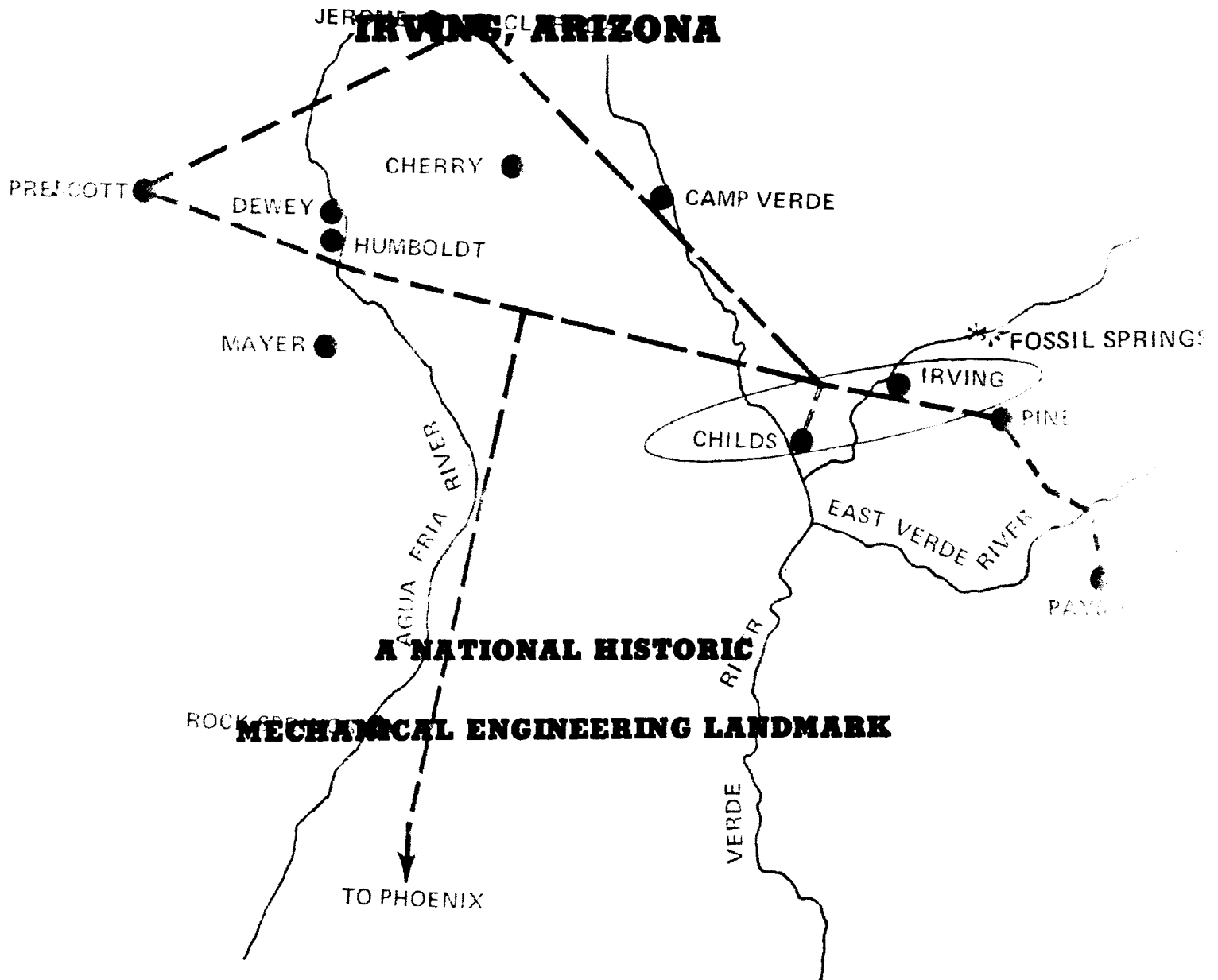


# THE CHILDS-IRVING HYDRO-ELECTRIC PROJECT

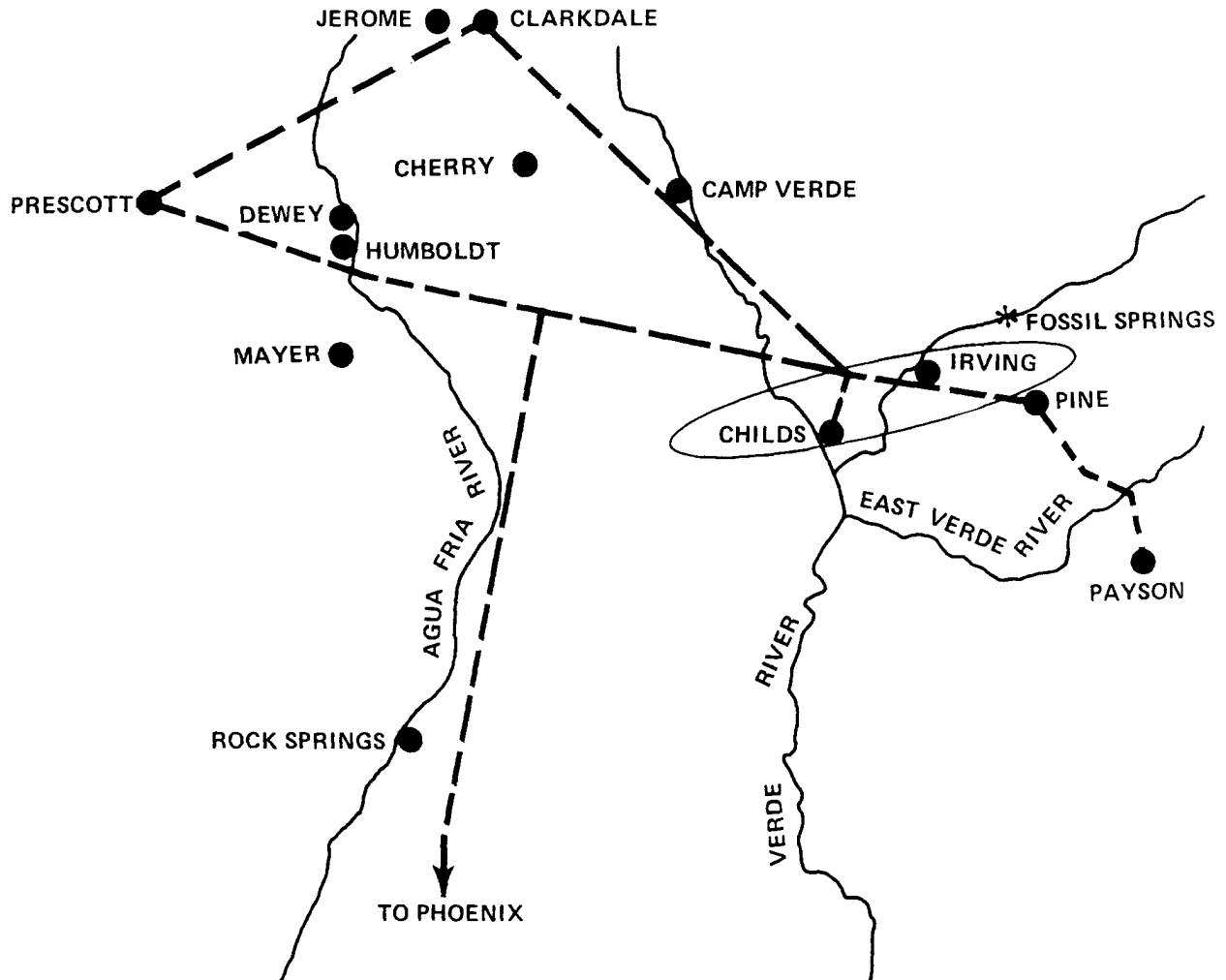


THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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THE CHILDS - IRVING  
HYDRO-ELECTRIC PROJECT  
IRVING, ARIZONA



1907 - 1909 & 1914-1916

The location of two plants in this desolate area demanded many innovations in design, transportation and construction. Among these were steel transmission towers, forged penstocks and the handling of every component by mule teams. Electrical energy was essential to the exploitation of the region's rich copper deposits.

R. S. Masson, Chief Engineer  
Arizona Power Company

CHILDS AND IRVING HYDRO PROJECT

Edited by  
Walter A. Biddle

About sixty years ago Lew Turner, A Yavapai County Arizona cattleman, told his partner at the old Army Post in Camp Verde that the biggest spring he ever heard of gushed forth from under the rocks one hundred yards or so below where the Apache Trail crossed the biggest canyon on the way to Strawberry, over in Gila County. He told him the water from these springs covered sticks and stones, ferns and rocks with a formation which made them look like fossil-- and they named the creek Fossil Creek.

Later Lew Turner made a filing on the water rights at the Springs and appropriated the use of the water for himself and his assigns forever. These original rights were made by notice posted February 26, 1900, and a subsequent amended appropriation was made on May 6, 1901.

He succeeded in interesting capital early in the year 1902, and a company was formed to develop these springs.

Over a period of several years accurate measurements of the flow of water were made to determine the stability of this water supply. Gaugings were taken daily, and at the end of two years time the gauger, J. C. Palmer, recorded in his notebook that there was no need to take further readings, as he had repeated the same figure for each reading taken during the entire period, except when the notations carried the word "rain".

The source of this water? The best guess is that it drains the large area south of the Grand Canyon. Rainfall from this area sinks into the cinders and passes through sedimentary formation over which an impervious over-cap of lava exists. The water

percolates through this underground formation and comes up through a volcanic crack, or fissure, at Fossil Creek.

The water's heavy mineral content (calcium and magnesium carbonates, calcium sulphates and chlorides, silica and iron oxide, 520 ppm total solids) is accounted for through its dissolving these minerals from the sedimentary formations which lie under the lava over-cap.

The minimum flow of water from these springs is 43 second feet, which is equivalent to approximately 20,000 gallons per minute, or 28,000,000 gallons per day. This flow does not vary appreciably summer or winter, wet years or dry years, or from season to season.

An engineering study was made in 1902 to determine the best way to utilize the water from these springs to develop power. It was found that a total head of 1,600 feet could be developed in a distance of 10 miles. It was also found that a large market existed for this power in the mines and towns of Yavapai County. Arizona Power Company (an Arizona Territorial corporation) was organized and did some construction and development work, but it was not until 1907 that development of the project actually started in earnest.

The Electric Operating Construction Company, organized by Messrs. R. S. Masson, Francis Veile and others, began construction upon completion of financing and execution of contracts for power sales to the United Verde Copper Company.

The Arizona Power Company (a Maine corporation) was subsequently organized in 1908 and took over the assets of the Electric Operating Construction Company.

The Childs Plant was constructed as the No. 1 development. Its location was chosen because of the small flat then known as

"Dry Lake," which could be used as a lake for regulating the flow of water from the springs. Subsequently, a regulating reservoir was built on the site, at the head of the Childs penstock, and is now known as Stehr Lake.

Mule teams transported all of the material to the plant site over a road which was built from the nearest railroad at Mayer, Arizona, across Tule Mesa, and over the Verde River rim to Childs. All of the material, equipment and supplies needed for this development had to be hauled from the railhead in this fashion. The largest piece of apparatus, the generator stator, required a 26-mule team. Probably the most important man in the construction of the Childs project was the muleskinner, a colorful personality whose adventures are as legendary in the West as those of Billy the Kid.

The original plan contemplated the installation of a power plant at Childs and a double circuit 44,000 volt transmission line from Childs to Prescott via Mayer and Poland Junction, with a double circuit tap extending from Poland Junction to the mines in Jerome. This plan was carried out.

Towers for the transmission line presented a problem. It was impossible to transport wooden poles by burro, and steel towers had not yet been developed. In the end, steel windmill towers were adapted for the line, supplied by the U.S. Wind, Engine and Pump Company of Batavia, Illinois.

It might be interesting to note that the steel for the lower end of the penstock was forged by the Krupp Works in Germany and was transported via Cape Horn to the port at Los Angeles, where it was trans-shipped to Mayer, and thence by muleteam to the site. There was no company in the United States at that time which would produce steel pipe sufficiently strong to withstand the pressure of the water in the Childs penstock. All of the construction drawings for this pipe were in German.

As the result of almost superhuman efforts on the part of the construction crews, this project was completed, and Generator No. 1 was put on the line carrying load to the mines in Jerome on June 18, 1909.

This was rapidly followed by Generator No. 2, in service July 22, 1909, and Generator No. 3, in service by the latter part of the same year.

Construction of the Irving Power Plant began in 1914 and was completed in April 1916.

In 1914 the United Verde Copper Company decided to build a new smelter on the flat below Jerome at a place now known as Clarkdale, but the new smelter required additional power. Agreements between United Verde Copper Company and The Arizona Power Company provided for this additional power and led to the construction of the Irving Plant, including a transmission line connecting it with the Childs Plant.

While Childs and Irving are small by present-day standards... in earlier times they took care of the entire electric requirements of Yavapai County, including the mines around Humboldt and Jerome.

The two plants were particularly valuable in the '20's when a portion of their output was allocated to help satisfy the increasing hunger for electric energy in the fast-growing Salt River Valley around Phoenix.

A new 75-mile transmission line was constructed in 1919 from Sycamore to Phoenix to deliver 2,000 kilowatts of power. In the mid-1920's the so-called Sycamore line delivered 70-percent of all electricity used in Phoenix--then a city of 44,000.

In 1926, when again the Valley experienced a serious power shortage, the line was increased from 44,000-volts to 69,000-volts.

STATISTICS

CHILDS PLANT:

3 - Pelton water wheel driven generators (400 rpm)	9,000 hp
Static head . . . . .	1,075 ft
Total length of penstock . . . . .	4,799 ft
Total number of tunnels in Childs flume . . . . .	6
Total length of longest tunnel . . . . .	4,888.5 ft
Concrete flumes on bench, total length . . . . .	23,638.8 ft
Inverted syphon (Sally Mae Canyon) total length . . . . .	6,952 ft
Total number of bridges on the Childs flume . . . . .	10
Distance from Stehr Lake outlet to Childs . . . . .	10,916.7 ft
Capacity of Stehr Lake . . . . .	287 acre ft
Effective depth . . . . .	13.3 ft
Surface area . . . . .	27.5 acres

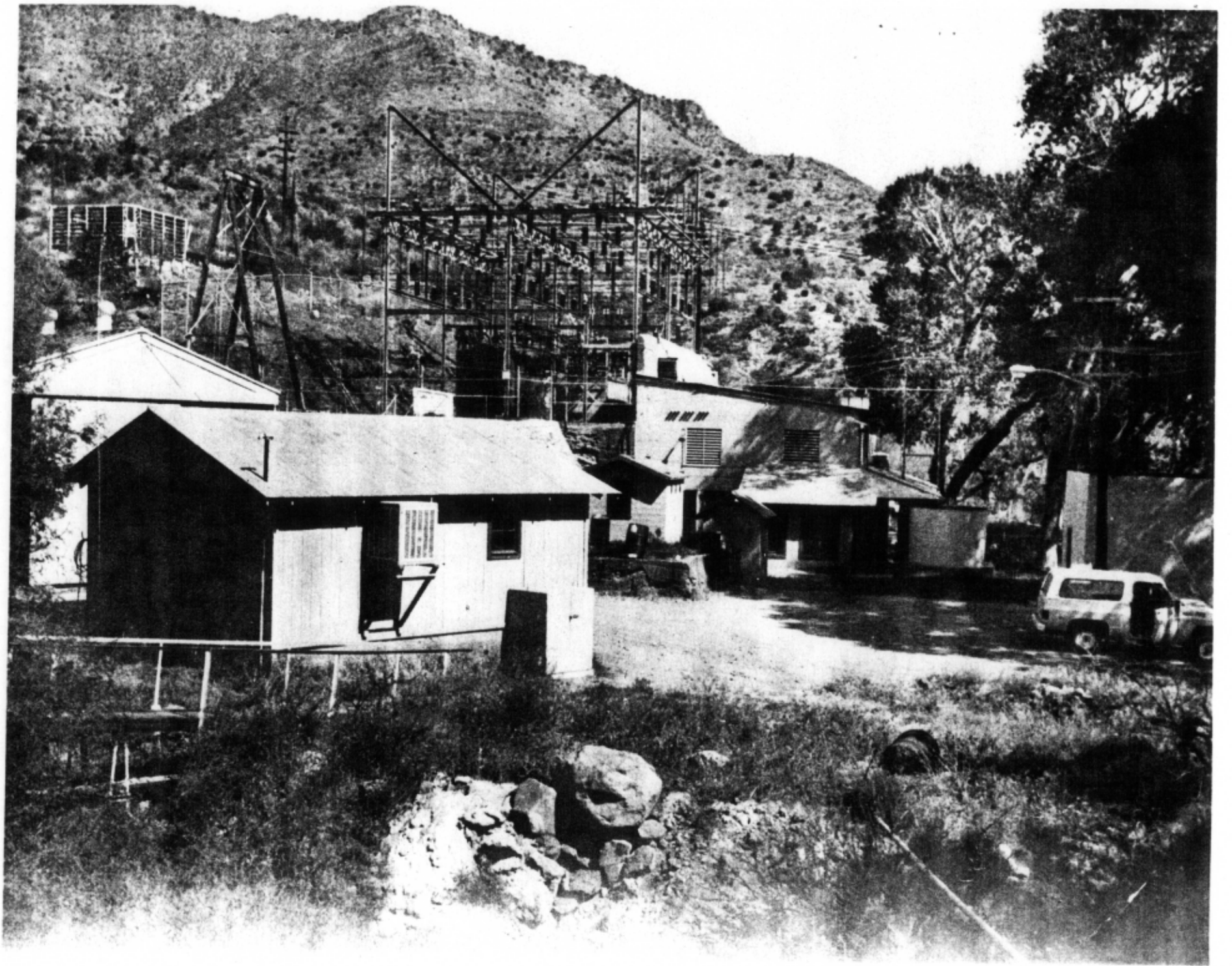
IRVING PLANT:

1 - Allis Chalmers reaction type Francis turbine	
900 rpm . . . . .	2,100 hp
Static head . . . . .	481.3 ft
Total length of penstock . . . . .	3,075.1 ft
Total number of tunnels . . . . .	1
Inverted syphon . . . . .	434 ft
Hess type steel flume - total length . . . . .	16,578.0 ft

OPERATION:

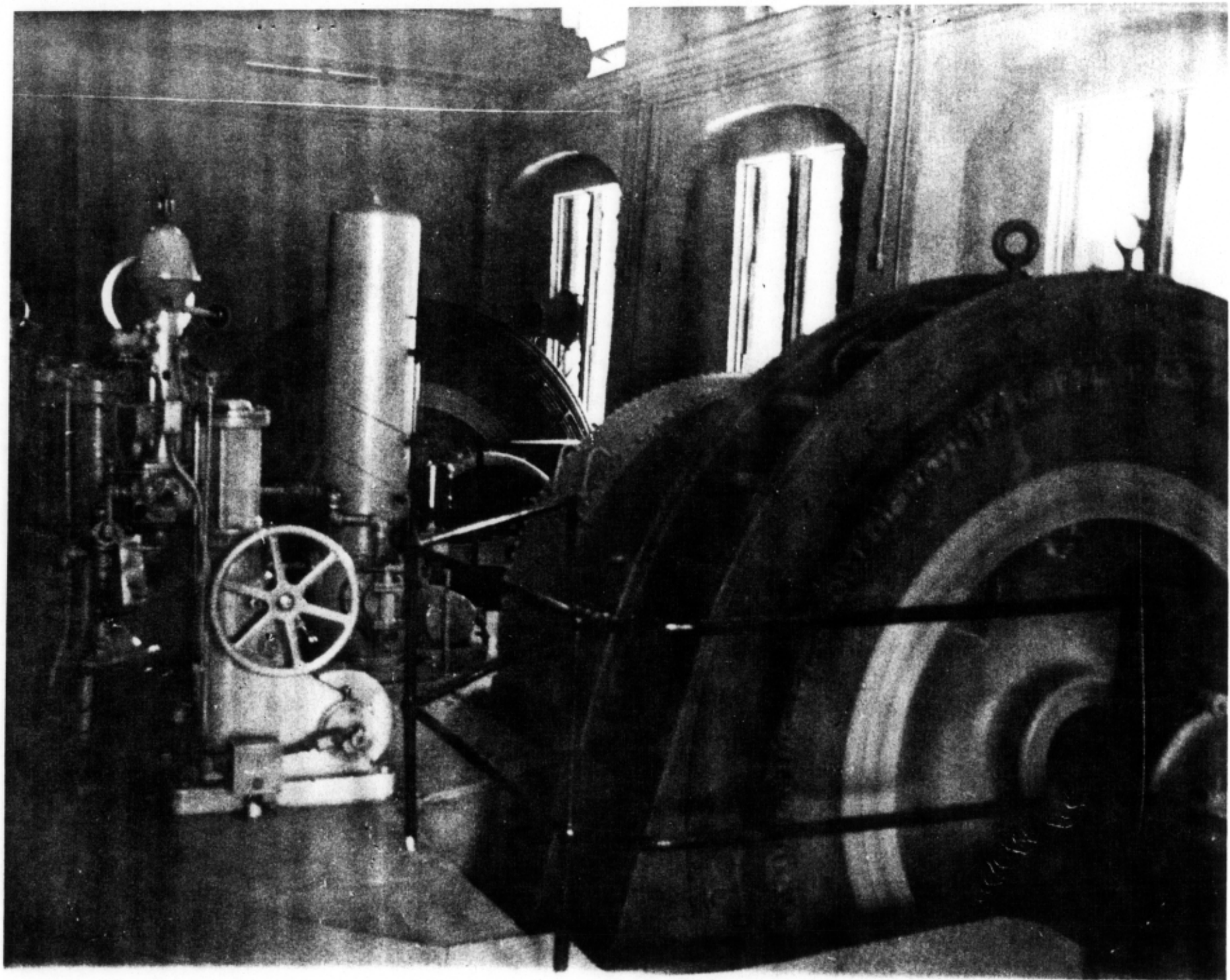
Annual output from Childs Plant . . . . .	23,392,000 kwh
Annual output from Irving Plant . . . . .	10,860,000 kwh
Annual maximum kilowatt load - Childs . . . . .	4,500 kwh
Annual maximum kilowatt load - Irving . . . . .	1,440 kwh

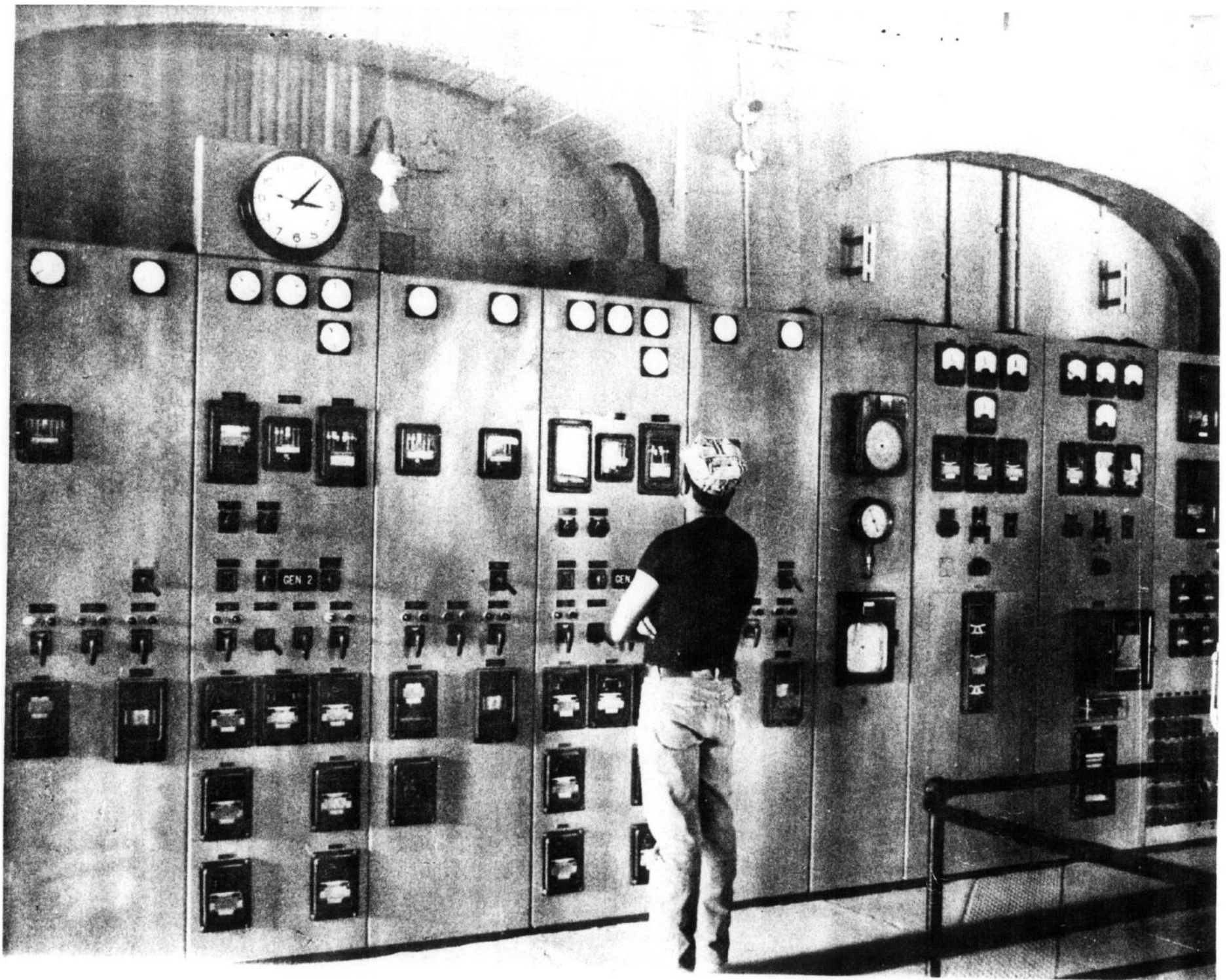
The Childs Pelton wheels originally installed are still in use.



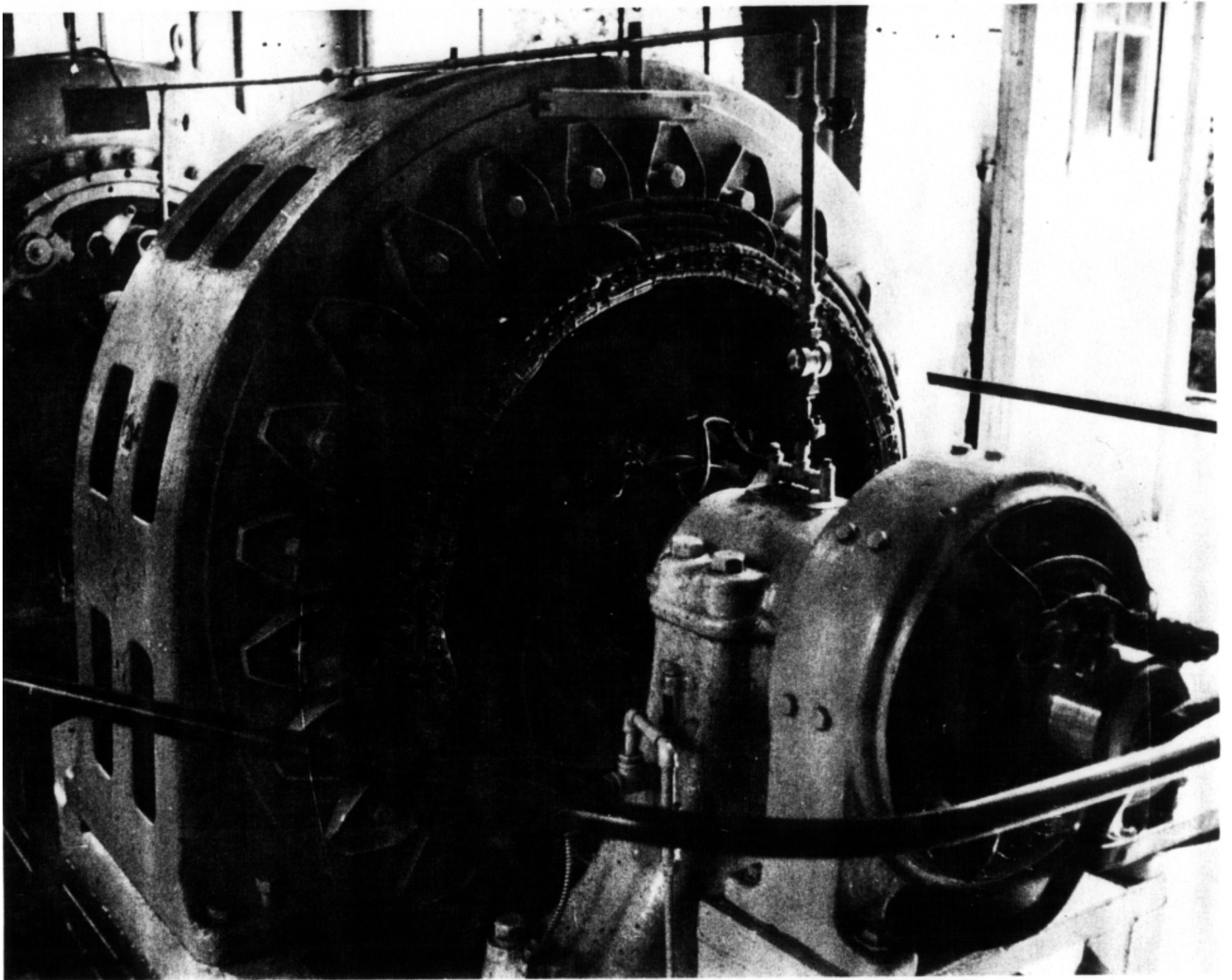
View of the settlement, (right).







CHILDS POWER PLANT: Central Control Panel



IRVING POWER PLANT: Turbine and Generator