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The "Liquid Gold" Rush: Groundwater Irrigation and Law in Nebraska, 1900~93

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THE "LIQUID GOLD" RUSH
GROUNDWATER IRRIGATION AND LAW IN NEBRASKA, 1900-93

SAM S. KEPFIELD

> Water is power. Water is strength. Water is health. In the Rocky Mountains, it is the most valuable of all assets. Nothing else compares with it, nothing else can compare with it. With it, we can produce trees and forests. With it we can make fertile fields on the desert plains, and make the unsightly and uninviting plateau attractive for agriculture and home-building.[1]

Former Senator Joseph M. Carey of Wyoming told in a 1908 speech of the grip that water held on the imaginations of empire-builders in the West at the turn of the century. Men such as Carey, Francis Newlands, Nebraska's William E. Smythe, and Major John Wesley Powell all held visions of the arid West as part of an "Irrigated Western Empire," stretching from the Hundredth Meridian to the Pacific Ocean.[2] Through a series of national conventions and congressionally funded surveys through the U. S. Geological Survey, irrigationists pushed their vision into the national eye, with no small measure of success.

By the time of Carey's speech, though, it was evident that irrigation from surface water was not enough to make the deserts bloom. Powell's irrigation survey in the 1880s and 1890s created a stir with its proposal to set aside large amounts of land for the construction of huge reservoirs. At the 1893 International Irrigation Congress in Los Angeles, Powell had told the delegates that only 12 percent of the federal land in the West could be reclaimed. He was roundly booed.[3]

Feasible or not, reclamation of western lands, including the portion of Nebraska west of the Hundredth Meridian, went forward. As Powell was being thrust off the stage he had built for reclamation, others, as early as 1890s,

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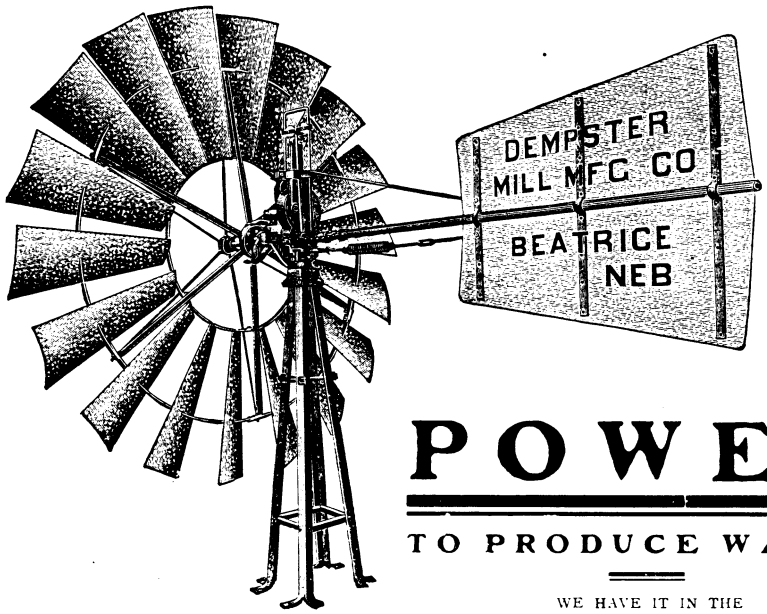

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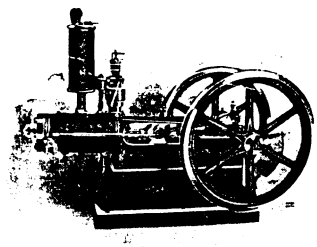

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FIG. 1. *Illustration from* The Irrigation Age, *Vol. 18, No. 9, 1903.*

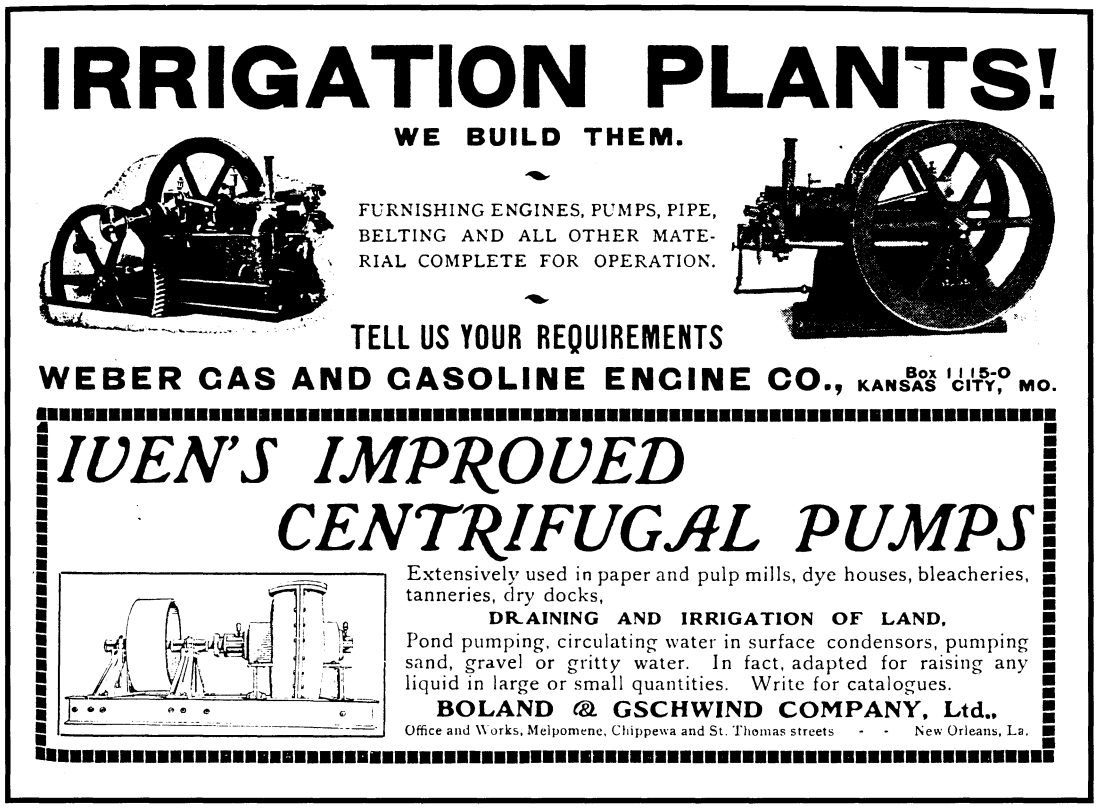

FIG. 2. *Illustration from* The Irrigation Age, *Vol. 18, No. 9, 1903.*

investigated the possibility of using underground water for irrigation. Richard Hinton pursued it at the federal level. In Nebraska William R. Akers, author of the 1895 irrigation law and secretary of the State Board of Irrigation that his law created, described a "very novel plan" of irrigating the Lodge Pole country. Water could be pumped, by windmill, from an "inexhaustible" supply not more than twenty-five feet below the surface and discharged into a trench. In 1898 N. H. Darton of the U. S. Geological Survey examined rock formations and underground water in southeastern Nebraska and noted that "very nearly all of this region is underlain by water-bearing deposits, which in most districts yield good supplies of water to pump wells."[4]

WINDMILLS AND PUMPS

Windmills, the primary means for pumping groundwater in the nineteenth century, were limited in how much and how deep they could pump. As early as 1895, a Clay Center farmer advertised that using two gasoline-powered internal combustion engines, with 3-inch cylinders having a 10-inch stroke, a man could pump 10,000 gallons of water in ten hours, enough to furnish a town of 600 with 16 gallons per person per day. Another elaborate scheme in the 1890s

called for an irrigator to sink 600-foot wells with electric pumps, erect a coal-burning, steam-powered dynamo, build transmission lines to the pumps, and water 24 sections of land, for $200,000.[5]

Although better than windmills, the newer centrifugal pumps of the early 1900s were generally suited only for shallow groundwater areas, such as those along riverbeds, which explains early irrigation development along the central Platte River valley in Nebraska.[6] Early wells for these pumps were hand dug, usually six to eight feet deep, seldom more than twenty. The inside hole was reinforced with brick, plank, or rock. Some of the very earliest pumps, when they reached bottom, brought up sand and gravel from the unfinished floor of the well, causing a cave-in and ruining the pump. This was solved by sinking a dry mixture of sand and cement in the well and allowing it time to harden; the pump was then lowered and ran without trouble.[7]

In the years before World War I, reports of pumps irrigating 75 to 125 acres were not uncommon (though some pumps were placed along rivers to bring surface water up into a ditch). In 1909, Nebraska had 66 operational pumping plants; by 1913, according to records of the University of Nebraska Agriculture College, there were 146 pumps operating, 69 of which were on the Platte River. A young Henry A. Wallace chronicled similar efforts on a larger scale in Garden City, Kansas, in his western travels in 1909.[8]

Despite promising beginnings, pump irrigation in this early period ended in failure. Although irrigation was stimulated by a drought in the 1910s and rising commodity prices during the famous "parity period" of 1909-14, the cost of the pumping plants themselves and the lack of any credit system to aid in their purchase put them out of the reach of many farmers. Moreover, the pump irrigation movement was oriented toward land speculation; it lacked the aura of a social crusade that drove the irrigation movement of the 1890s.[9]

By the 1920s larger vertical centrifugal pumps were employed, allowing deeper wells. Adaptation of engines to burning oil lowered fuel costs and increased horsepower. The cost of these improved units was beyond the reach of most farmers. Those who purchased them were plagued by mechanical problems—the belt system used to connect the engine with the pump constantly slipped and needed adjustment, and the internal combustion engines, still a novelty in the early twentieth century, were beyond the capacity of most farmers to repair and maintain.[10] The impact of the big pumps and deep wells, for all their problems, was enormous—it freed farmers from interstate rivalries on streams, particularly along the Platte River, and allowed more diversification of crops.[11]

More important, groundwater irrigation became cost-effective, comparable to irrigation with surface water. By 1930, for $2 an acre, a farmer could reap yields of 55 bushels of corn and 22 bushels of beets per acre. In the Depression of the 1930s, however, while irrigated farms gave better returns on investment and allowed greater stability in farm population, their bigger investments led to higher tax delinquency rates.[12]

By the mid 1920s the central Platte valley, especially near Grand Island, was "the best irrigated spot in the state," with nearly 150 pumps, sometimes running nonstop, irrigating a six-mile square tract of land.[13] Even after evidence that pump irrigation saved corn crops in the mini-drought of 1925-26, more than a few farmers remained skeptical. One delegate to the 1926 State Irrigation Association convention stated that a farmer who used pump irrigation "might have bought corn over in Iowa for a good deal less money than the pumps cost." Three years later, Buffalo County Agent Alvah R. Hecht pushed pump irrigation to little avail. One delegate, to great applause, asked Hecht how he could talk about pumps "when you are sitting here alongside water that is going to waste with great rapidity . . . Why don't you turn your attention to this gravity water that is going to waste?"[14]

Despite the doubts, pump irrigation spread rapidly. By 1930 Hecht claimed that there were

more than one thousand pumps in the state, of which half were located in Buffalo, Dawson, and Hall counties, and 100 to 125 in the Grand Island area alone. These pumps irrigated about 30,000 acres.[15]

Farmers began tapping the Ogallala Aquifer, a vast underground reservoir formed out of runoff from the Rocky Mountains deposited in layers of sedimentary gravel 150 million years ago. The lion's share of the Ogallala Aquifer, roughly one-fourth of its 220,000 square miles, lies under Nebraska, which has some of the deepest and thickest saturation levels in the entire region.[16] This apparent abundance of groundwater is crucial in explaining the course of Nebraska groundwater law.

The development in the 1930s of more powerful turbine pumps, movable sprinklers, and gated pipe allowed more and cheaper pumping from underground sources. High-speed, multicylindered engines (specially manufactured for industrial purposes or modified V-8s from production automobile blueprints) sold for considerably less than earlier models. The invention of the "geared-head" (or "gear-head") to link the engine differential with the pump did away with the cumbersome belts that were the bane of previous pumps. Plants could now be run continuously with less fear of breakdowns.[17]

The technological breakthroughs came just as the Dust Bowl demonstrated the need for irrigation as a form of crop insurance. No longer merely a tool to raise land values, pump irrigation began to attract the missionary zeal shown two generations earlier.[18] In January 1939 the Nebraska Pump Irrigation Association formed in Grand Island to further pump irrigation and make financial assistance available to pump purchasers. The group attracted the attention not just of farmers and land speculators but of local Chambers of Commerce and other leading citizens.[19]

By the end of World War II the state was poised for a surge in the use of groundwater for irrigation. By 1944 Nebraska boasted 5150 pump projects statewide, each irrigating an average of 50 to 60 acres, with some watering as many as 160 acres.[20] In order to begin the boom, several things were necessary—rural electrification, farm mechanization, and better understanding of groundwater. Throughout the 1930s and 1940s, all three were under development, but it took nature's frugality with moisture on the Great Plains in the 1930s to bring them together.

Rural electrification was a centerpiece of the New Deal with the creation of the Rural Electrification Administration in 1935. Transmission lines spread, web-like, from the huge dams of the Tri-County project on the Platte River and newer projects on the Loup River. The percentage of farms in Nebraska with electric power went from 9.7 percent in 1919 to 95 percent in 1954. Nebraska encouraged the expansion with a 1931 law giving irrigation districts the right to own electric light and power plants, lines, and any attendant machinery necessary for their operation.[21]

The irrigation manufacturing industry responded quickly, forging ahead with more innovations in pump technology suited for electricity than in any other area. Electric pumps were more efficient and easier to maintain than gasoline pumps and more constant in output than windmills, which relied on an external, uncontrollable factor, the wind.[22]

Electric pumps increased yields for farmers beyond their ability to handle with horses. Beginning in the 1920s, farmers rushed to purchase tractors, trucks, disk-plows, and combines, a process that culminated in a "postwar race to see who could mechanize fastest and shave their production costs to the lowest minimum." The costs of mechanization quickly drove out marginal operations, and as the number of farms decreased, the amount of equipment increased on the flat, treeless expanse of the Platte valley that was ideally suited to irrigation.[23]

Electricity and machinery were known quantities by the mid-twentieth century, but the mechanics of the groundwater itself were a mystery even to "experts" in the field. Nearly all claims about groundwater in the early days, from Darton's 1898 survey down through the

numerous speeches and claims of pump irrigation boosters, rested on one assumption—namely, that groundwater was "inexhaustible." In fact, very little was definitely known about it, where it was to be found, how it moved, and how much there was. Those in the forefront of the irrigation movement were most acutely aware of their ignorance. At the 1928 State Irrigation Association convention, delegates unanimously adopted a resolution calling for a survey of groundwater sources in the Platte Valley and adjacent lands that affected its water table.[24]

The Conservation and Survey division of the University of Nebraska began the survey in 1930, under the direction of Dr. George E. Condra. The results of the survey, the first comprehensive mapping of the geology and underground water resources undertaken in Nebraska, were published in 1943.[25] For the first time, a large body of information about groundwater was made widely available, and attention was called to its importance. The new knowledge came just in time for Nebraska's explosion in groundwater irrigation.

The drought of 1952-57, called "the Little Dust Bowl,"[26] provided the impetus for farmers to sink wells at record rates, much as the drought of the 1890s had given rise to the great Western irrigation crusade. Pump irrigation saw its most dramatic increases in the period from 1953 to 1956, in both numbers of wells dug and acres watered by pumps. From 1948 to 1953, Nebraska farmers installed about five hundred pumps per year. In the next three years, though, farmers nearly doubled the number of pumps from 9102 in 1953, to 16,603 by the middle of 1956. Fully one-third of the state's wells at the end of the drought were located in Buffalo, Hall, Dawson, and Merrick counties, where pump irrigation had begun half a century earlier.[27]

The boom in pump irrigation benefited businesses supplying the hardware. Hastings, Nebraska, was dubbed "The City of Liquid Gold" for its prominence as a distribution center for irrigation supplies. Beginning in 1954, pump orders jumped upward each year, and although installers normally began seeing their business diminish by the end of the summer, by August 1956 they began falling behind in fulfilling orders. New companies entered the field to help meet demand.[28]

During the early 1950s pump irrigation dramatically affected crop yields and values compared with those of non-irrigated crops. In 1950, for example, the total value of irrigated corn was $41 million for 28.7 million bushels, harvested from only 480,000 acres. By contrast, non-irrigated corn was valued at $319 million for 220 million bushels, harvested from 6.4 million acres. Irrigated corn yielded an average of 60 bushels per acre statewide, and dryland corn averaged only 34 bushels.[29] Irrigators were getting one-eighth the net value of dry-farmed corn, with only one-sixteenth the acreage.

By 1970 irrigated agriculture comprised a vital, $3 billion component of Nebraska's economy. Without it, the state would have suffered an annual loss of a quarter-billion dollars. Each irrigated acre in the state produced $499.77 from rises in crop production and processing, sales of fertilizer and seed, and labor inputs.[30] Overall, pumping from the Ogallala Aquifer added $21 billion, and a million jobs, to the High Plains economy by 1977, a powerful argument against those urging a return to dryland farming.[31]

The irrigated land itself produced greater crop yields that brought more on the open market. In 1987 crops harvested on totally irrigated land brought in $483 million, while non-irrigated land produced $602 million. Irrigated land, with half the acreage of non-irrigated land, produced 80 percent of the crop value of non-irrigated land. Consequently, by the late 1980s irrigated land was worth an average of $598 per acre as compared to $394 per acre for dry land.[32]

Center Pivot Irrigation

"It went around in a circle, some of the time. It watered, some of the time," recalled Robert B. Daugherty of the earliest center pivot. In 1948, Columbus, Nebraska, farmer Frank Zybach de-

veloped the center pivot irrigation system and tried it out on Colorado hay fields in 1952. Daugherty's irrigation supply company, Valmont Industries of Valley, Nebraska, was looking for ways to diversify and expand. Valmont bought the rights to the center pivot from Zybach and his business partner, A.E. Trowbridge, in the early 1950s.[33] Thus did groundwater irrigation truly come of age.

The advantages of the center pivot were chiefly economic. First, it reduced the hours of labor needed for the old, stationary sprinkler systems, making irrigation more labor extensive than labor intensive. A center pivot could apply as little as three-tenths of an inch of water to land, whereas earlier systems had a minimum of two to four inches. The pivot also enabled farmers to apply fertilizer automatically along with their water. Furthermore, center pivots could climb hills, irrigating uneven ground without leveling to ensure water flow. Yields for corn under such conditions reached up to 114 bushels per acre by the 1970s—unheard of even a generation before.

More important, though, the center pivot covered more acreage with less damage to growing crops than did earlier sprinklers. One farmer could operate six systems and irrigate more than 800 acres of land, twice the acreage possible with earlier systems. As federal farm programs in the 1960s and 1970s emphasized the withdrawal of land from farming, farmers had to increase their production on fewer acres, making it economically necessary for them to finance not only center pivots but also the high-cost machinery necessary to handle such large harvests.[34]

By the early 1970s center pivot irrigation had firmly established itself in Nebraska. From 1969 to 1974 Nebraska recorded a rapid, steady rise in the development of irrigation, averaging 6.2 percent annually (quadrupling the growth rates of larger states like Texas and California), largely through the use of center pivots.[35]

Policy and natural forces coincided in the 1970s to give center pivots and pump irrigation a boost. Following the Soviet grain deal, Congress passed the 1973 farm bill removing acreage restrictions and adopting what Secretary of Agriculture Earl Butz termed a "fencerow to fencerow" policy, designed to bring previously marginal land into production, largely through groundwater irrigation.[36] Roughly half of the new cropland planted in the spring of 1977, for example, had never been broken by a plow.[37]

Drought revisited the Plains in the mid 1970s. August 1976 was the driest August on record in Nebraska, topping records set in 1936. Forty-one Nebraska counties were designated as drought disaster areas in October 1976. Consequently, groundwater pumping reached new records, lowering water tables by 100 to 120 feet in some areas.[38]

By the winter of 1976-77, the peak of the center pivot industry in terms of sales, farmers were buying center pivots at the rate of nine per day, and pivots accounted for roughly 26 percent of land irrigated.[39] In 1972 Nebraska farmers operated 2700 center pivots on 378,000 acres. By 1986 the number had ballooned to 26,208 units on 3.4 million acres.[40] This growth turned Nebraska into the leading center pivot state in the Union, both in usage and sales. By 1983, the five largest Nebraska companies accounted for 80 to 85 percent of American center pivot sales, and the center pivot industry as a whole made up 6 percent of the state work force.[41]

By 1980, though, the energy crisis had taken the gloss off the center pivot boom. Diesel fuel costs had quadrupled since 1973, making center pivots less profitable and requiring higher commodity prices to sustain operators. Electric-powered units, even with timers, had become impractical, and some were switched over to liquid propane.[42] At this time, the notion of "sustainability" in agriculture, calling for policies and practices to be viewed in light of full long-range effects began to evolve.[43] With its anti-development roots, the movement was highly critical of the "mining" of groundwater for irrigation.

Perhaps the most heated opposition to center pivots in Nebraska came to their spread into the Sandhills. Outside investors—corporations and

professionals seeking investment opportunities—purchased land cheaply in the Sandhills, irrigated with center pivots, inflated the price of the land, and then sold at a profit. Land prices in the Sandhills rose by 35 to 85 percent, pricing it beyond the profit margins of most ranchers. The area was proclaimed nationally as "one of the last places one could put together a spread of highly productive land—fast."[44]

The rapid development ignited what one newspaper called a new "range war" between ranchers and the new farmers. Sandhills ranchers deplored the practice of chopping off hill tops and plowing them into ravines to level the land for center pivots, especially on land the U. S. Soil Conservation Service had classified as highly erodible and not to be used for crop production. The soil was prone to "blowouts," or severe, local wind erosion, if the natural cover of grasses was removed, and not even watering by center pivots would prevent it.[45]

By the mid-1980s, the worst fears of the ranchers were realized. Sagging commodity prices and a sluggish farm economy bankrupted many large operations that had installed center pivots on credit from outside investors. The huge, costly machines sat rusting in bare fields that quickly turned into mini-deserts, prone to Dust Bowl-like "blowouts," although attempts at reseeding met with success.[46] Ranchers found little help from Nebraska's water law. Center pivots routinely dried up artesian stock wells; nitrate pollution from fertilizers easily permeated the sandy soil. Finding Natural Resources Districts too weak to resolve the problems, counties considered using zoning ordinances to control center pivots.[47]

The economic slump and the drought of 1988 produced a sharp rise in the rate of well installation. In 1989, 702 wells were drilled, equal to the number for all of 1986 to 88. In 1992 farmers continued to up premiums on their "insurance policy" against drought, registering 1170 wells, the highest number in over a decade. With costs of production high, the risk of crop failure wiping out a farming operation justified the expansion of well irrigation until it accounted for 70 percent of all irrigation in the state.[48] Yet even with such widespread dependence on groundwater, Nebraska groundwater law was still trying to catch up.

GROUNDWATER LAW

Walter Prescott Webb described the early stages of Western surface water law as "something like chaos, a groping about for right principles, litigation over water rights, and a reinterpretation of the old law by court decisions in an effort to work out rules and regulations that were essential in this new and strange land." Groundwater law in the 1990s is a state-level balancing act between optimizing use, protecting rights, and efficient administration.[49]

The first session of the Nebraska Territorial Legislature in 1855 adopted the English common law. The law of "percolating waters" at the time was that a landowner possessed the land immediately below the property, "whether it is solid rock, or porous ground, or veinous earth, or part soil, part water," and the landowner could dig a well "and apply all that is there found to his own purposes at his free will and pleasure."[50]

This rule of "absolute ownership" did not last long in the western United States. In 1903 the California Supreme Court abolished the English rule in favor of the "reasonable use" doctrine. Instead of absolutely owning all water beneath the land, a property owner was limited to "such amount of water as may be necessary for some useful purpose in connection with the land from which it is taken." The court refined the concept by announcing the rule of "correlative rights," where landowners possessed their rights in conjunction with others drawing from the same source; hence, in times of shortage the water is apportioned between neighboring landowners. Nebraska's Supreme Court adopted the "reasonable use" doctrine in *Olson v. City of Wahoo* thirty years later.[51]

No legislative or statutory scheme formally adopted the rule, or more important, provided any means of preventing the age-old dilemma of the common pool from occurring. In the

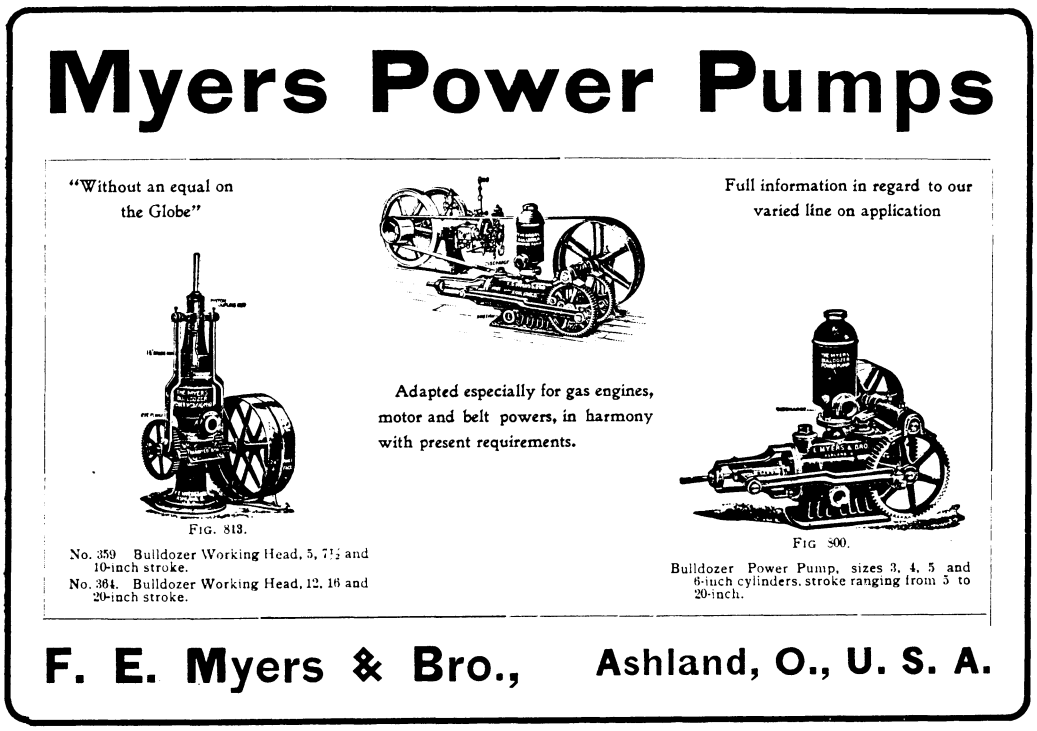

FIG. 3. *Illustration from* The Irrigation Age, *Vol. 18, No. 6, 1903.*

common pool problem, several parties lay claim to a resource and compete to develop it. Without any sort of mutually agreed-to restriction on development, there is no incentive to conserve. All owners exploit the resource until the production cost equals the market price, foregoing any sort of moderation in production designed to ensure continued future profits through measured exploitation. The incentive to pump is greatest at the outset, where costs are cheapest; as the pool is drawn down, costs increase. Ownership thus only conveys a privilege when it is inexpensive ownership.[52]

Not all lawmakers were oblivious to the problem. In December 1940, well before groundwater irrigation soared, State Senator Harry E. Gantz of Alliance addressed the Nebraska State Irrigation Association convention held in McCook. Gantz presented two diametrically opposed alternatives—the "law of the jungle," or a system for the state to grant, administer and adjudicate groundwater rights.[53] Until there was some way of recognizing and protecting appropriative rights to groundwater, farmers would be hesitant to invest in a potentially risky enterprise.

There was no initial reason to suppose a state system would not be defined. A similar void in the law of surface waters had been filled in 1895, when a drought made painfully clear the

shortcomings of a vague irrigation statute. New Mexico and Oregon both passed groundwater regulation laws in 1929; Nevada enacted a similar law in 1939.[54] Gantz served on a legislative committee that, a month before his speech, had recommended that groundwater be declared the property of the state, thereby subject to state administration of rights, state regulation for conservation, and state maintenance of groundwater quality.[55]

In February 1941 Gantz introduced L.B. 460. It followed the legislative council report, making groundwater subject to state regulation. The bill turned administration over to the Department of Roads and Irrigation, giving it the power to set up groundwater districts, determine allowable rates of appropriation, decide whether the supply was adequate for all users, and to apportion rights if it were not. The department would also be able to shut down violators. Gantz asked for withdrawal of the bill a month later, however.[56]

Legislators' reluctance to regulate groundwater merely reflected the wishes of their constituents. In hearings on proposed groundwater controls held from 1953 to 1958, legislative council committees met with loud opposition from farmers who believed no crisis existed and who also objected to central state control.[57] Despite the protests, by the 1950s it was clear that groundwater was no longer the "inexhaustible" resource of half a century before. In 1957 recorder wells run by the Conservation and Survey Division at the University of Nebraska showed that heavy withdrawals for irrigation had led to record low levels. In counties with heavy pump irrigation, wells showed progressively lower year-end water levels, accelerating even during the relatively wet decade of the 1960s. In 1965, 13 percent of wells showed record low levels; the following year 16 percent were at all-time lows. The heaviest areas of depletion were in the southwestern corner of the state and in south central Nebraska, south of the Platte river.[58]

The sentiments expressed in the groundwater hearings, and lawmakers' acquiescence, go a long way toward explaining Nebraska's neglect of the issue until the 1970s and its eventual decentralized approach. The center pivot boom of the 1960s and 1970s may have occurred precisely because of this neglect.

In 1957 the Legislature passed well spacing and registration laws as part of a general conservation program. Under the spacing law, wells were not to be drilled within six hundred feet of one another. It took until 1963 for state senators to define "groundwater" as that which "occurs or moves, seeps, filters or percolates through the grounds or under the surface of the land." (Not until 1993 did the Legislature further refine the definition by recognizing hydrological links between groundwater and surface water, but even then the action was more symbolic than substantive, putting well users on notice that the state was preserving its options for promulgating future regulations regarding groundwater withdrawals.) Nebraska water law expert Richard Harnsberger told the 1963 State Irrigation Association Convention that despite the new measures, Nebraska was far behind other states in restricting groundwater use.[59]

Natural Resources Districts (NRDs), created by L.B. 1357 in 1969, replaced more than 150 special issue districts with smaller, more manageable units based on river basin boundaries, giving Nebraska a unique structure for handling questions of water law and policy.[60] The NRD law supplied no methods for refereeing groundwater rights and apportioning groundwater in areas where it was deficient, however, despite a clear need.

In 1975 the Legislature enacted the Nebraska Groundwater Management Act, providing that NRDs could establish control areas where the groundwater supply was insufficient to meet present or foreseeable needs, subject to approval by the Department of Water Resources (DWR). The new law gave the NRDs few guidelines for setting up and administering control districts, however, so the establishment of control areas was merely discretionary and could only be initiated at the behest of those within the districts themselves. The Legislature diluted the Groundwater Management Act in 1982 with L.B. 375, authorizing groundwater

"management areas" as an alternative to control areas, partly in response to calls from Sandhills ranchers concerned about the havoc wrought by center pivots. Although similar to control areas, a management area was subject to establishment over the objections of the DWR.[61]

Nebraska's plan, for all its shortcomings, does not differ radically from those of other plains states. Texas and Kansas employ locally-controlled management, New Mexico and Oklahoma have strong central control, and Colorado has a mixture of both. All state laws allow for well spacing and withdrawal limits, with a variety of other powers. Generally, state groundwater statutes on the Plains differ "more in detail and form than in substance."[62]

The NRDs responded quickly to their newfound power and established three groundwater control areas. The Upper Republican control area in Perkins, Chase, and Dundy counties in the southwestern corner of the state was established on 1 August 1977. It contained the most serious depletions, with an area of some 1.17 million acres showing water table lowerings of 5 feet or more; 52,000 acres were at 30 to 42 feet below predevelopment levels. The Upper Big Blue control area (established 9 December 1977) and the adjoining Little Blue control area (established 2 January 1979) sited in Hamilton, Fillmore, Clay, and York counties in the south central region, had a combined total of 1.48 million acres where water tables were lowered 5 feet or more, and 1300 acres showing drops from 30 to 42 feet.[63]

Even so, groundwater law gave the appearance of a judicial construct, leaving farmers to rely on informal arrangements and lawsuits for resolving irrigation conflicts.[64] A 1989 study found that while the legislation, on its face, seemed to encourage "judicialization" of the issue, such was not the case, with very few water law cases actually entering the court system. True authority for water policy came from the NRDs and the DWR. On the whole, the study concluded that the Legislature had failed to address the issues of groundwater management.[65]

Two challenges in the past decade led lawmakers to reconsider the basis for groundwater law and to search for alternative solutions. In *Sporhase v. Nebraska ex rel. Douglas* the U. S. Supreme Court found groundwater to be an article of commerce, subject to the interstate commerce clause of the Constitution. A Nebraska statute regulating transfers across state lines was held to be an unconstitutional burden on interstate commerce.[66]

A brewing challenge to the Groundwater Management Act claims that groundwater withdrawal limits are a taking of private property for public use, which under the Constitution must be compensated. The Nebraska Supreme Court has not yet (August 1993) heard *Bamford v. Upper Republican NRD*, but has received briefs from all parties.[67] Most likely, the court will hold that the "right" to groundwater is merely a permit to use water that is owned by the state, a privilege conferred by statute, not a constitutional right. Under groundwater withdrawal limits, the ability to use is intact, but the quantity is restricted.[68]

Bamford may simply be ahead of its time in viewing groundwater as property. Sparked by the *Sporhase* decision, and influenced by the political culture of the 1980s, some lawmakers and commentators began seriously considering the privatization of groundwater—in effect, returning to the old common law of absolute ownership. All western states allow water rights in general to be sold, with a varying degree of restrictions. Nebraska is the only state with an absolute ban on transfer of use.[69] A 1988 study recommended that Nebraska statutorily allow market-based transfers of groundwater rights, for point of use and purpose of use, but it was not acted upon.[70]

The proposals to privatize groundwater drew sharp lines between the market forces and those advocating central state control. Proponents argue that only if rights are specifically defined and enforced as to amount and usage will producers have an incentive to conserve. The current system requires only use to determine the extent of the permit, often leading to a "race to the pumphouse." Furthermore, participation

in programs like the Conservation Reserve Program in the 1985 Farm Bill, where farmers forego any use of land for ten years, leads to a conflict with state appropriation laws, which can terminate rights for nonuse.[71]

Under a market system, a state would issue a deed to a certain amount of water in an aquifer, possibly in proportion to the amount of land owned over the aquifer, or, alternatively, to a landowner's capitalized value, through estimated future production. (Land values, which could be decreased by diminished production from groundwater, might vary.) The deed would have two parts: one a claim to a percentage of the basin flow, and the other to a percentage of the "stock" in the basin. At the end of each year, the "stock" account would be adjusted by subtracting withdrawals and adding natural recharge.[72]

Opponents argue that privatization would totally abandon the "water ethic," putting a price on the sense of community felt by farmers and other Americans. The national interest demands the government act to protect natural resources, not to mention to prevent the higher commodity and food prices that market-cost water rights would bring.[73] Opponents also argue that the methods of groundwater controls found on the Plains today, augmented by informal arrangements among irrigators, may be more effective in conserving groundwater than previously thought.[74]

The dilemma is likely to play itself out through the 1990s, particularly if the once-per-generation drought common to the Plains comes with any severity. It is unlikely that the hydrologic cycle will alter itself, and farmers, driven by rising costs to prevent crop losses from drought, are expected to continue drilling wells at the rate of 1000 per year.[75] More doubts, certainly, will be aired as to the feasibility of intensive farming in a marginally suitable climate. In this century, Nebraska groundwater law has traditionally followed technological development and drought, lagging by about a generation. For the next century, though, the law may have to anticipate and lead events, to strike the required balance between agricultural production and public interest.

NOTES

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