ERNEST TENER WEIR: 
LAST OF THE GREAT STEELMASTERS 

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Ernest Weir's lifework in the steel industry — a period of more than sixty-five years from teenage boy to octogenarian — spanned the ending of an old era and the beginning and maturation of the new era which continues today.

The old era was the age of the steelmaster. It reached its apex in the final quarter of the nineteenth century. It began its fade into oblivion in the early years of the present century, although traces of it could be found here and there for several decades. In its heyday many steel companies, small and large, had their "master," and his counterpart also was present in the entire range of contemporary industry and business. They differed markedly in character, status, and achievement. The great among them exerted a major influence in their particular fields and often far beyond.

Typically, the great steelmaster was endowed to an exceptional degree with strong will, courage, intelligence, and self-confidence. He was a daring entrepreneur, usually a founder of his company, and always its unchallenged leader. His attitude and conduct, well bolstered by substantial ownership, were those of a proprietor. On important matters, he relied on competent associates for essential information and respected their opinions and advice. But he reserved to himself the right and duty to have the last word and to bear full responsibility for it.

With noteworthy exceptions, the present era is characterized by what has become known as "modern management." Many chief and

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high ranking executives today are college-trained in business administration, technology, finance, and law. Available to them is a vast array of statistical and other pertinent information plus such aids as extensive research, surveys, test programs, and, of course, the ubiquitous computer. They view management as a profession and a science. In the old era both this view and its "tools" were rudimentary or non-existent. Nevertheless, the cardinal management function, now as then, is the making and execution of decisions. Today decision making is largely a collective process that ends in a consensus which dilutes individual authority and responsibility. It is, perhaps, this key difference between individual and group management that provides the sharpest contrast between old and new.

Because he had a foot solidly planted in each era, Ernest Weir has been described as an important transitional figure who belonged wholly to neither age. Certainly, he was keenly aware of new developments as they arose and adopted them in ways and to the extent that seemed good to him. As one evidence of his ability to cope with changing times, Fortune magazine published an article about his company some years ago which it chose to title: "Pace-Setter in Steel."

But in essential nature, attitude, and method Ernest Tener Weir was and remained the steelmaster — one of the greatest and the last of the breed. He has been styled often as the typical Horatio Alger hero, now held in such self-righteous contempt by the current crop of soi-disant intellectuals. True, he was born poor and died wealthy, but the dimensions of his character, works, and life extended on all sides far beyond the simple, narrow confines of Alger's "rags to riches" plots.

Personal wealth most certainly was one of his goals, but only one. It was, or became, secondary to his passion to create and build. His life was based on certain unchanging principles leading to actions that aroused opposition to the point of rage but which he regarded as the "good" in the philosophic sense of the word. He was a rugged individualist and totally unafraid to do what he considered right regardless of who might oppose him or where the chips fell.

Ernest Weir's parents, James and Margaret Manson Weir, were newly married emigrants from North Ireland. Like so many others, they came to Pittsburgh because it was the home of relatives and family friends. Here, Ernest was born on August 1, 1875. His middle name honored a Weir cousin in the family, which included John K. Tener, governor of Pennsylvania from 1911 to 1915. The second, and final, addition to the Weir family came five years later with the birth
of David Manson Weir. The brothers were strongly devoted to each other, and David filled key positions in the Weir enterprises until his death in 1929.

The father, James Weir, had sufficient funds to establish, adjacent to present Schenley Park, a livery stable which rented rigs with horses and also boarded and rented riding animals. At best, the business never yielded more than a meager living. He also built a home in Oakland. As described by Ernest, the ground floor consisted of two rooms: one a kitchen-dining-sitting room; the other the parents' bedroom. Above was a garret which served as bedroom for the boys. The cost was about $700.

At the time Ernest graduated from grade school, his father died. Total family resources consisted only of the home and whatever came from the sale of the livery business, probably very little. So Ernest got a job as office boy with the Braddock Wire Company. He left this after a short time to work in the same capacity for the Oliver Wire Company on Pittsburgh's South Side, a move made probably because one of the Teners was a company officer. Ernest's weekly salary was $3.00, and it was the total family income.

In boyhood and youth, life for Ernest was not all work. He was athletic, and his love was baseball in which he retained a lifelong interest. In those days, the site where the Cathedral of Learning and Heinz Chapel now stand was occupied by a brickyard. The corner opposite the Carnegie Museum had been stripped of usable clay, providing a reasonably level area which an Oakland team was allowed to use as their ball park. Ernest became the team's star pitcher, a fact he would mention in later years with obvious pride. His twin sons, Ernest and Kline, were inclined to regard this as a bit of rose-colored nostalgia. However, at a luncheon of some kind, the writer made casual acquaintance with an elderly gentleman who volunteered the information that he had been "Ernie Weir's catcher."

"Was he a good pitcher?"

"Good? Ernie was a damn fine pitcher. In fact, I always thought he could have made the major leagues." With a grin, he added, "The way things turned out, perhaps it's just as well he didn't."

While still an office boy, Ernest sat down with pencil and paper to calculate how many times the annual output of Oliver Wire could be stretched between Earth and the moon. The answer was an astounding number of strands. Since there were a good many wire companies, he could not see the potential use for all that wire, nor much of a future for himself in the wire business. Nevertheless, he stayed on for a
number of years, rising to salesman and traveling as far as Texas which had a very large demand for barbed wire.

Many years later, the then treasurer of Oliver Wire recalled that on one of his trips "Ernie's" wallet was appropriated by a pickpocket, necessitating a telegram to the Pittsburgh office for money. Ernest put the loss of something under $100 on his expense account, but the item was disallowed "to teach the young man to be more careful." When the treasurer's story was related to Mr. Weir he denied memory of any such incident. In general, his memory was excellent but in this case it might have been a bit selective.

Ernest made his move out of wire by going to the plant of another Oliver, John, who operated the Oliver Tin Plate Company, also located on the South Side. He became chief clerk which, despite the title, was an important position throughout the steel industry, at times ranking second from the top in a company or plant. During his time there a strike was called. Some workers stayed out; some stayed on the job. There was vandalism and more than a little violence. The strike lasted long enough to injure the business through loss of production and some customers. Workers' families suffered greatly. The aftermath was bitterness between worker and worker as well as between workers and management, with a resulting hostile environment and poor efficiency.

This incident left a permanent scar on the mind of Ernest Weir. It became his adamant conviction that a strike held no real benefits for anyone; that there was no valid excuse for one; that any management-worker disagreement could, and should, be resolved by reasonable give-and-take on both sides. And he meant both sides. As will be seen, this conviction was a key factor in later important decisions and actions.

Word of Ernest Weir's high ability began to circulate throughout the steel industry. In 1901 he left Oliver Tin Plate to go with another South Side employer as manager of the Monongahela plant of the American Sheet and Tin Plate Company — an acquisition of the newly formed United States Steel Corporation. In 1903 he was promoted to general manager of the company's Monessen plant at a salary of $5,000 a year. This was a new and, for the time, a large operation. The position was an enormous upward move for a man still in his twenties. It proved, however, to be a relatively minor step toward a much greater future. It was there that Ernest's career meshed with that of James R. Phillips who was in charge of sheet- and tin-plate sales for United States Steel over a wide area.
The two men became close friends. Phillips was the elder by some six or seven years. They were congenial in nature, highly capable, experienced in the same field of industry, and extremely ambitious. The strongest link between them was that both were eager to rise as far and fast as possible but deeply worried about roadblocks that seemingly stood in their way. They spent many long evenings in discussion of available ways and means to solve their dilemma.

The reason for their worry requires some explanation. The steel industry differed fundamentally in structure from that of today. Only a handful of companies was integrated to any degree. That is, such companies owned iron-ore reserves and mines, blast furnaces to smelt metallic iron from ore, open-hearth and Bessemer furnaces to convert iron into steel, facilities to convert molten steel into solid ingots, and blooming mills to roll ingots into the various shapes required for further processing into the wide range of finished steel-mill products. Carnegie Steel and Jones and Laughlin Steel in Pittsburgh were outstanding examples of integrated producers.

Even these, however, supplied neither all their own needs nor the full range of steel products sold to manufacturers or final consumers. For instance, they did not make all — or even some — of the coke which fueled their blast furnaces. That was done in thousands of "beehive" coke ovens owned and operated by a multitude of individuals and small companies. The usual practice was for coke brokers to contract for the entire annual output of coke makers at a fixed price per ton. The brokers then resold the coke to users, including steel plants and, in this case, again on an annual basis at a fixed price per ton. Also, the great majority of blast furnaces were owned and operated by individuals and small companies. Their product — cold pig iron — was sold mainly to foundries and, as opportunity arose, to steel plants.

These are examples on the raw material, or beginning side, of the steel industry structure. The difference between the industry then and now was even more sharply pronounced on the opposite side — that of finished products. The integrated producers made a relatively narrow range of finished material. Their major interest was in heavy products, such as rails, plates, and structural, for which the demand was large and growing. They also made other finished products, such as tin-plate, but the volume was small compared with the total output of independently owned and specialized finishing plants to which steel in shapes that constituted their raw material was supplied by the integrated companies.

Some of these specialized plants produced only steel sheets sold
in the first, or hot-rolled form, and in the second, more highly finished and expensive cold-rolled form. Others made these same sheets and, in addition, the still more highly finished and expensive sheets coated with tin or zinc. Still others concentrated on wire products, ranging from large rods suitable for the manufacture of such things as heavy bolts down to threadlike piano wire, or on various types of pipes and tubing, or on any of the manifold forms in which steel enters into the manufacture of end products for the ultimate consumer.

To summarize, each of the different but related steps of modern steel production was then the separate business of independently owned and operated plants. Their number was legion, they were relatively small, they were scattered over the country, and, in type and range, their production was dictated by the needs of their individual markets which were mainly local or regional.

When Weir and Phillips engaged in their long evening talks, this traditional industry structure already was threatened with the radical change which was evident to the perceptive. Its day was not over, but the hour was growing late. The catalyst was the United States Steel Corporation which had been organized by the Morgan interests and was proceeding at full tilt to lay the foundation for the mammoth enterprise it soon became. Its core — and largest — acquisition had been Andrew Carnegie’s steel company, of which a by-product was the creation of the famous “Carnegie Millionaires.” Now it was busily engaged in buying up other independent companies.

As seen by Weir and Phillips, their immediate problem was quite clear. They were employees of United States Steel and held well-paid positions. But each of the former independents already under the United States Steel tent, with others in the offing, had its full complement of executives, ranging from president, vice-presidents, secretary, treasurer, and downward. Many of them wanted to continue in active working careers. So, United States Steel had a vast pool of able, seasoned, and available management. To Weir and Phillips, it was not a pool but a great, dense maze through which progress to their personal goals would be very slow at best, impossible at worst. They resolved that their only chance was to establish a business of their own in the steel-sheet and tin-plate field which would solve their immediate problem and provide the foothold and base for an attack on larger problems they anticipated in the future.

Resolve translated into immediate action. They began to prospect for a sheet- and tin-plate plant which could be bought at a price they could hope to finance. As opportunity offered, they visited owners of
plants at various locations and always under assumed names, because they feared that disclosure of their intention would cost them their jobs. The search finally led to the Jackson Sheet and Tin Plate Company at Clarksburg, West Virginia.

This plant was entirely new but, for some reason, had never operated, although construction had been completed several years before. Most of its financing had consisted of heavy loans from banks. Weir and Phillips talked with everyone involved with the plant and eventually negotiated a purchase price of $190,000, well below its actual cost. The next problem was how to raise the money, and all of it had to be raised because the bankers who held the loans wanted nothing more to do with the plant.

Naturally, if Weir and Phillips expected to run the plant and attract investment in it, substantial financial stakes of their own would be necessary. Both had well-paid jobs for the time but no savings of consequence. Phillips managed to obtain a loan of $15,000 from a McKeesport bank. Now it was Ernest Weir's move, and he did not know where to turn. It was suggested that he try T. Hart Given, president of the Farmers Deposit National Bank in Pittsburgh. Ernest made an appointment with that colorful gentleman, described the proposed new enterprise together with his part in it, and ended with a request for a loan of $10,000. A brief but remarkable dialogue ensued:

“What's your collateral?”
“I have no collateral. It would have to be on my personal note.”
“You are married?”
“Yes.”
“Will your father-in-law cosign the note?”
“I think so but he has no collateral either.”
“Young man, bring your father-in-law in here tomorrow. If he cosigns the note, we'll give you the money.”

The next day, Ernest Weir had the $10,000 that bought his first 100 shares in the fledgling Phillips Sheet and Tin Plate Company which had been capitalized at $250,000. The sequel: as years passed and Weir rose to prominence, he came to know Given very well and one evening recalled the incident of the loan.

“You know,” Weir said, “it has always puzzled me that you were not willing to accept a personal note signed by one man who had no assets but perfectly willing to accept the same note signed by two men who had no assets.”

Given's reply: “I thought that if a father-in-law had enough con-
fidence in a man to cosign his note, the confidence was well founded.”

With their own stakes established, Weir and Phillips set out to raise the remainder of the purchase price and some working capital. The greater part of this initial funding came from a group of about ten Pittsburgh men, which included Charles M. Thorp, a prominent attorney; Maurice Falk, head of his own business; and Edmund S. Mudge, a large scale coke broker who also had interests in oil. These three men became directors of the original and succeeding companies and remained active in their expanding affairs to the ends of their lives.

Conclusion of the Clarksburg purchase in April 1905 brought the first real opportunity for a thoroughgoing inspection of the plant — with horrifying results. A former hot-mill roller, who had worked under Weir at Oliver Tin Plate Company, had designed the plant and was in complete charge of its construction. Weir’s comment: “He was a wonderful roller but a damn poor designer and builder.”

When a nonoperating trial run was attempted, water and steam spurted from faulty joints of pipelines throughout the plant. Awkward placement of some facilities impeded rather than expedited production by preventing smooth movement of materials from place to place. And there were hidden defects not discovered until later. As noted hereafter one of them could have been ruinous. So high hopes for immediate production were dashed. Instead of an outflow of income-producing orders, time and money had to be spent on bringing an idle plant into working condition.

The fact that Phillips became chief executive and that the new company bore his name makes it obvious that he was senior in the Phillips-Weir partnership. He was the older, more experienced man and probably obtained most of the original financing. Responsibility was divided between them. Weir was to be in general charge of all functions at Clarksburg; Phillips was to go out and get customers — a serious challenge to a newly formed company not yet in operation. They were to agree mutually and with their directors on policy matters.

While the plant was under repair, Phillips scurried about the country on sales trips that were not without success. What the future of the company might have been had he continued as chief executive through many years must remain forever unknown. Fate intervened. While returning from an eastern trip, he lost his life in a train wreck near Harrisburg, Pennsylvania — caused, ironically, by a shift in the load of steel on a car in a passing freight. This was in May 1905, the
second month of the company's existence and also the month in which it started operations.

From that day, there fell on Ernest Weir the full burden of top responsibility which he carried with spectacular success for so many years. Sales now became a most important part of his task, and this meant frequent and lengthy periods away from Clarksburg. Fortunately, he had available the broad shoulders of John C. Williams, a sturdy Welshman, who as general superintendent of tin-plate operations at Monessen when he decided to cast his lot with Weir and Phillips, was now given broad authority at Clarksburg.

By 1908, the company was on a solid basis and started a record of earning and dividends that was never to be broken. In the same year, the Clarksburg plant had been enlarged from eight to twelve hot mills with complementary facilities. Despite this rapid growth, Ernest Weir already was formulating decisive new moves which he knew had to be away from Clarksburg, because that location had certain defects, of which two were critical. It was far removed from the mainstream of steel production and distribution, thus enforcing abnormally high freight costs, both for incoming raw materials and outgoing finished products. Also the plant had a scanty supply of water, an absolute essential in all forms of steelmaking.

The water problem posed extreme danger in 1908, a year of drought. It was met with the ingenuity that recurred so often under Weir's administration. The creek on which the plant stood had shrunk almost to a trickle. An important step in tin-plate production is "pickling." This was done then by immersing both hot- and cold-rolled sheets in tanks containing an acid solution which removed dirt, oil, and scale to provide a bright, clean surface. The meager supply of water had to be recycled with the result that, at times, the acid content of the pickling solution increased to a point where it etched the sheets — a totally unacceptable condition. So work crews were sent out to build a series of small dams between the headwater and the plant-side pool. When the latter dropped to a certain level, the topmost dam was opened to permit its water to overflow lower dams and be trapped in the plant pool. However, the drought continued, and much time would be needed for the dams to refill. The alternatives were stark — find more water or suspend operations.

On the far side of the creek opposite the plant, there happened to be a sizable pond on which a farmer raised commercial flocks of ducks. It was spring-fed and had maintained close to its normal level. The farmer's land included about one-half the pond. So Ernest Weir went
out and bought the ground surrounding the other half. A pipeline and pumps were installed to move water from pond to plant pool. The farmer stormed into the company office with threats of a damage suit. It was gently pointed out to him that since the company owned half the pond, it was entitled to half the water. He did not accept this as entirely persuasive but took no legal action. The drought ended soon after, and the farmer had the pond to himself again.

There were other serious setbacks. In the old hot mill,* the individual mills were arranged in equal number on either side of a powerful engine which drove their rolls. The engine was connected to a gear wheel — twenty tons in weight and sixteen feet in diameter — which turned with great speed. One day this wheel “exploded.” Centrifugal force hurled fragments about the plant and through the roof. One chunk of its metal was found a quarter-mile distant. By great good fortune, no one inside or out received so much as a scratch. A new wheel was obtained and installed with little loss of time.

Another incident such as the one mentioned above was potentially ruinous. Someone noticed that the engine foundation was rocking slightly. If allowed to continue and worsen, the condition could endanger life, limb, and machinery. Operations were shut down to permit inspection and a decision on what to do about it. This mishap occurred at the worst possible time. The plant was flooded with orders, and there was heavy pressure for prompt delivery. A lengthy stoppage would result certainly in disgruntled customers and probably in a permanent loss of some who turned to other sources of supply.

A long shutdown would have been the inevitable consequence of conventional repair methods. Under these, the engine would have been disconnected and moved out of the way; the old foundation would have been broken out and a new one poured; the engine would have been moved back in place and reconnected; then, finally, the mills would have been operated on a nonworking basis until adjustments were made to assure proper alignment. Instead of this, excavations were made around and partway under the foundation, which proved to be solid enough but much too shallow for the weight and stress it had to withstand. With the foundation firmly shored, the engine was run at reduced speed which permitted continuance of curtailed but safe operation. Meanwhile, excavation was carried down to bedrock from which a new foundation was poured upward to the bottom of the

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* The term “hot mill” was applied both to an individual rolling mill and to a plant section that housed all such mills.
original foundation. Through this attack on the problem, production loss was minimal.

It is most unlikely that this daring approach was suggested by Weir. But one may be sure that it was he who spurred the search for a novel, timesaving method and gave final approval for its execution. He consistently rejected the idea that anything be done in a certain way "because it had always been done that way." He always was on the lookout for the new and better. Whenever equipment with superior advantages was developed, it was purchased to replace existing facilities long before the latter could be considered obsolete. And, through later years a remarkable number of replacements and additions were made during down cycles in steel demand — when most other producers clung to their cash and credit while awaiting a better day. This Weir policy brought distinct and important benefits to his company. New and more efficient facilities could be bought at rock-bottom prices; could be installed when the work interfered least with production; and were in place, proved out, and ready to go at the start of the next up cycle.

From the earliest Clarksburg years two considerations weighed heavily on the thinking and planning of Ernest Weir. His principal raw material was the sheet bar purchased from integrated producers who also made sheets and tin-plate. At any time, these producers could squeeze out independent companies by the simple process of increasing the price of sheet bar and reducing the price of sheets and tin-plate. This had never happened, but it was an ever-present danger. Even under the existing situation, independent companies that failed to maintain modern plants and aggressive marketing were falling by the wayside.

In order to test his judgment of the situation, Weir decided to go to New York for a visit with Elbert H. Gary. Judge Gary had guided United States Steel through the intricate course of its organization, was its dominant member of management, and was the most powerful man in the steel industry to his death in 1927. Weir frankly laid before him the dangers he saw as an independent* in possible price action by United States Steel with respect to sheet bar, sheets, and tin-plate. What assurance, if any, could he have that action of this kind would not be taken? There was no balm in Judge Gary's reply.

"We have never done that," he said, "and we have no intention of

* The term "independent" in those days applied to all producers of steel products that were not part of United States Steel Corporation. It has rarely appeared in print since the 1940s.
doing it now, but I can give you no guarantee that we will not in the future."

Ernest Weir now saw clearly that to safeguard the future of his company, it must be expanded eventually to integrated status. To make this possible, however, a preliminary step was essential. This was to increase the production and sales of his company's products to volumes that could support integration. The move toward this immediate goal started in 1908 with investigation of a number of locations for a new sheet and tin mill. The search ended with selection of acreage in a valley on the Ohio River near the village of Holliday's Cove, which is now a section of the city of Weirton, West Virginia. Weir described it as ground that "produced indifferent crops of wheat and apples." The location was in the mainstream of steel production and distribution. It had an abundant supply of water and other excellent advantages.

Another key reason for selection of this site harked back to the strike experience at the Oliver Tin Mill. Ernest Weir wanted to place his new plant in an area of small towns rather than in a large city. He believed that cities, if not breeders, were certainly magnifiers of discontent among workers. In a city, the associations of workers with each other and with management were limited mostly to their working hours. At the end of the day, they scattered to homes in different parts of a city. Plants of all kinds were concentrated in a city's industrial districts, and worker unrest in any plant had a contagious influence on others. In a small-town area, on the other hand, plants were few and separated. Workers and managers lived near each other; they belonged to the same churches and fraternal organizations; they participated in the same recreations; their children attended the same schools, and, in many cases, workers and managers were family members, relatives, or close friends. They knew each other well, not only in their work place but in the whole broad spectrum of life. They were close-knit and likely to think hard and long before taking action on the job that could disturb all their other cherished relationships.

Construction of a ten-mill plant started early in 1909, and it began operations before year-end. The building period had been used to recruit personnel. In this task, the key men were hot-mill rollers. If highly capable rollers were obtained, they could be depended on to bring with them crews of comparable skill. The hot mill was ultra-important. It was the starting point of production, and if its product was faulty, little could be done to improve it in the following processes. Ernest Weir was determined to have topmost craftsmen. To get them,
he had to offer superior earnings and employment conditions that would induce them to give up existing jobs and move their families to new homes. He did so, creating standards that were maintained through the future.

Some workers commuted from nearby Steubenville, Ohio, but most came from a distance. With existing housing not available, homes would have to be provided close to the plant for these new employees. Weir did his best to interest real-estate developers in the project. None of them would touch it because, too often, new plant sites became “ghost towns” that inflicted serious financial loss on everyone connected with them. So, home building had to be a “do-it-yourself” job through a real-estate subsidiary that diverted badly needed money and credit from the company. From the start, it was determined to get out of the real-estate business as quickly as possible. This took many years to accomplish.

As mentioned above, the hot mill was the critical facility, and its performance depended to a very great extent on the roller. The roller was a worker, not a manager, but was generally regarded as the “boss” of his mill. Using hand-held tongs, he made the decisive, final passes of sheets through his mill which brought them to the specified width, thickness, and imperative good surface condition. The mill’s output fell into certain grades of quality — a fact of great importance to mill crews and the company.

The first grade was “prime” sheets which were considered perfect from a commercial standpoint. They brought the highest price. The next grade consisted of “seconds” which contained minor flaws and were sold at a lower price. There were still lower grades which could be sold at even lower prices.

The mill crews were paid hourly wages, but these were minor compared with the proportion of income provided by tonnage rates when business was reasonably good. These rates varied on a descending scale from the roller through the other jobs of the crew. The highest rates were paid for “primes” with progressively lower rates for inferior grades. In most cases, lower grade sheets did not result from poor workmanship but from faulty metallurgy of the raw material — the purchased sheet bars. Metallurgical quality in those days depended mainly on rule-of-thumb experience for lack of today’s vastly superior equipment and methods as well as sophisticated procedures for tests and control of quality. The occasional poor sheet bars were accepted as a “rub-of-the-green,” because, through the law of averages, they were evenly distributed through the mill crews. Naturally, the tonnage
rates gave the crews the strongest incentive to produce a maximum quantity of prime material, and the best rollers were those who consistently produced the highest proportion of "primes." The target of every roller was a $50 day for himself with proportional high earnings for his crew members. It was attained at times and even surpassed. Needless to say, the buying power of $50 in the early 1900s was a good deal higher than $50 in 1975.

The company's progress continued apace. In 1910, the Holliday's Cove plant was doubled to twenty mills, and another addition of six mills was made a few years later. In 1911, the company acquired the twelve-mill plant of the Pope Sheet and Tin Plate Company in Steubenville. By 1915, the Phillips Sheet and Tin Plate Company operated a total of fifty hot mills at its three locations with an annual output of tin-plate second only to that of United States Steel. At this juncture, also, the company had finally established a strong base for its next major move — integration.

Many years later, Ernest Weir made this comment:

"Here is something that I have never said publicly because it could too easily be taken for hindsight boasting. But we definitely had integration in mind from our very beginning. I believe this is proof."

He then took a sheet of paper and drew a rectangle representing the original site at Holliday's Cove. He placed an "X" at the extreme lower left-hand corner and a second "X" a little above and to the right. Pointing to the first "X," he continued:

"This is where we built the power house, against a hill we knew was unstable. In fact, there were several mud slides and one was rather serious." Pointing to the second "X," he added, "Here is where we located the tin mill." Then he placed a third "X" at the rectangle's mid-center. Putting his finger on it, he said, "If we had been thinking only of a larger sheet and tin-plate operation, this is where we would have put both power plant and tin mill. It would have been logical to allow room for expansion on all sides. What we actually did would have been completely illogical if we did not plan to integrate."

In the same conversation, he commented on the relation of debt to growth:

"Debt is a good thing for a company — extremely good when used with judgment. Of course we withheld money from earnings but bank loans were our major source of funds. Through our early years, we were constantly in and out of debt on an increasing scale. Loans provided the means for rapid growth. And, with the constant threat of the sheriff knocking on our door, there was a powerful stimu-
lus to pay them off as soon as we could; then go on from there."

From 1915 the company moved vigorously on the road toward integration. Iron ore and metallurgical coal properties were acquired. Construction of a blast furnace plant started, followed by installation of open-hearth furnaces, facilities to pour ingots and heat them to rolling temperature, and a powerful, steam-driven blooming mill. At this point, the company was self-contained. It had everything needed for its production — from raw materials through finished products.

In 1913 the company had acquired a plant that produced strip steel — a flat rolled steel finished in a range of widths narrower than sheet steel which was used in the manufacture of durable and semidurable goods of many types. This relatively small plant was the original Weirton Steel Company, the first to include the name of Ernest Weir. Integration, in its first stage, was completed in 1918. On August 1 of that year — Weir's forty-third birthday — the company, at all locations, was reorganized under the name of the Weirton Steel Company in honor of the man whose leadership had raised it from the tiny beginning at Clarksburg to a major integrated producer with markets throughout the United States and abroad — a feat accomplished in the remarkably brief period of thirteen years.

However, there was no time to rest. Continuing growth demanded additional basic steel capacity which was provided by expansion of the blast furnace and open-hearth furnace operations. Then in the mid-1920s came a development which was to revolutionize steel production with effects that continue in the world steel industry today.

At Ashland, Kentucky, the American Rolling Mill Company had engineered, built, and started operation of a mill designed for the continuous rolling of steel into hot-rolled coils. Its purpose was to process steel with much greater speed, efficiency, and economy, as well as quality in a tonnage equivalent to the total output of scores of the then conventional hand-fed hot mills. This novel mill consisted of roll-stands, accurately aligned and spaced at intervals over its length. At the entry end, a power-driven roller bed fed a long section of red-hot steel (up to four feet wide and about one inch thick) into the rolls of the first stand. From there, it progressed automatically and with increasing speed through the remaining roll-stands, each of which maintained the original width of the section while increasing its length and reducing its thickness to the required gauge. The steel — now a very long and relatively thin strip — emerged from the final roll-stand onto a runout table that conveyed it to equipment which wound it into coils. Two similar continuous mills were installed later at Butler,
Ernest Weir wanted a continuous mill of this type, but, in addition, he wanted facilities in front of it which would permit the fully continuous, one-direction rolling of slabs from the blooming mill into hot-rolled coils in a single operation. The problem was turned over to the Weirton engineering department, and, in due time, the design was completed and rendered into detailed drawings. Now the problem was to raise the money needed for the mill’s construction. Weir went to New York on visits to two large banks with which he had dealt before. With the long roll of blueprints under his arm, he stopped at the first bank and saw the president — a Mr. Alexander. After he was shown the drawings and given an explanation of the mill and its purpose, Alexander asked:

“How much money will you need?”
“Seven million dollars.”
“How much of it do you expect from us?”
“I hope to get half from you and half from another bank.”
“All right, Ernie, we’ll lend you $3,500,000.”

Weir thanked him and started to leave. As he reached the door, Alexander called to him. “Ernie,” he said, “if the other fellow won’t give you the money, come back here and we’ll give you all of it. In fact, come back anyway.”

With this assurance, Weir stepped around to the other bank. The president was out, so he talked with a senior vice-president, showing the drawings and explaining the project as before. The vice-president thought over the matter for quite some time, then he said, “Mr. Weir, this thing might work out very well. But, I must tell you frankly that I consider it much too speculative for our bank and must say so when I report your request for a loan.”

While they were talking, they saw the president come in and followed him to his office. The vice-president stated the reasons for his belief that the loan should not be made but the president indicated that he wished to discuss the matter further. Weir began to unroll his drawings, but the president stopped him. “I would not understand what I was looking at,” he said. “Just tell me about it.” Weir did so, and when he had finished the bank president immediately told him, “We will make the loan of $3,500,000. If you have this much confidence in it, I’m sure it will succeed.” Weir took the good news back to Alexander, who congratulated him and then asked:

“How soon do you expect to pay off these loans?”
“In about five years, I think.”
“I have a strong hunch you will do it long before that.”

The hunch proved correct. Weir had his $7,000,000 in credit with two banks on his personal notes without a dime of collateral and at the prime rate of interest.

The new mill was built to produce sheet material to a width of forty-eight inches — the maximum width for tin-plate and most hot- and cold-rolled sheets. Demand for steel sheets was then far below the levels attained later, and Weir once was asked where he expected to sell all the sheet material he could now produce. His response was an amazed question:

“Can’t you see what is happening in the automobile industry, alone?”

The mill started operating in 1927 and continued with high efficiency for twenty years when it was replaced with a fifty-four-inch mill to supply a growing demand for wider sheets. Prior to the continuous mill, most steel products were made in relatively small bits and pieces which required a great deal of hand labor and much handling of material as it moved step by step through the production process. The proven success of the continuous principle in hot-rolling soon led to its application in following operations such as pickling, cleaning, annealing, cold-rolling, and plating.

Under the old method, tin-plate and galvanized steel were made by passing steel sheets, one by one, and by hand through baths of molten tin or zinc. In the continuous tin-plating method, prepared steel in huge coils passes through a long series of tanks containing a solution through which tin is deposited by electrolytic action — atom by atom — on the fast-moving strip from ingots of the pure metal. Similarly, galvanized material is made by continuously passing coils of steel through a tank of molten zinc. Both galvanized steel and tin-plate are available to buyers in coils which have extended the benefits of the continuous process into the manufacture of end products.

There is no great exaggeration in the statement that if tin-plate still had to be made under old methods and with the present high labor and other costs of steel production, it could be bought only in jewelry stores at jewelers’ prices.

The continuous principle has since been applied in the making of many steel products not mentioned here. Now it is being expanded into basic steel production. This movement has been aided by the oxygen furnace now taking the place of the much slower open-hearth process. Oxygen steel is poured into huge ladles which are “teemed” into ingots and also, on an increasing scale, directly into continuous-
casting machines to produce a variety of shapes. This latter method bypasses the costly and time-consuming steps of ingot-making and blooming-mill rolling and significantly increases the percentage of raw steel that ends up as finished steel. For many years, there have been strenuous efforts to apply the continuous method to the making of iron — but, so far, without success.

As noted several times above, one of the remarkable aspects of Ernest Weir's extraordinary ability was his unchanging concern for the future — the far future. In the 1950s, he made a trip to the then new plant of a Houston, Texas, subsidiary, National Steel Products Company, which operated a large warehouse and manufactured certain galvanized products. Following a plant inspection, the Pittsburgh and Houston groups assembled in the manager's office. Weir asked:

"How much ground do we have here?"
"Ten acres with half of it under roof."

"This is a growing steel market. More ground should have been bought for expansion and if any is still available, we should buy it."

Near the same time, he commented on a subject of much greater import — the basic raw materials of steel production. "Any steel company," he said, "should protect itself at least fifty years into the future with reserves of iron ore and coal."

Ernest Weir was then in his seventies. He was thoroughly familiar with actuarial tables of life expectancy and did not think he would be around for another half-century or more. But he was confident that his company would be and was taking steps to help it arrive at that point in sound condition.

His foresight was demonstrated again in still another area of extreme importance. His company made other products, but light, flat-rolled steel was, and still is, the dominant portion of its total output. Other major producers also made light steels but had a continuing main interest in heavy products. It was not that Weir's company never considered other products. Experts were engaged to make detailed analyses of other steel lines — such as rails, pipe, and wire — but, in each case the final decision was "No." Emphasis on light, flat-rolled steel became a matter of fixed policy.

As always, the basic reasoning was simple and direct. Light steel was a principal raw material in the manufacture of countless end products used by the general public. At any point in the economic cycle, purchase of such products was the least postponable, and, therefore, steel made for them was the least vulnerable in down cycles. The most obvious example was the tin can. Under any economic con-
dition, people must eat to live. So, in the worst of times, tin cans continued to move in billions from store shelves to home pantries. To a lesser extent, the same principle applied to light appliances and other articles. Adherence to this production policy did a great deal to enable Weir’s company to maintain relatively high employment and wages, to realize earnings, and to pay dividends in each quarter of the Great Depression years — as well as in all others before and since.

It was the continuous hot-rolling mill at Weirton that led to the first meeting between Ernest Weir and George R. Fink, founder of the Michigan Steel Company on the outskirts of Detroit. This plant produced hot- and cold-rolled sheets on equipment similar to that in tin mills. The sheets had a wide variety of uses, but almost all of Fink’s output went to the automotive industry. Fink was thinking of adding a continuous mill to his plant and made an appointment to visit Weir at Weirton for a discussion of the project. Weir agreed that it could be done but warned that its cost and other factors would make such a mill viable only if it was backed by basic steel production. Fink went back to Detroit, raised money, and started construction of a steel plant in the city of Ecorse, on the Detroit River.

That first meeting was to have a sequel of greater consequence. Weir and Fink had a mutual friend and supplier in George M. Humphrey, chief executive of the M. A. Hanna Company of Cleveland, who relinquished this post only during the six-year period when he served as secretary of the treasury in the first and second Eisenhower administrations. The Hanna Company had major interests in several fields of industry, but its principal operations consisted of iron ore and coal reserves with mines in both, a fleet of Great Lakes carriers, and two blast furnace plants — one in Buffalo, New York, and the second a few miles distant from Fink’s then-building steel plant.

Certain conditions prevailed in the steel and iron-ore industries at that time which provided a compelling incentive for these three men to merge their operations. The contributions to the merger were: from Weirton Steel, all its operations and raw material reserves; from Michigan Steel, the operating plant and the steel mill under construction; from M. A. Hanna, iron-ore reserves and mines, the two blast furnace plants, and a fleet of Great Lakes carriers. This action, of course, was preceded by discussions among the three principals and their aides, by engineering studies and evaluations of the respective contributions, and by much detailed legal work. The result was the formation of National Steel Corporation under a Delaware charter in the fateful month of October 1929. The division of ownership among
stockholders of the predecessor companies was Weirton, fifty percent, Michigan Steel, twenty-five percent, and M. A. Hanna, twenty-five percent. Weir became chairman and chief executive, Fink, president, and Humphrey, chairman of the executive committee.

With molten iron now immediately available from the former Hanna blast furnaces near Ecorse, plans for the new steel plant there were substantially enlarged to provide more open-hearth furnaces and other facilities. This was financed through a $40,000,000 bond issue. Also the name of the Ecorse operation was changed to Great Lakes Steel Corporation, of which Michigan Steel later became a division. At the outset, the only operating steelmaking facilities were those at Weirton and its ingot capacity — the steel industry's traditional measure of size — ranked National Steel as ninth among major producers. However, with the start of operations at Great Lakes Steel and later increases in ingot capacity there and at Weirton, National Steel quickly advanced to fifth in the lineup. Today, it is the third largest steel producer in the United States and also a substantial producer of aluminum and other metals.

Through all these years, Ernest Weir remained a Pittsburgher. In the early days at Weirton, he commuted, taking an early morning train down and returning in the late afternoon and often late evening. When roads were improved, he made the same trips by automobile. The National Steel headquarters was established in Pittsburgh's just-completed Grant Building. From a geographic standpoint, Cleveland might have been a more logical location because it was at the center of the Weirton-Detroit-Buffalo triangle. Pittsburgh was chosen although National Steel's only operation and property in Pennsylvania at that time was the Isabella Coal Mine, near Brownsville. To Ernest Weir, Pittsburgh was home.

[To be continued]