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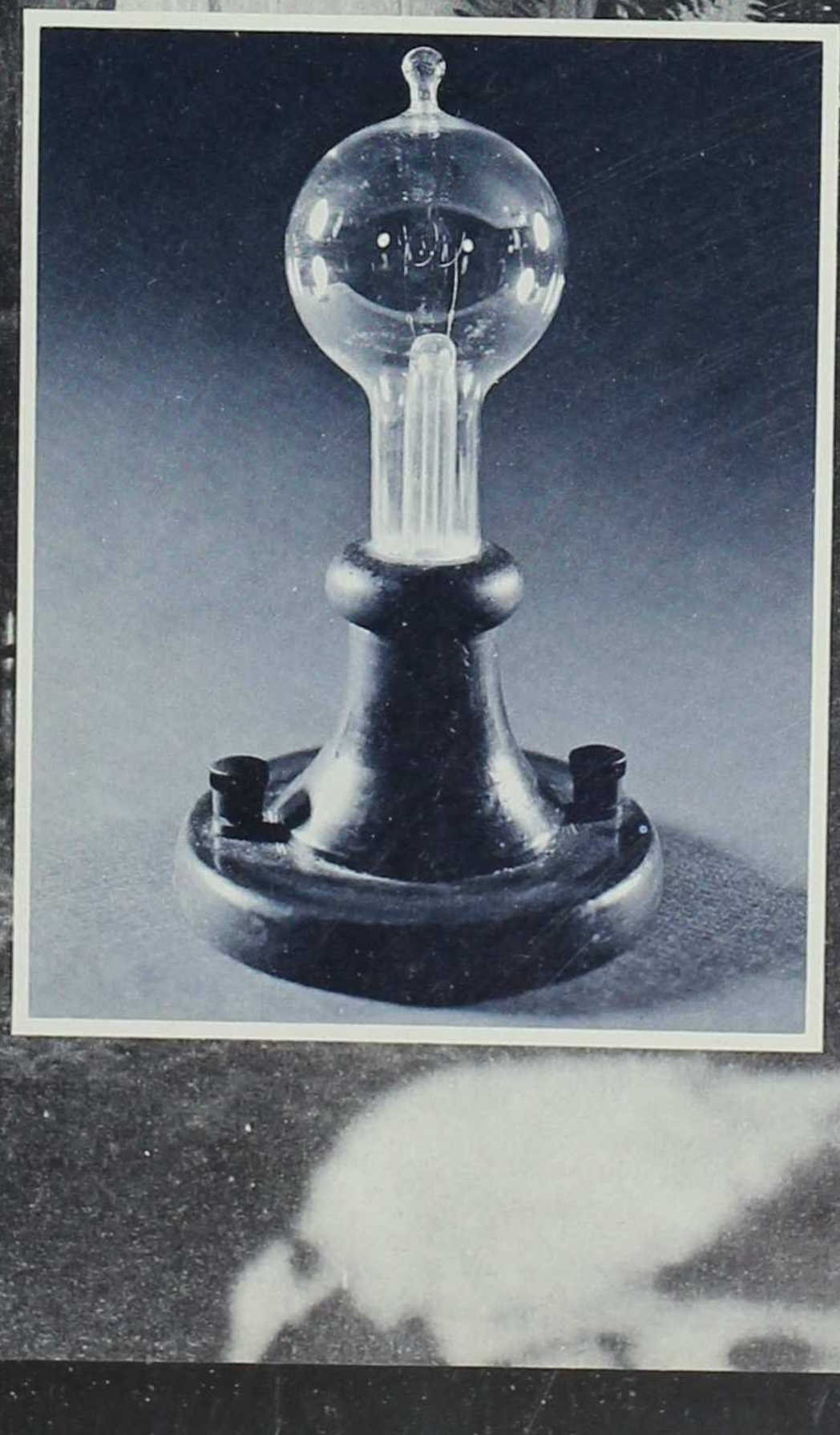

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The PALIMPSEST

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Peter T. Harstad, Director

VOLUME 60 NUMBER 5 SEPTEMBER/OCTOBER 1979

Charles Phillips, Editor

CONTENTS

Cover: *Thomas Alva Edison invented the electric light bulb 100 years ago and changed the world. In this special issue of* The Palimpsest *we examine the history of the industry engendered in Iowa by his invention and the changes it wrought on traditional Iowa farm life. Here a replica of an early Edison light bulb (courtesy Division of Historical Museum and Archives) is set against the kind of interior it would illumine and help to transform. (Photo by Alan Axelrod)*

The Meaning of the Palimpsest

In early times a palimpsest was a parchment or other material from which one or more writings had been erased to give room for later records. But the erasures were not always complete, and so it became the fascinating task of scholars not only to translate the later records but also to reconstruct the original writings by deciphering the dim fragments of letters partly erased and partly covered by subsequent texts.

The history of Iowa may be likened to a palimpsest which holds the record of successive generations. To decipher these records of the past, reconstruct them, and tell the stories which they contain is the task of those who write history.

A CENTURY OF LIGHT

The Development of Iowa's Electric Utilities

by

Alan Axelrod

Early in June, 1882 the Barnum and Bailey circus brought electric lighting to Cedar Rapids. The electric arc lamp, which produced a blindingly brilliant continuous spark between two carbon rods, had come into existence five years earlier in Britain, the work of chemist Charles Brush. But because the arc lamp was expensive to operate and produced such an uncomfortably bright and hot light, it was not practical for much indoor use. It wasn't until

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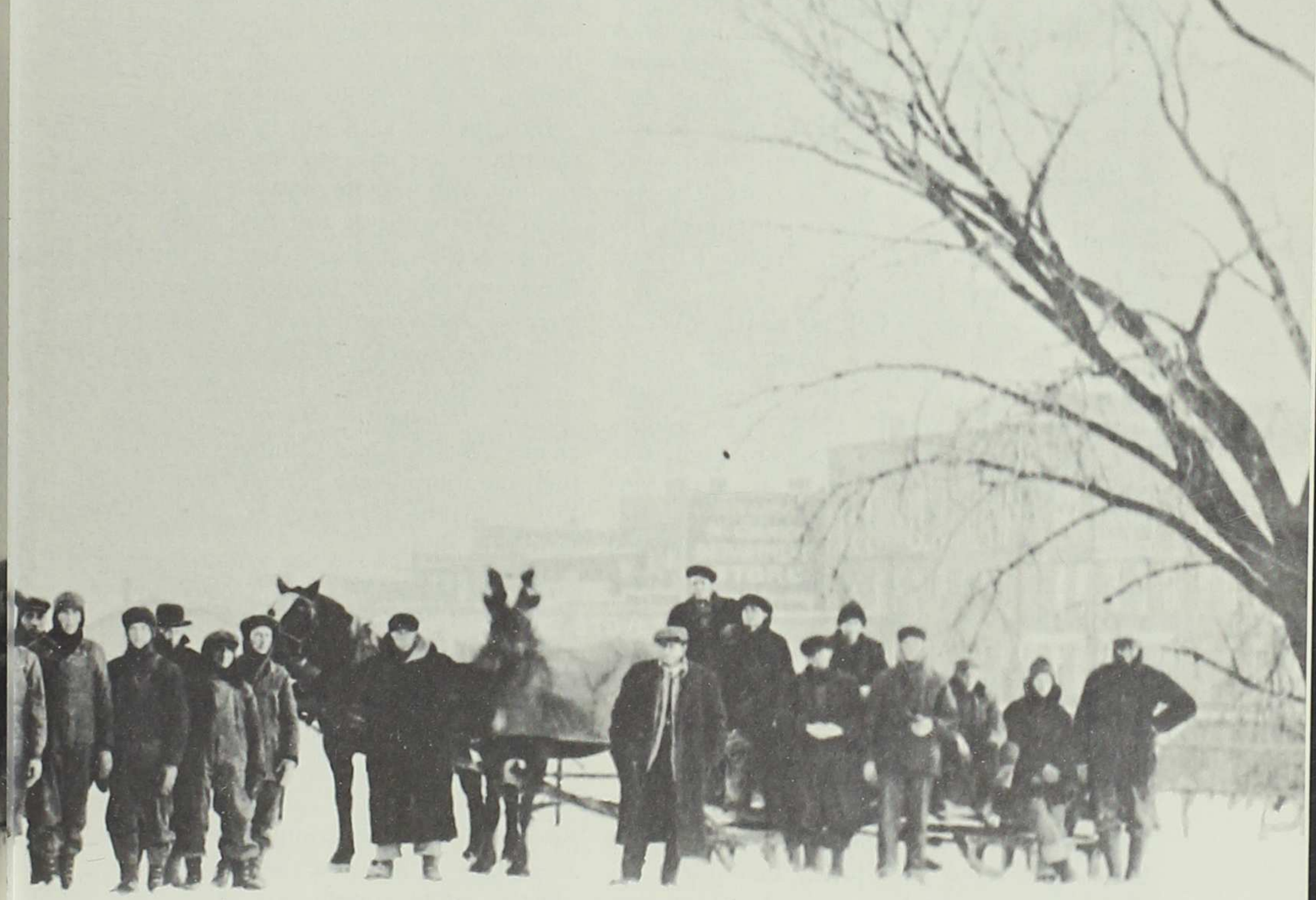

Construction crew at Manchester in 1917 (courtesy Iowa Electric Light and Power Company)

October 21, 1879, when Thomas A. Edison invented the first successful incandescent lamp — with its steady, softly-glowing filament — that electric lighting could become widespread and economical. But it was to be three months after the circus show at Cedar Rapids before Edison would actually demonstrate the practicality of electric light by putting his Pearl Street generating plant into operation lighting a tiny section of New York.

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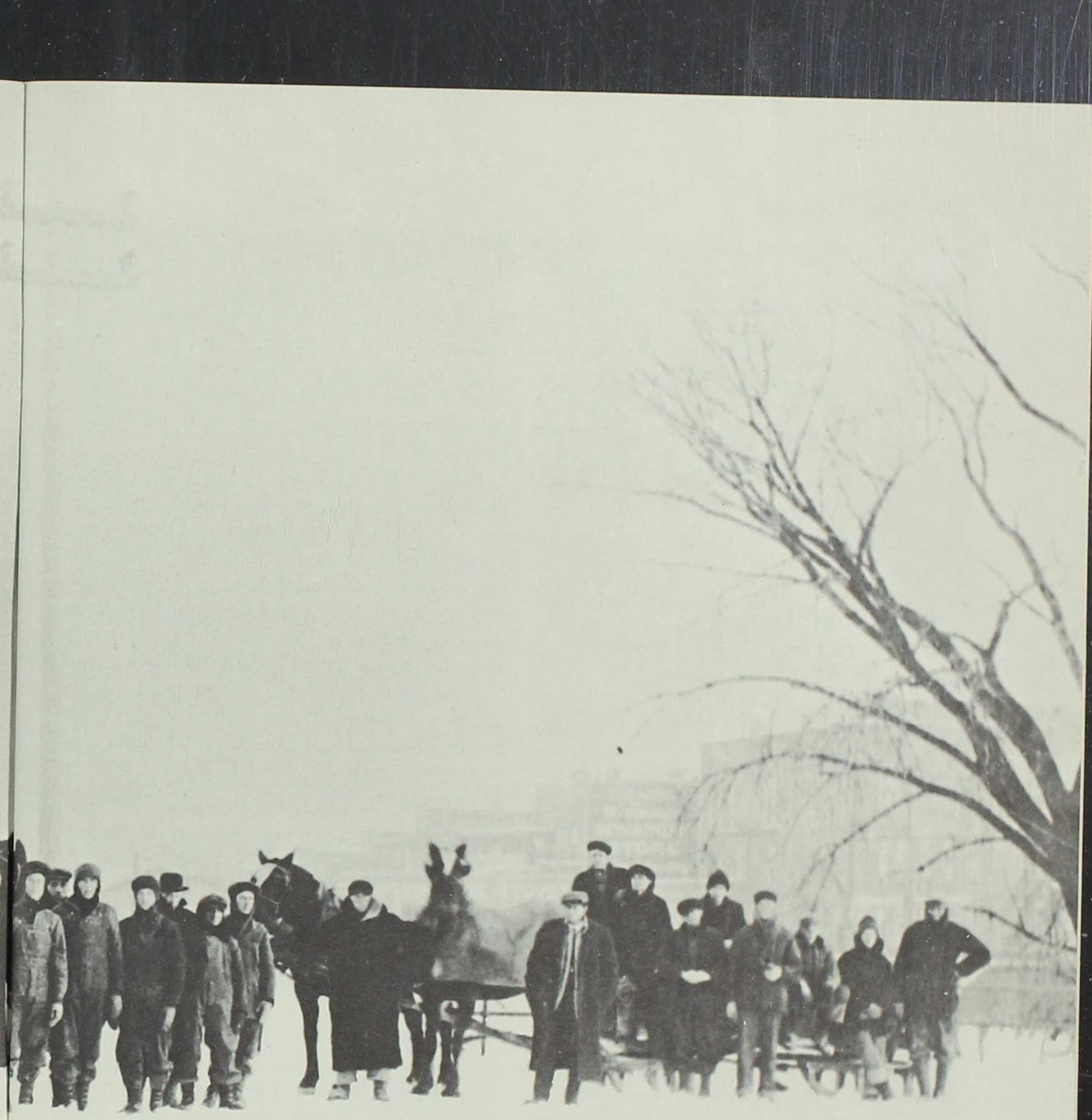


Construction crew at Manchester in 1917 (courtesy Iowa Electric Light and Power Company)

many who witnessed Barnum and Bailey's lights saw in them something more than a mere novelty. Just two months after the exhibition, on August 10, a meeting was held at the Grand Hotel. Interested citizens considered the sales pitches of two rival arc light companies proposing to illuminate the streets of Cedar Rapids. A few days after the meeting, two lamps were placed in Bilau's Drug Store, one in another shop, and a fourth in front of the opera house. By August 24, half a dozen companies were bidding on contracts to light the city. The August 31 *Cedar Rapids Times* announced the incorporation of the Cedar Rapids Electric Light and Power Company.

The new company's first big contract was to provide the lighting for a "Boat Club Entertainment" held early in September. Although the oil-burning generator gave out for a time, the "Entertainment" was successful enough to net the Boat Club $250. And it apparently netted the Light and Power Company another contract. The "Encampment and Prize Drill of Iowa Commanderies of Knights Templar" took place a few days after the Boat Club's festivities. Arc lamps were suspended from windmill towers constructed on the fair grounds. They gave so much light that some people sat up all night claiming it was "as light as noonday." The *Cedar Rapids Times*, somewhat less impressed, observed only that "electric light . . . was a bad give-away to ladies highly powdered and thickly enameled . . . The light gave the face a peculiar blue tint, causing the unfortunate frescoed female to look as if she were drowned dead, beyond resuscitation."

The new company did a brisk enough business lighting large rooms and storefronts, but by 1887 the Board of Directors was anxious to begin more serious operations. A power plant was built on the corner of D Avenue and Sixth capable of lighting about 2,800 incandescent lamps. Two years later, the company also secured its first contract with Cedar Rapids for lighting the city's streets — or at least a few of them — with 70 arc lamps. That first plant on Sixth Street had a generating capacity of about 75 kilowatts. Today, the Cedar Rapids Electric Light and Power Company's successor — Iowa Electric Light and Power — has a generating capacity of over a million kilowatts, with access, through various agreements with other companies, to considerably more.

But, modest as it was in the 1880s, Iowa's electric power industry had found a firm beginning. Although the Barnum and Bailey electrical sideshow was the first really dramatic demonstration of electric light in the state, the Davenport Electric Light Company had been incorporated a month earlier. And just a month after the show at Cedar Rapids, the Rock Island County Brush Electric Light Company was organized, followed in November by the Merchants Electric Light Company of Moline. Actual operations began in Rock Island in 1882, in Davenport the following year, and in Moline a year after that.

Des Moines saw its first electric lights in 1884 when the Des Moines Edison Light and Power Company converted for electric power the property of a defunct gas company it had purchased. By 1886, the Edison Company had installed 396 meters and handled a load of some 300 kilowatts in the city. In that year, too, the Iowa City Electric Light Company and the Sioux City Electric Company were organized. Sioux City citizens, incidentally, probably saw electric lights in operation some three years before Barnum and Bailey pitched its tent in Cedar Rapids. But the small generator C.W. Harvey set up to light a few streetlamps and storefronts in 1879 did not inspire Sioux City to the almost immediate action Cedar Rapids people took after they saw the circus. Sioux City Electric did not start its operations until 1886.

Dubuque's electric utilities came into being through a series of mergers in the 1880s, while Waterloo turned on the lights — a few at a time

— in 1888. Centerville, future headquarters of Iowa Southern Utilities Company, boasted 40 carbon arc streetlamps by 1890. Soon an electric street railway would be in operation there and, a little later, machinery in a nearby coal mine. Commercial establishments would begin to get lights in 1896.

Much of southeastern Iowa was getting electricity by the turn of the century, some of it from Foss Electric of Salem, the first direct current distribution system in the state. Between 1910 and 1913, a St. Louis man named Hugh L. Cooper engineered the construction of a hydroelectric dam at Keokuk. The largest power plant and dam of its time, it supplied — and continues to supply — electricity to St. Louis and the Keokuk area. Although southeastern Iowa did not enter the electrical age as precipitously as Iowa's large cities, its entrance was, when it came, spectacular.

So Iowa's electric power industry stirred into life. The company that began in Cedar Rapids would become the present-day Iowa Electric Light and Power Company, providing electrical service to 381 communities in central and eastern Iowa, the state's Great Lakes region, and a small area south of Fairfield. The plants that opened in Davenport, Rock Island, Moline, and Iowa City would develop into Iowa-Illinois Gas and Electric, serving the Quad-Cities, Iowa City, and Fort Dodge. The company that began as Des Moines Edison is now Iowa Power and Light. Its operating territory includes 189 communities in central and southwest Iowa. The Iowa Public Service Company had its origin in the early electrical efforts of Sioux City and Waterloo. It now provides electricity to 238 communities in the western and north-central portions of the state. Dubuque's utilities were acquired by a holding company incorporated under the laws of Delaware in 1925 as the Interstate Power Company. Today this utility, headquartered in Dubuque, serves 253 communities in northeast and central Iowa (as well as southern Minnesota, northwest Illinois, and a small part of South Dakota). Iowa Southern Utilities still operates out of Centerville and today serves 24 southern and southeastern counties. Union Electric Company, whose primary territory is in Missouri, took over small companies operating in and around Keokuk.

The process by which these seven present-day utilities grew from the various infant companies of late 19th-century Iowa is complex, involving not only financial and technical developments in the large cities, but the merger and consolidation of hundreds of tiny independent electric concerns in small towns. With the advent of the Great Depression and Franklin Roosevelt's New Deal programs, the rural electric cooperative movement also enters into the history of Iowa's energy industry. It is not possible here to do full justice to the complexity of the story, but we can outline its contours, pausing frequently to glimpse typical situations and scenes.

Early electric operations were relatively small businesses. In Cedar Rapids, the electric company was something of a family affair, with the Greenes, Reeds, Smiths, and the Dows family — all prominent in Iowa business and politics — taking very personal command. In the Quad-City area — then called the Tri-Cities — the Davis brothers personally built an industry. Iowa's electric utilities were born in an age when, for better or worse, even the most public of commercial concerns were dominated by the personalities of those few in charge. The often faceless corporate indentity that marks so much of big business in our own day was not yet in evidence in the Iowa electric companies around the turn of the century.

Appealing as this individualism may seem to us, the small operations were quaintly inefficient. Cedar Rapids, typical of the more electrically advanced Iowa cities, did not see 24-

hour light service system-wide until 1912. That was 30 years after the Barnum and Bailey show, and 24 years after the Cedar Rapids Electric Light and Power Company began to offer incandescent light service. Arc lighting, used in Cedar Rapids for outdoor purposes and special events since 1882 and for street lighting since 1887, had been limited to nighttime and early-evening operation. Of course, there was no reason to operate the brilliant carbon arc lamps during the day. But when the softer, more economical, and more manageable incandescent lamps made interior and residential lighting more practical, the company did attempt in 1888 to institute 24-hour service. After two months operating in the red, the Sixth Street generating plant was closed during the day.

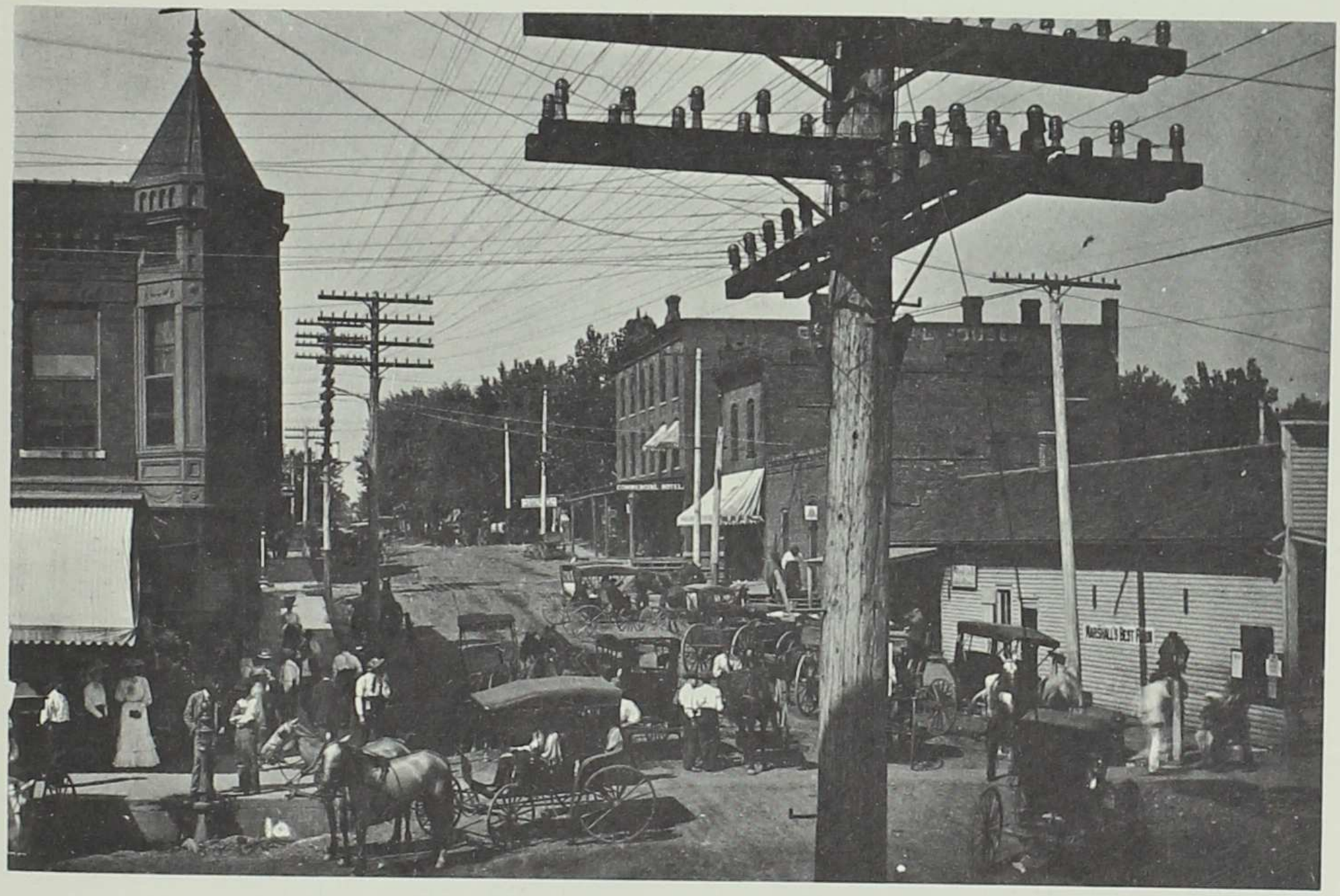
In those early days, two rival systems competed for the electric power market. Thomas Edison's companies offered generating equipment for direct current — the kind of electric energy we get today from ordinary batteries. George Westinghouse had invented and was promoting an alternating current system. Unlike the simpler DC system, which sends out a steady stream of electric current, AC delivers power in cyclic pulses. The Edison system had the advantage of its simplicity and — because a practical AC motor was not available in the 1880s — was the only system that could be used both to light electric lamps and to drive motors. Its major shortcoming, however, was its very limited range. Whereas alternating current could be transmitted over great distances, direct current could not. In the end, of course, AC would win out — today we all use AC — and the Cedar Rapids company had the foresight, as early as 1887, to choose the Westinghouse system equipment. This meant, however, that "power service" — supplying current to run electric motors — would be unavailable until 1891, when the company installed a 550-volt DC generator to supplement its AC lighting equipment. Capable now of offering power service as well as light, the company reinstated 24-hour operations — but only to run motors. Machine shops and factories, after all, operated during the daytime and could not be expected to alter their schedules to suit the electric company. The 6,000 lights of Cedar Rapids, however, still glowed only after sundown.

The town of Perry got electric lights toward the end of 1892, but it was not until 1907 that 24-hour service began. The grateful editor of the *Perry Record* hailed the event in headlines fit for the Second Coming:

THE PRAYERS OF 10 YEARS ANSWERED.
PERRY TO HAVE ELECTRIC LIGHTS IN DAYTIME.

Similar gratitude was common across the state as towns and cities first turned on the lights and then, often after years, were able to leave them on all day.

As the *Perry Record* headline suggests, electricity was making a difference in the lives of Iowans. But many of the early changes were not as revolutionary as we might imagine. Take Perry's streetlights, for example. Before 1892, its streetlighting consisted of kerosene oil lamps on top of wooden poles. "An old gentleman," the *Record* pointed out, had formerly to make the rounds of each lamp "with a push cart in which he had such equipment as a short ladder, a can of kerosene, lamp wicks, chimney burners, cleaning rags, etc. . . . In the evening a boy rode around on a pony and lit each lamp." Larger towns, of course, had gas lamps, but even these required individual maintenance and lighting. One would think electricity changed all that. But, no, the early carbon arc lamps also required individual maintenance — the carbon contact points had to be replaced as frequently as kerosene wicks needed trimming or gas mantles required cleaning. Indeed, in some early electric streetlight systems, each lamp had to be turned on individually at sun-



The "new" skyline over Walnut Street in Columbus Junction, ca. 1910

down and shut off at dawn.

Whatever its shortcomings, however, electricity was here to stay, and the public's demands steadily increased. There is little evidence, though, that electric companies were influenced by what we would today call "pressure groups." Change was often prompted by the modest requests of a few individuals. The Cedar Rapids company used to work six days a week and rest on the seventh. Sundays the plant was shut down and, if there were no odd jobs to be done, employees might take in the pleasures of the countryside. Billy Lavell, Cedar Rapids Electric's first chief engineer, reported that one Sunday morning in the summer of 1894 he "closed the throttle on the engine and . . . almost before the engine had stopped turning over . . . headed up over the hill with visions of a pleasant picnic." Before Lavell and his crew got more than a hundred yards from the plant, they were approached by company president C.G. Greene who issued a stern order. "We will have to start up again; Mrs. B's mother is sick and Mrs. B has asked that the current be kept on the line in order that she can use the electric fan." Lavell returned to work, despite the fact that the woman's fan did not draw enough current to net the company more than 1¢ an hour. From that day on, Cedar Rapids has had electricity seven days a week.

Today an electric utility might have to make special decisions about accommodating some new, substantially large customer — a major factory, say — but in 1906 even the smallest increase in customer demand required execu-

An early work crew (courtesy Iowa Electric Light and Power Company)

tive decisions. Electric lights were installed in Marion in 1894, and the next year the Marion Light, Heat and Power Company, F.H. Hodges, president, was incorporated. The minutes of the Board of Directors meeting on August 29, 1906 record a debate about the advisability of permitting Mr. Hodges's wife to use an electric iron. Drawing considerably more current than a light bulb, the iron threatened to overload the system. But, after much discussion, Mrs. Hodges's request was granted. The electric iron, the first household electric appliance to come into general use, did in fact create something of a crisis for a number of small generating operations. Dr. F.S. Schadel, president of the Red Oak Electric Company, was forced to impose a strict schedule upon his customers. One half of Red Oak was told to iron on Tuesday only; the other half, on Wednesday.

Almost as feeble was the electric service in Marshalltown around 1892. Located on First Street between Main and Church, the tiny plant was owned by General Electric. It must have been a half-hearted operation, with little more than 300 customers who complained that their lights were dull and red. So inefficient, gloomy, and depressing was this light that most of Marshalltown's 10,000 citizens preferred gas illumination, even with all of its inconveniences and dangers. Improvements were made, however, when the Marshalltown Light, Power and Railway Company took over operations, and, in 1907, the town's outmoded

and inadequate generating facilities were brought up to the state of the art with one of the first — perhaps *the* first — steam turbines installed in the Midwest.

For the less-than-satisfactory service Marshalltown customers received in 1892, they paid 20¢ per kilowatt hour — considerably more than double today's rate. Some Iowa companies charged as much as 25¢ per kilowatt hour, and metering the cost of electric service in the early days was more ingenious than sophisticated. Many firms used a chemical "meter" employing an electroplating device calculated to transfer one gram of zinc from the positive to the negative plate of the meter for each 16-candle-power lamp that burned 1,698 hours. The meter reader, during his monthly rounds, removed the negative plate from the device, and took it back to the company's office to be weighed. The customer's bill was figured accordingly. Occasionally customers suspected and even accused the power companies of cheating, just as they occasionally accused and sometimes caught the local butcher placing his thumb on the scale. But the total weight involved was so minute that customers — only half in jest — complained the utility company added 50¢ to the monthly bill by allowing a fly to land on one side of the balance. Many early companies found chemical metering so cumbersome that they charged simply by the number of lamps the customer used. This was no bargain either, since the power company at Toledo assessed charges at 60¢ per month per lamp in 1897. When the Des Moines Edison Company adopted the more efficient magnetic meters around 1895 (which operated on a principle similar to today's recording watt meters), it was able to offer customers a more reasonable 15¢-per-kilowatt-hour rate.

Larger cities and towns usually built plants expressly for the purpose of generating electricity — or, at least, they converted older utility buildings, such as gas and waterworks, which lent themselves readily to the installation of generating equipment. But even the smaller towns wanted electric service and, lacking adequate finance or population to warrant the construction of new plants, seized whatever building happened to be available. Keystone converted a blacksmith shop and generated electricity in it for 20 years. Van Horne set up a generator in a creamery, and Springville commandeered a poultry packing plant. Spurred on by local chambers of commerce, citizens in a number of very small towns wired their homes and businesses even before plants and transmission lines had been built.

Although larger cities often designed plants specifically for the production of electricity, working conditions in them were at best informal, even makeshift, and — too often — dangerous. Des Moines Edison employed 16 persons in 1887. A manager and one bookkeeper minded the office. Two linemen and two installers worked the field while everyone else kept the boilers going in the powerhouse. Firemen stoked their fires 12 hours a day, seven days a week, for $1.25 a day. Nor was the buck-and-a-quarter always paid in cash. A worker might be forced to accept orders on grocers or clothiers who owed the company back payment on past-due electric bills.

By 1918 the Des Moines power plant operation had grown — almost, it seems, without design — into a collection of diverse machinery. There were two 400-kilowatt General Electric turbine generators and two more DC units powered by Corliss steam engines. The plant's 19 coal-fired boilers consumed nine carloads of coal every 24 hours. In addition to this equipment, an 800-ampere generator run by water power at the west end of the Center Street dam was operated by the dam's janitor. More or less makeshift, too, was the distribution of power to the city. Customers from west 18th Street to east 9th plugged into direct current, while those beyond 10th got AC. This meant that motors used on one side of Des

Moines were useless on the other side. Working conditions at the plant had been improved, however. Employees still labored a seven-day week, but for only eight hours each day.

By the 1920s, power plants in the state's larger cities were becoming awesome places. Harry Billings, who retired recently from Iowa Electric after some 40 years of service, recalls what it was like working with the electric boys in Cedar Rapids. He was a teenager then, having just joined the company as a meter reader. The men in the meter shop sent him about 2:30 one afternoon to the grocery store with an order for two pints of milk and a dozen bismarcks. But, somehow, halfway to the store, young Harry got the orders mixed up and had to return to the shop. The men repeated their requests, but this time one of them told him to stop at the powerhouse on his way back to "get the ohm sifter."

"Well," Mr. Billings explains when he tells the story today, "an ohm sifter is like a left-handed monkey wrench — it don't exist."

I went to the store about a block away and got the two pints of milk and the bismarcks, and they put it in a peck sack. Well, the milk bottles sweat. I went over to the powerhouse, and they didn't know me from Adam, and I'd never seen the inside of the powerhouse. . . . I went up to someone on the operating floor and said, "I'm from across the tracks and I want to get the ohm sifter."

"Oh, yeah! You see that guy in the engine room" — powerhouse is about a block long — "you see that guy down there? I think he's got it."

I went down there. By God, he said:

"You ever been down here before?"

"No."

"See that stairway going down there?"

It was down in the ash pit. Conveyors going by. Ashes. You couldn't see a thing. He got me down in there. Scared to death of the noise. I was over there until — well — about four o'clock. And the milk bottles had soaked through and fell out of the sack with the bismarcks. And I came back, dirty — but I'd seen the powerhouse, by God, I'll tell you. Conducted tour all by myself.

A newcomer to the electric company must have felt like a tenderfoot in the Old West, bewildered and subject to the same kind of hazing. And if the business of making electric energy was in fact a kind of frontier during the early part of the century, it was also governed by some of the same rough-and-ready rules that made up the code of the cowboy. Anyway, the humor it spawned was suited to the Old Frontier, as Harry Billings demonstrated when he paid back the meter shop gang for his wild-goose chase to the powerhouse:

I've always experimented with blasting. . . . I filled one-amp fuses with black powder and put the fuses in all their test equipment. I even filled 60-amp fuses — and that's as big as a shotgun shell. The first blast was down at the end of the test bench and there was a lot of smoke. And the next tester — he was gonna test — and bang! Well, the grand climax came when that 60-amp — it blew that switch box all to hell. One piece of that fuse's brass end went through sheet rock — a sheet rock partition. If I'd known it was gonna do that . . . Well, about a month later I admitted I did it.

The utilities, of course, do not do all of their work at the power plant. From the beginning, operations involved a lot of field duty as well. For this the companies acquired an often motley collection of vehicles for their meter readers, linemen, installers, and traveling engineers. Sioux City Gas and Electric spent $40 in 1910 to buy a bicycle for their "complaint man" who serviced streetlamps in downtown Sioux City. One hundred-eighty dollars more bought the company a motorcycle for the chief engineer and the shop foreman. Des Moines meter readers traveled to industrial customers in a Model-T roadster in 1918. The men who were unfortunate enough to have to install residential meters tied three or four on their backs and walked — or if the company saw fit — rode streetcars. In the 1920s, Harry Billings made his meter-reading rounds on a bike. Back in Des Moines in 1918, engineers and inspectors used Model-T's (or streetcars), while linemen had a small fleet to choose from, including a 1912 Buick, a 1912 Locomobile, a 1912 Dart one-ton truck, and — interestingly enough — two electric trucks.

Cedar Rapids Electric also used an electric truck, as far back as 1910. It replaced a horse named Pete, who served not only as a dray horse but also as a perennial fixture of Labor Day and carnival parades. The electric company in Des Moines retained its horse and wagon for the "pole gang" — the men responsible for erecting power poles — until 1921 when the company acquired another truck. Veteran Iowa Power and Light Company employee Oscar F. Swanson remarked that the transition from horse and wagon to truck nearly incited a strike. The pole gang complained that the new vehicle got them to the job "too quick."

Harry Billings sums up the early years not only of his company, but of the electric utility industry in general: "The first 25 years they operated disorganized — not because they weren't intelligent, but because they had so many things to confront them that they didn't know exactly what the hell to do." In the 1930s, Iowa Electric traveling engineer John "Pa" May recollected "some great experiences" trying to give what was called "good service" at the Boone Electric Railway and Light Company in 1894. Once the plant had to be shut down because a fireman closed the valve in a pipe that fed water into the boiler, bursting the boiler's air chamber. May sent a man to Des Moines to get a new air chamber made of brass. After 24 hours, service was restored. "We patted ourselves on the back for having done such a good, quick job," May reminisced. "Had we known our business, the break could have been repaired in a few minutes by simply screwing a two-inch plug into the air chamber connection."

Too often, however, the industry's growing pains were more than merely inconvenient. About 1889, for example, the Davis brothers in the Tri-City area were experimenting with hydroelectric power. At their Moline plant a number of devices were tried for transmitting the power from waterwheels to the dynamos. Because the Davises were among the very first to attempt to harness water power for the production of electricity, they had no practical experience to draw upon. They tried to connect the waterwheel and the dynamos with shafts and gears. When these failed, they used a long rope. Although this finally proved successful, in one trial it pulled out the entire side of the building, nearly destroying the plant.

Nor were the Moline powerhouse's problems over. Probably because no one had calculated the large amount of current needed to get Moline's new electric streetcars up the 15th Street hill, an unexpected overload caused a spark to jump a gap between contacts on an old wooden switch panel. The spark ignited the panel, fire spread rapidly, and, on September 26, 1892, the electric station at 4th Street in Moline burned to the ground.

No one was hurt in the Moline fire, but, two years later, the Perry Electric Light, Heat and Power Company was not so fortunate. The Perry plant had been in trouble from the day it opened in 1892. Zealous citizens rushed into the power business without much know-how — even about fixing rate schedules — so that there never seemed to be enough money in the bank to finance extension of service or even much-needed routine maintenance. The plant's boiler was in particularly bad repair.

It was the custom of the company to supply hot water from the boiler to anyone who came by with a bucket. Townspeople quickly got into the habit, and on one July day their demand for the free hot water was particularly great. In the course of the day the water level in the boiler dropped to a dangerously low level. When Perry turned on its lights that evening the boiler exploded, destroying the plant and killing H.C. Hock, one of the company's owners. The explosion nearly destroyed the company financially, too, and it was only with tremendous effort that Gus Hindret, Hock's partner,

"Cedar Rapids also used an electric truck as far back as 1910. It replaced . . .

managed to gather the funds to refinance his operation.

Big city companies were not immune to dangerous practices either. Harry Billings recalls that, in the 1920s, Iowa Electric in Cedar Rapids "didn't know how many guys was killed, but I wouldn't say they didn't care. We was losing about three a year. Electrocuted." As late as 1930, linemen worked on live 33,000 volt long-distance rural transmission lines. "We didn't have any rubber gloves," Mr. Billings reports, "but the boys working in town, they'd be working on 2,400 volts. On a sultry day they'd bitch" because they could feel the current tingling through the wooden sticks used to handle the hot lines.

Common safety practices were not standard. Mr. Billings remembers the day he saw his friend Leonard Johnson electrocuted when he tried to clean cobwebs out of a fuse connection on a pole transformer. It was a most common — but apparently not universal — practice to connect the hot wire to the top fuse connection and the ground wire to the bottom. One was generally safe as long as one stayed clear of that top terminal. "Fuse blew out," Mr. Billings begins the grim story, and Johnson

> pulled it down and he proceeded to dig the cobwebs out at the bottom. He never looked. It was his fault, too. He never looked that the high-voltage primary came in at the bottom. He reaches in there while he's standing on the transformer. He reached in with his fingers. Phhht. That was it. . . . We couldn't do anything.

But if those early days were a time of trial and error, they were also a period of trial and re-

. . . a horse named Pete, who served not only as a dray horse, but also as a perennial fixture of Labor Day and carnival parades." (Photos courtesy Iowa Electric Light and Power Company)

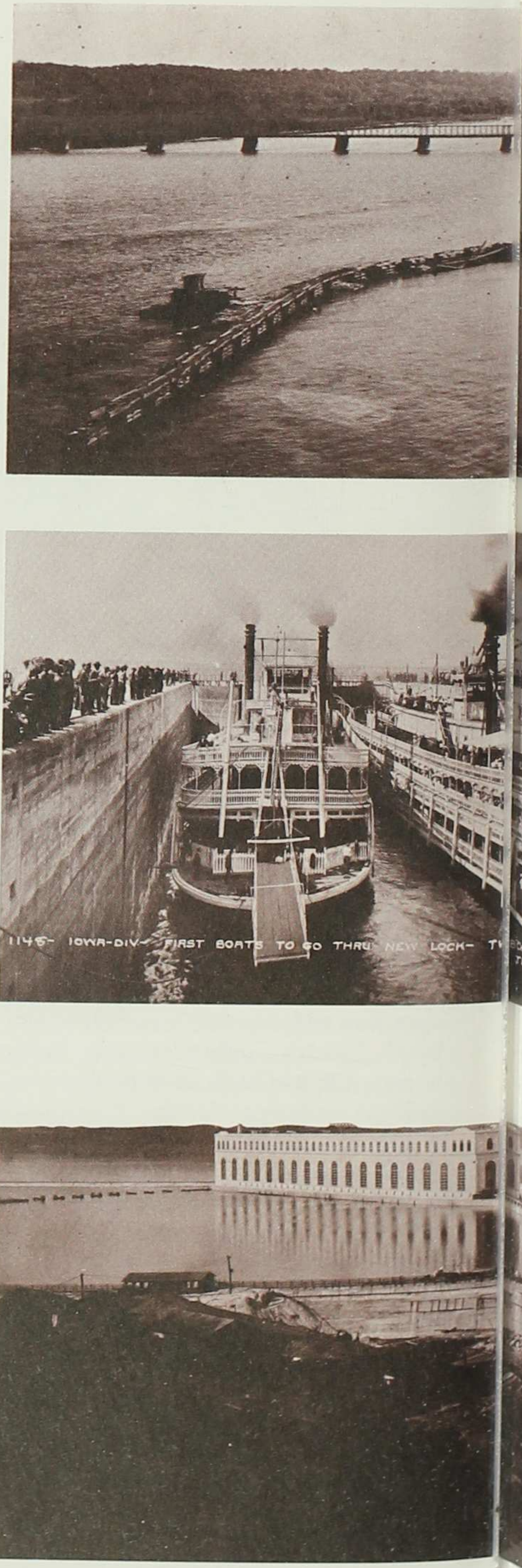
markable success. The three companies founded in 1882 in the Tri-Cities had gone into operation with amazing speed. The Rock Island Brush Electric Light Company built eleven towers, 125 feet high, each equipped with two brilliant arc lamps. For this almost instantaneous mass streetlighting the city paid $365 per year per light. Just two years after it was founded, Merchant's Electric Light Company of Moline installed one of the largest generators in the nation. Developing 600 volts, the machine — set up in an old waterworks building — could light 50 arc lamps. Davenport's power capacity one year after the founding of the Davenport Electric Light Company was 20 lights drawing current from a generator in a former gasworks. Two years later, in 1885, the city council resolved to light Davenport with 35 tower lights and 45 additional lamps at street intersections. Later in the decade, Davenport became the first of the Tri-Cities to install rotary convertors for changing direct current into alternating current, joining Cedar Rapids and other electrically farsighted communities across the nation in adopting George Westinghouse's improvement over Thomas Edison's simple direct current system.

In the 1920s, electric utilities began to develop what they called "super power" by interconnecting and pooling the generating resources of several plants in various locations. Today these systems of interconnections are highly sophisticated, linking the state in what the utilities call the "Iowa grid" and the grid to

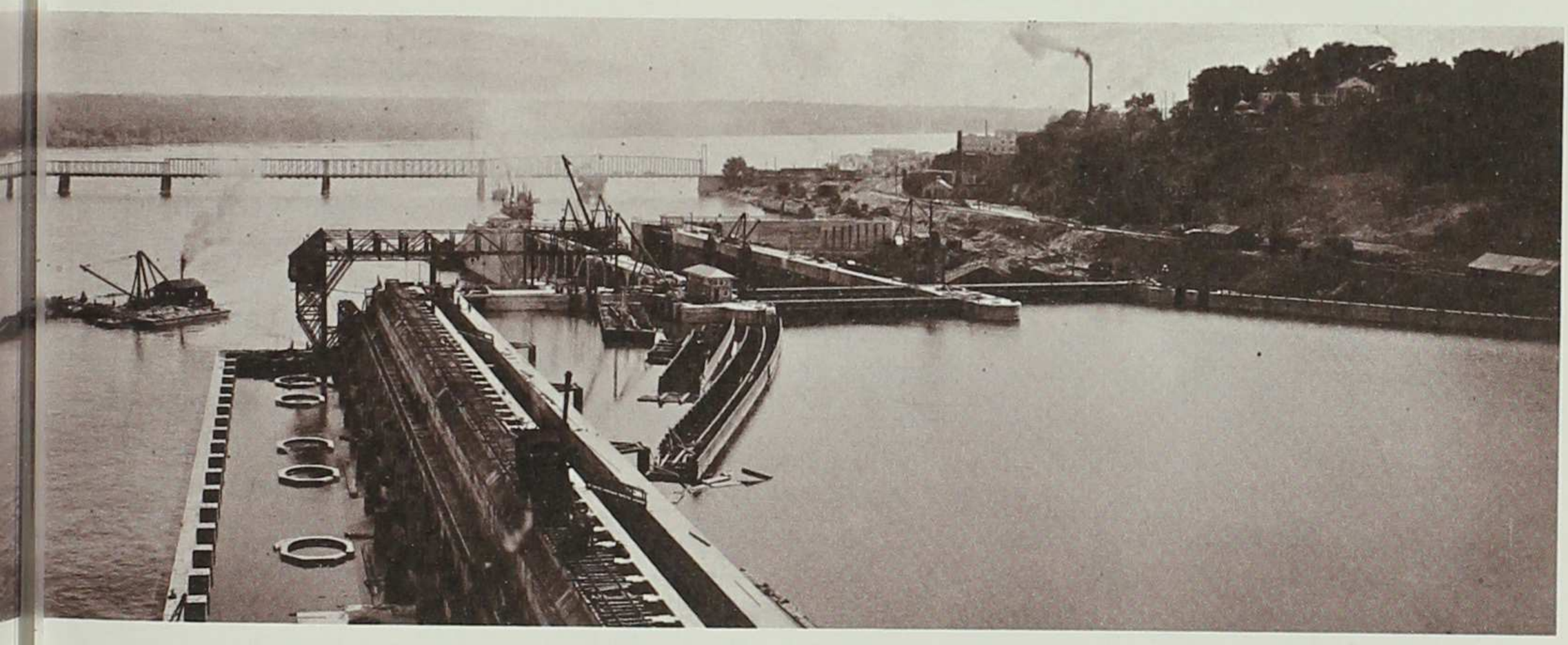
regional, national — even international — power pools. The Davis brothers, as early as the 1890s, extended lines between their plants in the Tri-Cities and interchanged power. Peoples Light Company of Davenport, incorporated by the brothers in 1888, was connected to the Moline power station by a 2,000-volt transmission line, one of the first high-voltage "long distance" lines in the nation.

Des Moines, too, was precocious in much of its early electrical progress. When the skies above the streets of many American cities were literally blackened by masses of overhead wires, Des Moines Edison began burying cable underground. Des Moines also presents a good picture of the rapid progress of the power industry's early years. The city was originally served by three rival companies. In 1892, Des Moines Water Power and Electric Company was the largest, with two 40-kilowatt dynamos and three more rated according to the number of incandescent lights they could power — 2,000, and two 1,200-light machines. The company's six arc light generators had a capacity of 80 carbon arc lamps each. At the same time, the Capital City Electric Company owned three Westinghouse generators capable of lighting 500 lamps each, one Thomson-Houston 600-light dynamo, seven arc machines with a combined capacity of 130 arc lamps, and a 100-horsepower generator to power electric motors. Des Moines Edison, the third company, eventually bought out the other two and, after a series of further mergers, became Iowa Power and Light Company. It had four 800-incandescent light dynamos and two more rated at 400 lights each in 1892. Des Moines at the time had a population of about 70,000, while the combined resources of the three power companies were capable of lighting about 10,500 incandescent lamps and 750 arc lights at a cost of 24¢ per kilowatt hour — about three times today's average cost.

Facilities were expanded before the end of the century, Des Moines Edison having added



Keokuk Dam, 1913

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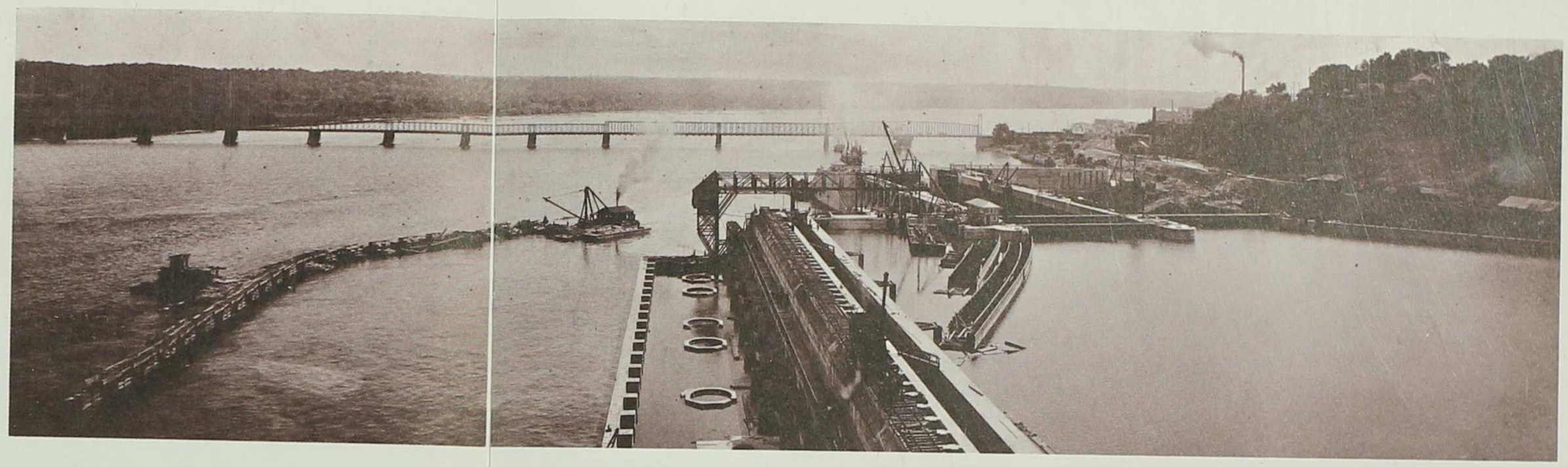
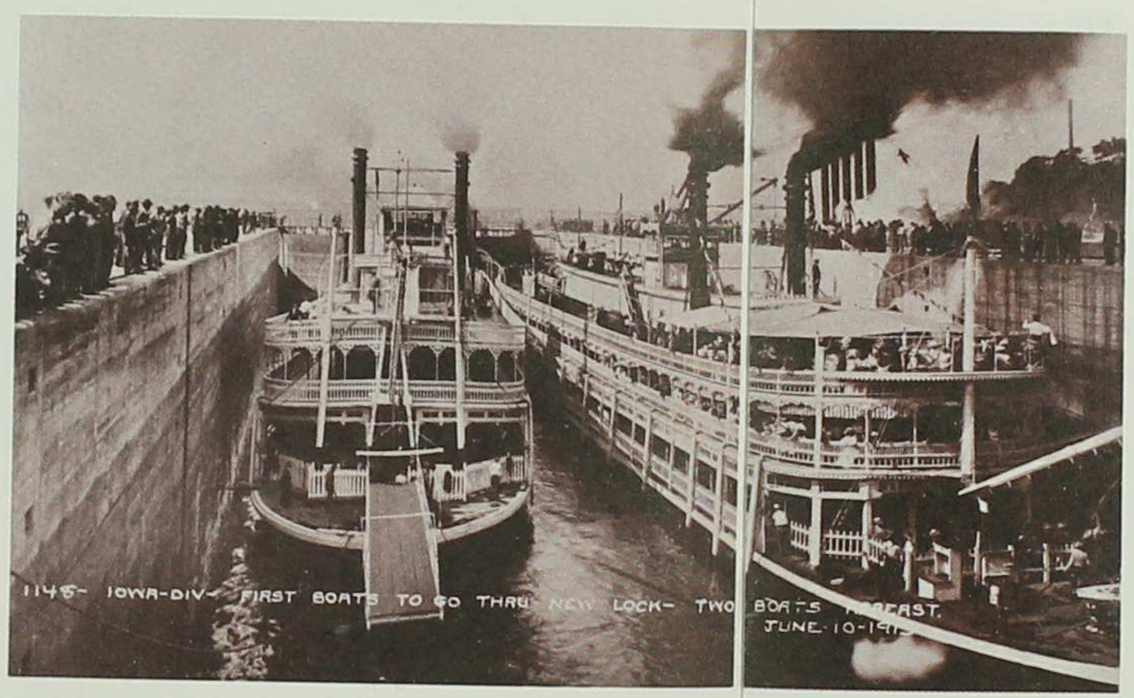
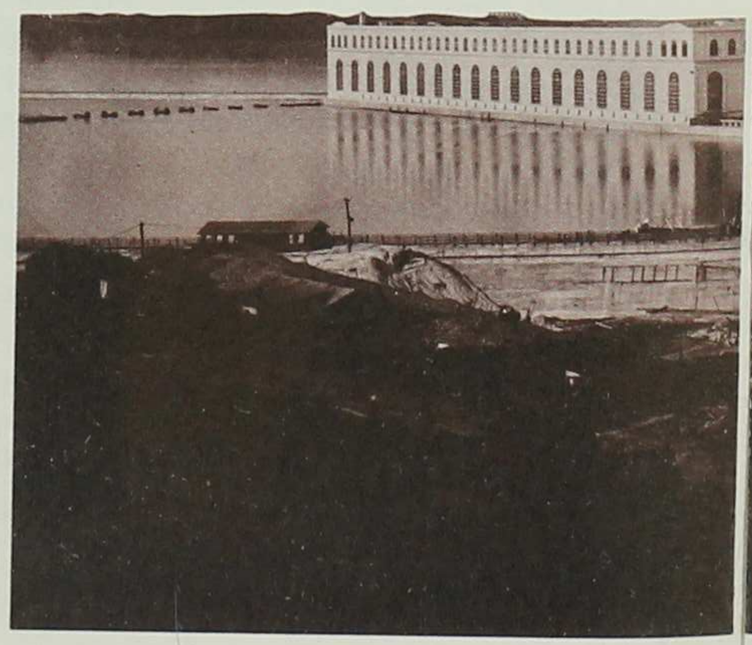






Keokuk Dam, 1913

two 350-kilowatt, one 400-kilowatt, and one 1,000-kilowatt generators by 1900. During 1909-10, Des Moines Electric, the Edison company's successor, planned to install a 2,000-kilowatt turbine, but Des Moines' demand for electricity almost immediately overtook these plans. One year after it was installed, the 2,000-kilowatt generator had to be replaced by a 4,000-kilowatt machine. Another 4,000-kilowatt machine followed in 1915, and yet another in 1918, with a 10,000-kilowatt generator being added to these in 1921.

Meanwhile, early progress in the southeastern part of the state was marked by at least one prodigious achievement. Although Hugh L. Cooper began work on the Keokuk dam in 1910, its history might be traced back to a young West Point graduate's survey of the Des Moines Rapids section of the Mississippi. In 1836 Robert E. Lee — years later general of the Confederate armies — called this area's waterpower potential to the attention of the United States War Department. The citizens of Keokuk, also recognizing its potential, built a dam to power textile and grain mills in 1848. Cooper's hydroelectric project was completed in 1913. The dam is seven-eighths of a mile long and the power plant building stands some ten stories above the upper water level of the river. It was the biggest power plant and dam in the world when it was completed and energized the longest and highest-voltage power line, carrying power to St. Louis. Union Electric bought the property in 1925 and today it produces approximately 135,000 kilowatts of power.

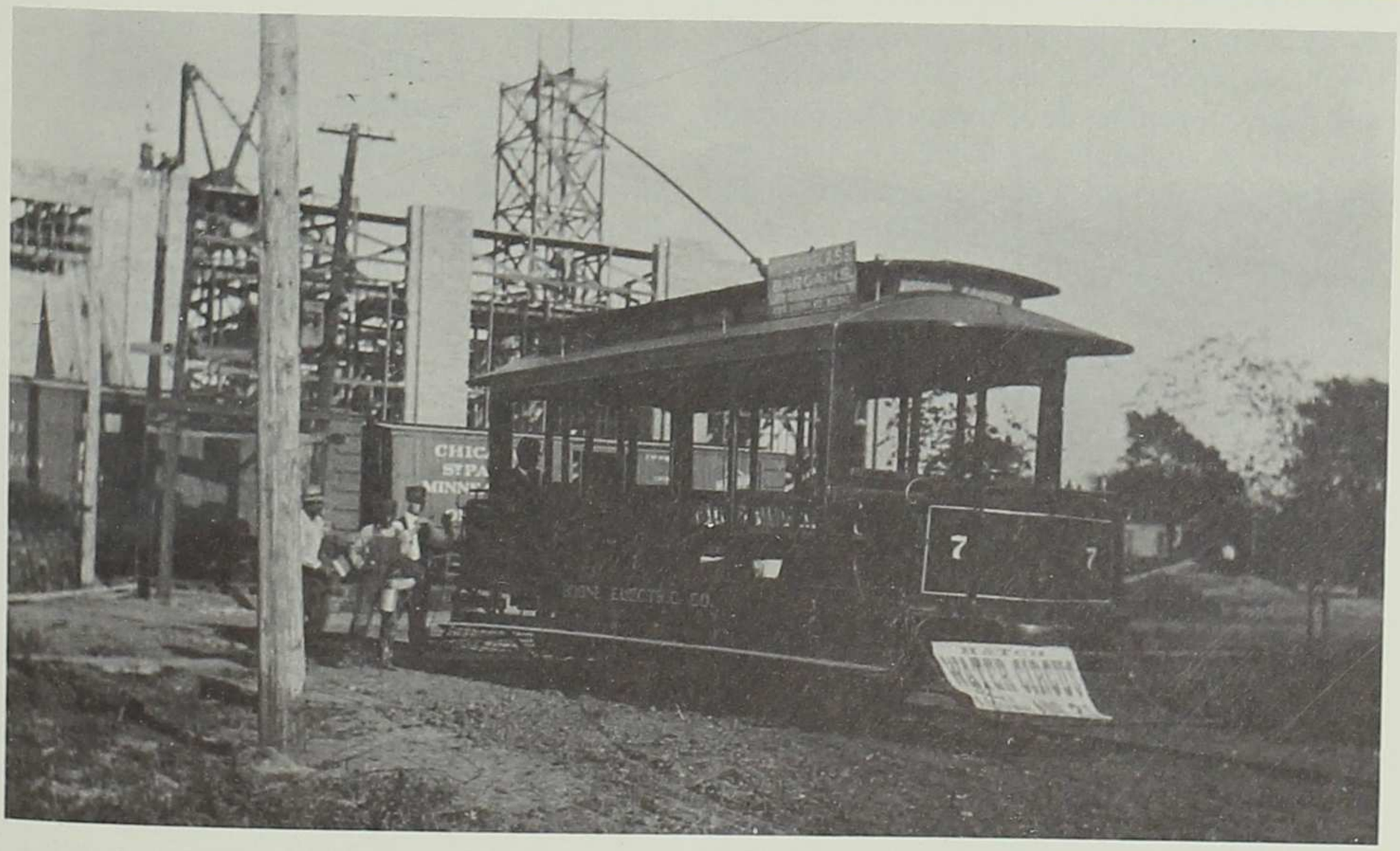
In Cedar Rapids, the company that was to develop into Iowa Electric was also making rapid progress. It opened its own hydroelectric installation in 1917 — the first automatically controlled hydro plant in the world. Earlier, the Cedar Rapids firm had pioneered arc lamp technology and voltage regulation. In the terrible winter of 1898, it even used electricity to thaw frozen pipes. By 1917 most of Cedar Rapids's homes and commercial buildings — about 17,000 of them — had been wired and were drawing electric power. And in the Tri-Cities, United Light — the company that would finally become Iowa-Illinois Gas and Electric — put its Riverside Plant into operation in 1925. The first fire stoked under the station's boiler was, in effect, 37 years old, having been ignited in the old Moline plant in 1888. When the Rock Island County Brush Electric Company started operation in 1882 it owned one 22-light machine. By 1925, the Riverside Plant could have been harnessed to illuminate 500,000 50-watt lamps. Just a year before the Riverside Plant went into operation on the state's eastern border, ground was broken out west for the Big Sioux Plant, since by 1924 Sioux City had outgrown its Kirk Station and the Court Street Plant.

The early electric companies were also closely tied to the development of Iowa's urban and interurban public transportation. Streetcars and traction railroading constitute a subject deserving its own full-length treatment. However, we should note here that Dr. William L. Allen pioneered the use of electric streetcars in Davenport as early as 1888. When he loaded 40 or 50 persons into a car that climbed Brady Street hill on August 13, there was probably no more than one other electric car line in the nation. And electric streetcar operations developed so rapidly that, by the 1890s, most of Iowa's larger towns had replaced the horse-drawn cars with electric ones.

Electric interurban lines also came into being just after the turn of the century. The Dows family, which has been closely associated with the building of Iowa Electric and its predecessor companies since the 1880s, also financed a number of Iowa railroad operations. On May 9, 1903 the Cedar Rapids Electric Light and Power Company transferred its property to the Cedar Rapids and Iowa City Railway and Light Company and, the following year, the first car left Cedar Rapids for Iowa

City. The company was almost sunk just two years after it was incorporated by a disastrous $100,000 wreck on July 4, 1905. But, by then, Cedar Rapids had decided that it could not do without an electric company, and businesses as well as banks extended generous credit to the beleaguered firm. Although a 1911 effort to extend the line east to the Mississippi got no farther than Lisbon, the Cedar Rapids and Iowa City Railway prospered until automobile and bus transportation made it obsolete as a passenger operation. Iowa Electric still owns the CRANDIC railroad — but its service is now limited to freight and its operation diesel rather than electric.

The other Iowa electric utility to get into interurban operations in a big way was Iowa Southern Utilities. During 1909-10, the Centerville Light and Traction Company built an electric rail line to Mystic, Iowa. Also in 1910, the Southern Iowa Traction Company was organized and took over the property of the Albia and Centerville railroad. It wasn't until 1914, however, that the company, under its new name of the Centerville, Albia and Southern Railway, electrified its property. Its rolling stock for passenger service consisted of two brand-new center-entrance cars powered by four 40-horsepower Westinghouse motors. Forty-five feet long, these cars were divided into three compartments — a "ladies' compartment," smoking section, and a baggage-and-mail compartment. Freight service was handled by two box motor cars, 40 feet in length and powered by four 80-horsepower motors. The two railroads — the Centerville Light and Traction's line to Mystic and the Centerville, Albia and Southern road — were consolidated as the Iowa Southern Utilities Company in 1916. More equipment was added, and although passenger operation stopped in 1933 — again because of competition from buses and automobiles — freight service continued into the 1960s.



Boone Electric Company streetcar, 1911

Among the many technical advances that came about in the early years of this century was the development of high voltage generation and transmission techniques. Utilities discovered that it was actually more economical to generate high voltages and step them down with transformers for home and commercial use rather than generating the lower voltages to begin with. Low voltage cannot be transmitted very far since resistance along the line drastically reduces power. High voltages, on the other hand, can be delivered over great distances. When alternating current systems were added to high voltage transmission technology, long distance transmission of electric power became really practical. This meant that generating facilities could be centralized, and it spelled the end for the hundreds of tiny power plants that had been serving Iowa's smaller towns since the late 1880s and '90s.

We have seen that, colorful as they were, most of these small-town operations were marginal. Not only was technical know-how in short supply, but financial management was also often faulty. The Tama and Toledo Railway and Light Company, for example, became the property of the bank only six years after it was incorporated. Its promoters were, after all, first and foremost promoters — with little appreciation of the proper proportioning of operating expenses to income. The stockholders of the Boone Electric Company saw their utility as a simple investment. Whenever there was money in the cash drawer or the bank, they divided it as profit. But, just about a decade after the company was founded, its investors discovered that their equipment was rundown, faltering, and in need of repair. Unfortunately, the investors had seized as profit the greater part of the company's operating capital. Boone was left without electricity for a year and a half when the plant closed down in 1892, having simply worn out. The electric railway operation nearly suffered the same fate in 1901.

If small town operations managed to stay above water it was often due only to the main strength and endurance of a single determined owner. In 1896, the Mount Vernon town council granted a Chicago man named R.M. Gardner the privilege of operating an electric light and power plant for 20 years. But many of the townspeople opposed using so "ethereal a substance as electricity" for light and power — even as relatively late as 1896. Mayor Myron Neff appealed to the town's civic pride, however, and succeeded in convincing the opposition that Mount Vernon could not afford to be out of step with surrounding communities that were already getting electric power. So, on March 1, 1897 the plant began operation from dusk until midnight at what was in those days the comparatively cheap rate of 15¢ per kilowatt hour.

Of course, the low rate necessitated certain economies. Gardner had no office, for example, and for years his only employee was his son George, who tended the plant at night and read meters in the daytime. Bills were issued from the Gardner home and it was George's job to collect them. This he usually accomplished by standing at a major intersection and buttonholing anyone he recognized who had not paid his bill. Some years later, Gardner hired another assistant outside of the family to run the plant at night and wire houses by day while young George sat on the corner and collected bills.

Obviously, such operations, marginally successful as they were, could not endure. And during the early decades of this century technical developments combined with the precarious finances of small companies and the corporate ambition of the larger firms to begin the process of merger and consolidation that marks the mature development of Iowa's power industry. It is quite impossible even to list the 500 or so independent operations that were eventually consolidated into the seven electric utilities that now serve the state. However, we can give a rough outline of the process.

Iowa Railway and Light Corporation was in-

corporated on May 25, 1925 and adopted its present name — Iowa Electric Light and Power Company — after corporate reorganization on May 31, 1932. Its first predecessor firm was the Cedar Rapids Electric Light Company incorporated in 1882. When electric rail operations began in 1903, the company became the Cedar Rapids and Iowa City Railway and Light Company. Although various small properties were acquired in the first decade of the century, the year 1912 marked the firm's greatest expansion as it acquired Marion Light, Heat and Power, Tama Electric and Tama Railway, Toledo Electric and Toledo Railway, Boone Railway and Boone Light, Perry Light, and the Marshalltown electric and rail properties. At this time the corporate name was changed again — to the Iowa Railway and Light Company. After acquiring properties in Jefferson and Mount Vernon, as well as the Boone Gas Company in 1924, the company became the Iowa Railway and Light *Corporation* in 1925. In 1951, the company — known since 1932 as Iowa Electric Light and Power — merged Central States Electric Company and, two years later, merged Iowa Electric Company. The latest acquisition came in 1954 when the firm assumed the assets, bonds, and liabilities of Northwestern Light and Power.

The Iowa-Illinois story is even more involved. It begins in 1882 when three companies were founded in the Tri-Cities, the Davenport Electric Light Company, Merchants Electric Light Company of Moline, and the Rock Island County Brush Electric Light Company. Merchants Electric secured a charter from the city of Moline and drew up plans for an electric system, but did not build a plant until S.S. and T.B. Davis took the company over. The Davis brothers also organized Merchants Electric in Rock Island in 1885. Three years later they organized the Peoples Light Company of Davenport and, in 1893, took over the Rock Island County Brush Electric Light Company and consolidated their own properties as the Peoples Power Company. The five Walsh brothers organized yet another firm, Davenport Gas, Electric Light and Steam Heating, which later became Davenport Gas and Electric. Then, in 1906, the J.G. White Engineering and Construction Company acquired all the local electric, gas, and street railway properties. A holding company, United Light and Railways, bought out White in 1912. In 1940, the Peoples Light and Power Company was incorporated in Illinois and, a year later, changed its name to Iowa-Illinois Gas and Electric. On December 31, 1941 it acquired a number of utilities in Iowa and Illinois, and the next year acquired all of the assets and assumed all of the liabilities of the ten former subsidiary companies of United Light and Railways. This outline, complex as it is, does not even take into account the various mergers within the local and subsidiary companies.

Iowa Power and Light Company traces its origin to the Des Moines Edison Company which, in 1884, acquired the property of a Des Moines gas company for a little over $10,000. The Edison Company competed with two other Des Moines utilities, Capital City Electric and the Des Moines Water Power and Electric Company. Although the Edison firm reported to its stockholders on October 31, 1891 that "Our business has been done at a loss of $3,772.24" due to competition from the other two companies, in the end it was the Edison Company that prevailed, finally absorbing Capital City and Des Moines Water Power and Electric. The Edison firm changed its name to the Des Moines Electric Company, and then, in 1909, to the Des Moines Railway and Light Company, and, in 1913, to the Des Moines Electric Light Company. Between 1910 and 1930 the company acquired the assets of small firms operating in the vicinity of Des Moines and, in 1938, it also acquired the Des Moines Gas Company. The company was incorporated under its present name on October 22, 1924. In 1943, having acquired the assets of

the Des Moines Electric Light Company, the corporation also bought some properties from the Iowa-Nebraska Light and Power Company in ten Iowa counties. Five years later, in 1948, Iowa Power and Light purchased electric distribution systems in six small towns and adjacent rural areas in Iowa from the Central States Electric Company. One year later, it purchased Western Iowa Power Company, which served Council Bluffs and the surrounding area. Until 1950, Iowa Power and Light was itself controlled by Continental Gas and Electric, which was in turn a subsidiary of a large holding company, United Light and Railways.

Iowa Public Service has its origin in the Sioux City Gas Light Company incorporated in 1872. In 1901 three Sioux City utilities were merged into the Sioux City Gas and Electric Company. In 1916, a group of Eastern businessmen bought the small electric plants at Carroll, Audubon, Manning, Sac City, Rockwell City, and Storm Lake. They incorporated under the name of the Iowa Light, Heat and Power Company, acquiring additional properties over the years in Sheldon, Rock Valley, Mapleton, LeMars, Marcus, Cherokee and elsewhere. Their plan was to build a network of transmission lines over a large area which would be fed by strategically located generating stations. Meanwhile, in the north-central part of the state, Waterloo was being served by the Citizens Gas and Electric Company. The Cedar Valley Electric Company, headquartered in Charles City, was furnishing power to Charles City, Nashua, Clarksville, Shell Rock, Parkersburg and others. In Humboldt, the Northern Iowa Gas and Electric Company was serving Humboldt, Emmetsburg, Eagle Grove, Clarion, and Spirit Lake. These three firms were merged in 1925 as the Central Iowa Power and Light Company with headquarters in Fort Dodge. The next year, Iowa Light, Heat and Power also moved to Fort Dodge and, in 1927, the two Fort Dodge companies merged as the Iowa Public Service Company. This new corporation was controlled by Sioux City Gas and Electric. In 1928, it joined its parent company at the Sioux City headquarters. Sioux City Gas and Electric also controlled the Nebraska Public Service Company, the South Dakota Public Service Company, and the Yankton Gas Company, which were already headquartered in Sioux City. But it wasn't until October 31, 1949 that all of the firms were finally merged as the Sioux City Gas and Electric Company which, at the time of the merger, adopted the name of the Iowa Public Service Company.

Interstate Power Company, a Delaware corporation which serves Dubuque and northern and northeastern Iowa, was incorporated in 1925. Its antecedent companies are numbers of small plants acquired by a holding company first called the Utility Development Corporation and later known as the Utilities Power and Light Corporation before becoming United Power and Light. Between 1913 and 1925 the United Power and Light Corporation acquired companies in Wisconsin, Minnesota, Illinois, as well as properties in Oelwein, McGregor, Marquette, Giard, Monona, Postville, Waukon, Decorah, Calmar, Ossian, and Cresco, Iowa. The major Dubuque property was acquired in 1924. After Interstate was incorporated under the laws of Delaware in 1925, additional Iowa, Minnesota, Wisconsin, North and South Dakota, Oklahoma, and even Canadian properties were acquired. The Public Utility Act of 1935 brought an end to this kind of far-flung holding company so that, today, Interstate operates only a consolidated, interconnected territory in Iowa, Minnesota, and Illinois.

Iowa Southern Utilities was organized under the laws of Delaware on February 12, 1923, but its predecessor companies had been operating street railways and lighting plants since the turn of the century. Like the other Iowa companies, Iowa Southern's development has been a process of acquisition and consolidation of

smaller firms. During the 1920s, properties in Creston, Grinnell, Burlington, and Ottumwa were acquired. In 1960, the Burlington Power and Light Company was added to the corporation's property; in 1964, New London's modest natural gas operation was acquired, and the electric and gas distribution systems in Wapello were added in 1970.

Unlike the other utilities that serve Iowa, the bulk of Union Electric's operation lies outside of the state. It traces its origin to the Brush Electric Association, St. Louis's first electric generating enterprise, founded in 1881. During the remaining years of the 19th century, some 30 additional electric companies sprang up in and around St. Louis, which, however, by 1902 had merged into three companies. On May 20, 1902, these three remaining companies merged once again into a single Union Electric Company. Between 1902 and 1925, the company expanded beyond the St. Louis area, acquiring considerable territory in Missouri and Illinois. When it bought the Keokuk dam and the hydroelectric operations associated with it in 1925, Union Electric moved into Iowa as well. After World War II, the company acquired further territory in Iowa and elsewhere by absorbing various subsidiaries, and, in 1958, Union Electric acquired R.W. Foss Electric of Salem, Iowa.

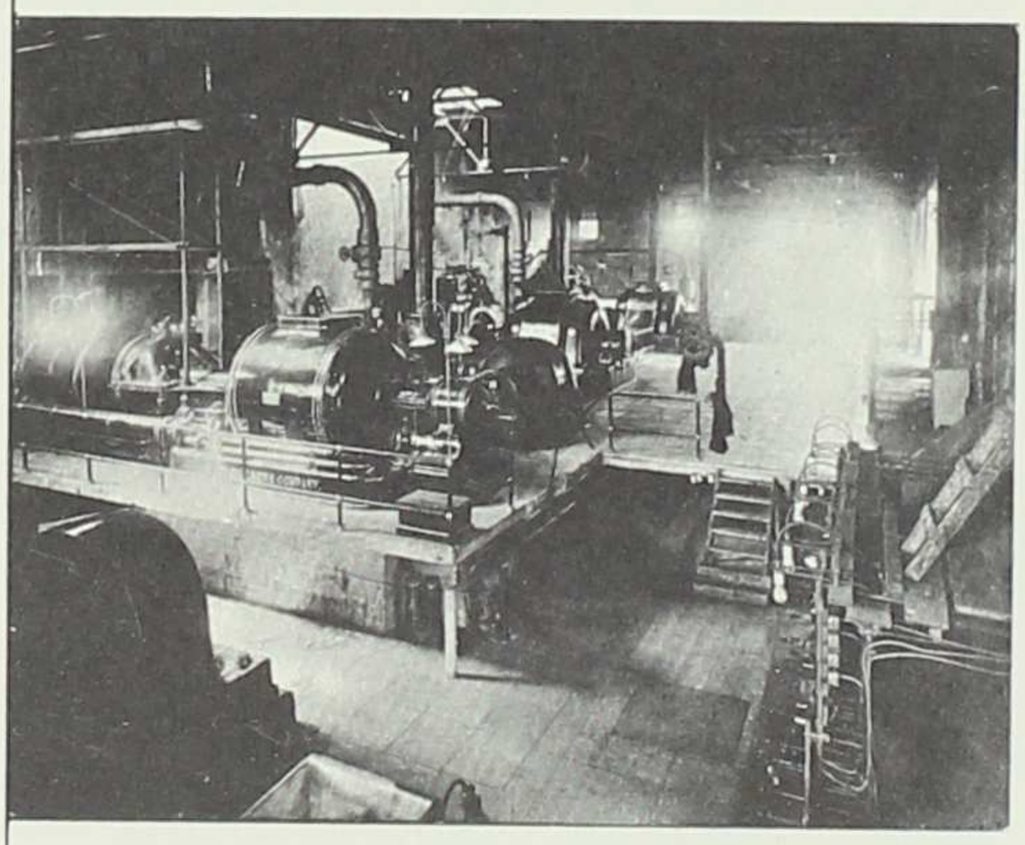
Although this complex process of merger and consolidation was made possible by the industry's technical progress and was in large measure a response to burgeoning public demand for electricity, it was also a symptom of the "holding company" movement that had begun in the late 19th century and had become rampant by the 1920s. Holding companies consisted of blocs of financiers who seized upon fledgling — and often (as we have seen) inefficient and faltering — utilities in order to consolidate them into power trusts. Large corporations such as Westinghouse and General Electric often bought up small utilities to insure a market for their electrical products. Some small companies, early on in their development, hired engineering and consulting firms which, often as not, had to be paid in stocks and bonds. Working closely with banks, these consultants were able to buy out the faltering utilities they had originally been called in to help. Other interests amassed firms simply through shrewd speculation. In any case, with the exception of Iowa Electric Light and Power and Iowa Southern Utilities Company, all of the Iowa power companies were at one time or another subsidiaries of national holding companies.

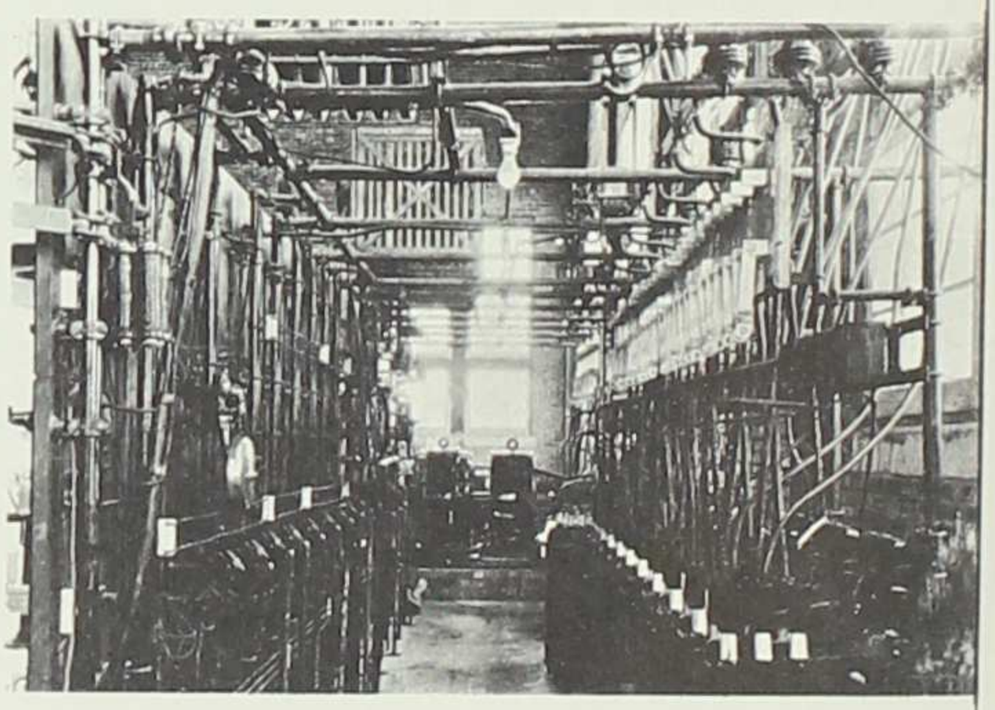
While it is true that the holding companies provided the capital needed for efficient expansion, their far-flung and even byzantine organization made them unwieldy and contributed to the kind of wholesale speculation that hastened the national financial collapse of 1929. It was,

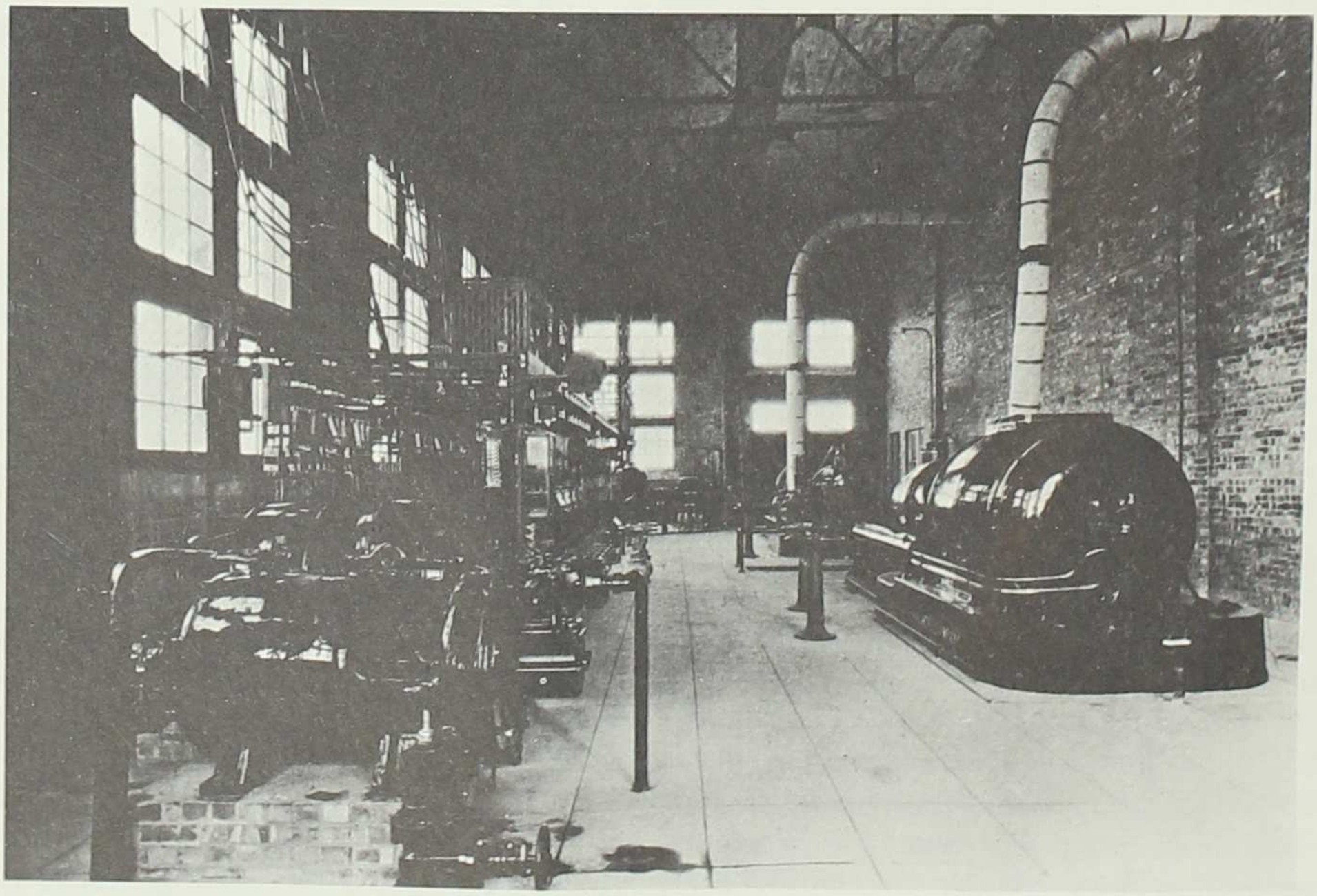
Note on Sources

Most of the information for this article was drawn from materials supplied by Interstate Power Company (Dubuque), Iowa Electric Light and Power Company (Cedar Rapids), Iowa-Illinois Gas and Electric Company (Davenport), Iowa Power and Light Company (Des Moines), Iowa Public Service Company (Sioux City), Iowa Southern Utilities Company (Centerville), and Union Electric Company (Keokuk). These materials include information publications, employee magazines, employee manuals, and such unpublished items as letters, speeches, memos, chronologies, corporate histories, and internal histories of the companies. In addition to this primary material, a number of books were very useful: *The Electric Power Business* (McGraw-Hill, 1970) by Edwin Vennard; *Determination Turned the Power On: A History of the Eastern Iowa Light and Power Cooperative* (n. pub., n.d.), *Corn Belt: Enthusiasm Made the Difference* (Corn Belt Power Cooperative, 1972), and *Rural Iowa Turns on the Lights* (Midwest Historical Features, 1965), all by Harold Severson. Edward Thomas Gray's unpublished 1967 University of Iowa M.A. thesis, "An Analysis of the Development and Performance of the Privately-owned Electric and Gas Utilities in Iowa," was of great value. The most recent information on the status of public utilities in Iowa was gathered from the companies' annual reports and from *Moody's Public Utilities Manual* (Moody's Investor Services, various years). Some of the most interesting insights into the history of electric power in Iowa were the result of interviews with Mr. Harry Billings and Mr. John Gaston, both associated with Iowa Electric Light and Power. Transcripts of oral history interviews on file at the Division of the State Historical Society also proved illuminating.

I wish to thank all of the public information officers and others at the seven member companies of the Iowa Utilities Association, and officials of the *Iowa REC News* and the Corn Belt Power Cooperative, for their generous help with this project.







(courtesy Iowa Electric Light and Power Company)

indeed, at the height of the Depression, in 1935, that federal legislation was enacted to break up the vast empires of the nation's network of holding companies.

Despite the holding companies and the subsequent dissolution of them, Iowa's utilities weathered the Depression well. Although expansion was slowed in some areas, Iowa Electric's Harry Billings recalls that his company actually had a difficult time coping with the demands of its broadening operation. He remembers one pay day when Iowa Electric asked its employees not to cash their paychecks for ten weeks because the company lacked ready money. Expansion had temporarily outstripped income. This was particularly embarrassing since the state's utilities had launched ad campaigns during the 1920s aimed precisely at expanding the market for their services. Bob Hayes, the supervisor of Iowa Southern Utilities' sales promotion department, explains the kind of marketing strategy that placed heavy demands on the power industry: "To be quite frank, we went in the red on appliance selling in those days" — about 1923. "What we wanted to do was to build load, much different than today's approach, which is aimed at making a profit on our sales and selling energy-efficient appliances." That steadily increasing load was not so welcome in the days when ready money for expansion became scarce.

The Depression had another — and far more profound — effect on Iowa's electric industry. By the 1930s virtually everyone in Iowa's cities and towns had electricity. In sharp contrast, fewer than 11% of the nation's farms had been electrified. By 1935, fully 95% of French farmers had electricity, 90% in Japan, 85% in Denmark, and 100% in Holland. It was not that American technology lagged behind that of Europe. Rather, the question was one of utility economics. Whereas a power company could expect anywhere from 10% to 50% profit on service provided to towns and cities, only 6% could be gleaned from the thinly-populated rural areas. And the utilities, often controlled by holding companies whose officers were far removed from the communities they were supposed to serve, were not willing to make substantial investments for so comparatively slight a return. If a farmer were lucky enough to live fairly close to an established power route, a company would consider building an extension to his farm — for anywhere from $1,500 to $3,000 per mile. What is more, after paying for the extension, the farmer was expected to sign over ownership of the line to the electric company. Adding insult to injury, rural electric rates were sky-high. At 25¢ to 40¢ per kilowatt hour, the rates recalled the very earliest days of electric service.

As early as 1909 a few farmers in Iowa began to respond to what they considered the utilities' outrageous terms. Farmers Electric Cooperative was organized 70 years ago in Kalona. In 1914, a group of farmers formed a small cooperative in Grundy County, putting up their lines at a cost of $360 per mile — far less than what the big utility was proposing. Eight cooperatives were organized around Webster City in 1919 and bought electricity from the municipal power plant there. In all, there were some 35 farmers' electric cooperatives in Iowa before President Franklin D. Roosevelt issued executive order #7037 creating the Rural Electrification Administration in 1935 as part of the New Deal. The executive order was further developed and made into law by Congress in 1936.

Its major provision was for loans to build generating stations, transmission lines, and distribution lines to rural areas that were not receiving central electric service. This did not mean that the federal government initiated projects — these had to originate with the farmers themselves. It was generally the job of the county agent to assess the interest in or-

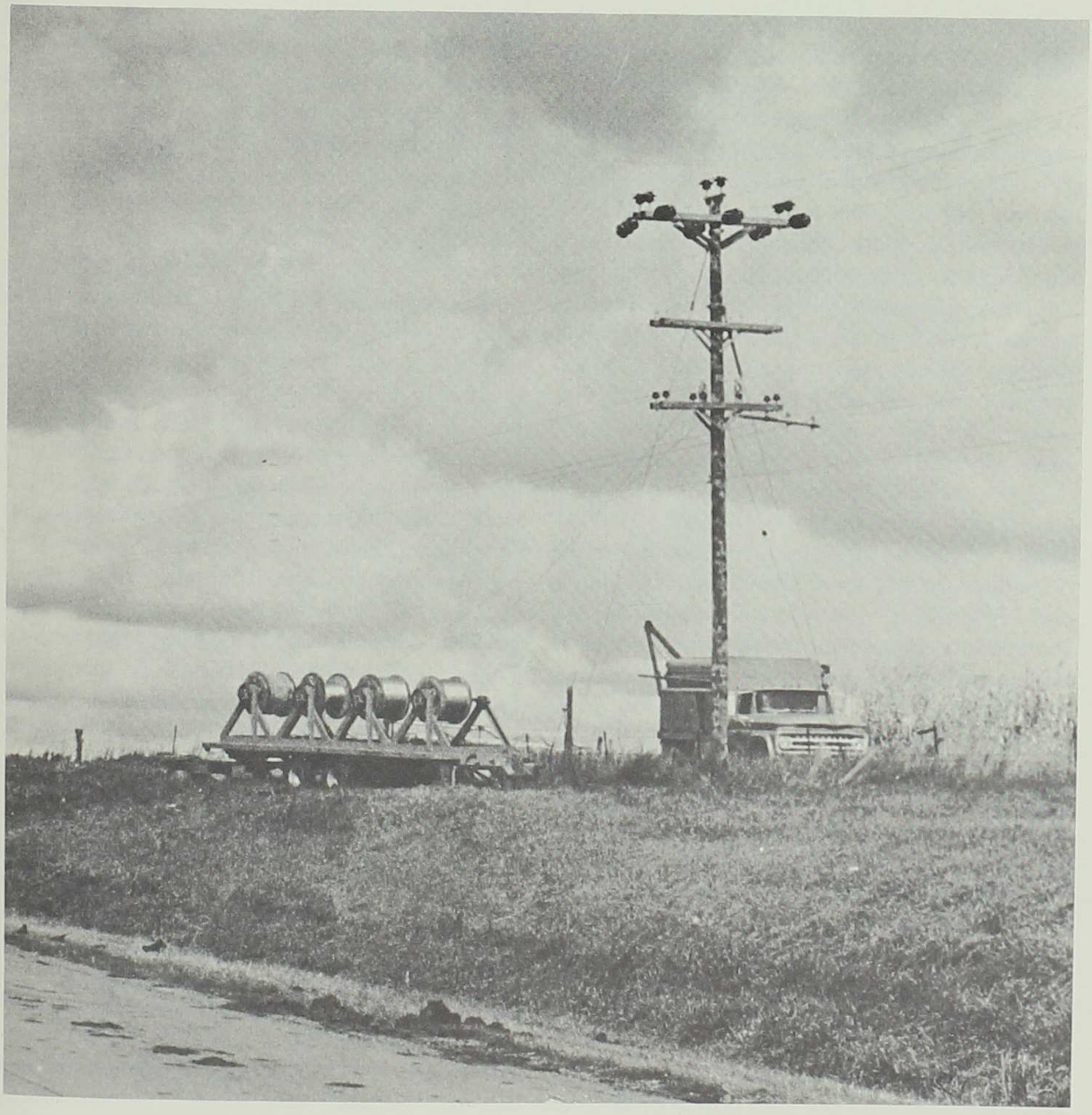
ganizing cooperatives in his county. Once enough interested farmers were gathered together — men who were willing to work for little or no pay (at least at first) to organize the cooperative — the job of signing up members had to begin. This meant convincing farmers to part with $5 and $10 membership dues to match the government's loans. In the Depression years few farmers could afford to gamble even $5 on something they were unsure of. What is more, the farmers also had to be talked into granting easements to the cooperative for the erection of power lines over their farms.

This initial phase of persuasion and recruitment often took months in each county. The organizers of the Southeast Iowa Cooperative, for example, ran up against fears that the government would foreclose on members' farms if the cooperative failed. Some farmers feared that storms would knock down the power lines that the cooperative proposed to run across their farms and endanger both livestock and family. Others insisted that if the big utilities, with all their years of experience, could not serve farmers, then a bunch of inexperienced farmers could not possibly succeed.

But the overwhelming majority of farmers did want electricity. A Kiron, Iowa man recalls that the utilities thought the farmers wouldn't accept even a $5 membership fee, so no attempt was made by the big companies to recruit interest in rural electric projects. "That's when the farmers started going by themselves. . . . Our South Crawford REC (Rural Electric Cooperative) was . . . the *greatest* thing to happen to the farmer: pumping water, grinding, refrigeration, all the appliances." With the advent of electric power, farmers could abandon their dangerous kerosene lamps or their undependable gasoline-powered 32-volt home generating units. "It was all it could do to run the lights," a farm wife in Archer remembers about one of these little generators. "We were on the first line that came out" in Archer about 1940. "Electricity, that was an awful wonderful thing."

At first most of the cooperatives were small operations that merely distributed power to their members. That is, they did not generate electricity themselves, but bought it wholesale from municipal plants or from the nearest utility company. In some cases, where a satisfactory wholesale price could not be agreed upon with a utility, the cooperative actually built its own generating facility.

Although Iowa's major power companies were generally opposed to the cooperative movement, protesting that public money was being used to finance private enterprise, equitable wholesale power agreements were more often than not arrived at. But something more than grudging cooperation was forthcoming from Iowa Electric, when, in 1946, it entered into a special agreement with the Central Iowa Power Cooperative. The Cooperative was to build the Prairie Creek generating station, which Iowa Electric agreed to operate. Both the utility and the Cooperative would draw power from the plant. The first such agreement in the nation between an investor-owned utility and a rural electric cooperative, the plan was good business for both. Under the federal rural electrification program, the Cooperative could float construction loans for a mere 2% interest — far less than the 5% or 6% financing that Iowa Electric might have gotten on its own. In turn, the Cooperative had gained access to the utility company's experience and expertise. Two additional units, owned by CIPCO and operated by Iowa Electric, went into operation at the Prairie Creek Station in 1951 and 1958. A fourth, built in 1968, is both owned and operated by Iowa Electric. That same year, the board of directors of Iowa Electric Company authorized construction of the 550,000-kilowatt Duane Arnold Energy Center at Palo. The utility announced that it was sharing ownership of this nuclear power plant with CIPCO and the Corn Belt Power Cooperative.



In at least one important way, the development of Iowa's electric cooperatives parallels the development of the investor-owned utility companies. Many of the smaller cooperatives were consolidated into so-called "super cooperatives" — such as Corn Belt, Eastern Iowa Light and Power, and Central Iowa Power Cooperative — in order to take advantage of a well-developed transmission network that would provide more efficient distribution of power. Although the Second World War, which brought many restrictions on the use of construction materials as well as fuels, temporarily slowed the progress of rural electrification, by the 1960s electricity had become available to any Iowan who wanted it.

On December 7, 1941 the Iowa Public Service Company of Sioux City tried to dedicate a new smokestack that had been added to its Big Sioux Plant. The ceremony was interrupted by news that the Japanese had attacked Pearl Harbor. The United States was going to war.

That interrupted ceremony might serve to symbolize the immediate effect the war had on the public power industry in Iowa as well as the rest of the nation. The bulk of energy production and construction materials was diverted into the war effort. John Gaston, who has worked for Iowa Electric for more than 50 years, helped to create the company's legal department "at the time of World War II, at the time that so much regulation began to proliferate. . . . Then we got into the regulations of the War Production Board," Mr. Gaston explains, "which required you to have a priority for any materials you bought. . . . There was much in the way of equipment and materials for which you had to get a special priority number from the government before you could even place an order."

But if the war effort retarded the power industry's development for the duration, it was in part responsible for the tide of rapid expansion that followed V-E Day and V-J Day. The end of the war brought the release of manpower for industry and, in the ensuing years, a dramatic increase in population. The demand for energy was therefore greater than ever. Factories which had tooled up for war work were in exceptionally fine shape and not a little anxious to continue their high wartime rate of production — production that had benefited from the technical advances necessitated by the war. The post-war course of Iowa's power industry, then, is one of remarkable expansion using much of the technology developed during the war to meet increased demand. What follows is only a sampling of company growth.

Iowa-Illinois added generating capacity to its Moline plant in 1955 and its Riverside Plant in 1961, bringing them to 65,000 kilowatts and 229,500 kilowatts respectively. With Commonwealth Edison of Illinois, it also owns a percentage of the Quad-Cities Plant and, with Iowa Public Service, Iowa Power and Light, and Iowa Southern, it owns a percentage of the George Neal Station, Unit Number 3, near Sioux City.

Iowa Power and Light expanded its Des Moines plant in 1964 from 155,300 kilowatts to 277,000. Its Council Bluffs unit, with a 90,626 kilowatt capacity, was built in 1954. Additions ten years later brought its total to 139,000 kilowatts. The River Hills unit, built during 1966-67, is capable of producing 127,000 kilowatts and the Sycamore installation, on line in 1974, also has a capacity of 127,000 kilowatts. In addition, the company owns a percentage of Unit 3 of the John Neal Station.

Interstate Power, which owns a percentage of Neal 4, also modernized its plants in Dubuque and Clinton. The Albert Lea plant, built in 1927, was modernized in 1947. A plant built at Fox Lake in 1950 was expanded in 1962. Iowa Southern Utilities' Eddyville plant was built in 1953 and modernized four years later. Its capacity is 71,000 kilowatts. The plant at Burlington was completed in 1968 with a total capacity of 211,950 kilowatts. In addition to these plants, Iowa Southern owns a percentage of the George Neal Station, Unit 3. Union Electric's only major Iowa generating installation is the Keokuk dam and hydroelectric station acquired by the company in 1925. It contributes about 135,000 kilowatts to the Union Electric System.

Iowa Public Service Company supplemented generating capacity with its first installation at the George Neal Station in 1964. A second unit went into operation there in 1974, a third in 1975, and a fourth in 1979. Neal 3, with a total capacity of 520,000 kilowatts, is a joint venture with three other Iowa utilities. Neal 4, rated at 576,000 kilowatts, involves the cooperation of Interstate Power Company as

well as eleven other municipal and cooperative utilities. This kind of power pooling and joint ownership is typical of post-war power consolidation, which proceeds less by fiscal merger than by a pooling of actual resources. In 1958, the Iowa Power Pool was formed and, in 1972, the Mid-Continent Area Power Pool was organized. Through these systems, Iowa is linked to a national network of power distribution. It is the culmination of the kind of "super power" operation the Davis brothers so precociously initiated at the turn of the century when they interconnected their plants in the Tri-Cities area.

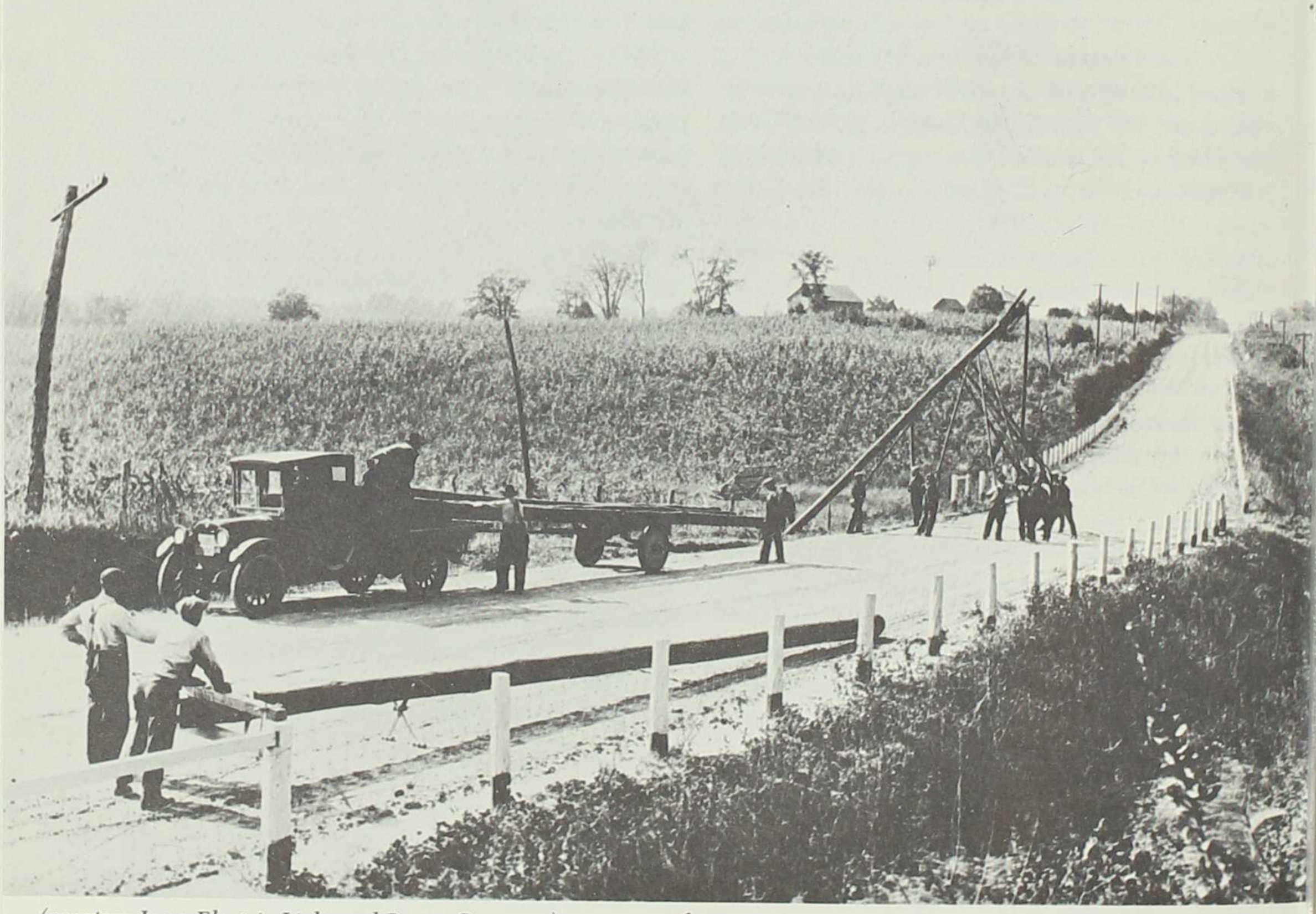
Of course, the most dramatic technological development of the war was in nuclear energy. The world witnessed the terrible power of the atom at Hiroshima and Nagasaki. The peacetime challenge was to harness that awesome force not for destruction, but to meet the ever-increasing demands for energy. In 1968, the Iowa Electric Company authorized construction of the Duane Arnold nuclear installation at Palo. The 550,000 kilowatt plant went on line in 1974, but had to be closed down for nine months in 1978 because of pipe cracks. Over the protests of some, the Duane Arnold Energy Center went back into operation in 1979.

Surely, in 1879, Thomas Edison had some appreciation of the magnitude of his invention. He must have had some idea of the changes his incandescent lamp would bring, and of the industries it would create. Indeed, he had the satisfaction of seeing many of these transformations for himself before he died in 1931. But even the inventor could not have predicted the full range of social, political, and environmental changes his blown-and-sealed glass with its glowing tungsten wire would bring.

Through the 1960s and '70s we have become increasingly aware of the finitude of our energy resources, even as we have made greater demands upon them. Iowa's power industry, with the rest of the nation, has continued the process of consolidation and centralization that began when finance, technology, and the marketplace made this process possible and, apparently, imperative. Many see nuclear energy as the only economically feasible fuel for firing the boilers that produce the steam that runs the turbines that make the electricity. And others now talk about turning the history of the great utilities around by decentralizing the sources of power, running many more but much smaller plants with water, wind, or the sun in order to power a few buildings or even an individual dwelling.

Iowa's energy historian a hundred years hence may well be writing of power plants whose output will tower over present-day nuclear installations even as the Duane Arnold Energy Center dwarfs the first plant opened in Cedar Rapids. Or, perhaps, it will fall to that future historian to tell how the generating stations became smaller and multiplied as today's centralized energy networks were dismantled. Whichever version of — or variation upon — these stories history will require on the occasion of the Edison bicentennial, that story will be a sequel to the profound changes our grandparents, parents, and ourselves have seen wrought by the first century of light. □

Farm Life When the Power Changed



(courtesy Iowa Electric Light and Power Company)

Laying the Cascade line

by James Hearst

James Hearst has been called Iowa's major poet. In addition to his many books of poems and his prose articles, he will soon have a novel, Bonesetters Brawl, *published by Dorrance and Co. His work is exciting and his fans and his friends legion and loyal. He has lived most of his life in and around Cedar Falls, and his sense of place and of history is as finely honed as the poetry he creates from it. Here he writes of the change in farm life experienced by him and his contemporaries in a century marked by the transformation of existence by technology. – Ed.*

The change in the kinds and application of power came slowly to our farm. In my boyhood the farm supported itself as an independent country bound to the outside world of town and city only by the roads. We lived amidst a rich harvest of food. The yield of garden and orchard filled every corner of storage space, every mason jar, each jelly glass, and every wooden peg in the smokehouse. We boys were mother's "hired men," helping weed and pick and carry in all the vegetables and fruit needed for a family of six, eight, ten — depending on the number of hired girls and hired men that lived with us. No one ever went hungry, but almost everyone complained of the work necessary to bring the produce to cellar and bin. It was an autumn of discontent and a winter of fulfillment.

As soon as his boys were old enough to operate the farm, Grandfather went his own way. He planted a huge apple orchard of yellow spicy-smelling Grimes Goldens, Black Oxfords, whose seeds rattled when you shook the apple if it was ripe, the Oldenbergs, hard as baseballs and about as tasteless, then all the usual kinds: Russet, Snow, Dutchess, Jonathan, and especially cherished by us children, Whitney Crab. He even planted a Whitney Crab in the pasture, and when I went for the cows, I stopped to pick a pocketful. When the low-hanging ones were gone, I stood on the little mare's back to reach for more. Once she went off and left me hanging from the branches, strange fruit for the tree to bear. Grandfather also found room for early and late cherry trees and four kinds of plums. To this day I can still smell the odor of plums rotting and fermenting under the trees and hear my gasp as a cherry limb broke and let me with my pail of cherries plummet to the ground.

The blackberry patch, four rows ten rods long, never failed to load us with its shiny black fruit. And the bounty of raspberry patch, the two kinds of currants, red and white, and two long rows of grapes, early white ones and the purple Concords. Sometimes if the grapes hung too long and a rain came, they split open. A few days of sun fermented them and we children used to go out and watch the goldfinches and warblers, slightly drunk, cheep and flutter along the ground, too intoxicated to become airborne. We never tried to catch them, though. We respected their right to freedom.

A row of rhubarb, first fruit of the spring: how we looked forward to it! We used it for medicine when we played doctor, dipping the stalks in sugar we stole from the kitchen. We wove the leaves into hats and wore them pinned together with twigs. The asparagus patch was large enough to support ten families, and so was the strawberry bed. Mother hated the strawberry bed because it harbored, she said, garter snakes. In the vegetable garden we planted row after row of carrots, beans, peas, celery, radishes, lettuce, onions, turnips, parsley, and parsnips that we left out all winter and dug up in the spring (I still can't stand the stuff).

In these days of supermarkets and packaged foods, no one knows how many hours of work went into preparing our winter supply. Sweet corn, cut off the cob and covered with netting to keep the flies off, dried in the sun on the porch roof. In the winter the hard dry kernels, cooked and creamed, gave a special touch to many a meal. I still can imagine that taste — like nuts baked in cream. Making sun-cured strawberry jam, we spread berries on an old table that had each of its legs in a can of water to keep ants from crawling up to the fruit. The canning, jellies, preserves, and watermelon and cucumber pickles boiled and sizzled on the big range.

Each fall, usually after cornhusking, we butchered a hog. We children watched in a kind of morbid fascination how the pig, with a rope around one hind leg to keep it from run-

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ning away, was gently herded toward an improvised platform beside a barrel of steaming hot water. Father shot it in the forehead with a .22 rifle, and after it collapsed the hired man stuck a knife in its throat to bleed it.

Father prepared the hog for butchering and hung the carcass overnight to cool. Cut up the next day, the hams and bacon sides went to the smokehouse, the meat from the head sliced out and used for headcheese, scraps and strips of meat run through the grinder for sausage, and all the fat divided into chunks to be melted down for lard. It was a greasy day in the kitchen, with the boiling kettle sending up clouds of stinking smells, the kitchen table slippery and piled with chunks of fat yet to be rendered, the floor stained and spotted with grease. The decks of the *Pequod* never slopped awash with more grease than our kitchen at butchering time. But when the day ended, the lard and sausage packed away, the green hickory sticks smoldering in the smokehouse, we could be thankful for a winter's supply of meat.

Mother raised purebred Plymouth Rock chickens. Carefully choosing the proper bloodlines, she bought her roosters from a Mr. Hemingway in Waterloo. The Plymouth Rocks grew to be big solid chickens, and when a hen quit laying she became the meat course for our Sunday dinner. We children waited for the day when a rooster outlived his usefulness and ended up in a kettle to be boiled all day long on the stove because he was so tough. Then Mother made noodles, rolling the dough so thin you could almost see through it, and hung it on the backs of the dining room chairs to dry. She cut the dough into very thin strips, which she cooked with the chicken broth. The rooster, tough or not, made a feast we could hardly wait to devour.

A backward glance shows me that Mother must have found more hours in a day than most women today. It seems a kind of miracle she could accomplish so much without a vacuum cleaner, refrigerator, or electric lights. True, she often had a hired girl to help out, and as her children grew older they pitched in, gathering eggs and bringing in baskets of wood. But there were hired men to cook for as well as the family. We always ate in the dining room, a linen tablecloth on the table, the linen napkins all washed and ironed by hand. I am ashamed to think I complained about running the washing machine on Monday morning, while Mother sorted, rinsed, and hung the clothes on the line even in freezing weather. I wish she could have had the electric washer and dryer we have now. Granted, Father worked hard — put in long days of labor, taught us patiently how to harness a horse, milk a cow, help a sow deliver her pigs — but he vanished into the barn before the threat of helping around the house. Mother depended on her children — and a hired girl, when she had one — for help.

In the early morning, while Father built a fire in the range, Mother dressed by lamplight and then came down to prepare a big breakfast for her family and hired men — oatmeal, fried eggs and bacon, sometimes sausage and pancakes, coffee, and toast. She packed our four lunches by eight o'clock, then made the beds, filled the kerosene lamps and lanterns and cleaned their chimneys. By 12 o'clock she had dinner ready.

But this was routine. She also found time to read to us when we were little and to tend her flower garden. She was president of the Ladies Aid in the Congregational church, a member of the P.E.O., drove a horse to town for the meetings, and brought home groceries and books from the library. She taught us manners — savages that we were — and tried to instill an appreciation of good books, good music, good pictures, and good speech in our grubby little souls. So, by precept and example, we learned to take off our caps in the house, to wipe our feet before coming in, and to control our appetite until everyone was seated and served. We learned to remain quiet in church and not to speak until spoken to. Courtesy, said Mother,

was the sign of a civilized, educated person. Practice it, she said, and meant it. Almost without being told, we knew we should help with the work — the everlasting chores.

We might complain, but we did what had to be done. As soon as we were old enough, my brother Bob and I graduated to barn and farm work. Here Father took over, teaching us the mechanics of the farm. Though two years younger than I, Bob was bigger, and could sling those heavy breaching harnesses over the rump and back of ton-size workhorses as well as I could — or couldn't. We had to grow into that job. We milked cows, fed the pigs, carried corn, and threw down hay. But so did all the other boys in the neighborhood. We just followed farm custom.

Before we were big enough to handle the tough jobs individually, Bob and I teamed up. He drove the horses on the cultivator; I managed the shovels. We husked corn as a pair and many a time we chased Father or one of the hired men until we caught up and made them turn out to let us through. We went threshing together, two of us on the same bundle wagon, and, not only kept our place in the routine, but even hustled some of the older men who did not enjoy being hustled.

A metamorphosis was slowly taking place in farm life. We did not know it then, but technology was about to shove aside the way of life we knew. The heavy workhorses and their harnesses, complicated in the summertime with fly nets (how we boys struggled with them), the horse shoes — sharp caulks for winter, smooth plates for summer — the breast strap driving harness with its fancy leather fly net, saddles, riding bridles, halters, and currycombs — all these were slowly disappearing.

The change came slowly at first. One neighbor installed an acetylene plant — no more kerosene lamps and lanterns for him. Another neighbor bought a Waterloo Boy tractor (the forerunner of the famous John Deere) and a two-bottom plow. Perhaps Bob's death — he died from cancer at 22 — and my hospitalization after a diving accident hastened change on our farm. One Sunday when I was home for dinner, Chuck drove up to the house on a Cletrac — an endless tread tractor — with a three-bottom plow. We sold some of the horses now — the ponies had long ago been sold to the Clyde Miller Circus. Our house burned down and we wired the new house for electricity. The manager of the Public Service Company, an old friend of Father's, promised us an electric line if we would permit the company to erect its poles along our fence. Father gladly gave permission, but the electricity never came.

We all shrugged it off, except Father, who felt he had been betrayed. When Uncle Will (Dr. W.L. Hearst) was elected to the city council, he suggested that the Municipal Utilities run a line out 27th Street. The manager, Clark Streeter, promoted the idea as a way to unite the farm people with the town. These political theories did not mean anything to us — we just wanted juice in our lines. Eventually the day came when the posthole diggers began to move our way. Because of regulations, Iowa Public Service took one side of the road, and the Cedar Falls Municipal Utilities had to take the other. This meant the telephone lines had to come down and go up on the electric light poles. We owned our own telephone lines and phones, so there was no problem there. But Northwestern Bell did not want lines coming into their switchboard that hung under electric lines. Finally safety fuses were agreed to and the problem settled.

Every time we drove to town we watched the progress of the line of poles, and every Saturday when Father came home from Des Moines he would walk around the house and snap the switches as if electricity appeared by osmosis. The day finally came when the switch at the plant sent the juice through the wires and the lights came on. Farm life took on a new dimen-

sion. Not even the telephone changed our way of living, thinking, and acting as much as the coming of electricity. This break with the past seemed an entrance to the modern world. Later we learned of some of the risks involved in our loss of independence. But right now farm life bloomed under an aura of light that came out of a wire, a bright spreading light, not the dim glow of smoky lanterns and old-fashioned lamps.

Iowa State University sent a man from the Extension Department to show us the cost and voltage of toasters, refrigerators (goodbye old icebox!), vacuum cleaners (goodbye brooms!), and motors to run washing machines, milking machines, and the pump at the wellhead. We kept the windmill for years, mainly because the radio antenna was fastened to it, but the storage battery that powered the radio gave way to generated electricity. Mother approved of this: once the acid in the battery had leaked and had eaten a hole in her carpet.

Horses were still important on the farm. The tractor plowed, disked, and sometimes harrowed. But horses still pulled the oat seeder, the corn planter, and wagons filled with hay, corn, and oats at threshing time. But machinery had begun to supplant the horses. We found it more to our liking to grease and oil machines than to repair harnesses and take care of horses. We bought a grinder and a belt and hitched them up to the tractor to grind our own livestock feed. Trucks began to haul livestock to the stockyards and packing house. We no longer rose at daylight to drive a load of steers on foot and horseback through main street to the Illinois Central stockyards.

Changes jarred and jolted and scraped feelings. Perhaps change can never happen without resistance and harsh criticisms, and we all felt its impact in threshing season. The original threshing ring took in a lot of territory. The machines we used — the big steam engine and a separator with a 46-inch cylinder — could knock out 4,000 bushels a day, threshing out the oats as fast as we could throw in the bundles. Sometimes we used two spike pitchers which meant that four men had to throw bundles into the machine. We exchanged help with each other, and in a big ring like ours there was always plenty of help. But when the gasoline-powered tractor appeared, the days of the steam engine came to an end.

Because a tractor could only power a smaller separator, more time was spent at each farm to thresh the grain. So the big threshing ring broke up into several small ones. It was difficult to find enough manpower. We hired extra help when we could, but men willing to put in a day's work out in the August sun were not easily found. Then the bickering began. If one man with 20 acres of oats threshed his crop in half a day, why should he spend more than half a day helping the rest of his neighbors? But his help was needed and when he did not show up, the rest of us had to work harder to fill the vacancy. The 20-acre man had logic on his side, but there still existed an obligation to stay with the work until it was finished.

Our crop was the largest, Art Larsen's on the Jewell farm came next. When the machine reached our farm only a skeleton crew showed up. Art was mad. He had sent four men and so had we, which made plenty of help for the small jobs. Neighborhood cooperation went a little sour. We said to Art, "Never again."

"What will you do?" he asked.

"Try one of the small combines."

This move had no precedent. Large combines had been used for years on the western plains, but there the dry ground could support them and the wheat stood up — dry and hard. But small combines in the Midwest, where it often rained during the harvest season, had never been tried. The implement companies were still experimenting with manufacturing a small combine for the Midwest farmer.

My brother Charles and I traded our last four horses (and cash) for a small tractor, a disk, and

a combine. Our experience with it could fill a book. We did not let the grain stand long enough to ripen thoroughly. We tried to combine it at the same stage when we had cut it with a grain binder, forgetting that it cured in the shock. When it rained we started to combine before the grain was completely dry. Then the cylinder would plug and a man could break his back trying to turn the cylinder back a few inches so he could pull out the wad of damp straw. More than once we pulled the combine up to the house, damp straw hanging from it like wool from the jaws of a sheep-killing dog. But we eventually learned how to harvest the crop.

The days of neighborhood threshing were over. In a few years anyone who did not own a combine hired a custom operator to come in and combine his grain. When the country schools closed and the school district began to bus country children to town schools, the neighborhood lost its center and was no longer a close-knit entity.

The coming of power machinery and electricity relieved the farmer of much back-breaking physical labor, and it lightened the load of the farm wife beyond measure. It angers me to think of the extra steps farm women walked day after day just to carry water from the well while women in town merely turned a faucet. If an enlightened government or private corporation had sent electricity to the rural areas years earlier, farm women might have had the same benefits.

The neighborhood became a number of private homes and farm operations, the group feeling disappeared, the cohesion of people in a kind of social entity dissolved. And, the independence of the farm eroded. Now a single copper wire took the place of the woodpile and windmill. The farm no longer existed as a self-sustaining unit. We had learned to depend on electricity. The helplessness of a farm without electricity came home to me when the power failed after an ice storm, and the city fire trucks had to haul water out to the farms for the livestock until the lines could be repaired.

But the destiny that fires the boilers of technology does not ask if change makes life better or worse for people. We may call it progress, but back in our minds the feeling persists that the cost of the changes must be reckoned with, too. □

CONTRIBUTORS

ALAN AXELROD was born in New York and grew up in Chicago. He was educated at Northeastern Illinois University and at the University of Iowa, where he took a Ph.D. in English this year. Former editorial assistant for the Division of the State Historical Society, he now teaches American literature at Lake Forest College, Lake Forest, Illinois.

The State Historical Society of Iowa is a Division of the Iowa State Historical Department, a state agency created by the Sixty-fifth General Assembly. Along with the Society the Department includes a Division of Historical Museum and Archives (formerly Iowa Department of History and Archives) and a Division of Historic Preservation.