

Orr Affidavit

Exhibit 57

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Excerpted pages of *Twin Falls Hydroelectric
Development*, by H.L. Senger of Idaho Power
Company, in ELECTRICAL WEST
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EXHIBIT 7

Engineering Symposium + +

[A monthly forum in which engineers will present and discuss their problems, this department is dedicated to advancing the art of power generation, transmission, distribution and utilization]



Twin Falls Hydro-Electric Development*

Idaho Power Company's New Hydro Plant On the Snake River Incorporates Unusual Design Features. Sliding Joint Permits Arch Dam to Adjust Itself to Load Changes. Powerhouse Built Below Station Yard Level. Control and Alarm System Simplify Operating Procedure

IDAHO POWER COMPANY has recently completed a 9,375-kva. hydro-electric development at Twin Falls, on Snake River, about nine miles northeast of the city of Twin Falls, Idaho. This project is known as "Twin Falls," deriving its name from the twin falls in the river. It is the fifth development of Idaho Power Company on the Snake River in Idaho, and there are three additional developments on tributary streams. About four miles downstream from the Twin Falls plant is the Shoshone Falls plant, with an operating head of 212 ft., the backwater from which is less than a mile below the tailwater of the Twin Falls plant. The completion of the Twin Falls plant makes it possible to utilize more fully the fall of the river in this section. The Twin Falls plant, which now has a head

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of 147 ft. and a generating capacity of 9,375 kva., can be changed by increasing the height of its dams to provide 179 ft. of head, thereby increasing the generating capacity of the present unit to 13,500 kva. The Twin Falls project is not primarily a storage proposition, but contrasted to the company's three run-of-river plants on Snake River and the three plants on tributary streams, has a small pondage for daily regulation. The Twin Falls dams, as constructed, form a small lake in the Snake River canyon of about 1,000 acre-ft. available storage to supplement stream flow.

RIVER REGULATION

The Snake River above Shoshone Falls is a highly regulated stream, its waters being used primarily for irrigation. The Jackson Lake Reservoir near the headwaters of the stream has a

capacity of 847,000 acre-ft. The Blackfoot Reservoir on the Blackfoot River, a tributary of Snake River, has a capacity of 409,000 acre-ft. The American Falls Reservoir and Lake Walcott, both on Snake River above Twin Falls and near Minidoka, have capacities of 1,700,000 and 107,000 acre-ft. respectively. The combined developed storage space of these and other reservoirs in the drainage area above Shoshone Falls is approximately 2,859,000 acre-ft. At Milner Dam, located about 22 miles above Twin Falls, the final diversion of substantially all water in Snake River is made into three large irrigation canals, having a combined capacity of 8,000 sec.-ft. The Snake River immediately below Milner Dam for the greater part of the time is practically dry, the measured loss by seepage and leakage being as low as 10 sec.-ft. The regulation of Snake River flow above Milner Dam for irrigation has been such as to eliminate flood run-off below

*A report prepared for Production and Generation Committee, Engineering and Operation Section, Northwest Electric Light & Power Association, for presentation at 1938 Annual Section Meeting.

View of Twin Falls development showing (left) the arch type dam across the main channel and (right) the station yard made by filling behind the rock wall constructed from the river bed to an elevation equal to maximum high water. Only the roof of the power house, the Gentry crane, the transformer and switch rack are visible above ground

Interference
this point of diversion for the past five years. Practically speaking, Snake River starts anew at Milner Dam. It is a remarkable coincidence that immediately below this dam Snake River plunges into a canyon, where it remains undisturbed by diversions for irrigation uses other than pumping installations for two hundred miles, and when it again emerges from this rock walled canyon it has replenished its supply from springs, drainage, and return irrigation water with 7,000 sec.-ft. of water.

At Twin Falls the accumulated minimum flow from return irrigation water and springs varied from 444 sec.-ft. in the year 1930 to 320 sec.-ft. in the year 1935. The monthly average flow rarely exceeds 500 sec.-ft. This condition applies throughout the year, excepting for occasional periods of flood and water released to the river below Milner Dam. On October 1, 1934, the Idaho Power Company entered into a contract with the United States Department of the Interior, Bureau of Reclamation, which includes the Snake River Valley Projects and the Owyhee Project, for conservation of Snake River water and the furnishing of transmission service.

The provisions of this contract are such that through the coordinated use of the combined power plant facilities of the United States and the Idaho Power Company, a saving of approximately 150,000 acre-ft. of Snake River water can be effected in the American Falls reservoir for irrigation purposes during the summer months.

Idaho Power Company has a contractual primary right to the release of 45,000 acre-ft. from the American Falls Reservoir which it may release as the exigencies of its system operations may require. It also has a secondary contractual right by virtue of which water from American Falls Reservoir may be used below Milner Dam, and which at present is limited to make the total flow at the head of Shoshone Falls at certain stipulated amounts from October 1 to March 15, inclusive. The Twin Falls plant, therefore, may be said to be dependent for its water supply upon that water returning to, or arising within, the 22 miles of river bed between Milner Dam and that plant, with the addition of such limited amounts of water permitted under contract to flow by Milner Dam.

NATURAL CONDITIONS

Twin Falls is in a deep rock-walled canyon 400 to 500 ft. deep. The geological formation of this region shows that it is a built-up plain formed principally of lava sheets deeply dissected by the Snake River canyon. At Twin Falls a sheet of lava a thousand or more feet wide and of unknown depth lies athwart the bottom of the canyon nearly 400 ft. below its rim. The natural falls at this point are 130 ft. high. An island of solid rock having its lower extremity at the rim of the falls divides the stream bed into two channels, the principal one being on the right or north side of the river. This channel is split by a deeply eroded crevice of sufficient capacity to carry the regulated low flow of the river thus leaving the remainder of the original stream bed dry. Below the north falls there is a pool of unexplored depth; that below the south falls measured 62 ft. deep. These pools were separated by a ledge of solid rock maintaining the water level in the south pool 6 ft. above the level of the main stream. The south falls under present conditions discharges a small amount of seepage water reaching this channel from the south wall of the canyon.

GENERAL PLAN

The entire development comprised seven units or sub-divisions; the construction of a road into the canyon, retaining wall and yard fill for substation, power house and substation, an arch dam in the north channel, gravity dam and headworks of power house in the south channel, penstock, and tail race.

The station is shaped in the form of a square; the generating unit being

placed in the main body of the structure with the control board cubicle, pumps and compressor, governor, air washer and auxiliary equipment conveniently located on the main and basement floors. This machine is a complete generating unit, having its own direct connected exciter, separate station service transformer and bus layout. There is no provision for a spare exciter. The terminals of each of the three phases are brought out and the windings connected "Y" and this neutral assembled to connect with ground bus through a disconnect switch. Current transformers are placed in each line between the machine and neutral and afford means of differential protection. The circuit of the main generator bus is through an oil circuit breaker and disconnecting switches to the main transformer.

No provision is made to remove the oil circuit breaker from service while in operation. Current to auxiliary transformer is supplied from line side of disconnecting switch. Through this system of switching equipment the machine is connected to the low tension side of a power transformer, consisting of one 9,000-kva., three-phase Westinghouse transformer connected delta on the 6,600-volt side and "Y" on the 132,000-volt side. With forced cooling the capacity of the transformer can be increased to 13,500 kva.

In regard to relay protection the machine and its auxiliaries and equipment are protected by differential relays connected to current transformers in the

Airplane view of the Twin Falls site in the irrigation season when gates of Milner Dam, 22 miles above, are shut down for maximum diversion. Note the natural formation readily adapts itself to a hydraulic development at this spot

