SHSI (IOWA CITY)

Water-Powered Mills in Iowa: A Forsaken Technology

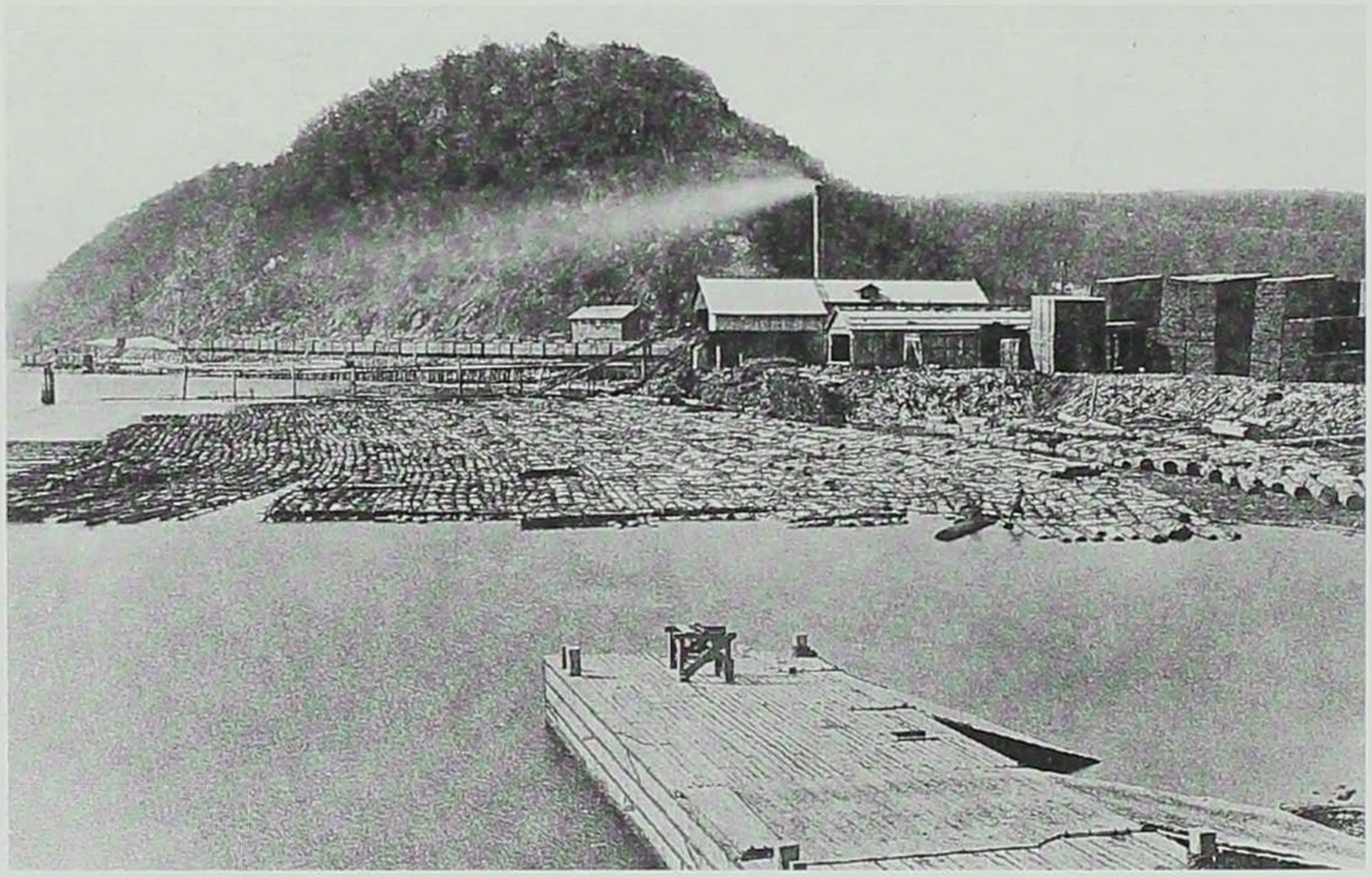
by Cornelia F. Mutel

Settlers entering Iowa in the 1830s had survival on their minds, and survival meant harnessing power to transpose raw materials into products that would shelter and feed them. At that time power—like most everything else—was locally produced and locally consumed. Muscle power was the form most readily available: settlers were known to grind their grains by hand with coffee mills or a carpenter's jointer, to turn millstones with horses, and to build log cabins with axes and human sweat. But water-powered mills provided a welcome alternative, and although the Iowa territory was relatively flat, its streams and rivers until the late 19th century powered a flurry of gristmills and sawmills that permitted settlers to nourish their children and to construct farmsteads, towns, and industries. Water powered Iowa through much of the century, and mills were considered essential to settlement and life.

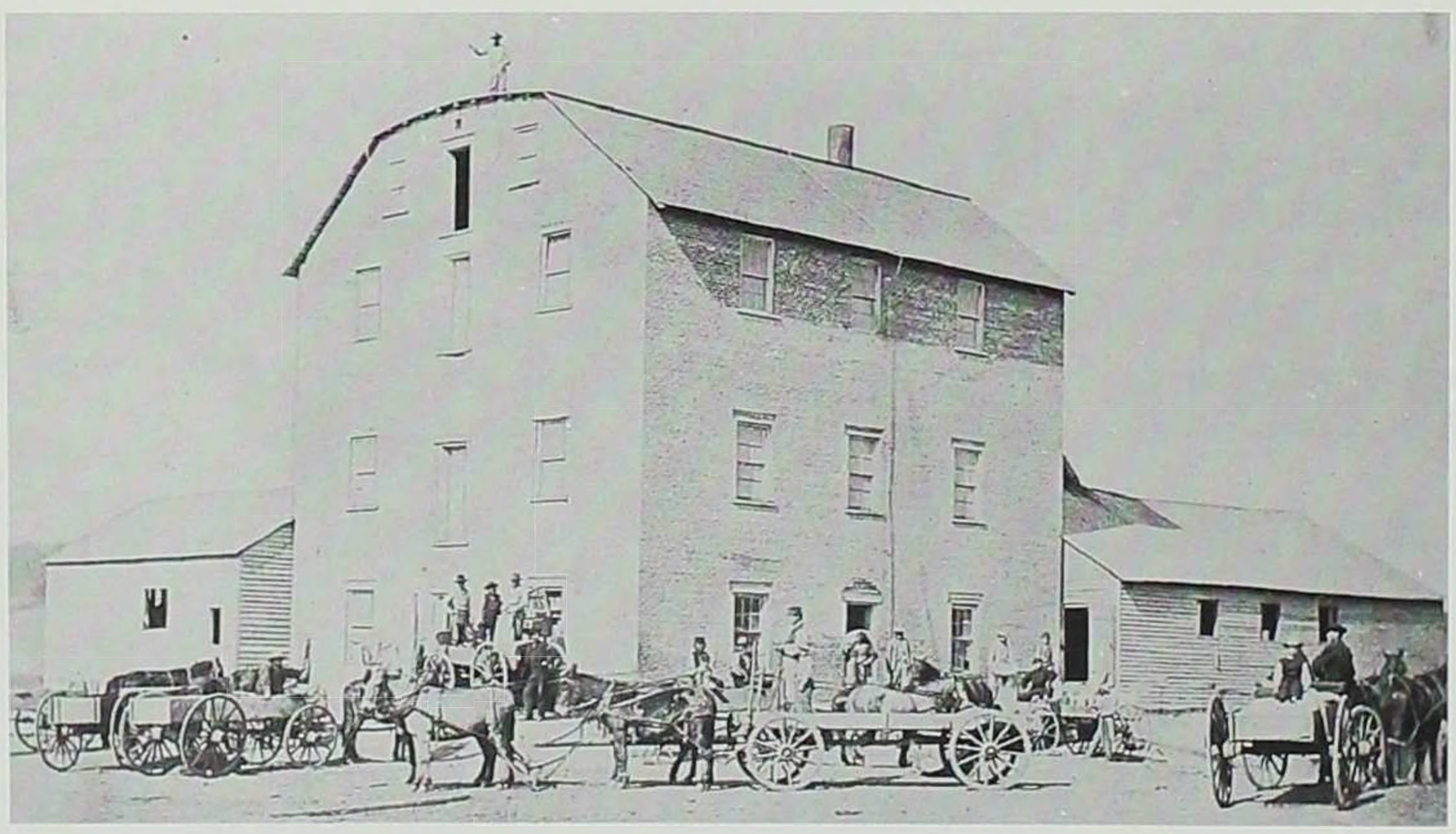
The first mill in Iowa was built in 1831 by the future president of the Confederacy, Jefferson Davis

Above: Once centers of thriving local industry, Iowa's water-powered mills, like Florenceville Mill in Howard County, have faded into the past.

BOTH PHOTOS: SHSI (IOWA CITY)



Above: Iowa's lumber industry helped develop Mississippi river towns, as did Fleming Sawmill at Marquette, Iowa. Below: Wagons line up at the J.F. Young Flour Mill at Vinton. Iowa's flour mills ranged from small country mills to large commercial mills on the Mississippi. The small mills served farmers, who brought in grain and took home flour. The larger, commercial mills bought grain from farmers, ground it into flour, and then sold the flour to whatever markets were most profitable at that time.



(then a lieutenant in the U.S. Army). This sawmill, on the Yellow River, provided lumber for the construction of Fort Crawford near Prairie du Chien, Wisconsin. But more typically, the earliest mills were fabricated by millers who forged a path into the Iowa wilderness, chose a site, and attracted settlers to follow. The water-powered mills served many functions. There were gristmills, flour mills, hominy mills, sawmills, paper and woolen mills, even calico print mills and oil mills. While Iowa was being settled and transportation remained poor, the abundance of small, local, water-powered mills allowed Iowans to survive in an era of self-sufficiency.

For nearly five decades, until the late 1870s, the number of mills gradually increased. The vast majority of these were sawmills and flour and gristmills. Already by the 1850s, mills had been established in many parts of Iowa, sawmills numbering 540 and flour and gristmills rising to 333. These early mills produced millions of dollars worth of goods annually; in 1860, their production of flour, meal, and lumber constituted Iowa's leading industries.

While small local sawmills were abundant in the early decades of settlement, the continuing proliferation of mills was most directly linked to the growing and processing of wheat, at first on a subsistence level, then commercially. Wheat, in the mid-1800s, was a mainstay of Iowa's agriculture, and wheat production necessitated flour mills. By 1870, 502 flour and gristmills speckled the state, and with the growth of wheat peaking in 1875, Iowa's flour and gristmills rose to a maximum of 713 by 1880, most of these run by water power.

While Iowa's streams powered the state's early economy, they also fueled Iowa's social life and shaped patterns of development. Early settlers often had to travel great distances to reach the closest mill, sometimes journeying a day or more with considerable difficulty. Once they arrived at a gristmill, they might join a line of dozens of horse-drawn wagons, waiting days in frustration for their turn, for the water to rise, or for machinery to be repaired so that the mill could grind their grain. While waiting, they camped near the mill or lodged nearby and vis-

SHSI (IOWA CITY): D.C. HALE COLLECTION

Motor Mill, near Elkader, was photographed by D.C. Hale in the 1920s. One of the few water-powered mills still standing in Iowa, it is now on the National Register of Historic Places.

ited with fellow travelers. Children who came along would roam the woods in search of flowers or fruits, or fish in the pond. Thus coming to the mill could become a significant social event, an uncommon occasion to cease labor and catch up on the local news. Mill ponds also served as social centers, as sites for ice-skating in winter and rowboating, fishing, camping, and picnicking in summer.

These activities, plus the cutting of much-needed ice from the ponds in winter, congregated travelers and settlers around the mills. Mills became a hub of activity, a site doubling as trading post and post office. Mills, often the first constructs in an area, started to attract support industries (such as flour barrel cooperages) and other constructions that formed the nuclei of villages. The millers themselves claimed status as well-to-do leaders in community affairs as well as counselors and authorities on all subjects. It is thus little wonder that the mills, which were coupled with the power, supplies, water, and social and economic activities upon which settlers depended, became a focal point for regional development. Mill sites served as the kernels of many Iowa communities, and even today, many Iowa cities and highway crossings form lasting tributes to the sites of Iowa's original mills.

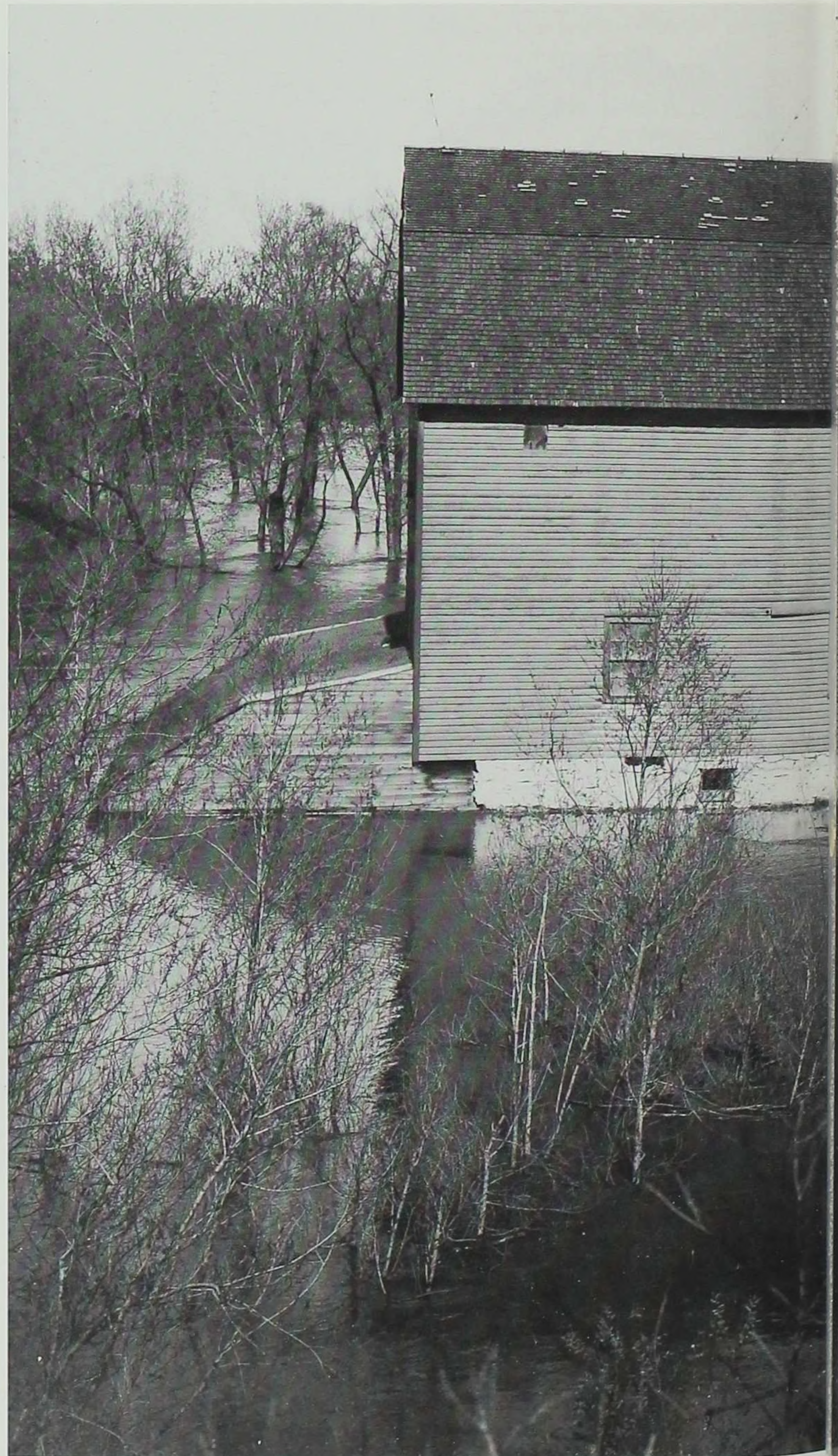
A suitable site for a mill was greatly valued. Such a site included a stream with sufficient drop and flow to turn the water wheel, which in turn rotated millstones or other equipment. Sites with a steep gradient and high runoff were excellent, but locating such sites in Iowa's relatively flat terrain was difficult. Quantity of water also was a consideration: streams that were too small or erratic would not provide the necessary power, but bigger rivers meant larger floods and ice jams that threatened the mills.

Sites were often modified to

provide the optimal conditions: dams were constructed of brush, logs, or stone, sometimes reinforced with clay, and these dams enhanced the drop and speed of water and thus its force. The higher the dam, the greater the drop and the resulting power. Mill ponds created by dams also provided a more constant source of flowing water (and thus of energy) than Iowa's erratic streams supplied. Today, artificial waterfalls on Iowa's streams frequently mark the location of a former mill.

The construction of a millrace (an artificial channel that conveyed water to the wheel) could save the miller the cost and maintenance headaches of a dam, provided that the natural drop was sufficient. The race might, for example, connect one section of a river with a distant, lower section. However, a millrace also might be a short diversion dependent on a dam for its drop. Longer millraces might allow the mill's equipment to remain distant from a river's destructive forces. The canal dug from the Iowa River through the Amana Colonies was a seven-mile millrace that powered woolen, calico, hominy, and other mills, in addition to a starch factory, machine shops, and threshing machines.

All of these structures were exposed to the elements, which frequently degraded or destroyed them. Water's natural erosive power could eat away at dam and mill foundations, a problem exacerbated by the soil substrata



SHSI (IOWA CITY): SCHWINN COLLECTION

Flood waters catch the attention of men on a riverbank near Red Oak. Floods and ice jams could do great damage to the foundations of structures built along Iowa's rivers and streams. Droughts, on the other hand, could bring mills to a standstill.

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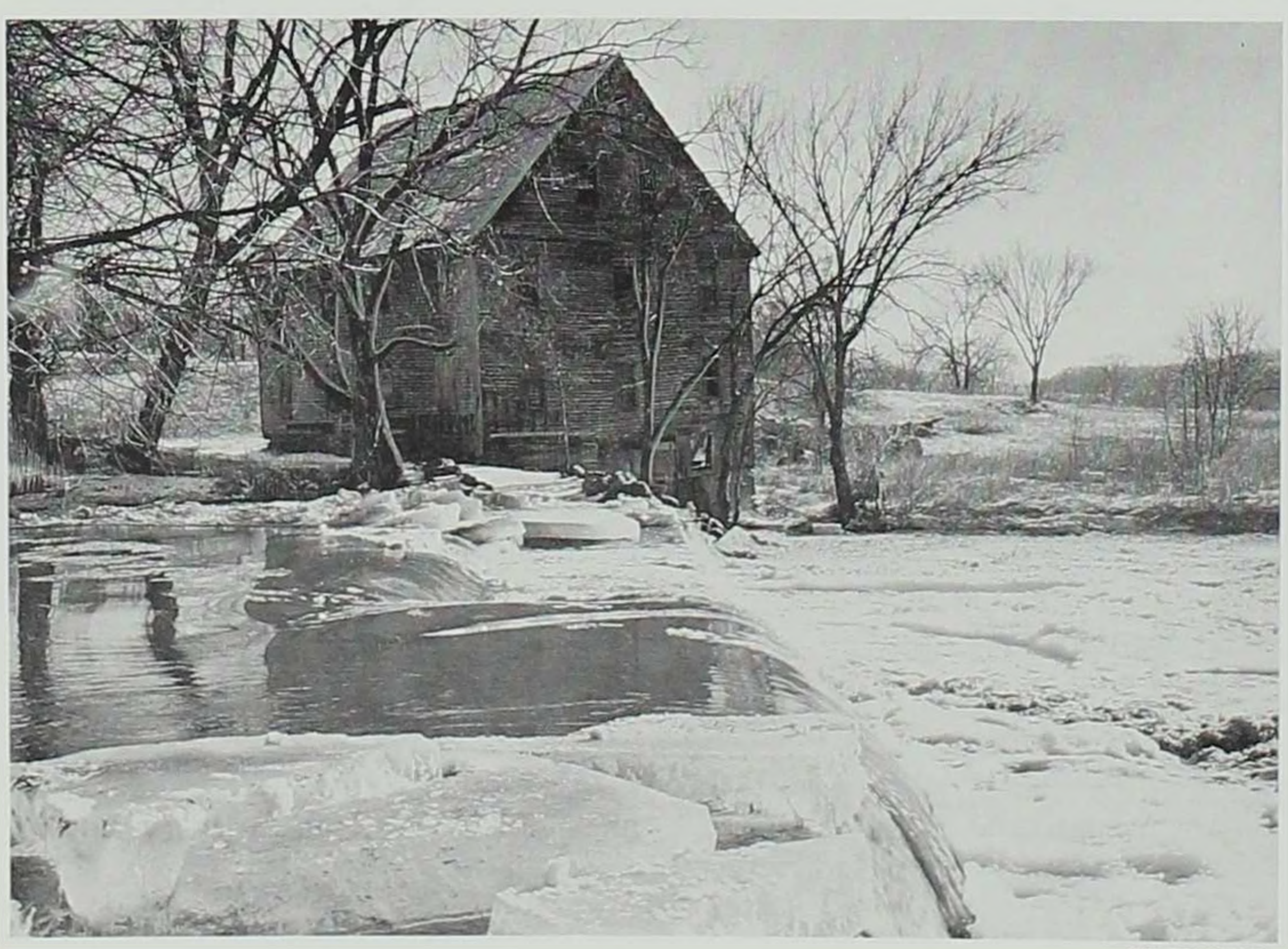
Above: Churning flood waters tear into Thompson Mill in Elkader, as photographed by D. C. Hale in June 1880. Ice could also be sinister, destroying wooden water wheels. Below: Chilly waters and ice floes rush past the Lennon Mill at Panora.



SHSI (DES MOINES)

(rather than solid rock) upon which most Iowa mills were constructed. Floods could wash out dams and millraces, carry away water wheels, or invade the mill itself. Log and ice jams bombarded dams and water wheels, and a wheel might be trapped and rendered inoperable by freezing water. Increased sediment loads from soils washing off the plowed prairies clogged ponds, races, and wheel pits. Mill structures required maintenance, and a failure of any one structure would close the mill. Dam failure and low water were frequent seasonal problems.

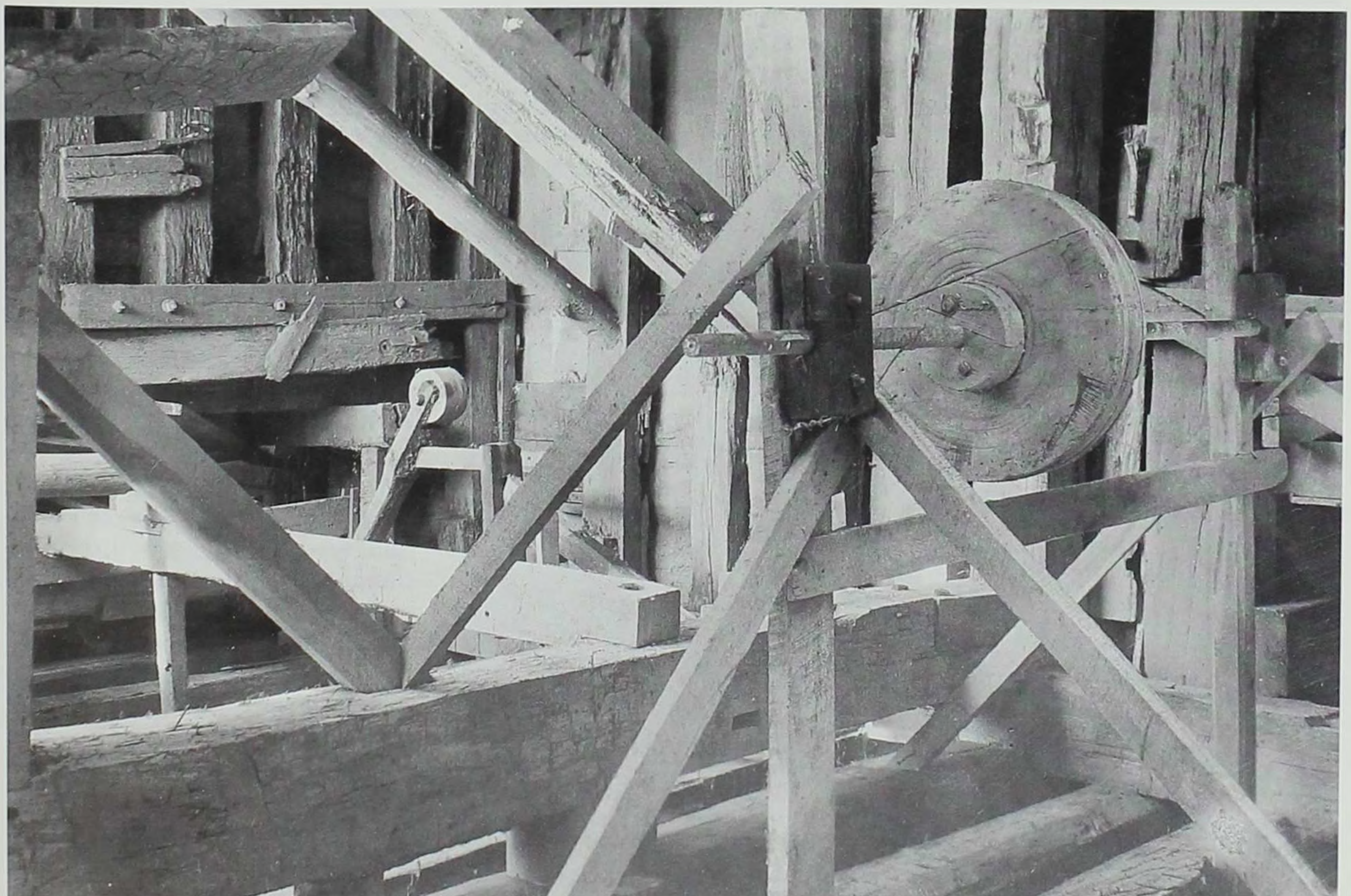
Gristmills came in various sizes and degrees of sophistication. The earliest mills were often simple and rough-hewn structures, but soon Iowa's mills were being constructed according to standardized plans that had been developed by Oliver Evans, an American inventor and engineer, and published in his 1795 book *The Young Mill-wright and Miller's Guide*. Evans detailed a mechanized mill that could be managed by a few operators who controlled the flow of grain and water power via a series of levers, gears, and leather pulleys or shafts. Gravity fed the grain to one or a series of millstones (which in later years were combined with or replaced by rollers) that ground the grain, and thence through various dressing, fanning, screening, and sifting machines that sorted, cleaned, and otherwise processed the flour. Ground grain might be cycled through cleaners and reground several times, until the desired particle size and quality were attained. Eventually, the bins, hoppers, and chutes would pour the finished flour into sacks.

Because of their dependence on gravity-fed flow, mills were tall structures, typically four floors high. Wheat might first enter the third floor of a mill where it would be cleaned and then fed into hoppers on the floor below, which in turn would feed the millstones below them. The ground grain would then be hoisted back upstairs by elevators, to be fed through sorters, sifters, and the like as it again flowed from one floor down to the next. The grain might cycle from upper to lower and back to upper floors several times before processing was completed. Power was fed from the stream into the mill on the lowest level and transported directly to the turning millstones. Machinery to run the various auxiliary processing equipment was located on the uppermost floor, the power transmitted to these machines through a series of shafts and leather belts whose velocity was regulated through cogs and gears. Mills operated with a rhythmic slurp of water and a creaking and grinding rumble of equipment that endeared them to settlers and were later nostalgically remembered.

Mills ran on direct mechanical power: the force of moving water was captured by water wheels, which pivoted on hefty shafts that spun around with the wheel and transported the power into the mill and its equipment. Water wheels that powered gristmills turned the uppermost of a pair of millstones, between which grain was ground. Both water wheels and millstones were crucial components of Iowa's early water-powered mills.

Vertical water wheels were broad, massive, wooden devices 18 or even 24 feet in diameter, big enough to rival steamboat paddlewheels in size. Water flowed beneath the undershot wheels, which had a series of paddles around the outside that were pushed forward by the water, thus turning the wheel. Breast wheels and overshot wheels, in contrast, had a series of buckets or grooved pockets. Water

A rare photo of a mill interior reveals the hand-hewn timbers of walnut or oak in Forest Mill near McGregor.



SHSI (IOWA CITY): NAGLER COLLECTION

flowing over the wheel was caught in the buckets, which were pushed downward by the weight, thus turning the wheel. Each wheel type had its advantages. Even a few feet of drop could power an undershot wheel, which dipped directly into a running stream or millrace and then turned in tempo with the speed of the water. Thus dams were not an absolute requirement. Breast wheels and overshot wheels were more efficient, but could only operate if the water had sufficient drop, typically created by a dam. They also required the construction of a trough or race that fed the water onto the wheel. All wheels were prone to broken shafts and, because they extended directly into the water, were vulnerable to ice damage and to floods, which sometimes washed them away. None operated once the surface water iced over; mills with vertical water wheels were seasonal operations.

The shaping and sharpening of millstones was an art in itself. Not just any stone was acceptable. The best millstones were made from a very hard silicate found in France's Seine valley, and France became famous for its buhrstones, which were shipped to America in pieces and then cemented and bound together with wide iron hoops. American millstones, in contrast, were usually chiseled from a single stone block. They were manufactured in several eastern states and sometimes carved from Iowa's "prairie boulders," glacial erratics transported here and deposited many thousands of years ago.

Grain was funneled into a hole in the center of the uppermost millstone, which rotated against a fixed lower millstone, the pulverized grain moving outward along a series of radial grooves and spilling from the stones' outer edges in the process. The setting of the millstones determined the coarseness of the finished product. For flour, millstones were brought close together and run fast, so that the sharp stone edges could grind grain as fine as possible during the first run. The stones wore down in the process. Thus the edges of the grooves or furrows that were carved into the two rotating stone faces had to be sharpened, or "dressed," as often as weekly. The thread-like lines had to be kept distinct and separate, the grooves deepened just a bit, and the stone surface roughened. Dressing a stone was both an art and a tedious, demanding chore.

Water powers an overshot wheel at an unidentified mill. Mills used four kinds of wooden wheels—breast, overshot, tub, and undershot—to harness Iowa's sometimes erratic water flow.

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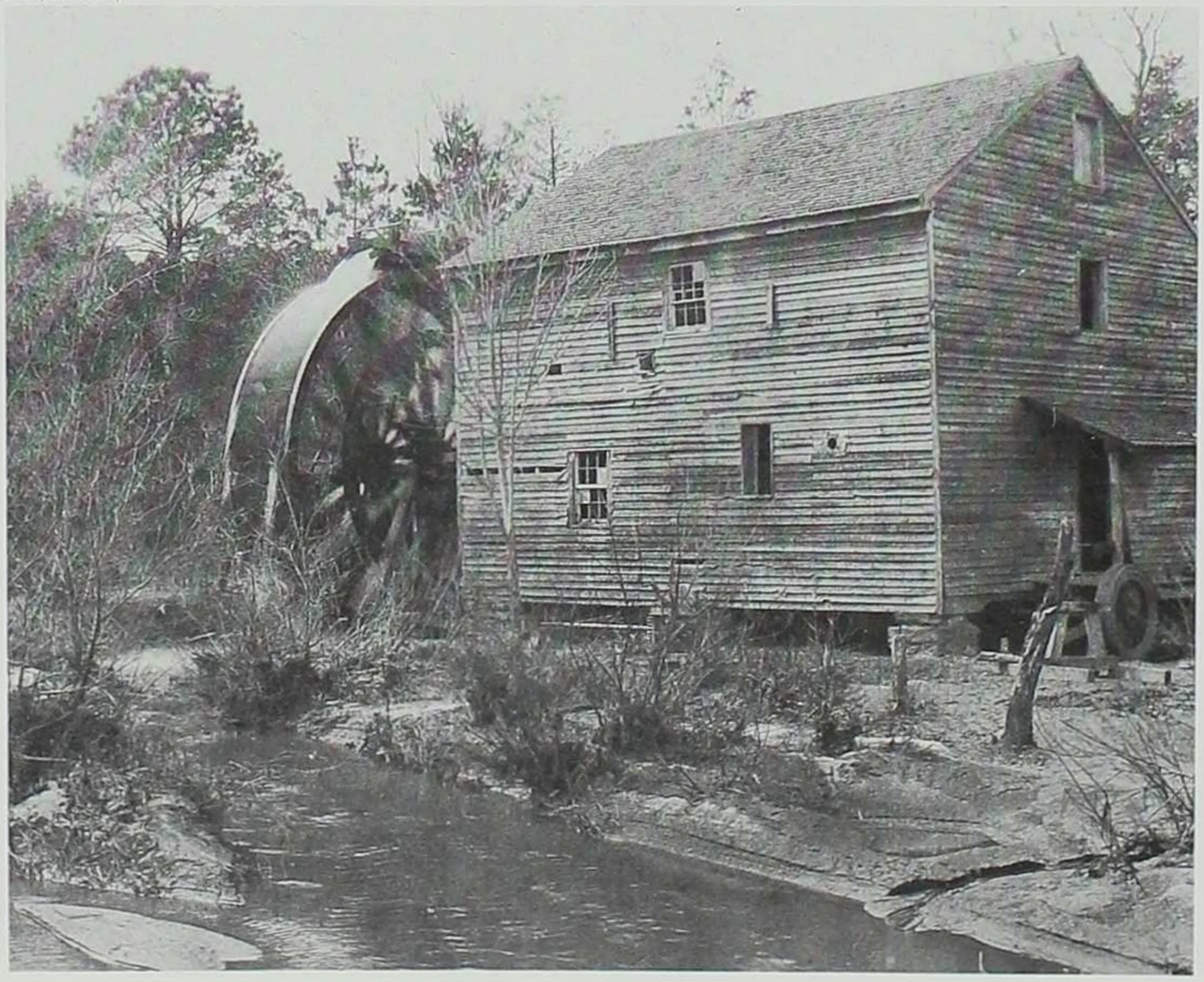
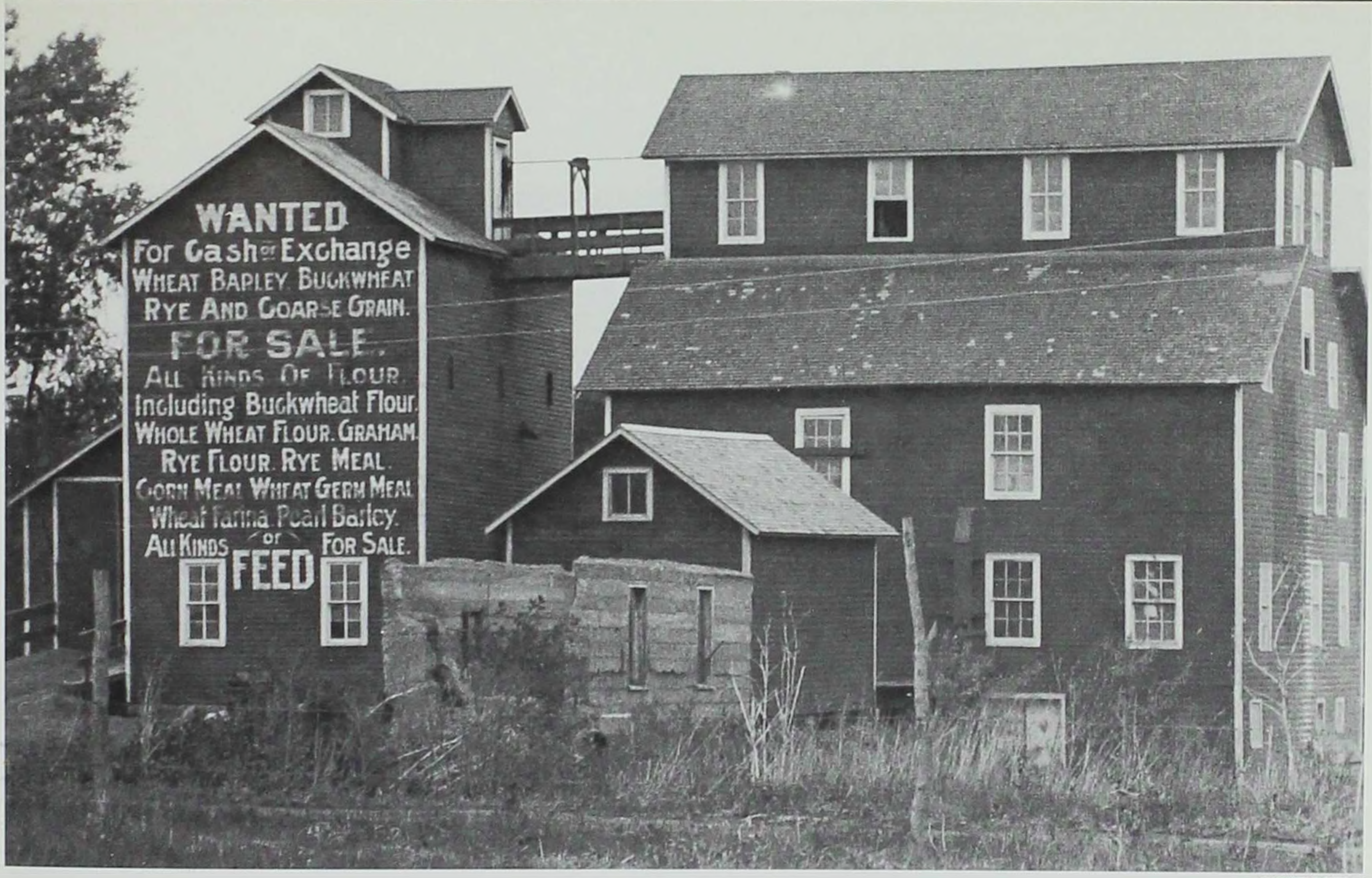


Wooden water wheels and millstones were ancient devices, dating back to antiquity. Both were surpassed, however, by newer technologies during Iowa's brief romance with water-powered mills. The vertical water wheel gave way to the tub wheel and then to the turbine, a metal wheel that was rotated within a fixed case by moving water. Both were horizontally oriented. Although far less picturesque and charming than the vertical wooden wheels, turbines claimed several advantages. They were much smaller and far more efficient than the wooden wheels, powering mills with greater constancy at a fraction of the water power. They operated during low water. They also ran throughout the year because they could be powered by water fed from underneath an icy surface, and thus they did not close down in winter.



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The modern turbine, which was developed in the mid-1800s, offered such benefits that many pioneer-era mills with wooden wheels were rebuilt to accommodate turbines in the 1860s and 1870s. Advancing technologies of many sorts swept westward like a wave across the state, even as the land was being settled and development intensified. Mills built later in Iowa's development or in the western part of the state incorporated turbines from the start, entirely bypassing use of vertical wooden wheels.

Grain-grinding technologies were also in transition. While some early mills had bolting (sifting) equipment to separate and refine the flour, many mills had none. Thus they ground the entire wheat kernel into an indiscriminate mass that included the bran and oily germ. This produced a flour that might be discolored by the heat generated from friction of the millstones' speed and pressure and was not uniform in texture or quality. The flour, bran, and intermediate "middlings" were eaten as a unit, often as a coarse "stone-ground whole wheat" flour. In the 1870s, a new milling process using a middlings purifier was adopted. Grain was run beween the stones, which had been adjusted to break apart the bran but not grind the wheat kernels. Then the grain was run through the purifier, which employed a blast of wind to blow out the bran, and the millstones ground the kernel a second time, producing premium-quality branless flour. Shortly thereafter, in the 1870s and 1880s, adjustable rollers replaced millstones completely. Rollers produced a flour of more uniform texture, white color, and supposedly higher quality, devoid of germ and bran. Rollers also required less space, were more energy efficient, and did not require the careful, frequent dressing of millstones.

Mills were rapidly refurbished to incorporate these latest improvements. However, although the turbines and roller mills replaced the early mills' wooden water wheels and hefty millstones, the mills incorporating these new technologies remained local, numerous, and water-powered.

A mill on the Floyd River in Plymouth County in the 1890s solicits for "wheat, barley, buckwheat, rye and coarse grain." As grain-grinding technologies optimized the milling of gluten-rich spring wheat, and wheat production moved north and west, Minneapolis replaced St. Louis as the center of the premium-quality flour industry.

And then, just as the turbines and roller mills were revolutionizing Iowa's mills, the grain that had mandated Iowa's many flour and gristmills took its leave. Locally grown wheat had fed first Iowa's pioneer children and then Iowa's economy and had nurtured both into robust adulthood. Wheat had been easy to plant and to sow, its production readily bringing in good profits. The amount of wheat produced in Iowa climbed steadily from the time of settlement until it peaked

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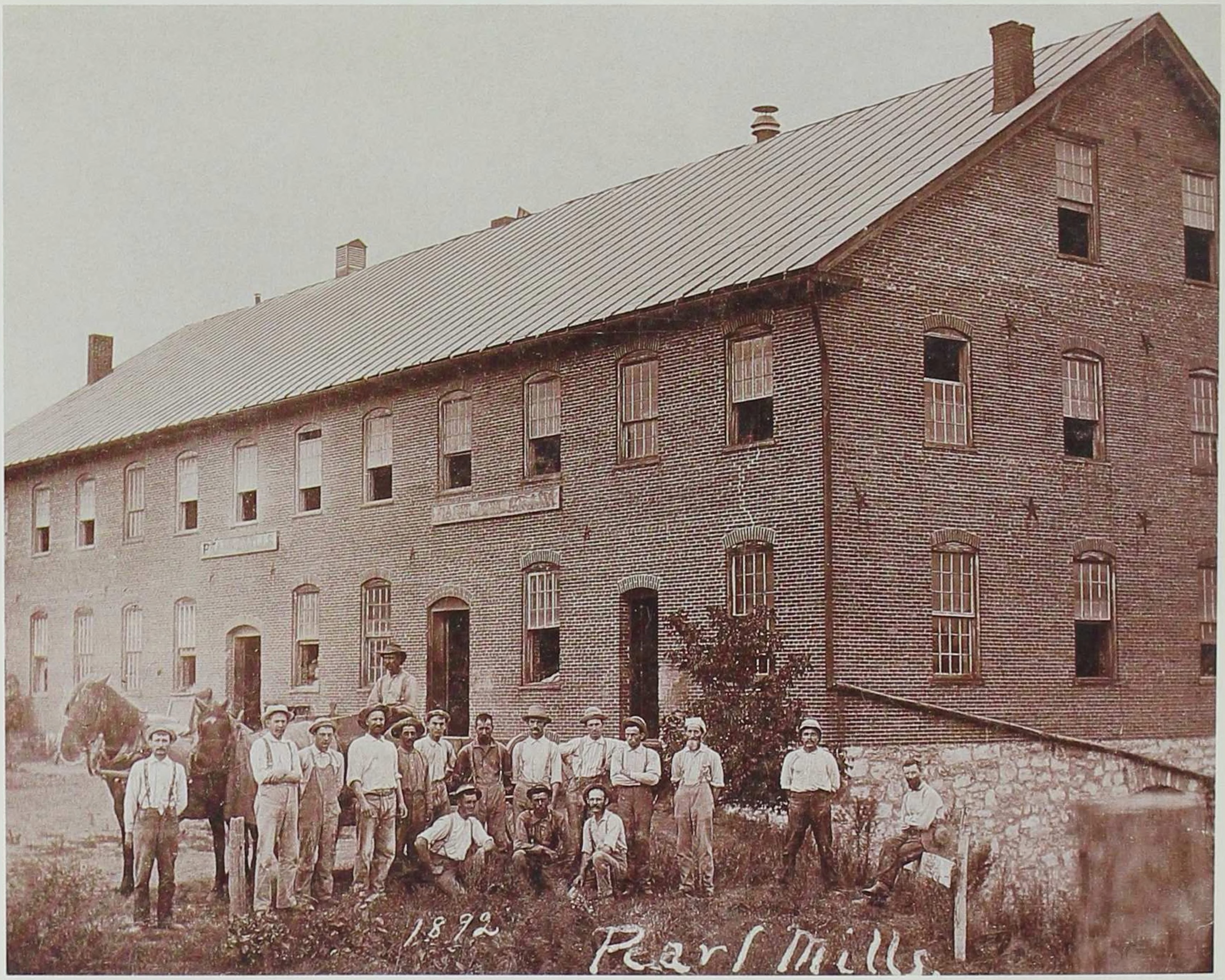


Workers line up outside Pearl Mill in Coralville in Johnson County. By 1892, the date of this photo, the number of local mills was diminishing as milling became more centralized and commercialized.

in 1875. Early Iowa was a land of wheat, with large expanses being repeatedly planted in this crop.

Now the land recoiled. Monocultures of wheat were depleting the soil of nutrients. Periods of dry weather stifled crops, and years of extreme heat and drought resulted in massive wheat crop failures. And insects increasingly staged attacks on wheat. Some years grasshoppers came in so rapidly and thickly that they were likened to blizzards, and young, succulent wheat seemed to be their favored food. Chinch bugs also proved devastating, ravaging entire wheat crops.

In the midst of wheat failures, corn was providing a viable alternative to troublesome wheat production. Corn, associated with a more diversified agriculture, tended to provide greater financial security and to retain higher soil fertility. It found its most profitable use as feed for cattle and hogs, which could be readily marketed, and livestock numbers increased with the swelling corn acreage. In 1870, Iowa ranked second in the nation in production of both corn and wheat. But by 1890, wheat production had declined dramatically and corn dominated Iowa's agriculture: that year more corn was raised here than in any other state, and Iowa had fallen to 19th place as a wheat state.

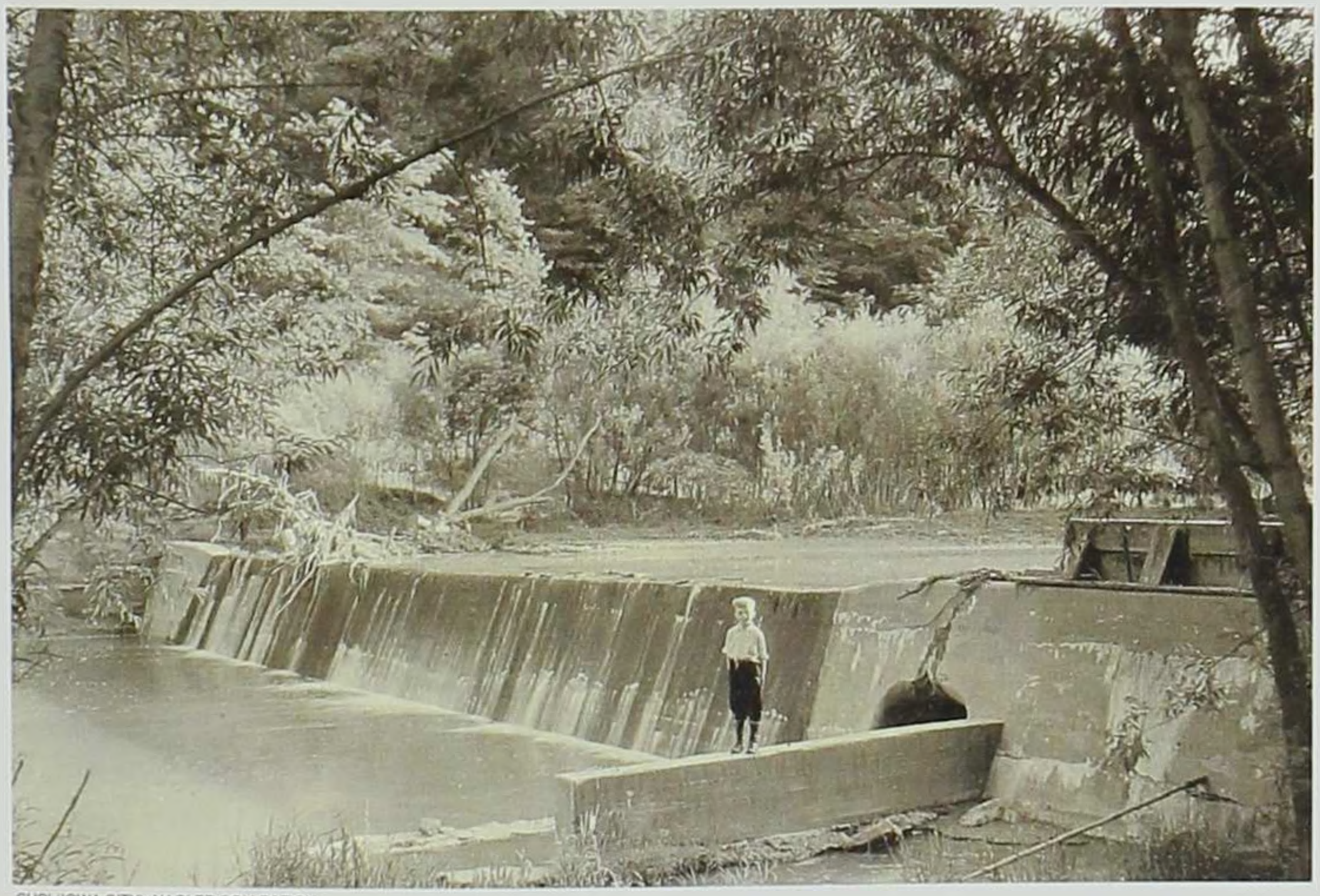
Meanwhile, the wheat industry had moved on to the Dakotas and Minnesota, the farmers tempted there by the lure of cheap government land

and the ability to ship processed flour with ease back to users farther east. This ability was fed by the development of roller mills, which were capable of processing the gluten-rich spring wheat grown in those regions, and separating the bran and oily germ from the kernel, which was then ground into flour that could be sacked and sold in stores without spoilage. Rollers also could efficiently produce larger quantities of flour. And the growing web of railroads provided easy and economical transport of wheat to mills and of flour to stores. Improved equipment was allowing the harvesting of larger wheat fields and thus increasing wheat production. These factors collectively encouraged the concentration of the milling industry in metropolitan commercial centers to the north and west of Iowa. Flour now could be bought at the market more economically than it could be grown and ground locally.

With railroads carrying processed flour from large centralized mills into Iowa, there was no longer a call for local mills to grind Iowa's wheat into flour. Wheat production and Iowa's milling industry declined together. In the 1880s, Iowa's flour and gristmills decreased from 713 to 441, commencing a steady and continuing decline in number. By 1930, only 63 mills of any type still ground grain in Iowa. Most of these were centralized commercial mills, far different in size, type, and operation from the small water-powered mills that had characterized Iowa in the middle-1800s. As one miller stated, "The big mills had swallowed up the little ones."

Small, local, water-powered sawmills, fed by Iowa's meager quantities of local timber, had already passed through a similar transformation. At the time of settlement they had provided vital rough lumber for constructing farmsteads, but within a few decades Iowa's choice trees had been cut and local forests could no longer keep up with the increasing demand for wood. Settlement of timber-thin prairie lands throughout the Midwest became dependent on the import of millions of white pine logs from the north woods of Wisconsin. These were rafted down the Mississippi to massive, centralized, riverside urban sawmills in Iowa and elsewhere, where the logs were converted to lumber or wooden constructs, which were distributed via the growing web of railroads. Iowa's widely scattered smaller sawmills declined in relative importance and most disappeared, with those surviving converting from water to other power sources. Toward the end of the 19th century, as the north woods of the upper Midwest became logged out, the larger mills also closed their doors due to lack of raw materials. A greatly reduced number of scattered small mills remain to this day, but these long since have been converted from water power first to steam, then to electricity.

Meanwhile, the small local gristmills that remained followed their predecessors down the road to annihilation. The millers' original heavy investments of time, effort, and money had produced highly vulnerable mill structures, and through the years many an Iowa water wheel, dam, or entire mill succumbed to flood, fire, ice, or old age. A decade after the 1933 death of Floyd Nagler (hydraulics expert and Iowa's chronicler of old mill sites), the few old mills remaining were nearing their end, and most of these were no longer functioning as originally intended. Some shel-



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Bear Creek Dam near Quandahl was the site of two mill-dams built by Norwegian settlers. Hydraulics expert Floyd Nagler reported that Bear Creek was the smallest Iowa stream still driving a water mill in the late 1920s.

BOTH PHOTOS: SHSI (IOWA CITY): NAGLER COLLECTION

tered livestock. Others had become residences or taverns, and one was a cheese factory. Nagler in the late 1920s had counted 40 that had been converted into hydroelectric generating stations, "with mute wires of copper radiating to the many small urban communities of the state—a marked contrast to the visible and noisy activity of the pioneer mills." But most lay abandoned and decaying, their millstones and turbines buried in the mud of the adjacent creek.

Hartwick Mill, one of Iowa's earliest, was built on the Maquoketa River in 1836 and dynamited nearly a century later when the Delhi dam was built. Floyd Nagler described the scene: "The inertia of the heavy stone walls was so great that they remained erect for the camera a fraction of a second after their foundations had been ruptured by the blast." In the bottom image, the mill lies in ruins.

Today a mere handful of these picturesque relics still function as mills or stand transformed into modern shops or businesses, residences or museums. The vast majority remain only in memory, as Nagler nostalgically recounted in his paper, "The Passing of the Old Water Mills In Iowa": "Childhood memories bring back with a dusty haze and a musty odor, that tingling sensation of awe and delight which always accompanied a visit to the old water mill. What a slapping and swishing of belts, a grinding and roaring of gears, and an ominous swish and gurgle beneath! The smell, the slippery chaff on the floor, the powdery smoothness of each board and handle, and most of all, the hatted and overalled dusty miller, stamped 'the mill' as an unforgettable impression."

Nagler continued, "Slowly but surely, since 1880, these old water mills have been disappearing, eventually leaving only scant traces of their former existence in a few logs held firmly underneath a pile of boulders in a stream bed or an abandoned stone wall on the river bank. . . . These old mills have taken with them in their decline some of the poetry and romance of the pioneer life in Iowa."

Even had Iowa maintained its hold over wheat agriculture and the milling industry, the days of water-powered mills were limited. The settlement-era mills were aging, and repairing or rebuilding a mill was impractical, especially in a state where water power had always posed serious limitations: the flat terrain limited the potential for water power, and the flow of water was too erratic; mills were subject to closure when water was either too high or low. Thus deteriorating mills were usually abandoned.

Those mills that had withstood the passage of time were gradually converted to other power sources. This trend actually had commenced with Iowa's first settlements: some of Iowa's earliest millers had supplemented water power with steam so that the whims of Iowa's streams did not interrupt their service, and the use of steam power became more common through the 19th century. Toward the end of the century, both water and steam power were being replaced by electricity in Iowa's continually declining numbers of mills.

The importance of water as a power source made a brief comeback in Iowa in the early 20th century—not as a means of powering mills, but rather through powering hydroelectric plants. Not until the 1890s did electricity commonly present itself as a replacement for locally produced water or steam power. However, once this new power was available, the lust for electricity to light cities and move electric street cars grew rapidly. The nation's first successful hydro-

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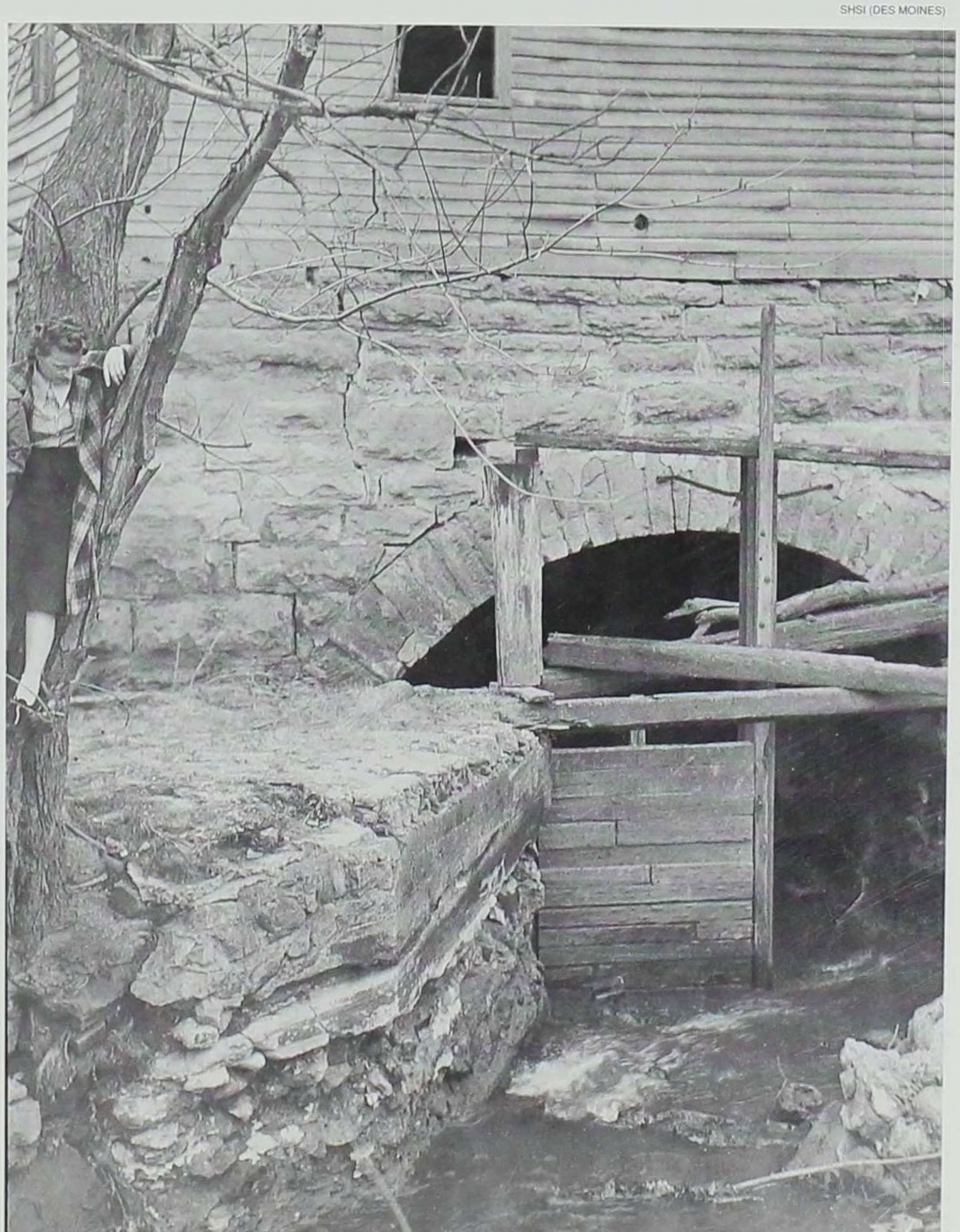
Above: Union Mill in Hardin County stands in ruins. Below: A woman climbs a tree for a close look at the sluiceway, where waters from the English River flowed through the Wassonville Mill near Wellman. The mill was slated to be torn down for a jog in a state highway in 1939.

SHSI (DES MOINES)



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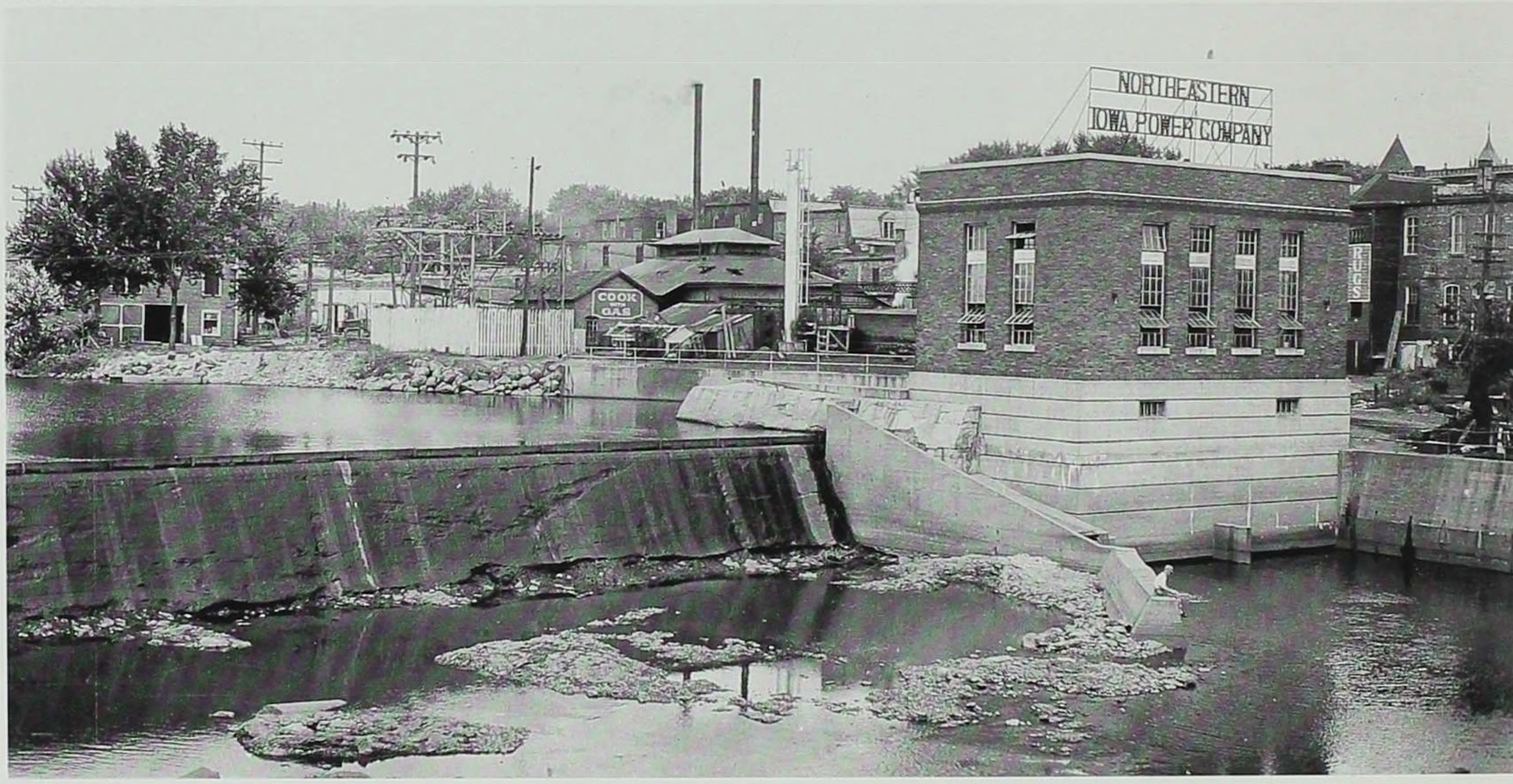

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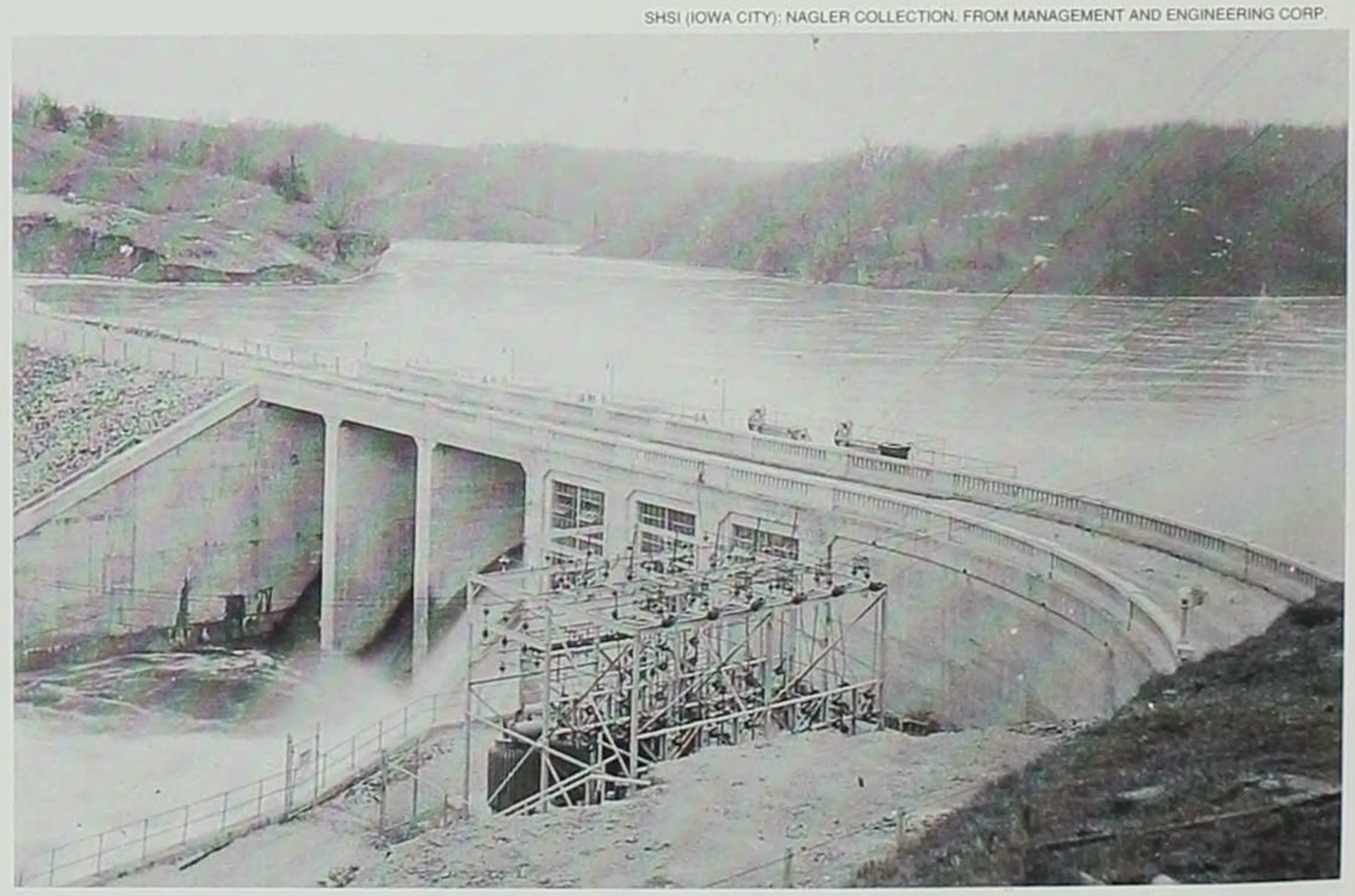

The hydroelectric plant at Independence was built across the stream from the flour mill and produced twice the horsepower, according to Floyd Nagler in the late 1920s. Right: Two old mill sites were submerged when the Maquoketa River was dammed at Delhi in 1927, producing ten times their power and a recreational lake.

electric plant was constructed at Niagara Falls in 1895, and soon hydroelectric plants were being constructed throughout the Midwest.

Many of Iowa's old mill sites were converted to small hydroelectric plants in the early 1900s; these were run by local companies, which channeled the power primarily to local industries. By 1910, Iowa boasted 28 hydroelectric sites, and in 1920, two-thirds of the state's electric power flowed from hydroelectric plants. The number of such plants increased to 48 in 1927, and to 49 in 1950. However, these sites had peaked in their contribution to the state's electricity budget in the 1920s, when Floyd Nagler was so avidly promoting hydroelectric power. The state's streams were not capable of being tapped for any more power, and the amount they were already producing simply could not keep up with the climbing demands for electricity. In contrast, large coal-fired steam electric plants were soaring in their relative power production. They were rivaled only by the Keokuk power plant on the Mississippi River, which, when built in 1913, was the largest single water-power development in the world; most of its power, however, was exported to other states.

Mimicking the trend in milling, the newer plants were large and centrally located, reflecting an economy of scale. Thus the smaller, locally operated hydroelectric plants shut down as their equipment wore out; the amount of power they produced did not justify the cost of maintaining their structures. Today, only six hydroelectric plants remain in Iowa: Union Electric Plant at Keokuk and five small plants on inland streams. Water power has thus followed water-powered mills in the lineup of Iowa's forsaken technologies. ❖

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NOTE ON SOURCES

Major sources on the milling industry in Iowa include Jacob A. Swisher's *Iowa, Land of Many Mills* (Iowa City: State Historical Society of Iowa, 1940) and an unpublished manuscript written in the late 1920s or early 1930s by Floyd Nagler, "The Passing of the Old Water Mills in Iowa," on file at both the Iowa Institute of Hydraulic Research and the State Historical Society, Iowa City. Carl A. Merry's 1988 technical report, *Phase II Investigations at 13WH228, The Kendallville Mill, Winneshiek County, Iowa: Iowa Department of Transportation Project Completion Report, Vol. 11, No. 120* (Iowa City: Office of the State Archaeologist, 1988) provided helpful information. Archives at the State Historical Society (Iowa City) and the Iowa Institute of Hydraulic Research were also consulted. Copies of Oliver Evans's 1795 book, *The Young Mill-wright and Miller's Guide,* are at the University of Iowa Main Library (microfiche) and the State Historical Society in Iowa City (reprint). Cornelia F. Mutel's "The Historic Role of Iowa's Trees," in *Famous and Historical Trees of Iowa* (Des Moines: Iowa Department of Natural Resources, 1966) presents a synthesis of the lumbering industry and the history of sawmills in Iowa. Additional references are cited therein, while statistics on the importance of that industry are in Floyd B. Haworth's "The Economic Development of the Woodworking Industry in Iowa," *Iowa Studies in Business* XIII (1933), pp. 35-36. The Iowa Conservation Commission's and Iowa State University's 1979 publication, *Iowa's Low-Head Dams, Their Past, Present, and Future Roles* (ISU-ERI-AMES 79225, ISWRRI #96 Special Report, published by the Iowa Conservation Commission in Des Moines), gives an excellent summary of the history of hydroelectric power in the state. Leslie C. Swanson's booklet *Old Mills in the Mid-West* (1963, rev. 1985; published by Leslie Swanson, Box 334-M, Moline, IL, 61265) is recommended as a guide to mills remaining in Iowa and nearby; however, the booklet was not used as a source for this paper. Annotations to the original manuscript of this article are held in the *Iowa Heritage Illustrated* production files (SHSI-Iowa City).

The site of Fredericka Mill in Bremer County on the Wapsipinicon became an idyllic spot popular for fishing. Such picturesque photos of abandoned mill sites belie the dusty, noisy activity of the mills decades earlier, when they were essential to settlers' survival and local economics.

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