

113/32

HOOVER DAM! Boulder City! Magic Words! The eyes of the nation are focussed on what was only a few months ago one of the remotest, inaccessible spots on this continent. Today, hundreds of trucks roar, air drills hammer and blasts thunder in the shadow of forbidding cliffs, where only yesterday the sullen Colorado flowed undisturbed and unwatched. Nothing in this decade has captured the public imagination as has this daring attempt of man to tame a mighty river that has long defied him.

Hoover Dam is news, its daily events are broadcast to an interested nation. A prolonged legislative battle, with consequent wide publicity, had prepared the popular consciousness, so that when bids were finally let by the government for the construction of this mighty project in the midst of a great economic depression, Hoover Dam, or Boulder Dam as it was then called, became a national issue.

This remote desert area, where a city has sprung up over night, where 3,000 men labor night and day, has become a mecca for tourists. Writers come, marvel, write columns of copy, more people are attracted, and the process is repeated. The project is so vast, the engineering and construction problems on such a grand scale, that a description cannot be compressed into a few pages. Much has been accomplished and much remains to be done in the next six years. In attempting to picture it, only the highlights can be touched upon.

THE PROBLEM

"The Colorado river is an an-

omaly among the great rivers of the world. In addition to certain unique physical features, it has differed radically from other waterways of comparable size, because the mighty stream has generally repelled man's efforts to put it to use. The majority of large rivers have lent themselves to utilization in one way or another. They have facilitated exploration; they have aided man in many subsequent ways; and finally they have stimulated industry and commerce in the development of contiguous waterways.

"In all of these respects, the Colorado river has stood forth in conspicuous contrast, and after the hundreds of years the white man has known about this river, it still is of service to him in only a small measure of its potential capacity. These facts emphasize the problem now squarely faced in the building of Hoover Dam, so that the stream can be controlled and utilized in ways that so long seemed impossible."

The Colorado river is in a continual state of unstable equilibrium and varies widely in the volume of water carried in summer

and winter from year to year. It has been described as the most talked about, but least known, river on the continent. Parts of seven states form its watershed, and a quarter million square miles send their waters down this river, sometimes in great floods, and sometimes in dry summer trickle, so that it is never known what to expect from one year to the next.

Without regulation, the lower river has little value. The melting snows of spring and early summer make it a turbulent and dangerous force. Nearly a hundred miles of levees have to be maintained at great cost to keep the river floods from inundating the farms of Yuma and Imperial Valley. When the snows are gone the river shrinks to a shadow of what it was two months before; the quick runoff the river and the absence of summer rains accentuate this difference between the high and low water. These conditions call for a large reservoir to regulate the river's flow, and to protect the Imperial Valley from inundation as well as to provide storage for irrigation and power purposes.

THE COLORADO COMPACT

For 20 years the Reclamation Bureau studied the river, to find the best storage sites. Black Canyon was found to be the lowest site for a deep reservoir of adequate capacity, and this fact led to its adoption. Before this site was definitely adopted 70 different sites had been examined.

When the building of a great storage dam in the lower section of the stream began to be discussed the upper states took alarm. To meet this active and vigorous opposition of the upper states a

conference of the seven states and of the United States was held in Santa Fe, New Mexico, in 1922. Herbert Hoover, then secretary of commerce, was made the nation's representative and became chairman of the conference. An agreement was reached, and a compact signed, which was submitted to the federal government and to the respective states for ratification. It was based on the assumption that the average yearly discharge of the river was somewhat in excess of 16,000,000 acre-feet. Of this, 7,500,000 acre-feet were allotted to the four upper basin states—Wyoming, Colorado, Utah and New Mexico—and 7,500,000 acre-feet to the three lower basin states—Nevada, Arizona and California,—with the right of the lower basin states to increase their consumptive benefits and use of such waters by 1,000,000 acre-feet per year. Six of the seven states ratified the compact. Thus far, Arizona has not done so.

POWER

During the months preceding the passage of the bill, the original purpose of the act, which was to protect Yuma and Imperial Valley from floods and drought, extend the irrigation area to Arizona and

California and furnish additional water for domestic and other uses to the coast counties in southern California, was lost sight of. It had ceased to be a measure to provide water and had become in the discussion and public opinion, a measure for the production and disposal of power.

The opinion widely held that Hoover Dam is to be paid for out of taxes is erroneous. It must be, and will be, paid for out of power revenue and charges for storing water. The power will pay for the entire cost of the dam and leave a very considerable surplus of money to be divided between the states of Arizona and Nevada, the bill providing for such provision. It would appear that each of these states stand to receive as an annuity somewhere between \$350,000 and \$700,000 per year.

The price fixed by Secretary Wilbur for storing water for the metropolitan water district is 25 cents per acre-foot. This price will involve a payment by the district of \$250,000 per year. Contracts for the sale of power have been made between the government and state, municipal and public utilities corporations for all the power. It was necessary that these con-

tracts be secured before construction work could commence.

CONGRESSIONAL ACT

The Boulder Canyon Project Act approved by the president on December 21, 1928, marked the end of the eight-year legislative fight and authorized, subject to future appropriations, the construction of a reservoir of not less than 20,000,000 acre-feet, the dam to be located in either Black Canyon or Boulder Canyon. The purposes of this act, in order of importance, are: (1) Controlling floods, improving navigation and regulating the flow of the Colorado river; (2) Storage of and development of stored water for the reclamation of public lands and other beneficial uses within the United States; (3) Generating electric energy as the means of making the project self-supporting.

The act also authorized the construction of an all-American canal to divert the waters from the Colorado river and to direct them to the Imperial and Coachella valleys, California, the cost thereof to be returned to the government as

provided in the reclamation law.

PRELIMINARY ENGINEERING STUDIES

The United States Reclamation Survey began its investigation of the Colorado river basin in 1904. After a prolonged study of the upper part of the main valley and principal tributaries, which study indicated a lack of necessary storage site at reasonable cost, an investigation of storage sites in the lower river was begun.

A preliminary examination of the problems and a reconnaissance of the Colorado river below the Virgin river was made, and as a result work was concentrated on the better damsites in Black Canyon and Boulder Canyon. Approximately half a million dollars was spent from 1918 to 1924 in foundation explorations at these canyons and in geological examinations and engineering studies of the feasibility and cost of the Boulder Canyon project, as well as in studies of alternative projects for the fulfillment of the same function.

BOARD OF ENGINEERINGS

Congress, by joint resolution in May, 1928, directed the secretary

of the interior to appoint a board of five engineers and geologists to review the plans and estimates, and to report on the safety, economy, engineering feasibility and adequacy of the plan presented. This board, called the "Colorado River Board," and consisting of Major General William L. Sibert (chairman), D. W. Mead and Robert Ridgway, consulting engineers, and W. J. Mead and Charles P. Berkey, consulting geologists, made a report on November 24, 1928, which report was generally favorable to the project and the plan submitted.

WATER SUPPLY

Reports of discharges of the Colorado river have been recorded at various stages for varying lengths of time and are available for points of the main streams in the upper basin since 1895. From these data, estimates have been prepared of the flow of the Colorado river at Boulder Canyon for a 33-year period.

The Colorado river carries to the sea each year an enormous amount of solid matter in suspension. It is estimated that the average yearly discharge of silt is equal to all the earth removed in digging the

(Continued on Page Three)

Work Fruition of Long Studied Plan

(Continued from page one)

Panama canal. One of the functions of the dam is to store the site and prevent it from being carried down to the delta region.

BOULDER CANYON RESERVOIR

The reservoir formed by the proposed dam will be 110 miles long, and will be the largest artificial body of water in the world. The greater part of the storage will be obtained in the valleys of the Virgin river and Las Vegas wash on the Nevada side, and in Detrital wash on the Arizona side. The upper part of the reservoir is a narrow canyon and has comparatively little storage space. The major portion of the reservoir is a hilly basin of hard rock and there is no evidence of the existence of any porous rock through which the water might escape.

THE DAM

Hoover Dam is to be nearly twice as high as any dam yet built. But this single fact gives only a fragmentary view of the dimensions of the tasks involved. With 4,500,000 yards of concrete, 30,000 tons of structural steel, and over 70 miles of grouting holes, with

diversion and spillway tunnels ranging from 50 to 80 feet in diameter, and 2,000 tons of needle valves, the structure that is to be set in the path of the turbulent Colorado in a sheer walled narrow gorge in the bottom of an inaccessible desert canyon, in the remotest region of the United States, constitutes a work ranking with the greatest ever undertaken by human hands. It will take six and one-half years to build. It is the most advanced, the most thoroughly studied hydraulic enterprise in engineering history.

Through special effort the Bureau of Reclamation put the call for bids ahead six months, to help bring earlier relief to our lagging productive activities. On March 4, 1931, bids were opened in Denver, Colorado; on March 11, in Washington, D. C., Secretary Wilbur signed the award of contract to Six Companies Inc., the low bidder for the construction of Hoover Dam, power plant and appurtenant works. The contract was signed by W. H. Wattis, then president of Six Companies Inc., in San Francisco on March 25; at

Las Vegas on April 11 by R. F. Walter, chief engineer; and on April 13 by Dr. Elwood Mead, commissioner, and by Secretary Wilbur in Washington on April 20.

But the contractor did not wait for the formal signing of the contract. Soon after the award was made hard rock men were on the job, ready to turn the mighty river from its path, to erect a camp, to drill and blast trails and roads, to commence this monumental effort in the romance of engineering. Today the work is well ahead of schedule; a construction camp, the like of which the world has never seen, houses 3,000 workers. Paved highways span the desert wastes, railroads cut the canyon walls, a roar not unlike a large city comes from the mighty gorge, which blazes by night with countless lights as the work goes on. Daring in imagination, calling for resourcefulness and courage, defying adequate description, Hoover Dam is being built. The dreams of a generation are being unfolded. Drama is being enacted daily. No wonder Hoover Dam has captured the popular fancy.