

ENGINEERING

Grand Coulee or Boulder Dam: Which Holds Honors for Size?

**Boulder Dam Highest, Impounds Most Water;
Grand Coulee Longest, Provides Most Power**

ENCOURAGEMENT given the nation by President Roosevelt's expressed faith in the Grand Coulee and other power projects brings up the question, which is the world's largest dam?

Resulting opinions are immediate but confusing. Boulder is the largest dam; it cost more and holds more water. . . . Grand Coulee is the largest; the water it does hold is capable of producing more horsepower.

And so the argument continues. As each yardstick comes up it is found that both dams have numerous claims to greatness.

In dollars and cents the Colorado project wins. Its total cost of \$165,000,000 is nearly three times as much as the \$63,000,000 that will be spent for the Columbia Basin project.

Grand Coulee will eventually generate 2,225,000 horsepower. This is a substantial margin over the 1,835,000 horsepower that will be harnessed in Black Canyon. Grand Coulee will also be the longest concrete masonry dam in the world. Here it has two sets of figures to offer. The low dam to be constructed first for power alone has a crest length of 3,400 feet. When this is capped with more concrete for the subsequent irrigation project it will be 4,000 feet long with a maximum height of 500 feet above the lowest foundation.

Boulder is only 1,180 feet along the crest. On the other hand it will be 726 feet high, another world's record.

The reservoir impounded by the Boulder Dam contains 30,500,000 acre feet, or 5,000 gallons of water for every human being on earth. Grand Coulee contains only 1,200,000 acre feet, its reservoir extending about 50 miles up the Columbia River. The normal course of the Colorado, however, will be submerged a distance of 115 miles by the man-made lake, giving a total shoreline of about 550 miles.

In the amount of masonry to be poured into each structure Grand Coulee will be surpassed by Boulder Dam. The latter will contain about

4,200,000 cubic yards of concrete in the dam, power plant, and nearby works. This amount, if placed on an average city block, would rise to a height greater than that of the 1,248-foot Empire State Building in New York.

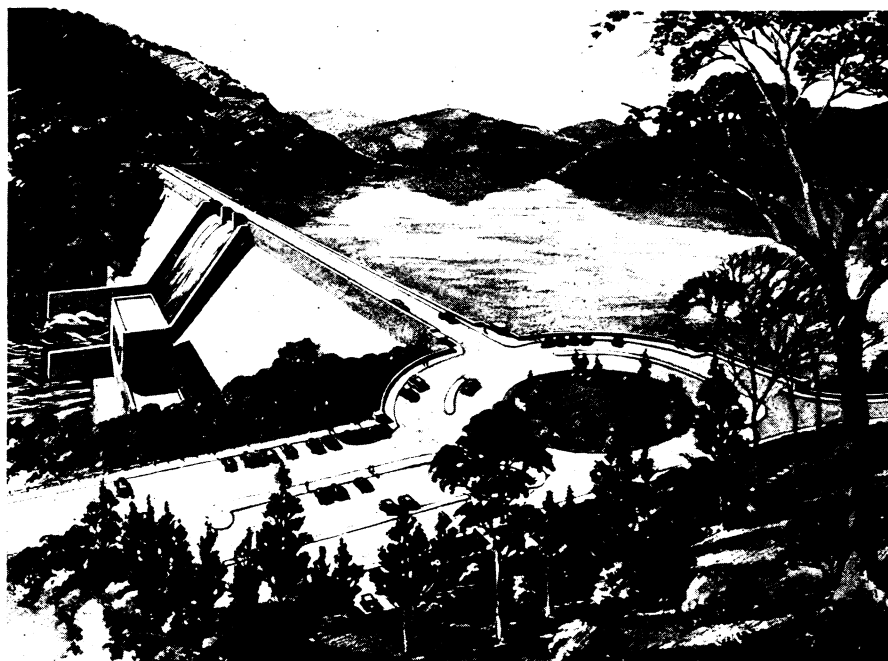
Comparisons continue endlessly in the same way. The safest position to take is a neutral one or to point with pride to American versus foreign projects.

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SEISMOLOGY

Quakes Most Frequent At Night and in Winter

IF YOU LIVE in a region of weak earthquake shocks, as in the United States, the greatest number recorded occur during the night with a maximum around midnight. On a yearly basis the greatest number occur in winter.



WHEN IT'S FINISHED

Norris Dam on the Tennessee River as it may look when finished. Artist's drawing shows idealized view of the dam and the great lake of water it will store. Drawing from The Explosives Engineer, courtesy The Hercules Powder Co.

In geologically unstable regions, like Italy and Japan, where earthquake shocks are strong the maximum number occur during the daytime around noon. More occur in summer than in winter.

Dr. Charles Davison of Cambridge, reporting to the *Journal of Geology*, suggests that the noon and summer maxima are linked with the elevation or swelling of the earth's crust. The midnight and winter maxima correspond, he thinks, to a contraction of the crust.

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ENGINEERING

91 Miles of Tunnels in World's Longest Aqueduct

TO CARRY water 241 miles across the sweltering deserts of southern California, the world's longest single aqueduct will pierce hills and mountains in 29 different places.

A total of 91 miles of tunnels will be necessary before Colorado River water can flow from the Parker Dam on the border between Arizona and California to thirteen cities of the Los Angeles metropolitan area.

Tunnel driving operations are at a maximum this year in the \$220,000,000 project to maintain a flow of water across one of the most arid regions in the United States. Completion of the lined tunnels is not scheduled until 1938, R. M. Merriman, superintendent,

Coachella District of the Metropolitan Water District of Southern California, has reported to the *Engineering News-Record*.

At present thirteen contractors are at work on 58 miles of tunnels, in addition to the Metropolitan Water District's crews, working on the other 33 miles. Each contractor maintains an independent camp, roadway, and water facilities. Because of excessive heat many of the camps are equipped with air-cooling systems.

The East Coachella tunnel, running through a range of hills whose peaks rise to about 3,000 feet is the longest in the series. Its length of 18.3 miles will exceed that of the 18.1-mile Shandaken Tunnel in the Catskill aqueduct to New York City, which is at present the world's longest tunnel.

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ENGINEERING

New Motor Roads Planned For Hundred-Mile Speeds

PREPARING for the automobile of the future, progressive highway engineers are designing roads to accommodate cars travelling at speeds of 90 to 100 miles an hour.

Oregon is now designing roadways for twice the normal driving speeds by adjusting curves, visibility distance, and smoothness of road, the current *Engineering News-Record* reports. Highway officials of the neighboring state of Washington are planning their roads on a similar high-speed basis.

Until the automobile is improved to the point of being able to average 100 miles per hour the new highways will mean much greater safety for cars travelling them at the present average speeds of 45 to 50 miles per hour. They are far smoother, the curves more open, and the driver is permitted to see much farther ahead than on the ordinary roadway as now constructed.

Foresight in the construction of roads has been encouraged by the example of the past. There are many trunk highways built a dozen years ago that can now, with the advances in automobile design, permit only the leisurely gaits of the past decade.

The Columbia River Highway was cited as an example of this. Built a little over 12 years ago, it was designed to fulfill adequately the conditions of that time. Now it can qualify only as an artery for easy sightseeing travel.

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PALEONTOLOGY

Dinosaur Teeth Give Hope Of Finding Rare Skull

Paleontologist Expects to Use Airplane in Search For More Saurian Sites at Close of Season's Work

QUESTION Mark Quarry, near Billings, Mont., now being "mined" for dinosaur fossils by the American Museum-Sinclair Dinosaur Expedition under the leadership of Dr. Barnum Brown, may be on the eve of yielding a skull, to "head up" at least one of the hitherto quite skull-less dozen saurian skeletons found piled together as in a titanic charnel-house.

Dr. Brown describes the find in a statement given to Science Service:

"The first trace of the whereabouts of any of the skulls of the twelve sauropods in the fossil deposits on which we are working, is a group of eight teeth lying parallel and evidently in normal position close to and partly beneath a large vertebra. The roots of the teeth, which are about two inches long but very narrow, extend into thin bone which I believe to be part of the skull.

May be Barosaur

"The finding of this skull is a matter of vast relief as all other parts of a skeleton have been discovered and naturally headless sauropods would not make a complete exhibit. An important angle of the finding of the teeth is that they give the first indication of the type of sauropod we are dealing with. Such casual study as I have given them indicate that the creature to which they belonged may have been a hitherto undescribed type of Barosaurus, of which no skull has ever been found.

"It goes without saying that we are going ahead with the greatest possible vigilance so that not a bone fragment will escape us."

If Dr. Brown's conjecture that the teeth and possible skull fragment belong to a Barosaur, the find will be of outstanding importance, for though skeletons of this type of dinosaur have been found in the past, none of them has ever had a skull with it. The Barosaurs resembled the Diplodocus type of dinosaur: enormous potbellied creatures that walked on all fours, with tremendously long necks and even

longer tapering tails. Diplodocus heads were ridiculously small, in comparison to their huge size; it is not improbable that Barosaur heads resembled them. Dr. Brown's new find may help to throw light on this point.

Dinosaur hunting from an airplane is the thrill that awaits Br. Brown after he has completed his summer's work on his great "mine" of dinosaur fossil bones. This airplane dinosaur hunt will not be a romantic search for a Wellsian "lost world" of still-living monsters. The last dinosaurs died millions of years ago. Only their fossil bones remain, but these are worth the search for their scientific value. The formations in which they are embedded are frequently so situated that they are hard to approach from the ground, yet are easy to see from the air. Hence Dr. Brown's plans for an airplane reconnaissance, to be made some time late this month or early in September.

"The job we have before us—packing and preparing fully 50,000 pounds of fossil bones for shipment—is a major undertaking," Dr. Brown continued. "I figure that we will have about 4,500 bones to look after. They range from hip bones that weigh several hundred pounds apiece to tail joints that tip the scales at only a few ounces."

Searching the Dust

"Our task of removing the top layer is a ticklish one lest we should disrupt or ruin any of the underlying bones. We are moving entirely in the dark, and the fact that we have to proceed with great caution may make it necessary for us to prolong our work beyond the late summer or early fall.

"Another factor that slows us up is the continual cropping up of small but important pieces of fossil. We virtually have to sift every handful of soil to make sure that such items as fragments of petrified skin, teeth and bones of diminutive sauropods are not thrown into the discard.

"As the result of steadily growing importance of this deposit I may be