2, $3,950, f. o. b. Boulder City; Crane O'Fallon Co., Denver, Colo., item 1, $17,955.21, f. o. b. Boulder City; B. Katchen Iron Works, Irvington, N. J., item 2, $3,340; Los Angeles Valve & Fittings Co., Los Angeles, Calif., item 1, $19,715, f. o. b. Boulder City; Commercial Iron Works, Los Angeles, Calif., item 1, $19,350, item 2, $2,993, f. o. b. Boulder City; Atlas Car & Manufacturing Co., Cleveland, Ohio, item 2, $2,755; Schrader Iron Works, Inc., San Francisco, Calif., item 2, $3,940; Power Piping Co., Pittsburgh, Pa., item 1, $20,565, f. o. b. Boulder City; Pittsburgh Piping & Equipment Co., Pittsburgh, Pa., item 1, $19,600, f. o. b. Boulder City; Grinnell Co. of the Pacific, Los Angeles, Calif., item 1, $18,464, f. o. b. Boulder City; Midwest Piping & Supply Co., Inc., St. Louis, Mo., item 1, $18,690, f. o. b. Boulder City; C. J. Rainear & Co., Inc., Philadelphia, Pa., item 1, $19,004, f. o. b. Boulder City; John W. Beam, Denver, Colo., item 1, $23,375, f. o. b. Etna, Pa., item 2, $2,500 f. o. b. Peotone, Ill.;, Standard Sanitary Manufacturing Co., Denver, Colo., item 1, $21,115, f. o. b. Boulder City. The Associated Piping & Engineering Co. was low bidder on item 1, and was awarded the contract on November 11. John W. Beam has been awarded the contract for item 2.

On November 6 the Secretary approved award of contract under Specifications No. 638, two 82,500 kilovolt-ampere generators to the General Electric Co., Schenectady, N. Y., their bid being $1,342,000. He also on October 31 approved award of contracts for turbines and governors under Specifications No. 639 as follows: Schedule 1, Pelton Water Wheel Co., San Francisco, Calif., $551,000; schedule 2, Woodward Governor Co., Rockford, Ill., $30,800.

Bids were opened at Denver on November 29, under Specifications No. 744–D, for furnishing one 138-kilovolt, 600-ampere, 3-phase, outdoor-type oil circuit breaker; three 138-kilovolt, 600-ampere, 3-pole, single throw, gang-operated disconnecting switches; and one 3-pole, 138-kilovolt, lightning arrester for use on a grounded neutral circuit for installation in the switchyard at the Boulder power plant.

The Power Piping Co., Pittsburgh, Pa., was the low bidder on furnishing pipe hangers for the power plant (Specifications No. 735–D) bids opened at Denver on November 8, their quotation being $3,985 f. o. b. Boulder City, discount 2 percent.

The following bids were received at Denver on November 7 for furnishing pipe, valves, and fittings under Specifications No. 736–D: Salt Lake Hardware Co., Salt Lake City, Utah, $8,150; John W. Beam, Denver, Colo., $8,150; Grinnell Co. of the Pacific, Los Angeles, Calif., $6,196.75 f. o. b. Warren, Ohio; Power Piping Co., Pittsburgh, Pa., $7,730; The Mine & Smelter Supply Co., Denver, Colo., $8,542; Midwest Piping & Supply Co., Inc., St. Louis, Mo., $7,838; Standard Sanitary Manufacturing Co., Denver, Colo., $8,150. All bids except Grinnell were f. o. b. Boulder City. Grinnell has been awarded the contract.

The J. B. Martina Mosaic Co., Denver, Colo., was low with a bid of $51,717.75 for terrazzo work at Boulder Dam and power plant, as provided in Specifications No. 642. Three bids were received at the opening at Boulder City on October 28, the others being $57,737.50 and $70,624.83 from the Special Service Flooring Corporation, San Diego, Calif., and Consolidated Terrazzo Companies, Inc., Los Angeles, Calif., respectively.

On December 7 bids were opened at Riverton, Wyo., for construction of the Bull Lake Dam (Specifications No. 658). The principal items of work and esti-

mated quantities involved are as follows: 1,025,000 cubic yards of all classes of open-cut excavation; 7,300 cubic yards of backfill about structures; 642,000 cubic yards of earthfill in embankment; 136,000 cubic yards of rock fill on downstream slope of dam embankment; 48,300 cubic yards of rock riprap; 1,500 cubic yards of screened gravel under spillway floor; 14,875 cubic yards of concrete; 20 cubic feet of pressure grouting; placing 1,630,000 pounds of reinforcement bars; fabricating and driving 180 M ft. b. m. of timber sheet piling; driving 132,000 pounds of steel sheet piling; constructing 5,700 linear feet of 6-inch to 18-inch clay pipe drains; installing 591,000 pounds of metalwork; and installing electrical conduit, conductors and apparatus. The work is located near Riverton, and must be completed within 700 days. The Bureau will purchase reinforcement bars, sheet piling, metalwork, and electrical equipment.

Owyhee project, Oregon–Idaho.—J. A. Terteling & Sons, Boise, Idaho, with a bid of $19,395.50 was low on constructing earthwork and structures, North Canal laterals, under Specifications No. 723–D, bids opened at Ontario, Oreg., on October 18. Other bids were as follows: P. L. Crooks & Co., Inc., Portland, Oreg., $31,199; Parker-Schram Co., Portland, Oreg., $27,988.40; Geo. B. Henly, Nyssa, Oreg., $26,686.50; Brent Sturgill Co., Inc., Cascade Locks, Oreg., $20,344.

Five contractors bid on constructing earthwork and structures for Mitchell Butte drains (Specifications No. 724–D) opening at Ontario, Oreg., on October 18. The bids were: J. A. Terteling & Sons, Boise, Idaho, $15,976; Geo. B. Henly, Nyssa, Oreg., $17,276.50; Brent Sturgill Co., Inc., Cascade Locks, Oreg., $25,817.50; Parker-Schram Co., Portland, Oreg., $25,824.40; P. L. Crooks & Co., Inc., Portland, Oreg., $47,091.

Bids were opened at Ontario, Oreg., on October 19, under Specifications No. 725–D, for building structures on North Canal laterals, with the following results: Morrison-Knudsen Co., Inc., Boise, Idaho, $21,038.50; J. A. Terteling & Sons, Boise, Idaho, $21,061; Geo. B. Henly, Nyssa, Oreg., $27,545; John Gardner, Klamath Falls, Oreg., $20,564; John Klug, Nyssa, Oreg., $20,895; Fife & Co., Nyssa, Oreg., $20,988; Otis Williams & Co., Vale, Oreg., $19,918; David A. Richardson, Nyssa, Oreg., $20,224.50; Henry L. Horn, Nyssa, Oreg., $20,552. Williams was awarded the contract on November 13.

Geo. B. Henly of Nyssa, Oreg., with a bid of $18,178. was low among four bidders at the opening of bids, under Specifications No. 726–D, for constructing earthwork and structures on North Canal laterals, on Dead Ox Flat division. Other bids were as follows: Parker-Schram Co., Portland, Oreg., $25,677; Brent Sturgill Co., Inc., Cascade Locks, Oreg., $19,292.50; J. A. Terteling & Sons, Boise, Idaho, $18,360.50. Henley was awarded the contract on November 13.

Bids were opened at Ontario on October 21 for constructing earthwork and structures on the South Canal (Specification No. 646). Six bids were received, as follows: Brent Sturgill Co., Inc., Cascade Locks, Oreg., $53,639; Morrison-Knudsen Co., Boise, Idaho, $64,419.50; Triangle Construction Co., Boise, Idaho, $64,827.50; Dan Teters & Co., Ogden, Utah, $65,832.50; Geo. B. Henly, Nyssa, Oreg., $67,098; Parker-Schram Co., Portland, Oreg., $69,020. The Sturgill Co. was awarded the contract on November 14.

J. A. Terteling & Sons, of Boise, Idaho, with a bid of $17,221.15, was low at the opening at Ontario on October 28, under Specifications No. 733–D for the construction of North Canal laterals on the Dead Ox Flat division. Geo. B. Henly, Nyssa, Oreg., bid $17,935, and Joseph P. Brumbach, Parma, Idaho, bid $23,494.20.

Salt River project, Ariz.—Bids were opened at Phoenix, Ariz., on November 25 for the first construction job with the Emergency Relief allocation of $3,500,000 the construction of a spillway at Stewart Mountain Dam (Specifications No. 651). The work is located on the Salt River about 25 miles northeast of Mesa, and must be completed within 180 days from date of receipt of notice to proceed. The estimated quantities involved are as follows: 86,500 cubic yards of all classes of excavation, 100 cubic yards of concrete, placing 750,000 pounds of reinforcement bars, chipping and roughening 360 square yards of old concrete surfaces, constructing 2,110 linear feet of 6- to 12-inch sewer-pipe drains, installing 5,050 pounds of metal work, constructing a motor-generator house, and reconditioning gates.

Burnt River project, Oregon.—Bids were opened at Yale, Oreg., on November 30, under Specifications No. 653 for constructing the Unity Dam. The principal items of work and estimated quantities involved are as follows: 325,000 cubic yards of all classes of open-cut excavation, 2,500 cubic yards of tunnel and shaft excavation, 12,000 cubic yards of backfill, 137,000 cubic yards of earth fill in embankments, 22,000 cubic yards of rock fill on downstream slope of dam embankment, 7,050 cubic yards of riprap, 725 cubic yards of concrete in tunnel and shaft, 3,830 cubic yards of concrete in spillway, 735 cubic yards of concrete in other parts of dam, 1,650 cubic feet of pressure grouting, placing 492,000 pounds of reinforcement bars, drilling 2,000 linear feet of grout and weep holes, drilling 1,380 linear feet of holes for anchor bars, constructing 2,815 linear feet of 4- to 18-inch clay pipe drains, installing 240,000 pounds of metal work, and installing electrical conduit, conductors, and apparatus. The work is located on Burnt River about 4 miles southwest of Baker, Oreg. The dam must be completed within 700 days, and liquidated damages for delay will be $75 per day. Purchases of reinforcement bars, gates, valves, clay pipe, metalwork, and electrical equipment will be made by the Denver office.

Sun River project, Montana.—At the Fairfield project office on December 2 bids were opened for construction of earthwork and structures, Mill Coulee wasteway, laterals and sublaterals, under Specifications No. 650. Principal items of work and estimated quantities involved are as follows: 88,900 cubic yards of excavation for wasteway and laterals, 24,300 station cubic yards of overhaul, 2,250 cubic yards of excavation for structures, 2,275 cubic yards of backfill, 837 cubic yards of concrete in structures, 300 square yards of grouted paving, 30 square yards of dry-rock paving, placing 49,000 pounds of reinforcement bars, erecting 2 M feet board measure of timber in structures, laying 1,344 linear feet of 15- to 30-inch concrete pipe, laying 926 linear feet of 15- to 48-inch corrugated metal pipe, and installing 16,300 pounds of gates and miscellaneous metal work. The Denver office will purchase reinforcement bars, pipe, and metal work.

Boise project, Idaho.—Bids were opened at Ontario, Oreg., on December 2 for the first construction job on the Payette division, the construction of tunnels nos. 1, 2, 3, and 4, on the Black Canyon Canal (Specifications No. 654). The principal items of work and estimated quantities involved are as follows: 100,000 cubic yards of all classes of open-cut excavation, 30,550 cubic yards of excavation in tunnels, 366 cubic yards of concrete in portal structures and transitions, 6,782 cubic yards of concrete in tunnel lining, placing 40,000 pounds of reinforcement bars, furnishing and installing 136,000 pounds of permanent steel tunnel supports, furnishing and erecting 60 M feet board measure of permanent timbering in tunnels, furnishing and installing 148,000 pounds of steel tunnel liner plates, constructing 3,400 linear feet of 6- to 10-inch diameter tunnel drains, and drilling 1,500 linear feet of grout holes. The work is located near Emmet, Idaho, and must be completed within 400 calendar days.

Gila Valley project, Arizona.—Initial construction work on this project in southwestern Arizona comprises the construction of earthwork and tunnels on the Gravity Main Canal, station 17–50 to station 942–60 (Specification No. 657). Bids were opened at Yuma on December 4. Items of work and quantities involved are as follows: 3,398,000 cubic yards of all classes of canal excavation, 95,000

cubic yards of excavation for drainage channels and dikes, 93,300 cubic yards of excavation in tunnels, 580 cubic yards of concrete in tunnel portal structures and transitions, 19,550 cubic yards of concrete in tunnels, placing 64,000 pounds of reinforcement bars, furnishing and installing 486,000 pounds of permanent steel tunnel supports, and furnishing and erecting 155 M feet board measure of permanent timbering in tunnels. The work is located near Yuma, Ariz. It must be completed within 600 days.

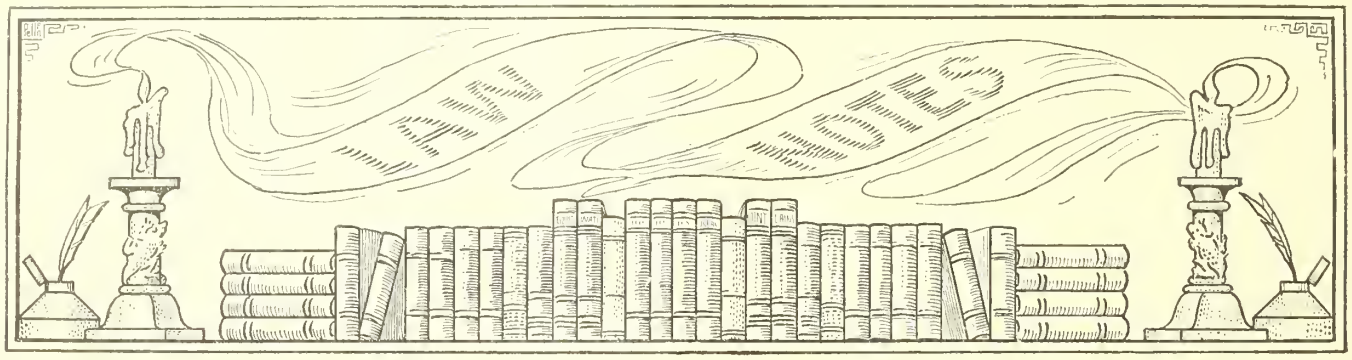
Shoshone project, Wyoming.—Work on the Heart Mountain division with $1,500,000 immediately available, is being started with construction of tunnels nos. 1, 2, and 3 on the Shoshone Canyon conduit. Bids under Specifications No. 656 were opened at Cody, Wyo., on December 5. Following is a list of items of work and quantities; 18,300 cubic yards of all classes of open-cut excavation, 64,220 cubic yards of excavation in tunnels, 2,150 yards of backfill, 715 cubic yards of concrete in cut-and-cover conduit sections, 15,170 cubic yards of concrete in tunnels, 1,800 cubic feet of pressure grouting, placing 139,000 pounds of reinforcement bars, furnishing and installing 192,000 pounds of permanent steel tunnel supports, furnishing and erecting 121 M feet board measure of permanent timbering in tunnels, furnishing and installing 60,000 pounds of steel tunnel-liner plates, constructing 11,875 linear feet of tunnel and cut-and-cover conduit drains, and drilling 900 linear feet of grout holes. The work must be completed within 750 days. It is located near Cody, Wyo.

Yakima project, Washington.—Bids were opened at Yakima on December 3 for the initial work on the Roza division, comprising construction of tunnels nos. 1, 2, and 3 on the Yakima Ridge Canal. The specifications are no. 652. Items of work and estimated quantities are as follows: 62,800 cubic yards of all classes of open-cut excavation, 141,200 cubic yards of excavation in tunnels, 450 cubic yards of backfill, 850 cubic yards of concrete in portal structures and transitions, 35,000 cubic yards of concrete in tunnels, 800 cubic feet of pressure grouting, placing 82,000 pounds of reinforcement bars, furnishing and installing 180,000 pounds of permanent steel tunnel supports, furnishing and erecting 60 M feet board measure of permanent timbering in tunnels, furnishing and installing 160,000 pounds of steel tunnel liner plates, constructing 6,455 linear feet of 6- to 10-inch diameter tunnel drains, and drilling 400 linear feet of grout holes. The work is located near Yakima, Wash., and must be completed within 750 calendar days.

RECLAMATION TABLE 17.—*Power plants operated on Bureau of Reclamation Projects during fiscal year 1934–35*

Project	Name of plant	Outgoing line voltage	Plant capacity (kilovolt-amperes)	Number of units	Head in feet	First cost of plant	Cost of operation and maintenance without depreciation	Estimated depreciation	Cost per kilowatt-hour exclusive of depreciation	Distribution of kilowatt-hours generated: Sold to consumers	Distribution of kilowatt-hours generated: Irrigation and drainage requirements	Distribution of kilowatt-hours generated: Used for other purposes	Distribution of kilowatt-hours generated: Losses	Total output (kilowatt-hours)	Gross power sales
Boise	Black Canyon	66,000	10,000	2	75.5–90.3	$414,317.21	[1] $24,579.00	$12,000.00	[1] 80.00077	[2] 23,804,587	[2] 29,636,097	1,589,114	[7] 710,027	53,448,955	Not reported
	Boise River	22,000	1,875	3	21.4–25.3	167,905.37	(1)	3,297.00	(1)		2,605,430	34,000		2,290,870	Do.
Grand Valley	Grand Valley power plant	2,300	3,750	2	73–79	210,500.00	[4] None	[4] None							
Minidoka	Minidoka power plant	33,000	10,000	6	[5] 52.04–46.09	1,110,190.86	46,504.94	40,476.00	.000879	[6] 18,369,838	[6] 25,123,565	9,021,646	3,178,176	45,141,000	[6] $147,976.52
	American falls power plant.[7]	33,000	540	1	44	76,975.00									
Newlands	Lahontan	33,000 66,000 2,300	1,875	3	110–20	141,886.01	8,827.91	4,260.00	Not known	(8)	113,000	(8)	None to district	4,247,800	8,625.73
North Platte	Guernsey	33,000	6,000	2	70–90	454,244.27	14,620.26	10,043.45	.002515	[8] 11,446,405		149,392	[9] 1,286,700	5,812,700	[9] [10] 167,961.35
	Lingle	33,000	1,750	4	106	184,791.74	17,138.20	6,500.16	.002544			143,543		6,736,240	
Rio Grande	Elephant Butte	2,300	150	1	18–180	8,440.50	3,235.00	None	.0222	None	None	[11] 145,590	Unknown	145,590	None
Riverton	Pilot Butte	33,000 2,300	2,000	2	100	262,809.00	15,430.86	7,800.00	.01309	827,938	None	269,602	91,080	1,178,620	19,225.98
Salt River	Roosevelt	110,000	19,250	7	70–240	1,372,193.73	41,913.24	68,609.70	.002161	[13] 165,529,971	[13] 44,776,348	[13] 208,884	[13] 38,529,994	[13] 249,045,197	[13] 2,167,802.54
	Horse Mesa	110,000	33,300	3	265	952,756.47	23,127.33	49,137.82	.0002512						
	Stewart Mountain	45,000	13,000	1	35–114	344,070.32	9,082.45	17,203.51	.0004494						
	Mormon Flat	110,000	8,750	1	40–150	472,011.68	10,746.76	23,600.58	.00031967						
	Cross Cut	11,000 40,000	5,250	6	111	663,920.33	22,688.42	33,196.02	.002162						
	South Consolidated	40,000	2,000	2	34	176,202.81	16,193.68	8,810.14	.002406						
	Arizona Falls	11,000	1,060	2	19	115,566.47	6,569.93	5,778.32	.0021883						
	Chandler	11,000	600	1	40	177,410.37	6,633.47	8,870.52	.002228						
Shoshone	Shoshone	33,000	7,000	3	220	880,375.56	18,261.13	28,787.40	.00263	6,092,605	None	117,700	727,155	[12] 6,937,460	72,772.46
Strawberry Valley	Spanish Fork	11,000	1,000	2	123.5	136,227.82	20,714.02	4,074.72	[12] .0088	2,759,145	None		[14] 120,557	[13] 3,179,702	46,222.00
Yakima-Kennewick	Prosser	66,000	3,000	1	40	404,843.88	5,775.44	9,000.00	.00026	[16] 21,782,576	None	34,929	314,765	22,132,270	28,950.76
Yakima-Sunnyside	Rocky Ford	6,600	187	1	73	23,000.00	1,596.40	1,006.40	.002	None	783,800	None	(15)		None
Yuma	Siphon Drop	33,000	2,000	2	[5] 13.69–10.12	364,856.00	12,756.30	13,248.00	.001716	[10] 7,044,280	327,330	60,744	442,806	7,808,760	65,205.44

[1] Includes both power plants and Deadwood Reservoir.
[2] To Idaho Power Co. for transmission.
[3] Losses Jan. 1, 1935, to July 1, 1935 only, previous losses included in preceding figures.
[4] Contractor operates and maintains plant at own expense and distributes all power generated.
[5] Maximum to average.
[6] Includes 10,532,225 kilowatt-hours from Idaho Power Co.
[7] American Falls (West Side) Plant operated only in case of emergency; not operated since 1927. Island plant partly dismantled, first cost included.
[8] Figures include 527,100 kilowatt-hours from Idaho Power Co.
[9] Both Lingle and Guernsey.
[10] Includes $2,881.23 for rental.
[11] Hydroelectric plant for power and lights at Elephant Butte Dam and camp service.
[12] Includes 1,260 kilowatt-hours of purchased power.
[13] Includes cost of peak power purchased.
[14] Includes camp usage
[15] Includes purchased power.
[16] Includes 4,800,000 kilowatt-hours of winter power delivered to Pacific Power & Light Co., in payment for transmission of power to irrigation districts.
[17] Includes 1,227,100 kilowatt-hours to Yuma auxiliary project for irrigation.
[18] Information not available



The Legal Status of Water Rights in the Pacific Northwest

By B. E. STOUTEMYER, District Counsel

(*Continued from November Issue*)

THE California court in its decision in the case of *Peabody* v. *City of Vallejo* (40 P. (2d) 486, 490), perhaps because misery loves company, has listed with California a number of other so-called "irrigation" States which it is claimed are still adhering to the riparian rights doctrine. In the case referred to, the California court said:

"In adopting a policy modifying the long-standing riparian doctrine of this state, California has done by constitutional amendment what many of the western states have done by statute or court decisions. Of the seventeen western states which are generally referred to as the irrigation states, nine now recognize the modified doctrine of riparian rights and eight have entirely abrogated the doctrine of riparian rights and recognize only the doctrine of appropriation. The nine are North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Washington, Oregon, and California; and the eight are Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizona, and New Mexico. Wiel on Water Rights, sections 117, 118. Mr. Wiel at the time properly listed Montana as a riparian state, but in 1921 it was held in *Mettler* v. *Ames Realty Co.*, 61 Mont. 152, 201 P. 702, that the doctrine of riparian rights was abrogated and that the doctrine of prior appropriation obtained exclusively in that state" (*Peabody* v. *City of Vallejo*, 40 P. (2d) 490).

It is evident from the recent decision of the Supreme Court of the United States in the case of *California Oregon Power Co.* v. *Beaver Portland Cement Co.* that the California court was mistaken in listing Oregon among the States which still retain the riparian-rights doctrine even in the limited form which prevails in California and Washington.

In referring to California and Washington as the only arid land States which retain even a modified form of the riparian rights doctrine, we have omitted the other States listed by the California court in that category, namely North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas, for the reason that all of these States are located in the section where from 90 to 99 percent of the farms are dependent on natural rainfall rather than irrigation and therefore the riparian rights doctrine, which is well adapted to the rainfall section, has been retained in these States just as it has in Great Britain and in the Atlantic and the Mississippi Valley States of this country.

In the case of *California Oregon Power Co.* v. *Beaver Portland Cement Co.*, *supra*, the cause of the confusion which has existed in the States of California, Oregon, and Washington in regard to the conflicting principles of the riparian rights doctrine and the prior appropriation doctrine is explained as follows:

"The first question is of especial importance to the semiarid states of California, Oregon, and Washington, where climatic conditions in some sections so differ from those in others that the doctrine of the common law may be of advantage in one instance, and entirely unsuited to conditions in another. Probably, it was this diversity of conditions which gave rise to more or less confusion in the decisions, not only of Oregon, but of California, in respect of the subject. We have already spoken of the former; and one has only to compare the decision of the Supreme Court of California in *Lux* v. *Haggin*, 69 Cal. 255, 10 P. 674, with *Modoc Land & Live Stock Co.* v. *Booth*, 102 Cal. 151, 36 P. 431, to realize that the rule with respect to the extent of the application of the common law of riparian rights is, likewise, far from being clear in the latter" (*Cal. Ore. P. Co.* v. *Beaver P. C. Co.*, 79 L. ed., advance sheets, p. 757).

In the same case the conditions which led to the abandonment of the riparian rights doctrine and the adoption of the prior appropriation doctrine in the great majority of the arid region States is described by the Supreme Court as follows:

"For many years prior to the passage of the Act of July 26, 1866, chap. 262, sec. 9, 14 Stat. at L. 251, 253, U. S. C., title 43, sec. 661, the right to the use of waters for mining and other beneficial purposes in California and the arid region generally was fixed and regulated by local rules and customs. The first appropriator of water for a beneficial use was uniformly recognized as having the better right to the extent of his actual use. The common law with respect to riparian rights was not considered applicable, or, if so, only to a limited degree. Water was carried by means of ditches and flumes great distances for consumption by those engaged in mining and agriculture. *Jennison* v. *Kirk*, 98 U. S. 453, 457, 458, 25 L. ed. 240, 242, 243. The rule generally recognized throughout the states and territories of the arid region was that the acquisition of water by prior appropriation for a beneficial use was entitled to protection; and the rule applied whether the water was diverted for manufacturing, irrigation, or mining purposes. The rule was evidenced not alone by legislation and judicial decision, but by local and customary law and usage as well." *Basey* v. *Gallagher*, 20 Wall. 670, 683, 684, 22 L. ed. 452, 454, 455; *Atchison* v. *Peterson*, 20 Wall. 507, 512, 513, 22 L. ed. 414, 416.

"This general policy was approved by the silent acquiescence of the federal government, until it received formal confirmation at the hands of Congress by the Act of 1866, *supra*, *Atchison* v. *Peterson*, *supra*."

"For the light which it will reflect upon the meaning and scope of that provision

and its bearing upon the present question, it is well to pause at this point to consider the then-existing situation with respect to land and water rights in the states and territories named. These states and territories comprised the western third of the United States, a vast empire in extent, but still sparsely settled. From a line east of the Rocky Mountains almost to the Pacific Ocean, and from the Canadian border to the boundary of Mexico, an area greater than that of the original thirteen states, the lands capable of redemption, in the main, constituted a desert, impossible of agricultural use without artificial irrigation.

"In the beginning, the task of reclaiming this area was left to the unaided efforts of the people who found their way by painful effort to its inhospitable solitudes. These western pioneers, emulating the spirit of so many others who had gone before them in similar ventures, faced the difficult problem of wresting a living and creating homes from the raw elements about them, and threw down the gage of battle to the forces of nature. With imperfect tools, they built dams, excavated canals, constructed ditches, plowed and cultivated the soil, and transformed dry and desolate lands into green fields and leafy orchards. In the success of that effort, the general government itself was greatly concerned—not only because, as owner, it was charged through Congress with the duty of disposing of the lands, but because the settlement and development of the country in which the lands lay was highly desirable.

"To these ends, prior to the summer of 1877, Congress had passed the mining laws, the homestead and preemption laws, and finally, the Desert Land Act. It had encouraged and assisted, by making large land grants to aid the building of the Pacific railroads and in many other ways, the redemption of this immense landed estate. That body thoroughly understood that an enforcement of the common-law rule, by greatly retarding if not forbidding the diversion of waters from their accustomed channels, would disastrously affect the policy of dividing the public domain into small holdings and effecting their distribution among innumerable settlers. In respect of the area embraced by the desert-land states, with the exception of a comparatively narrow strip along the Pacific seaboard, it had become evident to Congress, as it had to the inhabitants, that the future growth and well-being of the entire region depended upon a complete adherence to the rule of appropriation for a beneficial use as the exclusive criterion of the right to the use of water. The streams and other sources of supply from which this water must come were separated from one another by wide stretches of parched and barren land which never could be made to produce agricultural crops except by the transmission of water for long distances and its entire consumption in the processes of irrigation. Necessarily, that involved the complete subordination of the common-law doctrine of riparian rights to that of appropriation. And this substitution of the rule of appropriation for that of the common law was to have momentous consequences. It became the determining factor in the long struggle to expunge from our vocabulary the legend 'Great American Desert', which was spread in large letters across the face of the old maps of the far west.

"In the light of the foregoing considerations, the Desert Land Act was passed, and in their light it must now be construed. By its terms, not only all surplus water over and above such as might be appropriated and used by the desert-land entrymen, but 'the water of all lakes, rivers, and other sources of water supply upon the public lands and not navigable' were to remain 'free for the appropriation and use of the public for irrigation, mining, and manufacturing purposes.' If this language is to be given its natural meaning, and we see no reason why it should not, it effected a severance of all waters upon the public domain, not theretofore appropriated, from the land itself. From that premise, it follows that a patent issued thereafter for lands in a desert-land state or territory, under any of the land laws of the United States, carried with it, of its own force, no common-law right to the water flowing through or bordering upon the lands conveyed. While this court thus far has not found it necessary to determine that precise question, its words, so far as they go, tend strongly to support the conclusion which we have suggested." (*California Oregon P. Co.* v. *Beaver Portland C. Co.*, 79 L. ed. advance sheets, pp. 757–759.)

It will be noticed that the rule stated in *California Oregon Power Co.* v. *Beaver Portland Cement Co.*, which is paraphrased in the syllabus of that case is as follows:

"After the enactment of the Desert Land Act of 1877, if not before, all nonnavigable waters in any part of the public domain became publici juris, subject to the plenary control of the designated states, including those thereafter created out of the territories named, with the right in each to determine for itself to what extent the law of appropriation or the common-law rule in respect of riparian rights should apply, the act not binding the states to any policy, but recognizing and giving sanction, as regards the United States and its future grantees, to the state and local doctrine of appropriation."

The rule is limited in its application to nonnavigable streams and to the effect that the Federal Government has retained and still retains its paramount control over navigable streams such as the Colorado and the Columbia, see *Arizona* v. *California* (283 U. S. 423, 75 L. ed. 1154); *United States* v. *Rio Grande Dam & Irr. Co.* (174 U. S. 690, 43 L. ed. 1136); *United States* v. *Chandler-Dunbar W. P. Co.* (229 U. S. 53, 57 L. ed. 1063).

Another recent illustration of the right of control which the Federal Government retains in the case of all navigable streams is the decision of the United States District Court for the Eastern District of Washington in the cases of *United States* v. *Continental Land Co., et al.* and *United States* v. *Burdin et al*, which were the suits for condemnation of the lands required for the Grand Coulee Dam site. The district court, relying largely on the decision of the Supreme Court in the *Chandler-Dunbar case* (*supra*), held that the landowners were not entitled to payment of any alleged value for damsite purposes because the right to control the navigable stream is in the Federal Government and not in the riparian landowner.

As to navigable stream, such as the Columbia and the Colorado and the lower part of the Snake at least as far up as Lewiston, Idaho, the United States holds and may exercise through acts of Congress the paramount right of control either with or without the consent of the respective States. In the absence of Federal legislation, however, affecting water diversions from such streams or proposed projects thereon, the State law applies the same as in the case of nonnavigable streams. But in the case of navigable streams, the Federal law controls whenever Congress deems it proper to exercise the paramount Federal right to control navigable waters, and this is well illustrated in the recent case of *Arizona* v. *California* (*supra*) (the *Boulder Dam case*) in which the Supreme Court, speaking through Justice Brandeis, stated:

"The claim that quasi-sovereign rights of Arizona will be invaded by the mere construction of the dam and reservoir rests upon the fact that both structures will be located partly within the state. At Black Canyon, the site of the dam, the middle channel of the river is the boundary between Nevada and Arizona. The latter's statutes prohibit the construction of any dam whatsoever until written approval of plans and specifications shall have been obtained from the state engi-

neer; and the statutes declare in terms that this provision applies to dams to be erected by the United States. (Arizona Laws 1929, chap. 102, sections 1–4. See also Revised Code of 1928, sections 3280–3286.) The United States has not secured such approval; nor has any application been made by Wilbur, who is proceeding to construct said dam in complete disregard of this law of Arizona.

"The United States may perform its functions without conforming to the police regulations of a state (*Johnson* v. *Maryland*, 254 U. S. 51, 65 L. ed. 126, 41 S. Ct. 16; *Hunt* v. *United States*, 278 U. S. 96, 73 L. ed. 200, 49 S. Ct. 200). If Congress has power to authorize the construction of the dam and reservoir, Wilbur is under no obligation to submit the plans and specifications to the state engineer for approval. And the Federal government has the power to create this obstruction in the river for the purpose of improving navigation if the Colorado river is navigable (*Pennsylvania* v. *Wheeling & Bridge Co.*, 18 How. 421, 430, 15 L. ed. 435, 436; *South Carolina* v. *Georgia*, 93 U. S. 4, 11, 23 L. ed., 782, 784; *Gibson* v. *United States*, 166 U. S. 269, 41 L. ed., 996, 17 S. Ct. 578; *United States* v. *Chandler-Dunbar Water Power Co.*, 229 U. S. 53, 64, 57 L. ed. 1063. 1076, 33 S. Ct. 667; *Greenleaf Johnson Lumber Co.*, v. *Garrison*, 237 U. S. 251, 259–268, 59 L. ed. 939, 943–947, 35 S. Ct. 551).

"And the fact that purposes other than navigation will also be served could not invalidate the exercise of the authority conferred, even if those other purposes would not alone have justified an exercise of congressional power (Compare *Veazie Bank* v. *Fenno*, 8 Wall. 533, 548, 19 L. ed. 482, 487; *Kaukauna Water Power Co.* v. *Green Bay & M. Canal Co.*, 142 U. S. 254, 275, 35 L. ed. 1004, 1011, 12 S. Ct. 173; *Re Kollock*, 165 U. S. 526, 536, 41 L. ed. 813, 816, 17 S. Ct. 444; *Weber* v. *Freed*, 239 U. S. 325, 60 L. ed. 308, 36 S. Ct. 131, Ann. Cas. 1916C, 317, *supra; United States* v. *Doremus*, 249 U. S. 86, 63 L. ed. 493, 39 S. Ct. 214, supra)." (*Arizona* v. *California*, 75 L. ed. 1163–4, 1166.)

In the case of *California Oregon Power Co.* v. *Beaver Portland Cement Co.*, which applies to nonnavigable streams, the Court pointed out that:

"And in *Schodde* v. *Twin Falls Land & Water Co.*, 224 U. S. 107, 122, 56 L. ed. 686, 692, 32 S. Ct. 470, an Idaho case which sharply presented conflicting claims under the common-law rule and the rule of appropriation, this court held that such common-law rights as were incompatible with the rule of prior appropriation for beneficial use could not coexist with the latter system" (*Calif. Ore. P. Co.* v. *Beaver P. C. Co.*, 79 L. ed. advance sheets, p. 760).

If the Supreme Court of the United States is correct in declaring that the riparian-rights doctrine is incompatible with the rule of prior appropriation for beneficial use and cannot coexist with the latter system, it would seem that the States of California and Washington are attempting a well-nigh impossible task in trying to maintain both of these two incompatible rules which cannot coexist.

The State of Washington, like the States of Oregon and California, has been trying to get away from or to remove the application of the riparian-rights doctrine which it borrowed from California. This is illustrated by the water code of the State of Washington, which declares in its opening section:

"The power of the state to regulate and control the waters within the state shall be exercised as hereinafter in this act provided. Subject to existing rights all waters within the state belong to the public, and any right thereto, or to the use thereof, shall be hereafter acquired only by appropriation for a beneficial use and in the manner provided and not otherwise; and, as between appropriations, the first in time shall be the first in right" (sec. 7351, Remington's Revised Statutes).

The limiting words "subject to existing rights" which have been included in the section just quoted have been held by the Supreme Court of Washington to continue in effect in that State in a measure the old riparian rights which existed prior to the adoption of the water code, at least in the case of nonnavigable streams. But it appears that in the State of Washington riparian water rights have never existed on navigable streams such as the Columbia and the Snake.

As to nonnavigable streams the decision of the Supreme Court of Washington in the case of *Hunter Land Co.* v. *Laugenour* (140 Wash. 558, 250 Pac. 41) furnishes the best statement of the extent to which the 2 conflicting systems of water law coexist on nonnavigable streams in the State of Washington and as to what may be done in the attempt to reconcile the 2 systems. Under the rule as stated by the Washington court in the *Hunter Land Co. case*, the appropriation of the waters of a nonnavigable stream cuts off riparian rights on such stream as to any settler or entryman on riparian lands who settled upon or entered the lands after the date of such water appropriation, but it is held (quoting from the syllabus):

"Rights in water by virtue of riparian ownership are superior to subsequently acquired rights by appropriation, but inferior to rights acquired by prior appropriation.

"Private ownership of land riparian to stream does not prevent appropriation of water for irrigation purposes for non-riparian land.

"Supervisor classifying water rights under Laws 1917, p. 447, held not justified in disregarding riparian rights of water claimants on ground that custom in particular district was to that effect.

"Riparian owners have coequal rights to use water for purposes of irrigation, notwithstanding settlement by one of them antedated other.

"Riparian right is not equivalent of right by appropriation, and cannot be exercised to exhaustion of waters, though needs of land require it, in disregard of rights of other riparian owners.

"Riparian claimant, as against subsequent appropriator, has only right to take for irrigating purposes such proportion of water as his riparian land bears to quantity of riparian lands on stream capable of irrigation" (*Hunter L. Co.* v. *Laugenour*, 250 P. 41–42).

(Continued in January issue)

Tunnels or Underground Channels

Opinion Prepared by D. G. Tyree, Associate District Counsel, Portland, Oreg.

DO THE words "ditches and canals" as used in the act of August 30, 1890 (26 Stat. 391), reserving rights-of-way for ditches and canals constructed under the authority of the United States, include "tunnels"?

Webster's dictionary defines the word "tunnel" as: "A subterranean passageway, especially one horizontal and open at both ends, as for a railroad, *canal*, drain, etc."

If a tunnel is correctly defined as a passageway for a canal, it is evident that a canal may be an underground waterway as well as an open ditch and that the right-of-way for a tunnel is, in fact, right-of-way for a canal.

The definition given by Webster of the word "canal" supports the same conclusion: "(1) A duct, a tubular passage or channel; (2) a water course, a channel; (3) an artificial channel filled with water designed for navigation, irrigation, etc."

On the other hand, it seems that the word "ditch" has a more limited meaning, for "ditch" is defined as: "A trench dug in the earth as for drainage."

Considering the difference in the meaning of the words "canal" and "ditch", it would seem that the purpose of Congress in adding the word "canals" after using the word "ditches" was to include something more than would be covered

by the word "ditches" and that the word "canals" was advisedly used by Congress for the purpose of including such structures as tunnels, a tunnel being well within the definition of the word "canal" although not within the definition of the word "ditch."

The Supreme Court in the *Ide case* (*Ide* v. *United States*, 263 U. S. 497, 68 L. ed. 407) has made it plain that the term "right-of-way for ditches and canals" is not to be narrowly construed, for in that case the court held that the reservation includes the right to use a natural ravine for such ditch or canal. We quote from the *Ide case:*

"We conclude that the plaintiff has a lawfully reserved right-of-way over the tracts of the defendants for such ditches as may be needed to effect the irrigation of the lands which the project is intended to reclaim, and that the defendants were appraised of this right by the patents which passed the tracts to them. In short, they received and hold the title subject to that right.

"Assuming that there is in the ravine crossing these tracts no natural stream or flow of water susceptible of effective appropriation, the plaintiff undoubtedly has the right to make any needed changes in the ravine and to use it as a ditch in irrigating the project lands."

In the case of *United States* v. *Big Horn Land & Cattle Co.* (17 F. (2d) 357) the Circuit Court of Appeals for the Eighth Circuit, construing the words "ditches and canals" as used in the Right-of-Way Act of March 3, 1891 (26 Stat. 1095) said:

"In the last clause before the proviso in section 18 we find that the same omission occurs. We quote that clause: 'Also the right to take, from the public lands adjacent to the line of the canal or ditch, material, earth, and stone necessary for the construction of such canal or ditch.' Now, it would hardly be contended that the Congress by this language intended to limit the right of the applicant to take material for the construction only of the canal or ditch proper, and not for the construction of the reservoir. We think the clear spirit and intent of the act applies to a failure to complete the reservoir as well as the canal or ditch proper; that in the particular clauses mentioned the words 'canal or ditch' were used in an inclusive sense, embracing the whole project."

In the *Big Horn Land & Cattle Co. case*, just cited, it will be noticed that the court held that the term "canal or ditch" includes the entire project, even a reservoir. Certainly it is a greater strain on the language of the act to hold that this term includes a reservoir than to hold that it includes a tunnel.

The decision of the Circuit Court of Appeals of the Eighth Circuit in the *Big Horn Land & Cattle Co. case* quoted above was cited with approval by the Circuit Court of Appeals for the Ninth Circuit in the recent case of *Twin Falls Canal Co.* v. *American Falls Reservoir District No. 2* (59 F. (2d) 19).

The Supreme Court of the State of Wyoming has come to the same conclusion in the case of *Johnson Irr. Co.* v. *Ivory* (24 P. (2d) 1053) where the court said:

"A separate section provides that nothing in the act 'shall authorize such canal or ditch company to occupy such right-of-way except for the purpose of said canal or ditch, and then only so far as may be necessary for the construction, maintenance, and care of said canal or ditch.' Section 21 (43 USCA sec. 949) While in section 21 reservoirs are not specifically mentioned, there can be no doubt that the words 'canal and ditch' as used here and in some other parts of the act, mean the whole project including the reservoir." Regulations, 36 Land Dec. p. 569; *United States* v. *Big Horn Land & Cattle Co.* (C. C. A.) 17 F. (2d) 357, 365; *United States* v. *Tujunga Water & Power Co.* (C. C. A.) 48 F. (2d) 689, 692; *Twin Falls Canal Co.* v. *American Falls R. Dist.* (C. C. A.) 59 F. (2d) 19, 23.

It frequently happens that it may be more economical for the Government, as well as far safer for the water users, to construct a short tunnel rather than to construct a long contour ditch around a projecting point. And it is almost always true that the tunnel would do far less damage to the landowner than would the open ditch, for the tunnel leaves the surface of the land undisturbed and the entire area over the tunnel can still be used for farming or any other purpose for which it is adapted, while the open ditch would divide the farm into two separate portions and destroy the usefulness of at least a strip of land for crop-production purposes.

It will be assumed that in passing the act of August 30, 1890, reserving rights-of-way for ditches and canals constructed under authority of the United States, Congress intended that the right-of-way should be available for a practical, economical, and safe canal system. It would not be supposed that Congress would intend to require that the Government should be required to construct an open ditch in order to utilize the reserved right-of-way where such open ditch is more costly and less safe than the tunnel construction, and particularly where the damage to the landowner would be far greater in the case of an open ditch than in the case of an underground channel.

Exploration of Salmon River Canyon, Idaho

A party of nine men, including Congressman D. Worth Clark of Idaho, recently completed a daring trip through the gorge of the Salmon River, sometimes called the "River of no return", in October of this year. This exploration was sponsored by the National Geographic Society and in addition to Congressman Clark the party included geologists Dr. Philip J. Shenon and Dr. John C. Reed of the Geological Survey, Maynard Owen Williams of the National Geographic Society, Howard R. Flint of the Forest Service, Dr. A. W. Fahrenwald, dean of the school of mines of the Idaho University, and Capt. Monroe Hancock in charge of the navigating of the barge, Mate John Cunningham, and Cook, David Chard, a total of nine men.

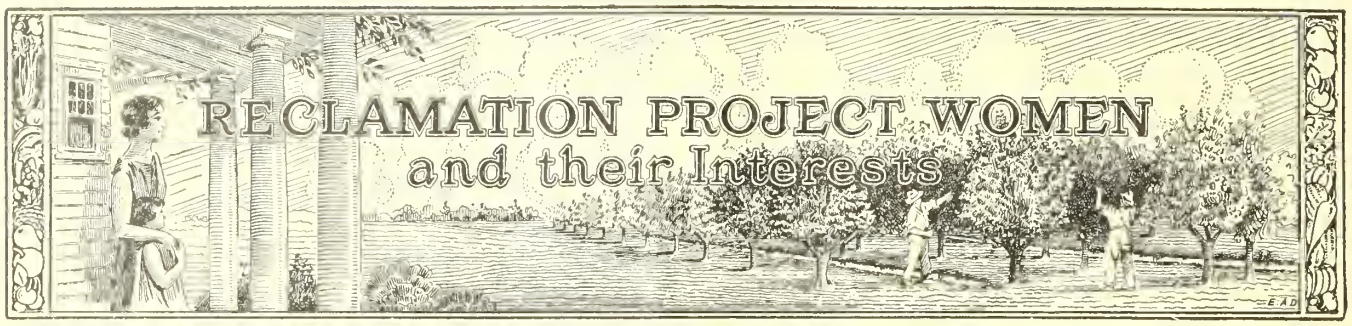
Concerning the trip which was made from Shoup, Idaho, through the canyons for a distance of about 300 miles, our construction engineer writes as follows:

"It is probable that for thrills from battles with the river and for grandeur of scenery and for amount and variety of wildlife, this wild plunge through the gorge of the Salmon River cannot be duplicated in the world. Every red-blooded man in this territory would like to make the trip, but, in addition to the danger involved, the trip can be made only at a very considerable cost, on account of the necessity of constructing a large and very dependable river boat which can only be used for the one trip."

Interest continues in settlement opportunities on the Riverton project, Wyoming. Thirty-three farm units are still available on the project.

The fifth annual meeting of the Federal Irrigation Congress was held in Billings, Mont., September 10–11, 1935.

A press report states that 6,18160 first-day covers stamped with the Boulder Dam commemorative stamp were canceled at Boulder City post office on September 30. This represented a total sale of 295,000 stamps for $8,850. The first-day sales at Boulder City exceeded in volume the first-day sales of any of the ten National Parks' commemorative stamps issued in 1934.



Christmas Trees, Too

WHILE armies of C. C. C. men are planting forests to establish shelter belts and replace the ravages of fire and blight, and millions of trees are being distributed by State nurseries and tree associations for the purpose of recreating farm wood lots on private- and State-owned land, planting for scenic beauty and the sheer joy of shade is left for us who are farsighted.

College campuses where each class as it graduates plants an arbor as its gift to the classes of the future; thoroughfares made beautiful with trees planted as memorials to war enrollees; home gardens where children plant and tend their own trees, these evidence gracious customs. Multiplied indefinitely they would make every community a garden spot. Yet we all know schools, streets, and homes innocent of any vestige of shrub or tree.

Mostly it's a matter of someone caring enough to do something about it. Women perhaps have more time.

Under the Clarke-McNary Forestry Law, trees are made available to farmers at cost through State nurseries in cooperation with the United States Forest Service. The Department of Agriculture publishes many booklets on tree planting. The Bureau of Reclamation publishes a pamphlet, Tree Planting on the Reclamation Projects, prepared in collaboration with the Forest Service. Tree associations will gladly cooperate with community plans.

Advice there is in abundance, if one has the will to plant trees. Experts who know the proper species for every climate and soil, and the proper practice to insure straight and sturdy growth, have put full instructions into print.

Women's clubs on the projects have made tree planting a part of their community program. Many canals have been made more durable and more sightly by rows of trees which flourish in the moist soil. Reclamation projects, themselves examples of man's ingenuity in overcoming nature's insufficient water supply, could by thoughtful planting be made atrractive examples of ingenuity in landscape planning, of women's ingenuity, perhaps.

HOME ON THE RIVERTON PROJECT, WYOMING.

Nearly all the settlers on this project have planted trees which make the settled sections appear as green oases in the surrounding sagebrush desert.

Growing Christmas Holly on the Farm, Department of Agriculture, price 5 cents a copy: A 22-page pamphlet describing the methods of producing Christmas holly greens. Practical details of culture, harvesting, and marketing are presented. The climate of certain sections of the Pacific Northwest is said to be especially favorable.

Farmer's Day at Orland

A Farmer's Day program, sponsored by the Grange, was held in Willows on October 22 and was well attended by project water users. The Boosters' Club of Orland staged a very successful entertainment for the children of Orland and vicinity the night of October 31. As a defense measure against the usual depredations experienced in small towns on Halloween, the entertainment was more than worthwhile. On the morning of November 1 the town presented to the early riser its usual placid appearance.

Klamath Junior Fair

On October 26–27 the annual junior fair was held at Klamath County Fair grounds. The junior fair is given by the Klamath County 4–H clubs and the Future Farmers of America. The 800 boys and girls enrolled in this work produced exhibits that made a very creditable display. Among the potato exhibits was Klamath County's 4–H potato exhibit, grown by Gene Short of Henley, which won first place at the recent Pacific International Livestock Exposition in Portland.

Naches Heights Woman's Club

By Jennie Whittington McKinney

The Naches Heights Woman's Improvement League was organized in 1912, primarily as an aid to an afflicted mother; and also to assist Rev. A. C. McIvor of Naches in the Sabbath-school work he had started in our community, as well as to keep in touch with the affairs of the day; so its nature was social, religious, and literary.

The club proved a wonderful asset to the community. The women helped to furnish equipment for the Naches Heights clubhouse built earlier in that year on ground donated by James D. Bean alongside the Government's ditch bank; for there were no roads then save the Government trails. Tieton headquarters, then called "Camp Four" could be reached by only one extremely steep and difficult grade still known as Schuler Grade which was constructed by the Government reclamation workers. There are now five good grades to reach the scenic land of Naches Heights, and the people of Yakima and vicinity enjoy showing their friends the beautiful views from Naches Heights, as well as the fine orchards and comfortable homes.

During the period of the World War, our club women passed up their activities to render service in the Red Cross work. The area around headquarters formed a strong Red Cross Auxilliary; the women nearer Painted Rocks Grade formed a circle or unit, so all of our members were giving time and strength to aid the Red Cross, and we are, I think, justly proud of our record. For some time following the armistice, we continued doing refugee relief work.

Later, in 1920, perhaps, our women reorganized as the Naches Heights Woman's Club, which has been one of the largest strictly rural clubs in the State of Washington. In 1925 we felt the necessity for a larger and more modern club home as well as for a more accessible location on the graveled road, and on August 4, 1926, the spirit of Naches Heights was proven in the completion and formal dedication of The Naches Heights Community Club House just 10 miles from Yakima's center via Garrettson Grade.

The Woman's Club has made donations of cash from time to time, and has provided draperies, furniture, kitchen equipment, linens, dishes, and 14 dozen each of knives, forks, and spoons of good plated make, marked "Naches Heights", to furnish this clubhouse. The ground for our present location was donated by Paul W. Berndt. Our women are associate members of the Community Club, and our husbands are honorary members of the Woman's Club.

The loyalty of the women of the community to their club work has been marvelous. In the blub year of 1926–27 there were 110 members enrolled; in 1931–32, there were 94; and the membership has not been lower than 75 since 1924–25. Our club has contributed liberally to the veterans' hospital at Walla Walla for a number of years, and sends annually a large amount of jams and jellies to the orthopedic hospital in Seattle. We have helped the 4–H club in their undertakings and are always ready and willing to work in any community affair. We are also much in sympathy with the affairs of Yakima, as we are properly addressed Yakima, Route 6, Naches Heights.

Articles on Irrigation and Related Subjects

Desilting Works: Colorado River desilting at Imperial Dam, illus., Eng. New-Record, Oct. 17, 1935, v. 115, pp. 538–541.

Fertig, Jerome H.: Construction of the All-American Canal, illus., Military Engineer, Nov.–Dec., 1935, v. 27, no. 156, pp. 467–469.

Ickes, Harold L.: A message for General Contractors (portrait). The Constructor, Nov., 1935, v. 17, no. 11, pp. 1–2.

Klotz, R. L.: Foundations of the Madden Dam, illus., Military Engineer, Nov.–Dec., 1935, v. 27, no. 156, pp. 439–446.

Mead, Elwood: No need to worry about silt in Boulder Reservoir, Commissioner says. Southwest Builder and Contractor, Oct. 25, 1935, v. 86, no. 17, p. 16.

O'Connell, Harold: Grand Coulee Dam, illus., Compressed Air Magazine, Oct., 1935, v. 40, no. 10, pp. 4840–4855.

Ogden River Project: Ogden River project assures Weber growth, illus., H. Lee Gilmore, The Utah, Oct., 1935, vol. 1, no. 1, pp. 15–16.

Reclamation Bureau: Bureau of Reclamation ready for December deadline, portraits Dr. Mead and Mr. Walter, Pac. Builder and Engineer, Nov. 2, 1935, v. 31, no. 44, pp. 20–21.

Utah, The: Vol. No. 1, Oct., 1935, 48 page illus. magazine, published by the Utah Pub. Co., 5th Floor, Felt Bldg., S. L. C., Utah. Single copies 15¢, $1.50 per year, Harry B. Miller, Editor. (A cons. and tourist magazine featuring the activities of the State Highway Commission and Asso. civic clubs of Utah.)

Vetter, Carl P.: Desilting works for the All-American Canal, illus., Western Construction News, Oct., 1935, vol. 10, no. 10, pp. 288–290.

Weymouth, F. E.: The Relation of the Colorado River Aqueduct to the Development of the West. Mimeograph copy of paper presented at National Reclamation Conference held in Salt Lake City, Utah, November 16, 1935. Address, F. E. Weymouth, general manager and chief engineer, the Metropolitan Water District of Southern California, Los Angeles.

Young, Walker R.: Boulder Canyon Project. A vast undertaking for regulation, water supply, and power—in immensity of conception and romance of execution it stands supreme. Commercial America, October 1935, v. 32, No. 4, pp. 10–11, 40 and 42.

Hot Lunches for Hyrum School Children

The Parent-Teachers Association on the Hyrum project, Utah, is sponsoring a movement, with the assistance of the Federal Emergency Relief Administration, to furnish during the winter hot lunches to school children. The association is gathering all the fruit and vegetables available for canning, and on the 1st of November 6,028 quarts had been canned. Parents supply either 5 cents a day for each child, or canning material of that value. The plans call for the services of three women hired through the F. E. R. A.

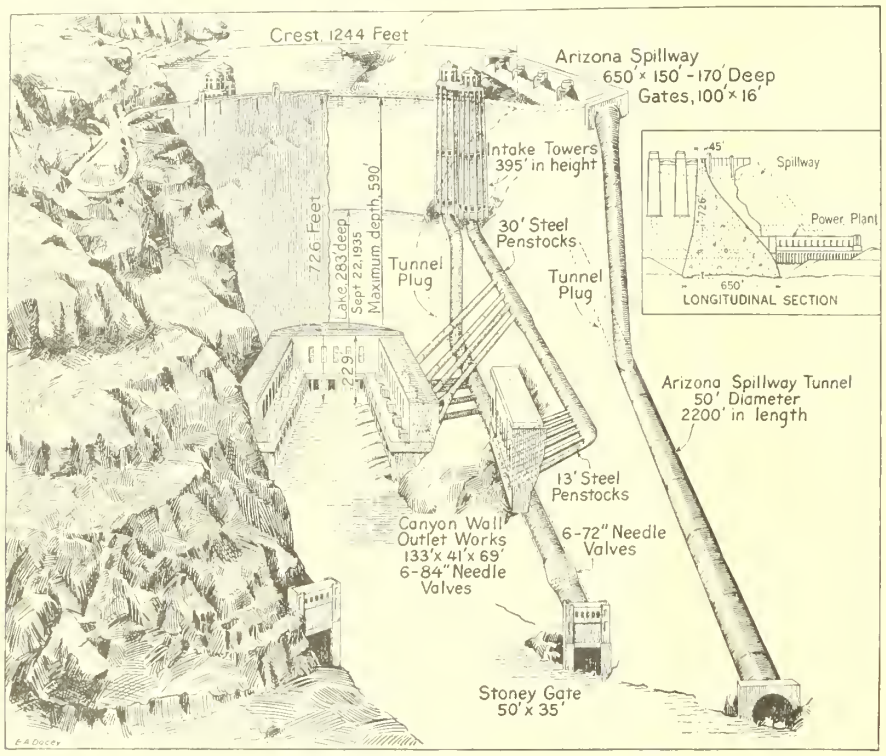
Rural Electrification Projects

An allocation of $700,000 for rural electrification in the Imperial Valley of California, in addition to an allocation of $295,000 made earlier to the Southern Sierras Power Co. for a project also in Imperial County, has been announced by Morris L. Cooke, Administrator of Rural Electrification. The allocation has been made to the Imperial irrigation district, a public body, for the construction of 497 miles of transmission and distribution lines to serve a rural area in Imperial County in which 1,500 families make their homes.

Court orders at present restrain both the Irrigation District and the power company from proceeding with the contemplated construction. The REA funds will therefore be made available only after these legal obstacles have been cleared. Mr. Cooke pointed out that

(Continued on p. 250)

How Does Boulder Dam Work? This Drawing Explains



Boulder Dam and power plant.

HOW does Boulder Dam work?

This question has been asked innumerable times. In an effort to explain the workings of the dam this drawing, with the Nevada wall of Black Canyon remaining solid, and the Arizona wall cut away to reveal the intake towers, the spillway, the penstock pipe, and outlet works, has been made by E. A. Dacey, chief draftsman of the Bureau of Reclamation staff.

For the convenience of readers the dimensions of the dam and its appurtenant works have been illustrated on the drawing.

A small longitudinal section has been inset on the drawing for the purpose of showing the thickness of the dam at its base and at its crest. This inset also will illustrate the relative position of the intake towers and the spillway to the power house and dam.

Inside the Nevada wall of the canyon a similar set of penstock, diversion, and spillway pipe has been placed.

It will be noted that all the diversion tunnels, constructed to carry the water of the river past the dam site during the construction period, have been used for at least a part of their length in the permanent construction. The 2 spillways lead by a sloping incline into the 2 outside diversion tunnels, which have been plugged upstream from the juncture. One of the penstock pipes on each side is carried for the major part of its length through the inside diversion tunnels, which also have been plugged.

The penstocks, it will be noticed, feed the turbines in the powerhouses through branch pipes, and continue down stream to outlet works emptying directly into the canyon below the dam.

The spillways are safety valves. They have a combined capacity of 400,000 second-feet. It is not probable that they ever will be used, but they stand ready in case of emergency. The largest recorded flood on the Colorado reached a maximum of approximately 250,000 second-feet. However, before records were kept a flood which may have reached a height of 300,000 second-feet occurred. Should even this latter flood pour into the reservoir when it was brim full, it would not tax the spillways or use more than three-quarters of their capacity. It is not contemplated that during flood seasons the reservoir will be allowed to remain brim full. The big floods on the Colorado always occur in the spring when snow begins to melt in the mountains, and they can be foreseen. However, as an added precaution the penstocks themselves can be used in time of emergency to dump an additional 100,000 second-feet of water past the dam.

Thus, a total capacity of 500,000 second-feet is provided in the spillways and penstocks, a capacity twice the greatest recorded flood.

Electrification

(Continued from page 249)

these allocations, subject to the outcome of the pending litigation, are preliminary to the announcement by REA of projects in other States upon which construction can proceed at once. Loan contracts are awaiting signature on rural electrification projects in other States. On many more projects action is approaching completion, and the negotiation of contracts probably will be completed in the near future.

In the Imperial Valley area electric energy will be furnished ultimately by hydroelectric plants owned by the Irrigation District which are under construction along the partly completed All-American Canal. Until such time as these plants are ready for service, electricity will be supplied by a Diesel power plant now under construction, for which other, non-Federal, financing had previously been arranged. The allocations contemplate self-liquidating three percent loans to run for 20 years and to cover the entire cost of the projects.

Progress of Engineering Investigations

Silt survey, Colorado River, Ariz.-Calif.—Work was continued on surveying cross sections along the Colorado River.

Northern transmountain diversion, Colorado.—Work was continued on an investigation of the transmountain diversion from the Colorado River Watershed near Grand Lake to the South Platte Watershed near Fort Collins and Loveland, Colo. Four planetable sheets showing topography and nine sheets showing power- and water-supply conduits were completed. Five topography sheets were partially completed. A detailed reconnaissance was made of a part of the proposed canal line from Big Thompson Creek to Poudre River. A reconnaissance was also made of a conduit line from Wind River Canyon to Estes Park. A geological reconnaissance was completed of three proposed tunnel sites in the Grand Lake and Estes Park areas. Six parties worked out of Grand Lake and two parties were located in Estes Park. Headquarters were moved from Grand Lake to Loveland, Colo., the last week of the month. Two field parties were added to the Estes Park force and the remaining field personnel started on horizontal and vertical control for areas to be surveyed around Loveland.

Upper Snake River storage, Idaho.—The principal activity in this region is

the investigation of the proposed transmountain diversion from Hebgen Lake on the Madison River in Montana to Henrys Lake in Idaho. Field work for the 8-mile tunnel line was completed early in the month. A preliminary geologic examination of the project was made. Field data and water supply records are being assembled for preliminary designs and estimates.

Buffalo Rapids project, Montana.—Investigation of irrigation possibilities between Miles City and Glendive, Mont. was continued. Conferences were held at Miles City, Mont., on October 24 and 25, at which the Bureau report was considered and ways and means discussed to finance the project.

Gallatin Valley, Mont.—Investigation of a reservoir site for additional water supply for irrigated lands in the Gallatin Valley was continued. Topography for one dam site has been practically completed. Base lines for the reservoir topography were finished. Assistant Geologist F. M. Murphy has made a preliminary examination of three dam sites and expects to return in time to outline drilling operations. Arrangements were made for the transfer of the diamond-drill outfit now working on the Upper Snake River project in Idaho to the Gallatin Valley investigations early in December.

Butter Creek, Oreg.—An investigation of the possible rehabilitation of the old Teel Irrigation District by a transmountain diversion from the John Day River watershed to the Umatilla River area of which Butter Creek is a tributary, was in progress and a study of the water supply available for diversion and a rough draft report were being prepared.

Deschutes project, Oregon.—An investigation of storage possibilities for supplemental irrigation supply of lands along the Deschutes River in Oregon was continued. An additional survey for a high diversion dam and the Ochoco pumping site was completed. Preparation was made for parties on canal location and soil survey during November, weather permitting.

Grande Ronde, Oreg.—The progress report on the investigations of this project has been completed and will be available in the near future.

Southern Nevada.—Investigation of irrigation possibilities in the Las Vegas and Moapa Valley areas by pumping from the Boulder Canyon Reservoir was continued. Canal and tunnel locations have been located in the Denver office on the topographic sheets, and cost estimates are being prepared for various alternate combinations. Cost estimates on pumping equipment and operation are being prepared by the electrical section.

Salt Lake Basin, Utah.—A survey for cost estimate purposes was made for an extension of the feeder canal which was constructed this last summer. About 8 miles of canal were located mainly along a steep hillside.

Colorado River Basin.—Work on these investigations during October was located in Colorado. Total area surveyed for irrigated area or classified during the month equalled nearly 100 square miles. The irrigated area survey was completed in Troublesome Valley, in the region upstream from Hot Sulphur Springs, Colo., and above Gore Canyon. Work is now going on in Sheephorn Valley and Eagle River Valley. Land classification was completed in the Blue River Valley, Troublesome Valley, and above Hot Sulphur Springs. A few days' work remains in the Muddy Creek Valley to finish the land classification and irrigated area survey above Gore Canyon except that connected with the transmountain diversion at Grand Lake.

Excerpts from October Project Progress Reports

Yuma.—Cotton picking continued steadily, 2,014 bales being ginned during the month. Alfalfa hay is looking good. Harvesting of maize is well under way, with fair yields. The acreage of this crop on the Reservation division is larger than usual. A large area has been planted to lettuce and indications are that an excellent crop will be harvested. Early pickings of pecan nuts indicate the best crop in 5 years, both as to quality and quantity, and it is estimated that the season's yield for the Valley division will amount to 80 to 100 tons.

Orland.—Harvesting of olives started about the middle of the month. Citrus prospects have brightened considerably, the Orland Register placing the estimate for oranges at 75 percent of a normal crop. The fruit is larger than usual and apparently is of very good quality. Pastures continued excellent and furnished feed for practically all project livestock. Five carloads of almonds, 2 of dried fruits, and 2 of grapes were shipped during the month.

Minidoka.—Harvesting of beets and potatoes was well under way during the latter part of the month. There was considerable damage to undug potatoes, caused by unusually cold weather. A farmer in the Burley district reports a yield of 38 bushels of beans per acre from 13 acres. This is considered an unusually good return, as there has been a general low yield owing to disease and insect pests. A number of lambs from the project were sold at the Pocatello ram sale on October 5, at prices ranging from $40 to $52.50 each. These prices were about 30 percent higher than those received a year ago.

Milk River.—Excellent harvest weather prevailed until the last 3 days of the month, when extremely cold weather caused a suspension of harvest operations. On the Malta division the harvest was complete and no damage resulted. On the Chinook division, about 10 percent of the crop remains in the ground and several days of warm weather will be necessary before harvesting can be resumed. The movement of cattle and sheep from the range for fall and winter feeding on the project was unusually heavy. There is an abundance of feed on the irrigated area and feeders are in excellent condition. The market continued fairly strong throughout the month and satisfactory prices were received generally for stock in good condition.

Sun River.—Crops generally were good and well harvested. Livestock is in good condition. There has been a marked movement of livestock to market this fall.

North Platte.—Some very good yields of potatoes were obtained, and advance reports indicate an average of about 13 tons per acre of sugar beets with a sugar content of about 16 percent. Good weather was experienced for the harvesting of potatoes and sugar beets.

Humboldt.—It is estimated that 15,000 tons of hay were produced during the past irrigation season. Practically all of this hay is being fed to feeder stock and has been sold at the rate of 14 cents per head per day, which is equivalent to a price of about $7.50 per ton. Approximately 4,500 head of feeder cattle are being wintered on the project. All cattle came off the summer ranges in good condition.

Carlsbad.—Cotton picking was in progress during the entire month except for a few days of wet weather. A total of 4,315 bales of cotton have been ginned. It is estimated that this will be about 45 percent of the total crop. Prices received for cotton to the close of the month exceeded 11 cents per pound. Grades are very good. The last crop of alfalfa hay has been cut in most instances, and considerable acreage of young alfalfa has been planted. Both fall-sown grain and alfalfa are in first-class condition.

Organization Activities and Project Visitors

Dr. Elwood Mead, Commissioner of Reclamation, has accepted an invitation proffered by the chairman to serve as a member of the dinner committee of the All-Engineers Dinner, American Engineering Council of Washington, which will occur on Friday evening, January 10, 1936. William McClellan, president of the Potomac Electric Power Co., is chairman of the dinner committee.

Commissioner Mead and Miss Mac A. Schnurr, Assistant to the Commissioner, were invited to be present at the annual meeting of the Association of Western Engineers, which was held at Salt Lake City on November 13–14, but were compelled to decline the invitation owing to the press of official duties requiring their presence in Washington.

Representatives of the Bureau of Reclamation in attendance upon the Salt Lake Conference of the National Reclamation Association, November 15–16, included the following:

Washington office: George O. Sanford, General Supervisor of Operation and Maintenance.

Denver office: R. F. Walter, Chief Engineer; E. B. Debler, Hydraulic Engineer; P. J. Preston, Engineer, Colorado River Basin Investigations.

District counsel: B. E. Stoutemyer of Portland, Oreg., and J. R. Alexander of Salt Lake City, Utah.

Construction engineers: Walker R. Young, Central Valley project, California; F. A. Banks, Columbia Basin project, Washington; J. R. Iakisch, Ogden River project, Utah; E. O. Larson, Provo River project, Utah; and D. J. Paul, Hyrum project, Utah.

H. H. Barrows, Department of Geography, University of Chicago, represented the National Resources Board at the meeting of the National Reclamation Association, held in Salt Lake City, November 15–16.

Howard P. Bunger, construction engineer, Colorado River project, Texas, was in Washington during November in attendance upon conferences in the Department on matters pertaining to the project.

George Tarleton, junior engineer, has been transferred from the Boulder Canyon project to the Denver office.

Officials of the Utah-Idaho Sugar Co. met in Great Falls on October 23 to discuss a program of growing beets and the development of that area for a sugar factory.

L. J. Foster, construction engineer on the Humboldt project, addressed the engineering class of the University of Nevada at Reno on the evening of October 10, his subject being "The Humboldt River Project."

L. S. Davis, of Denver, in charge of all C. C. C. camps on reclamation projects, visited the Provo River project on October 24 for the purpose of looking over the work proposed to be done with E. C. W. labor in the event that a camp is obtained for the project. Mr. Davis also visited the Minidoka project on October 25 and 26 and inspected the camp at Minidoka Dam and the work being done.

John R. Sutherland, assistant engineer, has been transferred from the Hyrum project, Utah, to the Upper Snake River project, Idaho, and assigned to the duties of office engineer.

Recent appointments in the Washington office include the following:

Public Relations Division: Miss Kathryne E. Cooksie, senior scientific colorist.

Chief Clerk's Division, personnel, Miss Eva L. Hasselquist; stenographic, Miss Emma Mae Rusnack, vice Mrs. Genevieve J. Norsted, resigned.

Accounting Division: Samuel Barrett and Joseph R. Galler.

Mrs. Norsted, whose resignation was effective at the close ot November 9, has returned to her former home in Minneapolis.

George O. Sanford, general supervisor of operation and maintenance, returned to the Washington office on November 21, having spent 6 weeks on a tour of some of the projects under his jurisdiction. This official visitation included the Orland, Newlands, Strawberry Valley, Ogden River, Hyrum, Grand Valley, Uncompahgre, All-American Canal, Yuma, Salt River, Rio Grande, and Carlsbad projects. R. C. E. Weber, superintendent of the Yuma project, accompanied Mr. Sanford to Carlsbad.

The headquarters of Andrew W. Simonds, engineer, was changed from Boulder, Colo., to Denver, effective October 24.

R. F. Walter, chief engineer, and C. M. Day, mechanical engineer, spent 2 days on the Boulder Canyon project, during the month of October.

Ewalt P. Anderson, chief clerk on the Hyrum project, has been transferred to the same position on the Uncompahgre project.

E. B. Debler, hydraulic engineer, attended the meeting, from October 21 to 29, of the board of engineers on the Colorado River project in Texas.

L. H. Mitchell, field supervisor in charge of district no. 4, returned to Washington on November 3. Mr. Mitchell's itinerary during the month of October included the following projects: Orland, Newlands, Strawberry Valley, Ogden River, Hyrum, Grand Valley, Uncompahgre, North Platte, and Belle Fourche.

J. C. Russel, agronomist, Department of Agriculture, State of Nebraska, and now connected with the land settlement section, visited the Belle Fourche project on October 29 for the purpose of acquainting himself with the suitability of that area for rehabilitation of farm families

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C. H. Howell, of Honolulu, has been appointed by the Secretary of the Interior to make the investigation for which Public Works Administration has allotted $25,000 to determine the feasibility of a water-diversion project on the Island of Molokai, one of the Hawaiian group.

Mr. Howell formerly was engineer for the county of Maui.

The proposed development would divert water across the mountainous back of Molokai Island for domestic and irrigation uses on a settlement of the Hawaiian Homes Commission.

On December 7, W. I. Swanton, of the engineering division, addressed the National Association of Retired Federal Employees in the Museum of Natural History in Washington, on the subject, The Story of Reclamation.

ADMINISTRATIVE ORGANIZATION OF THE BUREAU OF RECLAMATION

HAROLD L. ICKES, SECRETARY OF THE INTERIOR

Theodore A. Walters, First Assistant Secretary, In Charge of Reclamation **Elwood Mead**, Commissioner, Bureau of Reclamation

Miss Mae A. Schnurr, Asst. to Commissioner and Chief, Division of Public Relations; George O. Sanford, General Supervisor of Operation and Maintenance; John C. Page, Chief Engineering Division; Deane S. Stuver, Supervising Engineer, E. C. W. Division; Wm. F. Kubach, Chief Accountant; Charles N. McCulloch, Chief Clerk; Jesse W. Myer, Chief Mails and Files Division; Miss Mary E. Gallagher, Secretary to the Commissioner

Denver, Colo., United States Customhouse

R. F. Walter, Chief Eng.; S. O. Harper, Asst. Chief Eng.; J. L. Savage, Chief Designing Eng.; W. H. Nalder, Asst. Chief Designing Eng.; L. N. McClellan, Chief Electrical Eng.; B. W. Steele, Senior Engineer, Dams; C. M. Day, Mechanical Eng.; H. R. McBirney, Senior Engineer, Canals; E. B. Debler, Hydraulic Eng.; I. E. Houk, Senior Engineer, Technical Studies; Spencer L. Baird, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Field Representative

Projects under construction or operated in whole or in part by the Bureau of Reclamation

Project	Office	Official in charge		Chief clerk	District counsel	
		Name	Title		Name	Address
Belle Fourche	Newell, S. Dak.	F. C. Youngblutt	Superintendent	J. P. Siebeneicher	W. J. Burke	Billings, Mont.
Boise	Ontario, Oreg.	R. J. Newell	Constr. engr.		B. E. Stoutemyer	Portland, Oreg.
Boulder Dam and power plant.	Boulder City, Nev.	W. R. Young	do	E. R. Mills	R. J. Coffey	Los Angeles, Calif.
Burnt River	Unity, Oreg.	Clyde H. Spencer	do		B. E. Stoutemyer	Portland, Oreg.
All-American Canal	Yuma, Ariz.	R. B. Williams	do	J. C. Thrailkill	R. J. Coffey	Los Angeles, Calif.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	Superintendent	E. W. Shepard	H. J. S. DeVries	El Paso, Tex.
Casper-Alcova	Casper, Wyo.	H. W. Bashore	Constr. engr.	C. M. Voyen	W. J. Burke	Billings, Mont.
Colorado River	Austin, Tex.	H. P. Bunger	do	William F. Sha		El Paso, Tex.
Columbia Basin, Grand Coulee Dam.	Coulee Dam, Wash.	F. A. Banks	do	C. B. Funk	B. E. Stoutemyer	Portland, Oreg.
Frenchtown	Missoula, Mont.	J. W. Taylor	Resident engr.		W. J. Burke	Billings, Mont.
Gila Valley	Yuma, Ariz.	R. B. Williams	Constr. engr.		R. J. Coffey	Los Angeles, Calif.
Grand Valley	Grand Junction, Colo.	W. J. Chiesman	Superintendent	E. A. Peck	J. R. Alexander	Salt Lake City, Utah.
Humboldt	Lovelock, Nev.	L. J. Foster	Constr. engr.	George B. Snow	do	Do.
Hyrum	Hyrum, Utah	D. J. Paul	Resident engr.	H. W. Johnson	do	Do.
Klamath	Klamath Falls, Oreg.	B. E. Hayden	Superintendent		B. E. Stoutemyer	Portland, Oreg.
Milk River	Malta, Mont.	H. H. Johnson	do	E. E. Chabot	W. J. Burke	Billings, Mont.
Chain Lakes Storage	do	do	do	do	do	Do.
Minidoka	Burley, Idaho	E. B. Darlington	do	G. C. Patterson	B. E. Stoutemyer	Portland, Oreg.
Moon Lake	Duchesne, Utah	E. J. Westerhouse	Constr. engr.	Francis J. Farrell	J. R. Alexander	Salt Lake City, Utah.
North Platte	Guernsey, Wyo.	C. F. Gleason	Supt. of power	A. T. Stimpfig [1]	W. J. Burke	Billings, Mont.
Ogden River	Ogden, Utah	J. R. Iakisch	Constr. engr.	H. W. Johnson	J. R. Alexander	Salt Lake City, Utah.
Orland	Orland, Calif.	D. L. Carmody	Superintendent	W. D. Funk	R. J. Coffey	Los Angeles, Calif.
Owyhee	Ontario, Oreg.	R. J. Newell	Constr. engr.	Robert B. Smith	B. E. Stoutemyer	Portland, Oreg.
Parker Dam [2]	Earp, Calif.	E. A. Moritz	do	George H. Bolt	R. J. Coffey	Los Angeles, Calif.
Provo River	Salt Lake City, Utah	E. O. Larson	Engineer	Francis J. Farrell	J. R. Alexander	Salt Lake City, Utah.
Rio Grande	El Paso, Tex.	L. R. Fiock	Superintendent	H. H. Berryhill	H. J. S. DeVries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	do	C. B. Wentzel [1]	R. J. Coffey	Billings, Mont.
Salt River	Phoenix, Ariz.	E. C. Koppen	Engineer		W. J. Burke	Los Angeles, Calif.
Sanpete	Salt Lake City, Utah	E. O. Larson	do	Francis J. Farrell	J. R. Alexander	Salt Lake City, Utah
Shoshone	Powell, Wyo.	L. J. Windle [1]	Superintendent	L. J. Windle [1]	W. J. Burke	Billings, Mont.
Stanfield	Ontario, Oreg.	R. J. Newell	Constr. engr.	Robert B. Smith	B. E. Stoutemyer	Portland, Oreg.
Sun River, Greenfields div.	Fairfield, Mont.	A. W. Walker	Superintendent		W. J. Burke	Billings, Mont.
Truckee River Storage	Lovelock, Nev.	L. J. Foster	Constr. engr.		J. R. Alexander	Salt Lake City, Utah.
Umatilla (McKay Dam)	Pendleton, Oreg.	C. L. Tice	Reservoir supt.		B. E. Stoutemyer	Portland, Oreg.
Uncompahgre: Taylor Park Reservoir.	Gunnison, Colo.	A. A. Whitmore	Constr. engr.	Ewalt P. Anderson	J. R. Alexander	Salt Lake City, Utah.
Repairs to canals	Montrose, Colo.	C. B. Elliott	Engineer	do	do	Do.
Upper Snake River Storage [3]	Ashton, Idaho	H. A. Parker	Constr. engr.	Emmanuel V. Hillius	B. E. Stoutemyer	Portland, Oreg.
Vale	Vale, Oreg.	C. C. Ketchum	Superintendent		do	Do.
Yakima	Yakima, Wash.	J. S. Moore	do	R. K. Cunningham	do	Do.
Yuma	Yuma, Ariz.	R. C. E. Weber	do	Nobel O. Anderson	R. J. Coffey	Los Angeles, Calif.

[1] Acting. [2] Non-Federal. [3] Island Park Dam.

Projects or divisions of projects of Bureau of Reclamation operated by water users

Project	Organization	Office	Operating official		Secretary	
			Name	Title	Name	Address
Baker (Thief Valley division)	Lower Powder River irrigation dist.	Baker, Oreg.	A. J. Ritter	President	F. A. Phillips	Keatiug.
Bitter Root	Bitter Root irrigation district	Hamilton, Mont.	N. W. Blindauer	Engineer-manager	Elsie H. Wagner	Hamilton.
Boise	Board of Control	Boise, Idaho	Wm. H. Tuller	Project manager	F. J. Hanagan	Boise.
Grand Valley, Orchard Mesa	Orchard Mesa irrigation district	Palisade, Colo.	W. E. Stout	President	H. B. Smith	Palisade.
Huntley	Huntley irrigation district	Ballantine, Mont.	E. E. Lewis	Manager	H. S. Elliott	Ballantiue.
Klamath, Langell Valley	Langell Valley irrigation district	Bonanza, Oreg.	Chas. A. Revell	do	Chas. A. Revell	Bonanza.
Klamath, Horsefly	Horsefly irrigation district	do	Jerome Smith	do	Dorothy Eyers	Do.
Lower Yellowstone	Board of Control	Sidney, Mont.	Axel Persson	Project manager	O. B. Patterson	Sidney.
Milk River:						
Chinook division	Alfalfa Valley irrigation district	Chinook, Mont.	A. L. Benton	President	R. H. Clarkson	Chinook.
Do	Fort Belknap irrigation district	do	H. B. Bonebright	do	L. V. Bogy	Do.
Do	Harlem irrigation district	Harlem, Mont.	Thos. M. Everett	do	Geo. H. Tout	Harlem.
Do	Paradise Valley irrigation district	Zurich, Mont.	Amos Thompson	do	J. F. Sharpless	Zurich.
Do	Zurich irrigation district	Harlem, Mont.	C. A. Watkins	do	H. M. Montgomery	Do.
Minidoka:						
Gravity	Minidoka irrigation district	Rupert, Idaho	Frank A. Ballard	Manager	W. C. Trathen	Rupert.
Pumping	Burley irrigation district	Burley, Idaho	Hugh L. Crawford	do	Geo. W. Lyle	Burley.
Gooding	Amer. Falls Reserv. Dist. No. 2	Gooding, Idaho	S. T. Baer	do	P. T. Sutphen	Gooding.
Newlands	Truckee-Carson irrigation district	Fallon, Nev.	W. H. Alcorn	President		Fallon.
North Platte:						
Interstate division	Pathfinder irrigation district	Mitchell, Nebr.	T. W. Parry	Manager	Flora K. Schroeder	Mitchell.
Fort Laramie division	Gering-Fort Laramie irrigation dist.	Gering, Nebr.	W. O. Fleenor	Superintendent	C. G. Klingman	Gering.
Do	Goshen irrigation district	Torrington, Wyo.	Bert L. Adams	do	Nelle Armitage	Torrington.
Northport division	Northport irrigation district	Northport, Nebr.	Mark Iddings	do	Mabel J. Thompson	Bridgeport.
Okanogan	Okanogan irrigation district	Okanogan, Wash.	Nelson D. Thorp	Manager	Nelson D. Thorp	Okanogan.
Salt Lake Basin (Echo Reservoir).	Weber River Water Users' Assn.	Ogden, Utah	D. D. Harris	do	D. D. Harris	Ogden.
Salt River	Salt River Valley W. U. A.	Phoenix, Ariz.	H. J. Lawson	Superintendent	F. C. Henshaw	Phoenix.
Shoshone:						
Garland division	Shoshone irrigation district	Powell, Wyo.	J. O. Roach	do	Geo. W. Atkins	Powell.
Frannie division	Deaver irrigation district	Deaver, Wyo.	Floyd Lucas	Manager	Lee N. Richards	Deaver.
Strawberry Valley	Strawberry Water Users' Assn.	Payson, Utah	Clyde Tervort	President	E. G. Breeze	Paysou.
Sun River:						
Fort Shaw division	Fort Shaw irrigation district	Fort Shaw, Mont.	E. J. Gregory	Manager	E. J. Gregory	Fort Shaw.
Greenfields division	Greenfields irrigation district	Fairfield, Mont.	A. W. Walker	do	H. P. Wangen	Fairfield.
Umatilla:						
East division	Hermiston irrigation district	Hermistou, Oreg.	E. D. Martin	do	Enos D. Martin	Hermiston.
West division	West Extension irrigation district	Irrigon, Oreg.	A. C. Houghton	do	A. C. Houghton	Irrigou.
Uncompahgre	Uncompahgre Valley W. U. A.	Montrose, Colo.	Jesse R. Tompson	Acting supt.	J. Frank Anderson	Moutrose.
Yakima, Kittitas division	Kittitas reclamation district	Ellensburg, Wash.	V. W. Russell	Manager	R. E. Rudolph	Ellensburg.

Important investigations in progress

Project	Office	In charge of—	Title
Colorado River Basin, sec. 15	Denver, Colo.	P. J. Preston	Senior engineer.
Colorado River Indian	do	do	Do.
Columbia Basin Economics	Coulee Dam, Wash.	F. A. Banks	Coustruction engineer.
Deschutes	Bend, Oreg.	C. C. Fisher	Engineer.
Gallatin Valley	Bozeman, Mont.	R. R. Robertsou	Do.
Grand Lake-Big Thompson Transmountain Diversion	do	P. J. Preston	Senior engineer.

SALLIE A. B. COE, *Editor.*

CASPER-ALCOVA PROJECT, WYOMING

DIVERSION WORKS AT ALCOVA DAM SITE. CONSTRUCTION CAMP IN BACKGROUND

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