



**O**n the cutting edge of hydraulic research, Floyd Nagler also had a passion for earlier forms of Iowa water power. On his field trips throughout the state, he located, photographed, and researched remains of water-powered mills, thus documenting one of Iowa's most important industries in the 19th century. Here, he measures a rusting turbine.

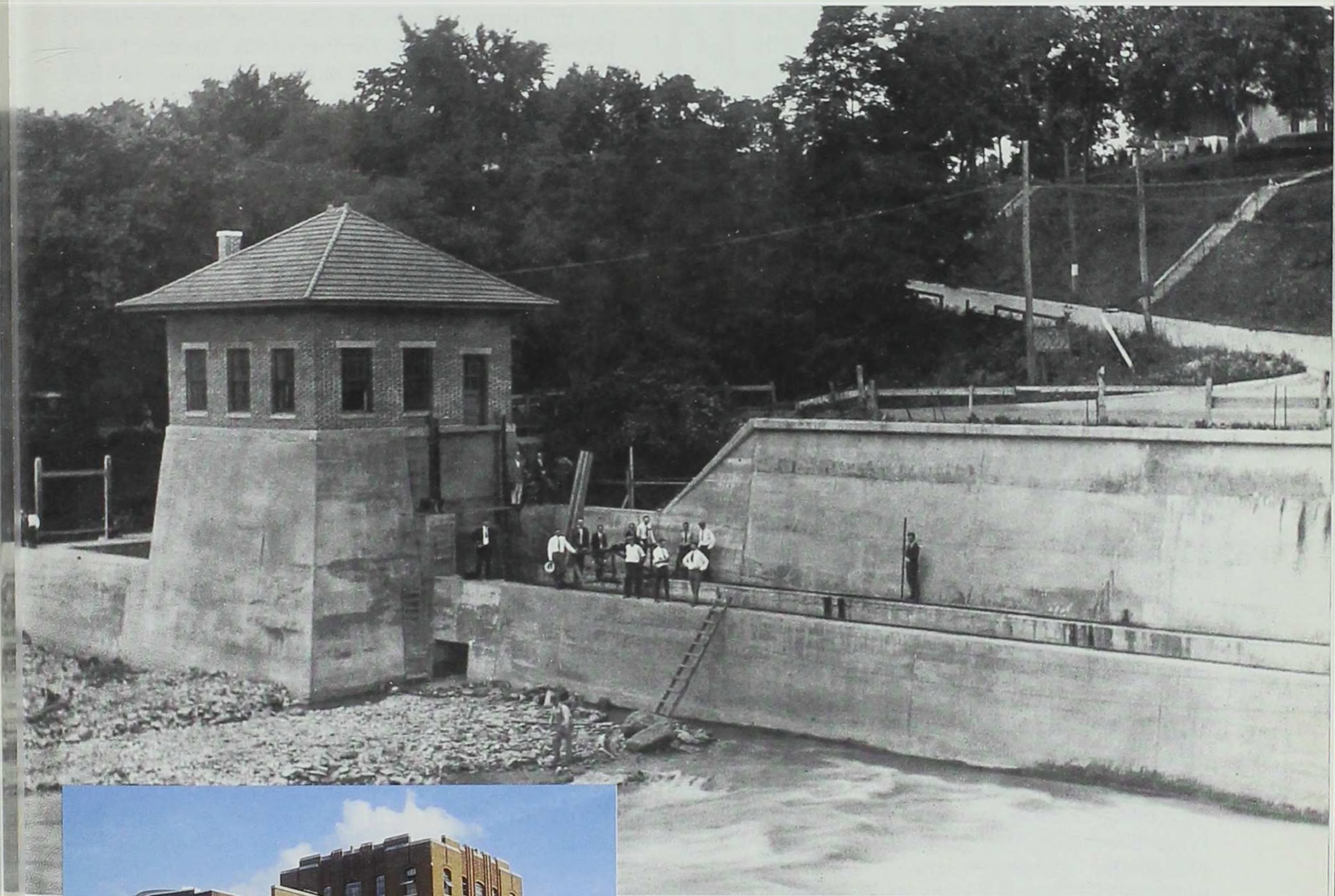
## Floyd Nagler's Passion for Water Power

by Cornelia F. Mutel

**F**loyd Nagler exuded a passion for water and a passion for life. It is said that he was a man of boundless energy and drive, capable of balancing ten activities simultaneously and keeping them all going. That in summer he rose at 4:30 a.m. to tend the family garden at his home in Iowa City, and then walked off to an early start at his work as director of the University of Iowa's Hydraulics Laboratory. That at night he carried his love of water back home with him, damming a small water course to build his children a pond for swimming and fishing. That he approached his prolific efforts at the university with eagerness, efficiency, precision, and thoroughness, inspiring the same in others who then had trouble keeping up with him.

Not the least of his tasks before his premature death at age 41 was the establishment of the Iowa Institute of Hydraulic Research, today one of the University of Iowa's stellar institutes, known around the world for its contributions to the understanding of water flow and fluid mechanics generally. Although he was on the cutting edge of hydraulic research in the 1920s and early 1930s, Nagler was equally fascinated with documenting the use of water to power Iowa's





**I**n little more than a decade, Floyd Nagler expanded the tiny Hydraulics Laboratory from a small cube on a concrete channel on the Iowa River (large photo), to a laboratory with 50 times the floor space (color inset). A man of boundless energy, he filled the new lab with researchers, equipment, and projects. Since his death, the outer facade of this structure in Iowa City has remained virtually unchanged. Today the building forms the administrative core of the renowned Iowa Institute of Hydraulic Research.

settlement-era mills (a technology that had passed into history) and in promoting the use of water power to generate electricity (a technology then at its height in Iowa). This mix of interests created a rare individual capable of simultaneously promoting the value of looking to the future and to the past.

Nagler was brought to the University of Iowa's Engineering College in 1920, to direct activities at its newly established Hydraulics Lab. The laboratory at

that time was a tiny square building, 22 feet on each side, perched atop a concrete experimental channel that fed water from the adjacent Iowa River into laboratory projects. Nagler immediately launched the lab on an energetic research program involving questions of water flowing through culverts and spillways, around river curves, underneath bridges, and over weirs and dams, and the countless other enigmas of water flow that concern hydraulic engineers. Over the



next decade, he solicited funds and directed the construction of an expanded laboratory with over 50 times as much floor space as his original workshop. He also attracted an ever-growing torrent of research funding and projects. Perhaps most notable among these were Nagler's surveys of Iowa's rivers.

Floyd Nagler seemed to have an absorbing love of free-flowing rivers and a fascination for their transformation into a "usable" form through human constructs. Nagler firmly believed that knowledge of our streams was imperative to harnessing the benefits of our waterways and decreasing their damage. "The information obtained from the adequate measurement of the flow of streams is almost indispensable in the economic design of a large variety of projects which directly or indirectly affect the public welfare, such as drainage, river pollution [*sic*] by sewage, flood protection devices, [and] waterways," he wrote to Iowa governor John Hammill in 1925. His own efforts focused on surveys regarding the water resource potential and flow characteristics of the Mississippi, its immediate tributaries, and smaller rivers in Iowa.

Some of these surveys were performed for Iowa's Board of Conservation and for the Fish and Game Commission, which were then preparing the *Twenty-Five Year Conservation Plan for Iowa*. Nagler became Iowa's chief consultant for water-related aspects of their projects, and he tramped the sites of future state parks, assessing their potential for artificial lakes and then designing the dams that would form the lakes. When the *Twenty-Five Year Conservation Plan* was completed, he continued similar consultations with Roosevelt's Civilian Conservation Corps, inspecting and reporting on sites where the CCC was considering constructing or improving an Iowa lake or dam, including the dam that would form Lake Macbride just north of Iowa City. A number of these projects would be under construction at the time of his death.

Nagler provided similar services to the U.S. Army Corps of Engineers (then the "U.S. Engineer Department"). The Corps, which for decades had attempted to train the Mississippi River's mighty flow, was asked in the 1920s to report to the U.S. Congress on the best method for controlling its floods regionally—and, incidentally, on possibilities for power production, navigation, and irrigation as well. Nagler, as the "Engineer in Charge of Stream Investigations," asserted that the Mississippi could best be understood by learning more about its tributaries, and he immediately initiated comprehensive surveys of Iowa's rivers and streams. Two field parties under his supervision helped him assess stream profiles and features, report

on prospective reservoir sites, and search out all power developments. During winter months, Nagler spent ten- to twelve-hour days spinning out detailed, lengthy reports on the Iowa, Des Moines, Boone, Raccoon, Turkey, Wapsipinicon, and nine other Iowa rivers.

By the time Nagler's work on the river survey project ended in December 1930, he had compiled a significant portion of the information needed to reshape the Mississippi River into its current state. While working in the Corps' Rock Island office, he had become involved in a number of engineering-related matters, including the planned construction of a nine-foot-deep navigation channel and associated locks and dams on the upper Mississippi. According to one source, Nagler was the first to recommend the channelization program that today characterizes the river. Because of Nagler, the Hydraulics Lab later became a major site for modeling federal river projects in the eastern United States.

**N**agler integrated a passion for the subject of water power into his work on Iowa's rivers. He envisioned Iowa as a land jeweled with lakes and dams, where water was put to service for the betterment of Iowa's people wherever possible. While his stream studies for the Corps firmly stated that he saw little need or desirability in using Iowa's rivers for irrigation or commercial navigation, he thought differently about water-power developments. For the Iowa River, for example, he recommended increasing the outage of the few existing plants and designated sites for 24 new power plants (although he admitted that only four of these really were feasible).

His bias toward the development of water power was revealed in a 1926 paper entitled "Will Water Waste or Work," in which he expressed resource-depletion concerns remarkably similar to those of the present day: "With only 5 percent of the water power of the world developed at the present time while the world's coal supply is being depleted at the rate which will mean its entire exhaustion in 200 years, the question of whether water shall work or waste presents a real challenge to the engineer-economist. In Iowa alone, and Iowa has comparatively little water power, there are 200,000 horse power which can yet be developed."

By the following year, he had increased his prediction to 400,000 horsepower, and wrote that this water power would "play an important part in the industrial development of the state" and save more than two million tons of coal per year. Here and elsewhere he



admitted that the harnessing of such water power in Iowa would not be easy or cheap; yet he maintained that water-power plants would be economical when tied into large electrical systems also fed by other power sources, and he pinpointed specific sites for dam construction and development of power plants.

These dreams of Nagler's never came to fruition. Although several dozen of Iowa's old millsites were converted to hydroelectric power in the early 1900s, and these contributed significantly to the state's total electric budget in the 1920s, they could not keep up with the state's soaring demands for electricity, and thus they were replaced with coal-fired generating stations as they wore out. Today, the few Iowa hydroelectric plants still in operation provide an infinitesimal amount of Iowa's total power needs. The generating potential of the running water of our rather flat state is simply too low and the flow too irregular to justify the expense involved in constructing dams and related power plants.

Nagler's passion for water power did, however, carry him into successful reconstruction of one aspect of the state's past. Floyd Nagler loved to wander the Iowa countryside, picking up an interesting rock here or there and searching out remains of earlier times. These walks cultivated his love of history, especially his fascination with Iowa's early experiments with water power. Old water mills particularly grabbed his fancy. Nagler himself rooted old millstones from the mud and sought out rusting turbines in scrapyards, arranging for these signs of earlier times to be transported back to Iowa City where he proudly displayed them in front of the Hydraulics Lab building and in a small park across the street. He also incorporated a pair of millstones into the construction of the Hydraulics Lab's entrance hall. His river surveys allowed him ample opportunity to exercise his historic passions, and his work with the Corps provided him with two field teams, which he instructed to locate and photograph as many old water-powered

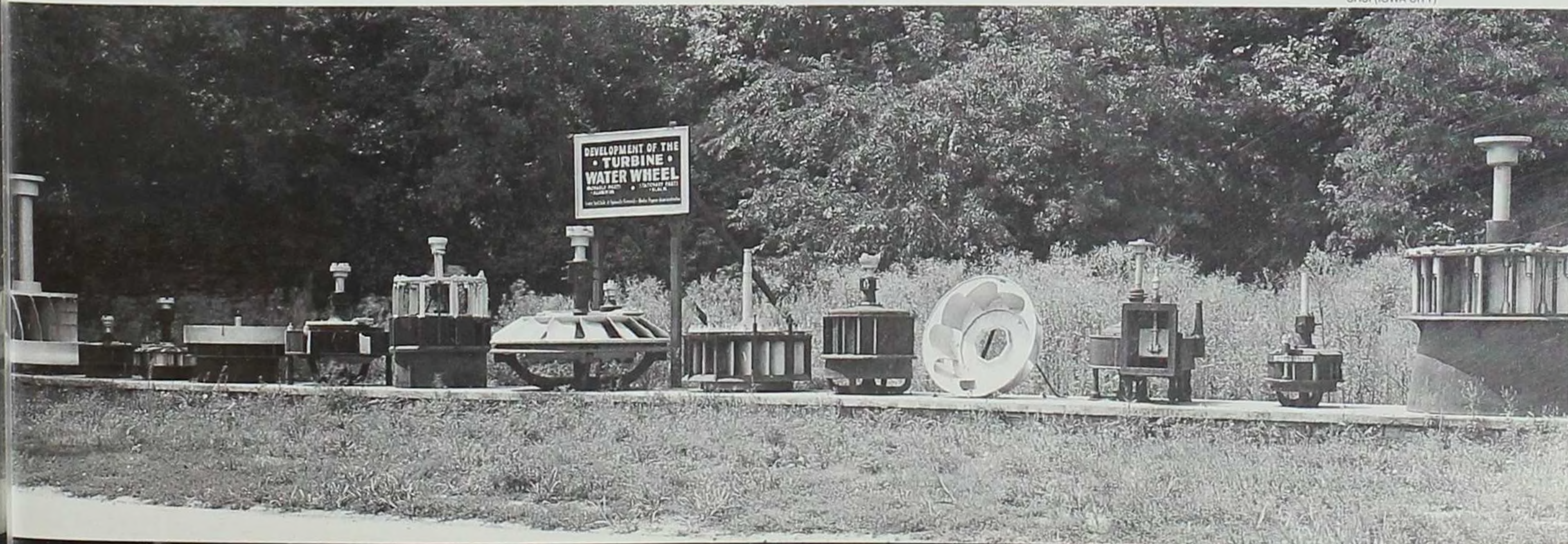
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Dear Mr. Tegtmeier:

I was recently at the town of Greene, Iowa, and noted that you have discarded three water wheels which are now rusting in the pile of miscellaneous material behind your power plant. I wonder how much persuasion it would take to get you to load these three wheels, complete with their guide cases, onto a Rock Island train and donate them to the hydraulic laboratory at the State University of Iowa. They would certainly be of interest and value to my students, and I have plans for making a collection of old wheels to adorn the front yard of the hydraulic laboratory. When I finished my undergraduate work, I had no conception of what a water wheel looked like, and I am determined that our students will know water wheels from "a to z".

In a letter dated November 3, 1927, Nagler explains his purpose for collecting remains of early mills and solicits the donation of a rusting turbine. The turbines that Nagler collected on his field studies in Iowa were displayed across the street from the Hydraulics Laboratory in Iowa City. He labeled the instructional exhibit, "Development of the Turbine Water Wheel" (below). Depression-era Work Projects Administration employees were directed to paint the movable parts of the turbines silver and the stationary parts black. The collection was later disbanded.

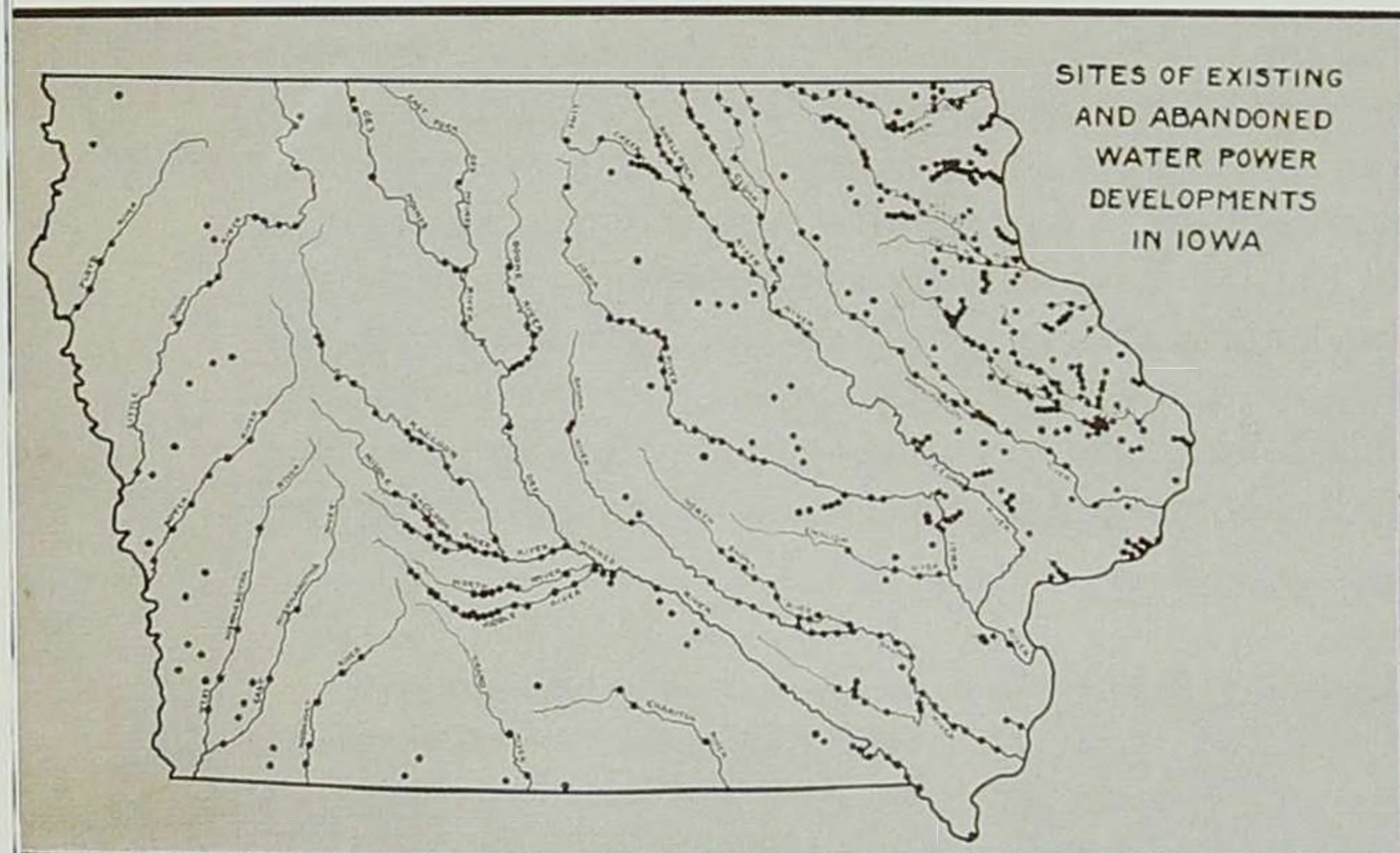
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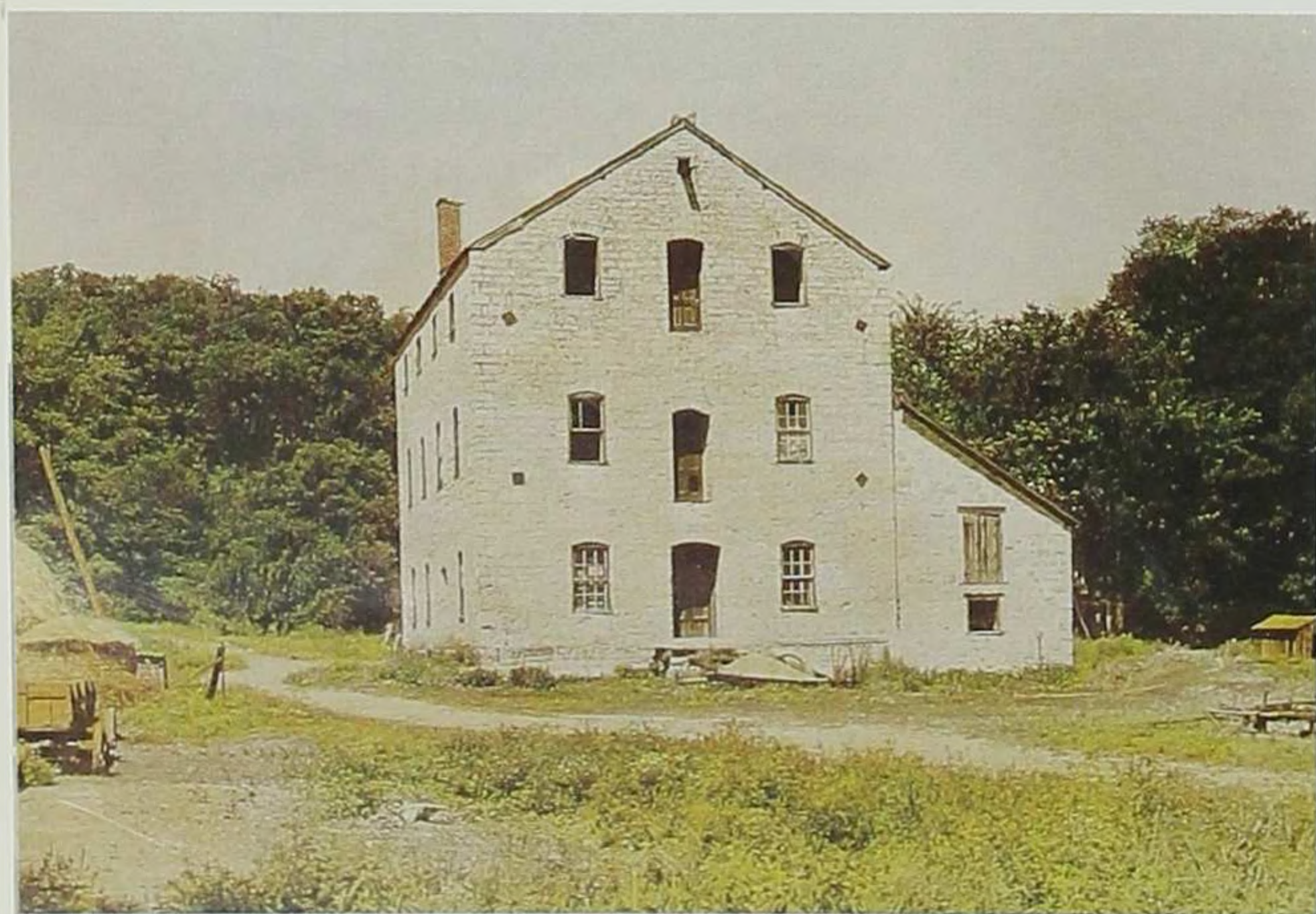


mills as they could. Nagler then put the glass slides of these mills together into a popular lecture that he presented repeatedly to the general public in Iowa City and elsewhere.

Floyd Nagler was a large, powerful man who routinely returned from his rambles in the field loaded down with rocks, which he used to build a rock garden with a fountain, waterfall, and three connected pools just outside his front door. But his unusually



**Nagler used these glass slides and two dozen more to illustrate his public lectures on Iowa's vanishing water-powered mills. The slide above, showing hundreds of "sites of existing and abandoned water power developments in Iowa," is a tribute to Nagler's efforts to locate all existing sites of former mills, and to 19th-century Iowans' efforts to harness water power. The hand-tinted slide below depicts Kleinlein's Mill.**



BOTH SLIDES: SHSI (IOWA CITY)

good health, strength, and vigor could not prevent a normal attack of appendicitis, which at first was diagnosed as the flu. After disregarding his supposedly minor illness for a few days, Nagler checked into the University Hospital a few blocks from his home and underwent surgery at midnight, but by that time his appendix had ruptured and the infection had spread. While his premature death likely could have been prevented with modern antibiotics, these were not available in 1933. He survived a second surgery two weeks later when portions of his liver were removed. Floyd Nagler died a few weeks after that on November 10, 1933.

However, his enthusiasm for the subject of old mills and water power continued to inspire historians. Jacob Swisher, a State Historical Society of Iowa research associate during much of the first half of the century who was recognized throughout Iowa for his prolific historical writings, credited "Floyd A. Nagler, eminent engineer and student of pioneer life" with inspiring Swisher's 1940 book, *Iowa, Land of Many Mills*, which remains the definitive volume on this aspect of Iowa's past.

Many photographs collected by Nagler appeared in Swisher's book, and a selection of them, as well as photos collected by others, illustrate the following article, which explores the milling industry and water-power developments that so raised Nagler's passion. Through Swisher's historical book and Nagler's own cutting-edge research commenced at the Hydraulics Laboratory, Floyd Nagler contributed significantly to historic efforts to understand and control the use of Iowa's water and water power. ❖

*Cornelia F. Mutel is a historian of science at the University of Iowa's Institute of Hydraulic Research, which is discussed in this article. The article is adapted from a book she is writing on the history of the institute, to be published as part of the University of Iowa's 1997 sesquicentennial celebration.*

#### NOTE ON SOURCES

Sources include correspondence, newspaper clippings, published and unpublished reports, and other materials archived at the Iowa Institute of Hydraulic Research and the University of Iowa's Special Collections (University of Iowa Library, Iowa City); thanks to Earl Rogers at Special Collections for his assistance. Thanks also to Floyd Nagler's son, Robert Nagler, for reminiscences of his father. Nagler's glass slides and lecture script are archived at the State Historical Society of Iowa (Iowa City). A more detailed accounting of Nagler's life and contributions is included in a forthcoming book on the history of the Iowa Institute of Hydraulic Research. Specific annotations to this article are held in the *Iowa Heritage Illustrated* production files (SHSI-Iowa City).