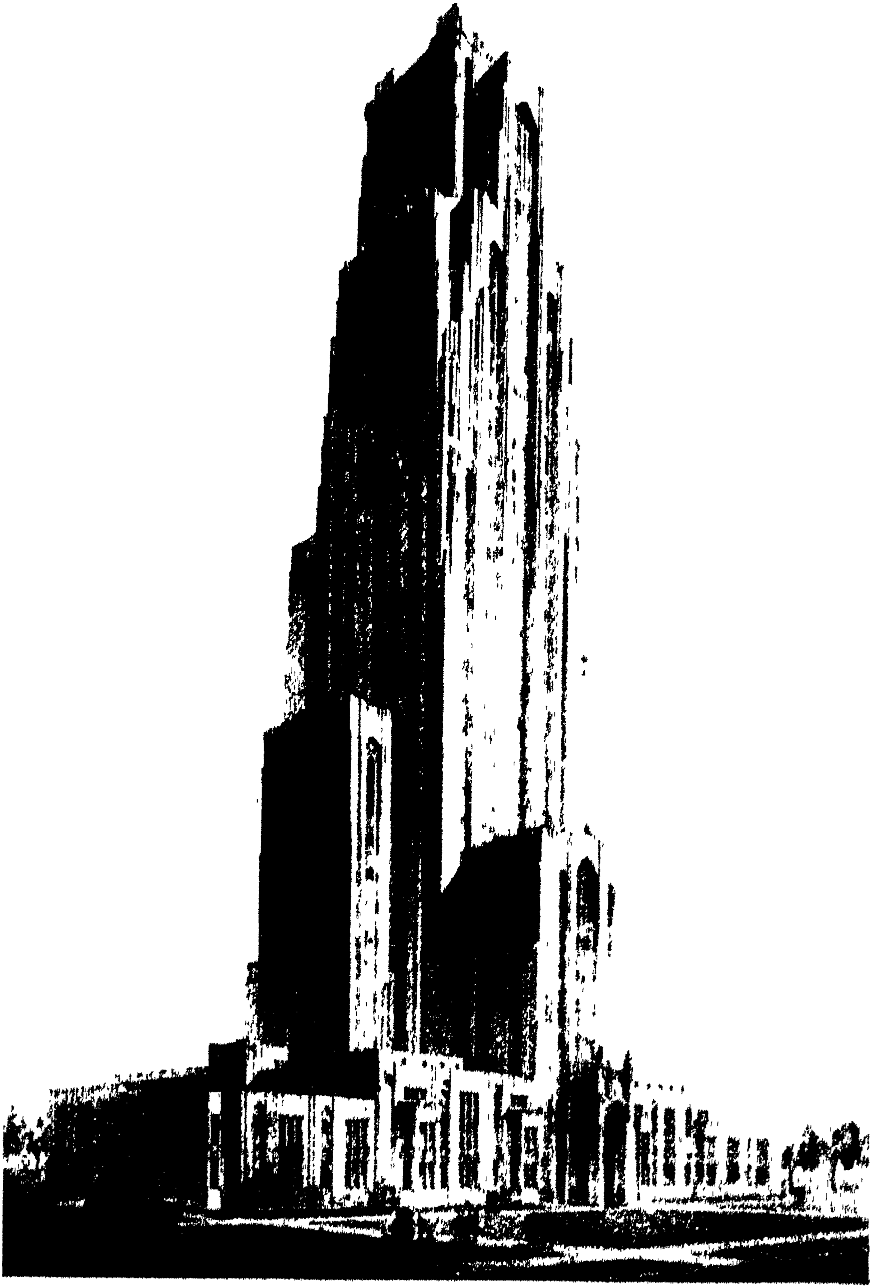
PITTSBURGH AND THE PITTSBURGH SPIRIT



CATHEDRAL OF LEARNING
PITTSBURGH

PITTSBURGH
AND THE
PITTSBURGH SPIRIT

Addresses at the
CHAMBER OF COMMERCE
OF PITTSBURGH
1927-1928

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Foreword

BY GEORGE R. WALLACE
Past President Chamber of Commerce
of Pittsburgh

WHEN we enter a city which we have not seen before, our minds are filled with the things which greet the eye. The towering buildings, the thoroughfares extending their fascinating perspectives in every direction, the great industrial structures, the public improvements, the schools and universities, the beautiful parks, the residential districts, the churches pointing their slender spires into the sky—all of these things beat in upon the imagination and fill our thought.

After we have been in such a city for a few days we begin to see its more intimate side. We may visit its libraries and art exhibitions. We may seek out its points of historical interest and we will form an impression of the character of the place from the people who throng the streets.

If we read books of travel or listen to travelers' tales, we shall find that outside of personal adventures the things mentioned above have absorbed their interest and the stories they have to tell are an endeavor to convey the impressions which they have received in these respects.

It is a singular thing in a way, and yet quite natural, that the casual traveler does not often think of the men who have accomplished these results. The builders are hidden by the things which they have built. The architect who designed one of the most wonderful temples of Greece caused his name to be carved secretly into the stones and filled the crevasses with plaster, which, in the course of years, fell out, and in this way his name was perpetuated. This temple was one of the wonders of the world, and yet the name of the architect would never have been thought of if he had not resorted to this device.

And yet the real essential thing about any great city is the men who have built it. Without the genius, the broad vision, the foresight, the energy and the practical capacity of such men, no city has ever been built.

The site of Pittsburgh was bountifully endowed by nature with advantages for the building of a city. The first French explorers who drifted down the Allegheny river in their canoes and the first adventurers from Virginia who pushed their way over the mountains and through the forests, coming in by the Monongahela valley, saw that the forks of the rivers formed the Gateway to the West. For decades the stream of population and of traffic flowing into the great undeveloped lands toward the setting sun passed through Pittsburgh. Even after the railroads for a time destroyed the supremacy of river traffic, Pittsburgh was still the entrepot of traffic movement. Both sides of the Allegheny and of the Monongahela and both sides of the Ohio are banded by the lines of railroads seeking a water level and the business of the populations in the river valleys.

Our abundant coal, oil, and natural gas and our proximity to ore bodies made Pittsburgh a natural place for the development of great industries, particularly in iron and steel.

Nevertheless, Pittsburgh could never have been more than a junction for trans-shipment to the river, or a center of railroad traffic, if it had not been for the genius and energy of the men who built up our great industries. They were the true pioneers. They caught the vision of what might be and with indefatigable energy and skill they struggled against the difficulties and discouragements incident to every new enterprise. They overcame them and they laid broad and deep the foundations for a great industrial city.

These men did not confine themselves to industrial success. They did not confine themselves to the building of great plants and the establishment of institutions of towering financial strength. In the midst of their busy and driving years they thought also of the human side of the community. They planned to build and they did build a city which would meet the craving of its people for recreation, beauty, and the refinements of art and culture.

We have beautiful parks, advanced institutions of learning, centers of art and music, churches and public schools which contribute to the moral and intellectual development of our people, and which surprise and delight visitors who have thought of Pittsburgh only as an industrial center.

We owe these things very largely to the men who have built our great industrial and financial institutions. Their maintenance and development are thought of and cared for by the leaders of today.

This book tells the story of the builders of Pittsburgh. Some of them already have almost passed from public memory. If their record had not been written now, the material for its making would soon have faded from view. Many of them have only recently passed from our midst, but their old friends and associates who labored with them have here inscribed from personal knowledge the narrative of their deeds. The Chamber of Commerce of Pittsburgh is very greatly indebted to Mr. A. L. Humphrey, president of the Westinghouse Air Brake Company and past president of the Chamber, for conceiving the plan of these addresses and securing its accomplishment. He is himself the builder of a great industry and, still in the prime of his activities, is lavish of his time and thought in the public interest. With his accustomed modesty he has sought no recognition for his efforts although he is the real creator of this book. His service should not pass unnoted.

The Chamber of Commerce offers this book to the public not only as a compilation of great historical interest but as a tribute of loving remembrance to the Fathers of Pittsburgh. They have not, like the architect of the Grecian temple, carved their names in the stones of their buildings but they have engraved them deeply in the hearts of their fellows.

Here is the story of the building of the city. It is a story full of inspiration and cheer for every true American.

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PITTSBURGH'S CONTRIBUTION TO CIVILIZATION

JOHN G. BOWMAN

John Gabbert Bowman, chancellor of the University of Pittsburgh and author of the address on "Pittsburgh's Contribution to Civilization" in the series on "Pittsburgh and The Pittsburgh Spirit", was born in Davenport, Iowa, May 18, 1877, the son of John R. and Mary A. (Gabbert) Bowman. He graduated from State University of Iowa, Iowa City, 1899, A.M., 1904; (LL.D. Coe College, 1912, University of Mississippi, 1914, Boston University, 1927). He married Florence Ridgway Berry, of St. Louis, on June 29, 1908. He did newspaper work 1899-1901; was instructor in English at the State University of Iowa, 1902-4 and at Columbia 1904-7. He was secretary of the Carnegie Foundation for the Advancement of Teaching, New York, 1906-11; president State University of Iowa, 1911-14; director of the American College of Surgeons, 1915-21. He became chancellor of the University of Pittsburgh in 1921. He is a trustee of the National Board of Medical Examiners (Philadelphia) and director of the Forbes National Bank of Pittsburgh.

Pittsburgh's Contribution to Civilization

BY JOHN G. BOWMAN

WHEN Mr. A. L. Humphrey asked me to talk on what Pittsburgh has given to the nation, I accepted his invitation without knowing how generous he was. He talked about the subject as though it were average size. It is larger, as a matter of fact, than you can know unless you go right up close to it.

Well, what has Pittsburgh given to the nation? The city is one of the great metropolitan centers of the country. It has contributed much to the life of the country. We know that to start with. In industry, commerce, art, political life, and good citizenship—in all of these fields it has a creditable record. But other great cities also have creditable records, and merely to repeat details of Pittsburgh's general accomplishments is not, I think, my subject. What Mr. Humphrey wants, as I understand him, is to know one or more of the individual and distinguishing contributions which Pittsburgh has made. In other words, except for Pittsburgh what would the nation not have today?

Let us agree, at the start, that mere bigness and numbers and tonnage in industry and in commerce are not the right answers to the question. By this I do not mean that we should take less pride in the bigness of our industries. No, we believe in big success. We have pride, also, in the elemental character of much of our industry; that is, in the changing of natural resources into usable form, such as the making of steel, iron, glass, and electrical equipment. We find pride, and even inspiration, in all of this record. Some years ago on one of the Windward Islands I got some fresh pride in Pittsburgh's achievement. I was in a town of 7000 or 8000 people in which there was not, so far as I could find, a pane of glass or an iron stove. The people were living as though Columbus had just discovered the Island. Evidently W. L. Monro and W. L. Clause and B. F. Jones, Jr., had not been there. You have to get away from these men in order to know what they have done for you. But however much pride we may take in Pittsburgh, I think we shall not find that pride enduring merely because of the bigness of anything we have done. We should look deeper into the facts and discover, if we can, the quality of mind or the way of thinking in Pittsburgh which lies back of its creative achievements. We should find the human element behind the details of success.

Pittsburgh has a spirit or an individuality of its own—a clear, sharply defined individuality which is dynamic and creative. We admit that. And the people here did not attain this individuality, or spirit, merely by dreaming about it, or entirely by inheritance. They attained it by living their way to it. My purpose now is to make clear what the qualities of this attitude are and how the people lived their way to it. This attitude or spirit, I think, is Pittsburgh's chief contribution to the nation.

In about 1758 a small Anglo-Saxon, or Scotch-Irish, settlement which the folk called Pittsborough began near where this Chamber of Commerce building stands, certainly in sight of it. During the early years of the settlement they had an experience somewhat like that of Robinson Crusoe. They came on horseback rather than on a ship; but, having arrived, they lived on what was left, and on hope. The little town was part of a dangerous frontier. To the east was a trail over the mountains; to the west, a "trackless forest." With their axes they cut down trees in this neighborhood and made log houses. They went to work for the necessities of life—for shelter, food, and clothing. Deer, turkeys, raccoons, squirrels, and rabbits could be had for the shooting of them; fish in plenty, for the pulling of them out of the rivers. Their lights at night were fire logs, their music, the owls and the wind in the trees. They worked for a livelihood. They raised hay and corn and turnips.

In 1760, there were in Pittsburgh eighty-eight men, twenty-nine women, and thirty-two children. There were one hundred and forty-six houses, stores, or shops. In 1761 there were three hundred and twenty-four men, ninety-two women, and forty-one children. The French and Indian war was over, but "drunken Indians" were plentiful in the village streets. In this year, the townsfolk "hired a school master and subscribed about sixty pounds for him for that year." He had twenty scholars. On Sundays, he read the Litany and Common Prayer, for the "people seem to long for some public way of worship." This information comes to us from the diary of James Kenney, a former prisoner at Fort Duquesne. In 1766, the Reverend Mr. McLagan "preached alternately in Scotch and English." A Lutheran church was established in 1783.

Here, then, as one quality in these people, was desire for education and for worship. That is important in all that happened later. In this connection, let us remember that these folk, most of them, came from Scotland, Ireland, and England; that the British Islands, then, were at peace and made the strongest nation in the world; that Methodism was rapidly spreading and that vice was no longer fashionable; that Samuel Johnson and David Hume were living and that Edward Gibbon was writing his "Decline and Fall of the Roman Empire," that Goldsmith and Robert Burns and Edmund Burke and Adam Smith were at the heights of their careers—all great voices which these people in the Pittsburgh Wilderness knew.

Eighteenth century England, in general, was a nation of formal gardens, of staid and formal manners, of correctness and order, and of good taste in literature and art. The people here must have felt keenly the contrast. They had almost no law, and little of the order they had formerly known. All was wilderness, hard work, and adventure. Land here, for example, away from their settlement, was free. Land close in, let us say at Schenley Farms, costing $50.00 for 100 acres, or $25.00 if the title were not guaranteed. Titles to land were of doubtful worth. Squatters' rights were not settled, and whether the district was part of Pennsylvania or of Virginia was a debate. If the purchaser of land assumed full responsibility for the title to property, the cost was one-half less than if the seller guaranteed the title.

As years went by, and the Revolution came and went, the great migration of pioneers to the west began. In those days

> ". . . stepping westward seemed to be
> A kind of heavenly destiny."

Life here, then, lost some of its danger; but it remained rugged and intense. One reason for its remaining intense was that Pittsburgh was the natural gateway to the west. As soon as roads were built across the mountains on the east, the pioneers came by hundreds, then by thousands, seeking, of their own volition, new homes in the Mississippi valley. This meant that Pittsburgh was a market. And the people were quick to know that they could make pots, spinning wheels, axes, horse shoes, candle molds, flails, guns, cow bells, and other useful articles and sell them to the home seekers. Pittsburgh was the natural fitting-out place for the pioneers.

Under these conditions industry started. It started, increased, and increased some more. Saw mills, tan yards, boat-building docks, lime kilns, and brick kilns were added to the list of manufactures. Coal was now being mined. About 1790 the making of iron began. Probably never before in the history of the world did such various industries spring out of sheer ingenuity and hard work and foresight; and probably never before did industry become so completely a creative experience of a people. It was all an adventure. Each man had his chance. He was free to pull, drag, or lift the natural resources of the district to his shop or furnace and to make them into salable articles. The necessity to work became eagerness to work. Each captured what wealth he could.

The actual frontier, in time, moved farther west; but the diversified industry stayed, growing stronger and more settled and more determined. The whole western migration, passing through, kept the community fresh and young and tense. "Pittsburgh manufactures" became a familiar sign over stores to as far as the Mississippi river.

Through this period, let us say from 1758 to about 1840, we had here a combination of industry and of pioneer conditions; we had an increasing market; we had the natural resources needed to supply that market; and we had the intuition and intelligence and vitality to take advantage of the whole situation. During this time the community developed some qualities which, I think, are as follows:

First, each man had to stand on his own legs. He had to trust his own experience and, generally, to mind his own business. He worked hard. He received practice every day in the meeting of new situations, in being original, and in industrial planning and management. Under these conditions, he had no time for mere wishing or dreaming; he became matter-of-fact and practical; and he lived a life pitched high in creative experience.

Second, the long pioneer period developed a feeling of independence and of security in the individual. It is true that these early settlers felt a common dependence upon one another and that they felt a common insecurity. But one man did not feel this more than his neighbor, and the result was that the individual developed much self-confidence. This is the basis for genuine brotherhood among men. This brotherhood, or religious sense, was not opposed to industry.

Third, the wild country through which these people had come on their way to Pittsburgh, the trails through the woods that led nobody knew where, and the wonder of the unknown, created in the minds of these people a sort of freedom of body and of thought. The new life on the frontier literally threw them into a new way of thinking. They were far indeed from eighteenth-century customs. Instead of believing that old methods were wise and right merely because they were old, they learned to look upon new and necessary ways of living as attractive and good, and, in general, as not bad because new. A quiet intellectual revolution took place within these eighteenth century people. They gained new ways of living, new ways of working, and new ways of thinking.

But these qualities in men and women, you say, flared up generally among the pioneers of the time. I think this is true, and, further, that it is one of the great facts of American history. These qualities, however, did not flare up and stay flared up in any other community for so long a period nor did they reach so intense a glow as they did in Pittsburgh. Pittsburgh not only sold the merchandise needed by the people of the new west, but it made this merchandise. Its creative ingenuity was called into action and was kept in action, fresh and alive, by the constant stream of pioneers passing through. Pittsburgh was not allowed to settle down and become dull and common-place and ordinary.

The significant fact now is that Pittsburgh through nearly a hundred years developed a new way of thinking and a new way of acting. These new ways became first-nature in the people. Let us look further at this development.

You and I are made in such a fashion that we respond to creative work well done. If we make a spinning wheel or a hoe or a lime kiln or a steel plant or a poem or a song, if we make any of these things well, we feel pleasure and satisfaction. The joy of creating is inherent in us. It makes us want to repeat the experience, to do the job again. But, having achieved once, we are not content to achieve again on the same level. We desire next time to do better, or to create something more perfect or more beautiful, or to be more efficient. And next time, again, we desire still to move on toward some sort of ideal perfection.

If this process is allowed to go on through many years, imagination will creep into the effort as surely as the sun comes up in the morning; and beauty, which is inseparable from spiritual growth, will also creep into the work. In this way life worth living is made. The principle applies to industry just as it applies to science, art, and religion.

Let me illustrate, first, from art. Wordsworth as a young man wrote verses in which he addressed "Hope" and "Kind Nature" and the "Gentle Muses." In the vague dawn of maturity, he tried to exincreased some more. Saw mills, tan yards, boat-building docks, lime kilns, and brick kilns were added to the list of manufactures. Coal was now being mined. About 1790 the making of iron began. Probably never before in the history of the world did such various industries spring out of sheer ingenuity and hard work and foresight; and probably never before did industry become so completely a creative experience of a people. It was all an adventure. Each man had his chance. He was free to pull, drag, or lift the natural resources of the district to his shop or furnace and to make them into salable articles. The necessity to work became eagerness to work. Each captured what wealth he could.

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Again, Foster wrote the great hymn called "Old Black Joe." That hymn, however, was the result of twenty-five years' work, during which time he wrote about 140 songs. As he wrote song after song, he was creating not only music, but he was also making Foster. His individuality, his fully developed self, seemed always to be in the future; and by persistence he was able gradually to unfold that self. But let us remember that he took twenty-five years to arrive at the "Old Black Joe" level. Wordsworth wrote for sixty-five years.

That same process is exactly what happened here in industry. Men with creative ability turned their energy toward industry here for nearly a hundred years. Just as Wordsworth learned to write poetry, just as Foster learned to write songs, these men in Pittsburgh learned to handle problems of management, and to see forward in commerce. Step by step they learned daring and foresight and soundness of judgment in industry. They attained new standards of excellence and new dimensions in the scope of business. The United States Steel Corporation, the Westinghouse Electric and Manufacturing Company, the consolidation of the oil industry, the Aluminum Company of America, the H. J. Heinz Company, the Jones and Laughlin Steel Corporation, are merely illustrations. Such organizations were inconceivable in the eighteenth century. They came into the nation here without precedent. They sprang from a power of mind which only a long creative experience in industry could develop. At some time in the future, I believe, the power to be pioneers in such industry will be recognized as genius. The creating of such corporations was not accident any more than the writing of "The Daffodils" or of "Old Black Joe" was accident. Both grew out of succeeding and of responding to success, of succeeding again on a higher level, and again of responding to a still higher level.

An important contribution of Pittsburgh to the nation, then, was the application of creative ability to industry. Business insight was developed here as the drama, for example, was developed in London at the time of Elizabeth. Courage in business, grasp of its human and technical problems, experimentation for new processes and for new materials, and the breaking away from all traditional limits of industry are phases of industrial success in Pittsburgh which originated here and which have affected industry, commerce, and science throughout the world. It was not accident that the Mellon Institute was started in Pittsburgh. That was just a natural sequence of what had gone before.

In other words, the old creativeness, developed here through a long period, is still in Pittsburgh, and I think that Mr. Humphrey and the Chamber of Commerce are wise to have the results of that spirit brought before us this winter. We should not, however, expect to find in our own history, or in any history, a formula or charm for success. Industry, like art and education, is both a being and a becoming. It is a growth that requires sound sense and foresight and, in addition, the courage always to break and to break again from the rigid forms and ruts about us into untried fields and there, away from precedent, to fight for success.

PITTSBURGH—ITS ORIGIN AND HISTORY

WILLIAM H. STEVENSON

William Holmes Stevenson, author of the address on "Pittsburgh—Its Origin and History" in the series on "Pittsburgh and The Pittsburgh Spirit", was born in Pittsburgh, January 19, 1857, the son of George K. and Mary Dickson (Brown) Stevenson, and was educated in the public and high schools He married Fannie La Une Large, of Pittsburgh, on April 7, 1881.

He is president of the George K. Stevenson Company, importing grocers (established 1826); vice-president of the Polar Water Company and a director of the Pittsburgh Free Dispensary He is also treasurer of The Carnegie Hero Fund Commission He was a member of Pittsburgh City Council 1902-4, 1906-9 (elected both times on reform ticket); reform candidate for mayor, 1909; has for many years been president of the Lake Erie & Ohio River Canal Board. He was president of the Pittsburgh Chamber of Commerce 1913-15, and has been a director continuously since 1903. He is president of the Historical Society of Western Pennsylvania and a member of the Pennsylvania State Historical Commission.

Pittsburgh—Its Origin and History

BY WILLIAM H. STEVENSON

PITTSBURGH enjoys a greater wealth of documentary sources in support of its written history than perhaps any other city in the country. From the earliest times this region was regarded as a strategic point in the movements for conquest and settlement, and as a result the early voyagers and explorers, Indian agents and missionaries, surveyors and colonists as well as the military commanders and civil officers have left contemporary accounts which enable the historian to write accurately of western Pennsylvania's pioneer struggles and the eventual rise of Pittsburgh from a frontier outpost to one of the world's greatest industrial centers.

The French-Canadian papers, the journals of Gist and Washington and the correspondence of Forbes, Bouquet, Irvine, Wayne, Hamilton and others furnish material that mirrors the pioneer life of the settlers and the development of industry and civic spirit is reflected in the files of our newspaper which was the first west of the Alleghanies.

Fantastic tradition and empty romance have no place in the annals of Pittsburgh. Its history is written from authentic sources and is substanial like the city and its institutions. Its glory is founded not on fiction or poetic fancy, but on actual deeds of valor and sacrifice.

If these same dramatic episodes were found in the history of the New England states they would have been immortalized in sculpture, art and song.

Countless years ago in the divine processes of nature began the history of Pittsburgh.

When in these rugged hills were stored treasures of coal, iron, limestone, petroleum and natural gas and when these valleys widened for the flow of majestic rivers on their never-ending journey to the sea —then were provided the instrumentalities with which man has built a great and enduring city.

These unwritten chapters are indeed the keynote to our community existence. Without our mineral wealth and the facilities for water transportation along with the natural gateway which they open to the rich agricultural regions of the West and South, we would have little significance in the sisterhood of American cities. Political boundaries are of secondary importance and our economic, social and educational growth has its inception in the mine and the forge, and is nurtured by the genius of transportation.

An anniversary deserving of our most devoted observance—but unfortunately it is not to be found in Pittsburgh's chronology—would be that commemorating the opening of the first pit in Coal Hill, which we now call Mt. Washington. An unknown hero is that British soldier from the garrison of Fort Pitt who scraped away the shale from the hillside, discovered the stores of bituminous wealth, dug out a portion of it which he loaded into his canoe and paddled across the Monongahela to kindle the fire that brought warmth and cheer to his dreary barracks! His act typified every progressive step in the mining industry—ownership, operation, transportation and utility. He was a pioneer of pioneers.

That first miner had many followers to the slopes of Coal Hill and many more mines were opened. The fort fell into decay, the soldier disappeared, and while no longer a military post, Pittsburgh grew apace as the result of the fame of her boundless supply of fuel and the glory of her waterways which made her the outfitting point for the throngs of emigrants who journeyed to the promised land through this, "The Gateway to the West."

My topic deals, however, not with Pittsburgh's industrial struggles and triumphs, but with the pioneer work of those founders of the city who made possible the full utilization of the great natural wealth with which this territory is endowed. Before our rich treasurehouse could be opened to industry it was decreed that blood must be shed on the threshold; and before these rivers could be traversed to facilitate the arts of peace their limpid streams were dyed red with the gore of men who battled to death for supremacy. Before this region could enjoy the rhythmic din of the forges, its hills gave back the tragic echoes of the savage warhoop, the roar of cannon, the clash of bayonet, scalping knife and tomahawk and the wail of death.

Out of this we have our cherished records of the valor of the pioneers which furnish a glorious background to the magnificent civic structure which is the pride of Pittsburgh today.

The territory in the Ohio valley was claimed by both the French and the English by right of exploration and conquest. The French claims were based on the discoveries by LaSalle and Celeron in their voyages on the western rivers; the English followed the boundless dominions of their early crown charters of Pennsylvania and Virginia. A treaty made in 1744 with the Delaware Indians ceded to the King of Great Britain all the lands in the vast claims of Virginia. The Ohio Company, organized largely by Virginians and Marylanders, obtained from the king a cession of the land south of the Ohio between the Monongahela and Kanawha rivers on condition that one hundred families would be settled thereon within seven years and a garrison maintained at the company's expense. The preliminary surveys were made in 1752, and in the same year aggressive steps were taken by the French to establish their claims.

Before any steps toward actual colonization were taken by the English the French from Canada erected a small outpost on a tributary of the Allegheny and did not disguise their intentions to strengthen their hold throughout the region explored by Celeron, embracing about 700 miles of the upper Ohio and Allegheny. This was disquieting to Governor Dinwiddie of Virginia who in the late autumn of 1753 dispatched his adjutant general, Major George Washington, to the commandant of the French fort demanding the object of France's aggression on Britain's dominions.

This was the first public service in Washington's long and notable career and the incidents in that journey through the wilderness furnish some of the most thrilling and dramatic chapters in the romantic history of our early settlements, linking the founding of Pittsburgh inseparably with the early life of the nation's greatest hero.

The Ohio Company had selected a site for a fort near the mouth of Chartiers creek on the bold promontory known as McKees Rocks, but the youthful Washington chose instead the triangle of land at the junction of the rivers as better calculated for defense and when he surveyed the ground on his arrival hither late in November, 1753, he wrote in his journal the first description of the place which today we call Pittsburgh. It reads:

"I spent some time in viewing the rivers and the land at the Fork, which I think extremely well situated for a fort, as it has the absolute command of both rivers. The land at the point is twenty to thirty feet above the water, and a considerable portion of flat, well timbered land all around it, very convenient for building."

Governor Dinwiddie's mission failed to check the advance of the

French into this region. It was apparent to Washington that they were preparing to make an incursion southward, and he hastened back to Viriginia to report the alarming situation on the frontier. That journey, made in the dead of winter and fraught with great hardships and innumerable dangers, we have lately commemorated in a monument of beauty and utility here in Pittsburgh. Fleeing from treacherous Indians, Washington and his guide and companion, the redoubtable Christopher Gist, on a December night built a frail raft to cross the Allegheny river while the stream was filled with running ice. In mid-stream both were thrown into the water and obliged to swim to a small island where they passed the night enduring the cold blasts that froze the back channel and enabled them to reach the mainland on the ice on the following morning. Today the Washington Crossing bridge spans the Allegheny at this historic spot and recalls the providential escape of the young Virginian who twenty-three years later led a forlorn hope in crossing the ice-riven Delaware on his way to the decisive battlefield in America's struggle for independence.

A clash between the French and English was inevitable, and it came a few months later. With the opening of the spring of 1754 a small party of English under Captain Trent, a British officer, commenced the erection of a stockade on the ground that Washington had selected at the Point. Little progress had been made on the work when a large flotilla of canoes and batteaux bearing a force of French and Indians numbering 1,000 men with artillery came down the Allegheny from their outpost at Venango. The English capitulated and the French erected the famous fortification which they named Fort Duquesne. The garrison was reinforced and they firmly established themselves in possession.

Washington soon returned to the western country and destiny decreed that it would be to his first battleground. At the head of several companies of Virginia militia he appeared on the Monongahela and after several days' maneuvering his small body of troops he overtook a French reconnoitering party from Fort Duquesne. An engagement ensued. Jumonville, the French commander, was slain and his force captured. Several were killed and wounded on both sides. This action, the first bloodshed in the French and Indian war, occurred on May 28, 1754, on an isolated mountainside a few miles east of Uniontown.

Washington was obliged to assume the defensive and concentrated his force in the Great Meadows and erected a stockade which he named Fort Necessity. Here he was attacked in overwhelming numbers by the French and Indians on July 3. After the unequal contest was continued far into the night, Washington was obliged to capitulate and on the following day, July 4, retired with the honors of war.

For a year the French remained undisputed masters of the western frontier. The British ministry in the meantime prepared a comprehensive plan of campaign to wrest the entire territory from France and Fort Duquesne was one of the principal objects of attack. An expedition composed of picked troops was placed under command of Major General Edward Braddock, a veteran of forty years' service, who had risen to high rank through many brilliant campaigns in continental Europe.

Braddock's army, numbering nearly 2,000 men, comprising two regiments of British regulars, several companies of seasoned troops from the colonies, artillery train, troops of cavalry, pioneers and engineer corps, was organized at Alexandria, Virginia, and marched from that place on April 20, 1755. By tedious stages Braddock followed the route taken by Washington on his two previous expeditions, and serving as a volunteer aid on Braddock's staff Washington now made his third westward journey to the Ohio country.

Braddock's obstinacy in clinging to the European system of campaigning increased the natural difficulties of the march. While cutting a wagon road through the wilderness the army made only a few miles a day and by the end of June had progressed only as far as the Great Meadows. Near here he divided his forces, leaving his heavy train and munitions with the sick, while he urged the movement to the Monongahela with 1,400 picked troops.

The evening of July 8, he reached the river and bivouacked a short distance north of the mouth of the Youghiogheny. On the following morning he forded the river near the present city of Duquesne and marched down the southwestern bank of the stream to a point opposite and a few rods below the mouth of Turtle Creek and made his last fording. The troops had regaled themselves with their midday meal and the second crossing was made with a magnificent display. Scouting parties of the enemy were believed to be observing the army's advance and a show of military pomp and strength was made in order to overawe the Indian allies of the French.

Nature aided in the brilliant setting. It was an ideal summer day and in the golden sunlight the waving colors, the glistening bayonets and officers and men in bright-hued uniforms made a striking and formidable appearance as they advanced with perfect step to the music of an inspiring march.

Across the river the army again plunged into the woods. The echoes of the fife and drum were answered by shrill warwhoops and the ominous crack of the rifles of an unseen foe. Braddock was ambushed. Instantly his troops were thrown into confusion. Advance guard and flanking parties rushed back on the main body struggling in the narrow road. Instinctively the Americans sprang behind trees and logs and sought to meet the enemy in Indian fashion. Some of the British regulars who followed their example were beaten back into the column by Braddock who rode into the most exposed positions and insisted on his men forming platoons. Artillery was brought forward in the hope that the heavy cannon would frighten the savage warriors, but so rapidly were the cannoneers picked off that soon none was left to fire the guns. Braddock ignored Washington's advice to adopt the Indian mode of warfare and again urged his men to fight in the open. But the tactics in which the general had been trained on the battlefields of Flanders were of no avail in the wilderness against the wily savages who constituted more than three-fourths of the French fighting force. Repeated efforts of Braddock and his officers to rally his men were futile. Nearly all of the colonial backwoodsmen had been killed. British regulars, although not lacking in bravery, fired blindly and killed many of their own men. Creeping through ravines and underbrush the Indians had surrounded the beleaguered army on three sides.

After several horses had been shot under him, Braddock was mortally wounded. After the fall of their commander the soldiers could not be rallied. The dying general was carried off the field and when the men retreated to the roadway the Indians leaped from their hiding places and scalped the dead and wounded. Panic seized the remnant of the army. Teamsters cut the traces of their horses and galloped off, carrying the news of the disaster to the camp at Great Meadows. Washington, who had two horses shot and whose coat was rent by bullets, was one of the few officers who escaped unharmed.

The survivors fled to the river and retreated across the ford, the wounded falling victims to the tomahawk and scalping knife. The pursuit ended at the river, the Indians returning to the field to plunder the dead. All that was left of Braddock's army withdrew to the camp near Great Meadows where the general expired on July 13 and in the night was buried in the roadway to conceal his body from the savages, the burial service at his lonely grave being read by Colonel Washington, after which the defeated army marched wearily back over its wilderness trail to the eastern settlements.

In few battles in American history is there a record of such a high proportion of casualties. Out of eighty-six officers, sixty-two were killed or wounded and in the rank and file the losses numbered more than 700. With not more than 1,000 men engaged the losses of the French and Indians is said to have been less than seventy.

The story of Braddock's defeat, while it is familiar to almost every one, is worth repeating in some detail because it afforded an opportunity for the display of that tenacity which is truly a British characteristic, and in the face of defeat plans were made to renew the struggle to capture the French stronghold at Fort Duquesne. Braddock's campaign was important for the reason that it gave the colonial troops an opportunity to display their mettle and the campaign afforded training for many Americans who afterward distinguished themselves as officers on the battlefields of the Revolutionary war. The body of General Braddock was recovered years afterward and re-interred in a grave near the old National road east of Uniontown. Here a monument has been erected and the spot is visited by thousands of persons every year.

Braddock's army retreated to Philadelphia, leaving the frontier settlements of Pennsylvania, Maryland and Virginia open to the ravages of the inhuman allies of the French. It was three years before another effort was made to remove the stigma of defeat and in that time the encroachments of the Indians reached the Susquehanna and the Potomac. However, in the summer of 1758 General John Forbes was placed in command of a second expedition against Fort Duquesne, the army fitting out in Philadelphia and proceeding westward through Carlisle and Bedford.

Forbes' advance, composed of 2,000 men under Colonel Henry Bouquet, a Swiss officer in the British service, was joined by the Virginia troops under Washington and reached the Loyalhanna (Fort Ligonier) early in September. While the main body of the army was making its way westward, reconnoitering party of 800 Virginians and Scottish Highlanders under Major James Grant was sent forward and approached within a mile of Fort Duquesne, encamping on the height of land now known as Grant's hill. While advancing presumably to obtain a closer view of the French fortification, the enemy made a sudden sortie and attacked Grant's men. This action, which began about the present site of Wood and Smithfield streets south of Sixth avenue, was a repetition of Braddock's unfortunate encounter. The troops were thrown into confusion and fell back to the hill. The Virginians made a brave stand, but large units of the force were surrounded and it was with difficulty and heavy loss that the others effected a retreat. Grant surrendered and his troops were routed with a loss of twenty-one officers and 273 men killed or captured. This battle, the last engagement for the possession of Fort Duquesne, occurred on the morning of September 14, 1758.

Undaunted by this defeat Forbes concentrated his army, and although suffering a mortal illness, he was carried on a litter with his troops and urged them forward. The British force was too formidable for the French to oppose and when Forbes approached within a day's march of the fort the commander embarked his garrison in batteaux at night, blew up the magazines and retreated down the Ohio by the light of the flames of the burning ramparts.

On the following day, November 25, 1758, the advance, led by Washington, took possession and on the ruins the British flag was unfurled. Forbes, writing immediately to England's prime minister to report his victory, dated his letter at "Pittsborough" in honor of William Pitt. The fortifications were hastily rebuilt for a state of defense and named Fort Pitt. It was garrisoned by 200 men from Washington's regiment under Colonel Hugh Mercer. With the main body of the army Forbes returned to Philadelphia where he died a few months later.

French domination was at an end. Fort Frontenac had fallen, the intrepid Wolfe was at the beleagured gates of Quebec and the rising of Britain's banner at the Fork's of the Ohio was the signal of Anglo-Saxons triumph in North America, insuring to the New World the English tongue, English jurisprudence, tolerance, education and freedom of worship.

A new Fort Pitt was built far encompassing the land where the old French stockade had stood. Peace reigned and British traders and American pioneers penetrated far beyond the Ohio. Outside the fortification a little settlement of cabins were clustered—the embryo town of Pittsburgh.

Beginning with the British occupancy of the Forks of the Ohio the history of this region deals with the development of American colonial life as we regard it in the traditional sense. For thirty years following that November day when Forbes took possession of the Point and gave it the name of Pittsburgh there was enacted here an epic struggle for the establishment of civilization. In this period we find at Fort Pitt or in the surrounding wilderness those redoubtable frontiersmen and Indian fighters Captain Samuel Brady, Simon Kenton, Adam Poe, Colonel William Crawford, the McCulloughs, the Weitzels and others whose deeds have thrilled six generations of American youth.

Peace following the French and Indian war was interrupted in 1763 when Pontiac formed a confederation of the northwestern Indian tribes and made simultaneous attacks on the forts of the frontier. Fort Pitt, then in command of Captain Ecuyer and held by a small garrison, was surrounded by a large band of warriors who sought by stratagem to enter the stockade. Failing in this the Indians began an attack with burning arrows which several times set fire to the frame barracks and creeping along the banks of the rivers a destructive rifle fire was kept up at close range, killing one man and wounding seven, including the commander.

Relief was brought by Coloned Bouquet who defeated the Indians in the decisive battle of Bushy Run which was fought twenty-one miles east of Pittsburgh on August 5 and 6, 1763. This was one of the very few pitched battles won by the white man over the Indians in all America's Indian wars. The siege of Fort Pitt was raised and the red men were put to flight. To provide greater protection against attack, Colonel Bouquet built a brick redoubt or blockhouse outside the ramparts of the fort. This structure, which still stands, is the last remnant of the elaborate fortification which is said to have cost Great Britain £60,000. The blockhouse, restored by the Pittsburgh Chapter Daughters of the American Revolution, is the oldest building in Pittsburgh and is one of the most interesting landmarks of America's colonial wars.

The overthrow of Pontiac and Bouquet's victory opened the way for the settlement of the surrounding country and an increasing number of traders made their headquarters near the fort. New cabins were built and soon the inhabitants of the village outnumbered the garrison. Streets were laid out and with the coming of permanent settlers buildings of a more substantial character were erected. A warrant was issued in 1769 for the survey of the Manor of Pittsburgh and in 1770 the hamlet had grown to such pretensions that it boasted of an inn which won the praise of Washington who stopped there on his third visit to the Ohio.

Events now moved rapidly on the frontier, and here in the wilderness was reflected the unrest that stirred the seaboard colonies. The streets of Boston had been reddened by the blood of the victims of the "massacre." In Virginia, Patrick Henry had lifted his voice in behalf of American liberty and in western Pennsylvania the situation portended an open rupture between the people and the representatives of the British crown.

Our first conflict with toryism occurred in 1774 when Lord Dunmore, governor of Virginia claiming the territory in Pennsylvania south of the Ohio, seized Fort Pitt and placed Pennsylvania magistrates under arrest. Dunmore's war revived the martial spirit in Pittsburgh and it was given forcible expression when in resisting the encroachments of the tory governor news reached the frontier of the outbreak of the Revolution at Lexington and Concord. At Pittsburgh and at Hannastown meetings were held by the people who pledged their united efforts to maintain by military force if necessary their honor and their rights against oppression by the British ministry. There was an immediate call to arms and around their rattlesnake banner they rallied for the cause of freedom.

The British garrison had been withdrawn from Fort Pitt in 1772 and it was taken over for the colonies by a company of soldiers from Winchester, Virginia, under Captain John Neville who remained until a more adequate garrison under General Edward Hand of the Continental army was posted here.

The vicissitudes which all America suffered during the Revolutionary war were visited severely on the inhabitants of western Pennsylvania. Many of the settlers returned to the seaboard and fought in the Continental army; others were enrolled in the local militia; all contributed their share in the struggle for independence, for the entire region was under arms to repel marauding bands of savages turned loose upon the settlements by the British governor of Canada. Fort Pitt frequently changed commanders, but among these military leaders are names that illumine the pages of Revolutionary history—Lachlan McIntosh, Daniel Brodhead, John Gibson, William Irvine. And it was here that General George Rogers Clark embarked on his expedition for the reduction of the British posts at Kaskaskia and Vincennes.

The end of the war found an ebbing morale here where the town was infested with unscrupulous traders and drunken Indians. Within a year after the victory at Yorktown the frontier was shocked by the burning of Hannastown, but this marked the end of the Indian incursions. Fort Pitt was little more than a heap of ruins. Squatters had taken possession of the barracks and other buildings, and cabins were erected on its crumbling bastions. But this was a hopeful sign in disguise; no longer had they use for forts, but they needed homes. The inhabitants soon overcame the demoralization caused by the war. The situation quickly improved when the tide of emigration turned westward following the disbanding of the Continental army. Former soldiers and their families came by hundreds to take up lands in western Pennsylvania. The Forbes road was opened, first for pack animals and later for cumbersome wagons. The famed Blue Grass region of Kentucky likewise was attracting settlers and Pittsburgh was the natural outfitting point for rafts and keelboats that carried the emigrants on their perilous voyages down the Ohio.

Pittsburgh's increasing commercial importance attracted a new type of settlers. Merchants and artisans replaced the Indian traders and dissolute camp followers. In 1784 was held the first sale of lots, this early sub-division embracing the streets constituting the present downtown business section of the city.

Pittsburgh now experienced a truly phenomenal growth and the influx of emigration was dominated by a hardy race of Scotch-Irish who swarmed in during the period from 1780 until the close of the century and practically pre-empted Pittsburgh. They differed radically from the earlier settlers of English descent who came from Virginia and established themselves here with the army or took up claims on the southern border of the state. The Scotch-Irish soon far outnumbered the Virginians and few Pennsylvania Germans who came here and ever since Pittsburgh has been regarded as a Scotch-Irish community and their leadership has been steadily maintained.

Energy, thrift and political activity, three dominant qualities of the Scotch-Irish race, were exemplified by the manner in which the settlers took up the task of building a city. In 1786 the first newspaper, the "Pittsburgh Gazette" was founded, a postoffice was established and in 1788 the county of Allegheny was formed out of a portion of Westmoreland, and Pittsburgh became the county seat. In the surrounding country a rich agricultural region was developed and roads were built connecting the rural villages and fertile farm-lands.

Another Indian outbreak and serious civil strife on the border at this time interrupted Pittsburgh's peaceful progress momentarily, but so great was the momentum gained in this eighteenth century "forward movement," that the fresh alarms of war could not stay the community's material advancement. In the winter of 1792-3 General Anthony Wayne organized his expedition against the Indians in Pittsburgh and established his famous training camp at Legionville on the Ohio eighteen miles below the city. His victory in the battle of Fallen Timbers saved western Pennsylvania from all danger of further Indian attack and opened Ohio for settlement, meaning still more trade for Pittsburgh.

Organized opposition to the new government's tax on whiskey developed in the Monongahela valley and in Washington county and several serious outbreaks marked by pillage and bloodshed occurred in 1794; but the promptness in dealing with this incipient rebellion by sending a large military force into the disaffected region and arresting the insurrectionists had a salutary effect. It taught a lesson in obedience to recognized authority and stabilized law and order throughout the frontier.

Pittsburgh now in the approaching dawn of the nineteenth century was the most important town in what was then the western United States. It had constant communication by packhorse trail and express riders with the populous cities on the Atlantic seaboard. Along this trail came endless caravans of new settlers. Westward the emigrants followed the forest trails into Ohio and Great Lakes. The channel of the Ohio carried thousands to Kentucky and adventurous boatmen were taking Pittsburgh products to distant French markets in Louisiana, and although difficult to realize, ships were built here and Pittsburgh products were sent direct to European ports without breaking cargo. It is related that a ship was built in 1801 at Pittsburgh, destined for Leghorn, Italy, when arriving at the latter port the custom house official would not credit her papers and threatened to confiscate the vessel on the ground there was no such port as Pittsburgh which was prima facie evidence the clearance papers were forged.

The trembling captain laid before the officer the map of the United States, directed him to the Gulf of Mexico, pointed out the mouth of the Mississippi river, led him a thousand miles up it to the mouth of the Ohio river, and thence another thousand miles to Pittsburgh: "There, sir, is the port whence my vessel cleared out." The astonished Leghorn official would as readily have believed that this vessel had been navigated from the moon.

In 1794 the town of Pittsburgh was incorporated as a borough with a population exceeding 1,000. Substantial buildings of brick were erected in place of log cabins and frame structures. Elementary schools were opened and an academy founded in 1787 was well patronized and destined to be chartered as the Western University of Pennsylvania. Churches were established by all the leading religious denominations. Music and art were encouraged and dramatic societies heralded the first theater in the west.

We have traced Pittsburgh's history from the time when it was established as a wilderness outpost to its growth to the dignity of a flourishing town. Its story has been one of a desperate battle for existence; of toil, sacrifice and honesty of purpose. And these same characteristics were found in the sturdy founders of the settlement and have animated Pittsburgh leaders ever since.

From this point the history of Pittsburgh is inseparable with its industrial, social and commercial expansion, and I will leave to others who will discuss the community's advancement in those various lines to take up the chain of its history.

Industrially Pittsburgh at the opening of the nineteenth century displayed confidence and poise. Coal mines had been opened in the surrounding hills and were being profitably operated. General James O'Hara and Major Isaac Craig had opened the first glasshouse and George Anshutz had paved the way for the iron and steel industry with his blast furnace erected about 1792. The lumber industry was flourishing, a piano factory was projected, and boatbuilding engaged many craftmen.

The manufacturing spirit had been implanted and it proved irresistable. In the surrounding country agricultural pursuits engaged the ever-increasing numbers of thrifty settlers. Other towns were springing up and new roads radiated from Pittsburgh. On these was carried an important trade of household utensils, hardware, nails, spinning-wheels and cow-bells which the obscure but prosperous workshops in those early days turned out. In the first census of the new century the annual value of Pittsburgh's manufacturers and commerce was $350,000. It spelled success in the prophetic vision of those who foresaw the magnificent future of Pittsburgh industries and commercial progress, which today is measured in hundreds of millions.

This represents merely an estimate of intrinsic valuation. But beyond this material progress we are assured of still greater accomplishments: in our civic, educational and social progress; in our achievements in music and art; and the spiritual life of the people as exemplified in their religious devotion and philanthropy. Pittsburgh is advancing likewise toward higher ideals of citizenship.

COAL—BASIS OF PITTSBURGH'S INDUSTRIAL SUPREMACY

J. H. HILLMAN, JR.

John H. Hillman, Jr., coal operator and banker, was born in Lyon county, Kentucky, April 27, 1880, the son of John Hartwell Hillman and Sallie Murfree (Frazer) Hillman. He married Juliet Lea Hillman and has seven children.

Mr. Hillman's business connections are: director and chairman of the board of Hillman Coal & Coke Company and Peoples Savings & Trust Company; president, Hecla Coal & Coke Company and Hillman Transportation Company; vice president and director, Oil Well Supply Company; director A. M. Byers Company, Spang, Chalfant & Co., Inc., First National Bank at Pittsburgh.

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Coal—Basis of Pittsburgh's Industrial Supremacy

BY J. H. HILLMAN, JR.

SCIENCE has done much toward increasing the output and efficiency of coal mines, but has to some extent robbed the industry of some of its most picturesque aspects. In the early days of the transportation by river of coal from the Pittsburgh District to New Orleans and the other down-river cities, the output of the small mines located along the banks of the Monongahela river was loaded into flatboats of fifty to one hundred tons capacity, and, upon a satisfactory rise in the river, these boats were set adrift and guided by hand and by Providence until they finally reached their prospective destination, if some hidden snag or other misfortune did not land the cargo upon the river bed. The speed of transportation depended not only upon the flow of the river, but upon the inclination of the rivermen to accept the wide open hospitality of the towns upon the shores of the lower rivers.

One of the oldest of the former river coal men, who could probably entertain my hearers better by relating his river coal experiences of the past, than I can by acquainting them with facts pertaining to the development of the coal industry, is "Old Bill" Brown, who, in spite of his many years' experience in his Wood street gun store, still recalls with a broad smile the happy days which he experienced in floating coal from Pittsburgh to New Orleans.

The romance of the old days of coal production and river transportation has given way to the more material realities of intensive competition, of large production, of immense steel barges, and of mechanical towing. The small drift coal mines from which only the most easily mined coal was produced, have been supplanted by deep shaft mines, equipped with such mechanical equipment as to permit the recovery of the greatest practical percentage of the coal seam. The small wooden barges of the old days have been replaced by steel barges carrying from 800 to 1,000 tons each, and instead of depending upon the vagaries of the river current for motive power, it is not uncommon for a single tow of upwards of 10,000 tons of coal to be handled with speed and safety by a modern steel towboat costing $200,000. Upon arriving at their destination, these barges are unloaded by tremendous grab buckets, which at one bite handle as much coal as the old-time southern darkey unloaded in a whole day at a southern port, the whir of rapidly moving machinery taking the place of the old plantation melodies of the former days.

Much information of a historical and statistical nature regarding the mining of coal in the Pittsburgh District is available, but for the purposes of this article, it will suffice to quote the following extracts from an article by B. F. Hoffacker of Pittsburgh, appearing in "Coal and Coke Trade Journal" in its issue of June 9, 1926:

"The earliest mention of coal mining dates back to 1760, when a certain Captain Thomas Hutchins, on a visit to Fort Pitt in July of that year, found a coal mine opened on the hill opposite the fort, which supplied the garrison with coal. This spot was known as 'Coal Hill,' and the opening was somewhere between the Point bridge and the Smithfield street bridge, on the south side of the Monongahela river. It is now that part of Pittsburgh known as Mt. Washington.

"In 1765 a Reverend Charles Beatty visited the mine and reported a fire that had been burning at least a year. This was probably the first record made of a mine fire in the country.

"In 1768 the Penn proprietaries purchased from the chiefs of the Six Nations all the bituminous coal fields of southwestern Pennsylvania, except that portion north of the old purchase line near Kittanning, for the sum of $10,000. This purchase includes all the territory to be discussed in this and following reports, on Fayette, Westmoreland, Washington and Greene counties. The actual cost of the Pittsburgh coal bed included in this purchase was less than one cent per acre.

"On January 6, 1769, John Penn, lieutenant governor of the province, acting on instruction from the proprietaries, Thomas and Richard Penn, gave notice to John Lukens, surveyor general, to survey 5,000 acres, including Fort Pitt and the 'Cole Mine' opposite the fort.

"In 1784 the Penns sold the privilege to mine coal for £30 per lot, in the hills around Pittsburgh, coal being then in general use by the inhabitants.

"In 1795 coal was mined under what is now known as Herron Hill by a Mr. Mossman, and brought into the town in wagons, for use by the few manufacturing establishments and householders.

"In 1803 the first coal was shipped by river. It was taken down the Ohio and the Mississippi, and finally to Philadelphia where it was reported sold 37½c per bushel.

"A Mr. F. Cummings, writing on the appearance of Pittsburgh in 1807 says, 'Another cause of the unprepossessing appearance of Pittsburgh proceeds from the effect of one of the most useful conveniences and necessaries of life which it enjoys in a permanent degree; namely, fuel, consisting of as fine coal as any in the world, in such plenty, so easily wrought, and so near the town that it is delivered in wagons drawn by four horses, at the doors of the inhabitants at the rate of five cents per bushel. A load of forty bushels, which costs only two dollars, will keep two fires in a home for a month. This great consumption of a coal abounding in sulphur, and its smoke condensing into a vast amount of lampblack, gives the outside of the houses a dirty and disagreeable appearance.'

" 'Cramer's Almanac' for 1814 reports three manufacturing establishments using 'Pittsburgh' coal, and in 1817 the same authority states that the number using steam power had increased to eight.

"In 1825 the consumption of coal at Pittsburgh was reported as 36,000 gross tons. Almost a hundred tons a day!

"In 1825 Walton's Pool No. 1 and Castle Shannon Mines were supplying coal to Pittsburgh. The writer was in the old workings of Walton's Pool No. 1 mine as late as 1920 when coal was still being mined from this pit.

"In 1837 there were, according to the city directory, not less than ten mines working in the Coal Hill section alone. Their annual production was estimated at over 200,000 net tons. Consumption at Pittsburgh was at the rate of 275,000 net tons that year. Along the Youghiogheny and Monongahela rivers near McKeesport, considerable river tonnage was being shipped as far south as New Orleans. This was the beginning of the enormous river shipments that were to follow.

"In October, 1841, Locks Nos. 1 and 2 were opened. They were single chamber locks, 50 by 190 feet. During the first eight weeks that they were opened, over 50,000 tons were locked through. In November 1844, Locks Nos. 3 and 4 were completed and opened, giving slack water from Pittsburgh to Brownsville. The succeeding year saw the introduction of the stern wheel towboat, when the 'Walter Forward,' owned by Captain Busnell, towed three flats to Cincinnati, loaded with

6,000 bushels of coal. It was several years later that the practice of putting the towboat behind the fleet was begun."

From the above we note that coal mining even in the early days was not without its difficulties and dangers, as a mine was reported on fire as early as 1765. The Penns purchased coal lands from the Indians at less than one cent per acre, which has in recent years sold at prices varying from $1,000 to $3,000 per acre. What is perhaps the first bituminous coal lease in western Pennsylvania is mentioned as having been made in 1784. Pittsburgh was "The Smoky City" as early as 1807. As early as 1814 manufacturing establishments were springing up near the fuel, and during the following years the output was increasing rapidly and river transportation was being perfected.

An extended discussion of the vast coal deposits of southwestern Pennsylvania can not be undertaken within the limits of an article of this kind. It is sufficient to state that nature designed the junction of the Allegheny, Monongahela and Ohio rivers as the site of a great manufacturing metropolis. Two seams of coal of rare purity and high quality were deposited over a vast area and were subsequently but little disturbed by geological agencies excepting by the erosion which produced the local river valleys. While this erosive action caused the disappearance of considerable areas of coal of the Pittsburgh seam, the mining and transportation advantages resulting therefrom have offset the loss in acreage. The Pittsburgh seam as it exists in the Pittsburgh district presents no unusual mining difficulties and is unquestionably the most valuable area of low-ash, low-sulphur and high-volatile gas and coking coal in the world.

In Allegheny county alone, the Pittsburgh seam of coal has already yielded an output of slightly over a half-billion tons and it is estimated that over 300,000,000 tons of coal of this seam are still available in the county. These figures represent but a small portion of the output and available future tonnage of the Pittsburgh district, as statistics show that between the years of 1909 and 1924, the coal output of the Pittsburgh rate district, bounded on the north by the Freeport rate district, on the east by the Connellsville rate district, and on the south and west by the state boundaries, amounted to from about 42,000,000 to 68,000,000 tons annually, with an average of about 55,000,000 tons.

If nature had supplied the Pittsburgh district with the Pittsburgh seam of coal alone, she could have felt that her duty to the district had been fully discharged, but she evidently decided to make Pittsburgh's supremacy as an industrial center even more secure by providing a second seam of coal of exceptional thickness and quality—the thick Freeport seam—at a depth of about 600 feet below the Pittsburgh seam. The thick Freeport seam, for some time erroneously thought to be a combination of the upper and lower Freeport seams, but now recognized to be an abnormal development of the Upper Freeport seam only, outcrops on both banks of the Allegheny river in the vicinity of Tarentum, but dips beneath the river a short distance farther south. The unmined thick coal covers a proven area of about 65,000 acres, with an estimated tonnage of about 650,000,000 tons. This is mostly in Allegheny county, but includes a portion of Westmoreland county in the vicinity of New Kensington. Extending as it does from some distance north of the Allegheny river to the Monongahela and Youghiogheny rivers, it is available both for rail and river shipment. The seam is about seven to seven and one-half feet thick, including a band of high-ash bone coal of about eight inch thickness, and the coal is of such low ash and sulphur content as to make it adaptable for the manufacture of by-product coke. In fact, large mines are operated in this seam by a number of the country's largest independent steel manufacturing companies, principally as a source of coal for their own by-product ovens.

Nature, not satisfied with furnishing such a large tonnage of fuel of the highest quality, brought the only practical transportation of the early days to the mouths of the coal mines. The earliest shipments of coal were by river, and to this day coal shipped by river controls the trade which may be reached by the rivers, notwithstanding later railroad developments. The records of the local United States Engineers' Office show that in 1925, the last year for which statistics are complete, the coal tonnage handled within the Pittsburgh district by the three rivers was: Monongahela, 18,698,000 tons; Ohio, 4,088,000 tons, and Allegheny, 915,000 tons.

River transportation is utilized in its highest degree by the United States Steel Corporation in conveying coal mined by one of its subsidiary companies in Fayette, Washington, and Greene counties, by means of large steel barges, to its immense by-product coking plant at Clairton. The adjective used belittles rather than exaggerates the size of the plant which, although it is now being further enlarged, is already by a considerable margin the largest by-product coke plant in the world. Upon the completion of the ovens now under construction, this coke plant will utilize over 11,000,000 tons of Pittsburgh seam coal annually, or two per cent of the normal bituminous coal output of the entire United States. A single day's consumption will exhaust three acres of the coal seam. One of the corporation's loading plants, handling the entire output of three of its mines over an underground series of rubber belt conveyors four and a half miles in length, is capable of furnishing almost one-third of this immense tonnage. Practically all of the fuel used at the large plants of the Jones & Laughlin Steel Company, both at Pittsburgh and at Woodlawn, is transported from its mines to its plants by river, as is also the fuel used by consumers in many other industries.

With its three navigable rivers and a net work of railroads belonging to three trunk lines, Pittsburgh industries have no cause for apprehension regarding a fuel supply which will continue its enviable industrial status far into the future. The coal industry itself is much in need of such co-operation from the railroads as will enable it to regain many of its more distant markets of which it has been deprived by the fact that the freight rates from southern mining districts seem unfair when compared with those for short hauls from the Pittsburgh district to the same destinations. The Pittsburgh Chamber of Commerce has lent excellent assistance to the coal industry in its attempt to obtain more equitable and more competitive freight rates.

The tremendous effect of cheap fuel and transportation upon the growth of the city of Pittsburgh and the Pittsburgh district is generally admitted. In the Pittsburgh coal district, within a short distance of the city of Pittsburgh are found: domestic coal for use in the grates, stoves, or furnaces of the householder; unsurpassed steam coal for the generation of power; gas coal, originally used in the manufacture of gas for lighting, but now most generally used for the manufacture of gas for industrial purposes; and last, but not least, the Connellsville coking coal, from which is made the standard metallurgical coke of the world. Crushed, sized, and screened coke are rapidly becoming popular as domestic fuel in competition with anthracite. Naturally, the home market for coal and coke of these grades has grown both with the population of the city of Pittsburgh and with the development of its various industries.

The city of Pittsburgh is the natural metropolis and clearing house of this vast mining and industrial territory. The normal operation of the coal mines tributary to the city of Pittsburgh requires an annual payroll and annual supply purchases estimated to aggregate $60,000,000. This money flows into every channel of trade and commerce in the city of Pittsburgh and the Pittsburgh district. The Pittsburgh bituminous coal mines today stand as evidence of the intelligence, ability, and courage of the men by whom they have been developed. Nowhere have steps been taken to meet the demands of the consumers in the matter of quality, preparation and economy of production more promptly than in the Pittsburgh district. Pittsburgh consumers particularly have been abundantly supplied with the various grades of coal required, at average delivered prices as low or lower than have been current in any other consuming market in the United States. The future holds forth the promise of still greater advantages to be derived from the presence of the vast coal deposits of the Pittsburgh district.

Although the advent of the by-product coke oven was a great step toward the utilization of the constituents of coal, resulting, in addition to the production of coke, in the production of large quantities of gas, tar, ammonia, benzol and other oils, it is evident from the disclosures made at the International Coal Conference recently held in Pittsburgh, that coal has a great future industrially. This future must certainly be felt in a very marked degree by Pittsburgh. Pittsburgh's Mellon Institute, its United States Bureau of Mines Station, and its two technical schools, give assurance that the scientific development of coal's future will be amply provided for.

Residents of western Pennsylvania and Pittsburghers in particular will view with keen interest and approval the progress of the plans for the construction of a canal to the waterfront of Lake Erie. By years of hard work on the part of the Lake Erie & Ohio River Canal Commission, this project has now been brought to the point where all objections to its further progress have been met and overcome, except the idea that the canal will not be economically profitable. With a natural harbor at each end, an abundance of water, and great tonnages of freight waiting to be transported in each direction, the statistical information prepared by the commission would seem to satisfy the most critical mind on this point. Regardless of the amount of coal which would be transported through the canal, its construction would give the industries of the Pittsburgh district such an impetus as would add materially to the consumption of fuel within the district.

In conclusion may I state that the success of our great public utilities, our transportation systems, and our great industrial enterprises has been founded upon an abundant and economical supply of bituminous coal and its by-products. No satisfactory substitute has yet been found, or is likely to be found, to replace bituminous coal in supplying those three essentials of modern social and industrial life—LIGHT—HEAT and POWER.

PITTSBURGH AND WATERWAYS

WILLIAM B. RODGERS

William B. Rodgers was born in Pittsburgh on February 14th, 1885. He is the son of the late Capt. William B. Rodgers and Alice Jackson Rodgers. He received his education in the public schools and went to work on the rivers for the Rodgers Sand Company in 1905. He became a licensed pilot in 1906, and secured a captain's license the year following. He is president of the Rodgers Sand Company, director of Allegheny Trust Company, director of Bellevue Savings & Trust Company, director of Suburban General Hospital, director of the National Rivers and Harbors Congress, and a trustee of the Western State Penitentiary. He is married and is the father of five children and lives on West Riverview avenue, Bellevue. He is an ardent supporter of all river improvement work.

Pittsburgh and Waterways

BY WILLIAM B. RODGERS

GREAT and permanent centers of population are not the result of accident, but have been brought about by some natural conditions over which man has very little control. The early history of Pittsburgh is the history of its rivers, for it was these great moving highways coming from the north and south and flowing to the south and west that caused the white men to stop and build here. It was natural that they should stop and build, for here were three great highways of which they knew little but which promised much. With their dugouts and canoes they could travel in three directions for their timber, furs, food and other necessities of life and convey them by an easy method to their homes, and so by 1760 a paper published at Brownsville, Pa., mentioned the fact that a settlement of considerable size had sprung up at the junction of the Allegheny and Monongahela rivers, but that it could not amount to much as it was too near to Brownsville.

Washington, in 1770, explored the Ohio from Pittsburgh to the Great Kanawha river and patented a large area of land. He was so favorably impressed with the land that he wrote to his agent, Col. Crawford, and had him take out a number of small patents for land for fear one man could not patent so great an area. As the settlement at the Point grew, larger craft for river transportation had to be built. Large rafts pushed by men with long poles, house boats with long sweeping oars, all manner of craft were used, worked by hand power. Rafts were built by those moving south, large enough to hold families with all their belongings including live stock.

Flatboats forty feet long and larger were the first to be used about Pittsburgh, and in 1782 the first flatboats left Pittsburgh for New Orleans. They were loaded with bear oil, flour, pork, cider, brandy, iron and salt and the boat was sold with cargo because they couldn't get it back. But this became expensive and the keelboat was developed, a boat which by means of a rope tied on the front mast enabled the crew to hold the boat's head out in the stream when it was pulled up over rapids. This was called cordelling. With the development of trade, keel boats were improved until they were the best craft for upstream work before the use of steam in navigation.

Occasionally there would appear a great monster of a boat on these waters such as the galley, armed as a gunboat under command of General Geo. Clark, which patrolled the rivers during the Revolutionary war. It was decked over and propelled by oars. In 1778, the first settlement at Marietta, Ohio, was made by a party of New Englanders, under General Rufus Putnam in a galley called the "Adventure." The boat was forty-seven feet long and twelve feet wide, had clean lines and a curved, raking bow. But these galleys were not practical for carrying freight. It was the keelboat and flatboat that carried the people and freight westward. Most of these were made at Pittsburgh. They were from sixty to seventy feet long, fifteen to eighteen feet wide, three to four feet draft, and cost from two to three thousand dollars each. They held as high as eighty tons, and it is said one man was required for each ton of freight carried.

By 1801, history tells us, that the exports from the Pittsburgh territory to New Orleans, then a Spanish port, were carried by one brig, two schooners, seven pirogues (a dugout canoe with square ends) twenty-six keelboats and 450 flatboats. In 1803 an attempt was made to start an up-river service by using horses on a tread mill. By the time the boat got to Natchez, Miss., from New Orleans, the horses were used up and the method abandoned.

At the beginning of the nineteenth century all manner of craft, could be seen about Pittsburgh, most of them going south. Arks that Noah might have used, housing a big family, its goods and live stock, a raft with a cabin on one end for the family, and the other end a shelter for the cattle; craft of all shapes and sizes, built of heavy timber which was used later in building their houses, barns, etc. Abe Lincoln in his youth felt the call of distant lands and became a member of a flatboat crew. On a trip south he saw the slave market for the first time and resolved to put an end to it. The flatboatmen were the toughest, most hard-boiled of men who feared neither man nor God, and prided themselves in the fact. There was no law about the rivers, every man was a law unto himself. It was a case of the survival of the fittest.

About the beginning of the eighteenth century, Europe was laying her plans for world dominion, disregarding entirely the commercial necessities of the United States. By secret treaty France gave the Louisiana territory to Spain. Hampered by the Spanish regulations of the port of New Orleans, the traders of the upper rivers began to realize the importance of the rivers as an artery of commerce. New Orleans was declared an open port in 1804, citizens of the United States being granted the right to free navigation as well as the right to deposit goods on the wharves at New Orleans and to export them. Shippers in the region of the Monongahela and Muskingum rivers conceived the idea of building seagoing vessels and loading them at Pittsburgh and ship direct to foreign markets. Ships, brigs and schooners were built at Pittsburgh and Ohio points and sent down the river not to return, for the difficulties of the return trip were too great to overcome. After three years of free navigation, Spain put an embargo in 1807 on goods from the United States and the building of ships ceased. Pittsburgh had been a seaport for a very short time.

In 1808, Zadoc Cramer, in writing on navigation of Ohio and Mississippi rivers says, "It is highly probable that Pittsburgh will become, from the many advantages which nature has placed within the grasp of its inhabitants, added to those which may arise from the addition of art, one of the most considerably inland manufacturing towns in the United States."

At this time, Jas. Watt was working on the steam engine and it occured to many men, among whom was Robert Fulton, that Watt's steam engine could be used successfully to propel boats. Many types of boats were built by many men, but it remained for Fulton to apply successfully steam to the operation of steam boats. In 1807, Fulton built the "Clermont" and successfully ran her between New York and Albany.

Associated with Fulton at times were Chancelor Livingston and Nicholas Roosevelt, a brother of Theodore Roosevelt's grandfather. Fulton tried to get patents on his boats, but there was nothing on the boats on which he could get a patent. He tried to get a monopoly on boat building in certain states but these did not last long. Roosevelt got a patent on a side wheel boat but he could not enforce it. He did succeed in making some side wheel owners pay him a royalty.

Fulton and his associates conceived the idea of building a boat at Pittsburgh and floating her down to Natchez, then run the boat between Natchez and New Orleans.

Roosevelt was sent to explore the Ohio and make a report. In 1809 he built a flatboat at Pittsburgh, and with his bride started to New Orleans. Roosevelt talked on his way down to all manner of people at every opportunity regarding the possibilities of running steamboats on the river. They gave him very little encouragement.

When he found coal on the banks of the Ohio river he bought and arranged to have the coal mined for his boats when they got started. He tried to interest capitalists that inland steamboats would pay, but with little success.

The Roosevelt party travelled all summer and it was fall when they arrived at New Orleans. Roosevelt, enthusiastically favorable to steamboating on the western rivers, sailed by ship for New York arriving in January, 1810, after a nine months' journey. He was not long in convincing Fulton and Livingston that steamboating was practical on these rivers and by December, 1810, the Ohio Steamboat Navigation Company was formed with Robert Livingston, De Witt Clinton, Dan'l Thompkins, Robert Fulton and Nicholas Roosevelt as incorporators. Roosevelt was already in Pittsburgh superintending the building of the first boat. The hull was built at Elizabeth, on the Monongahela river, and the machinery at Shousetown. This boat was 116 feet long, 20 feet wide, heavy, round bellied and setting deep in the water. She had two masts and sails and in all probability was a side wheeler.

Roosevelt brought some shipwrights and machinists with him from New York as the Pittsburgh mechanics knew only flatboats and barges. The timber was hewn from the surrounding forests, rafted in the Monongahela river and floated to the ship yard. High water nearly caused them to lose the boat before she was ready to launch, with a loss of $38,000.00, which was the cost of building, but they managed to save her and on the 17th day of March, St. Patricks Day, the "New Orleans" as she was called, was skidded into the water. Six months later she made a trial trip on the Monongahela river, and Roosevelt pronounced her ready. She arrived at New Orleans January 12, 1812, and began to make weekly trips to Natchez. On July 14, 1814, after two years of successful running, the New Orleans was caught by a falling river at Baton Rouge and sank, never to be recovered.

Captain Henry M. Shreve built boats at Bridgeport, on the Monongahela river, in 1814, and successfully ran them to New Orleans. It was Captain Shreve who fought the Fulton-Livingston monopoly which gave this company the full control of all boat building on these rivers. Though it cost Shreve a fortune, he freed these rivers to boat builders for all time to come. After Shreve had won his case, steamboats were built whenever rivermen could get enough money together. Captain Thos. Leathers built seven boats; as fast as he lost one he built another one finer, the last one built cost $200,000. He called each one of them "Natchez." The "J. M. White" built at Elizabeth, Pa., was the fastest and finest boat for many years on these rivers. From 1842 until the Civil war, the river trade was at its best. In the forties the steamboat tonnage of the Ohio and Mississippi valleys exclusive of New Orleans was 15,000 tons greater than all the Atlantic ports, and in 1843 New Orleans had twice the tonnage of New York.

In the Civil war the men of the rivers north and south acquitted themselves very creditably. The Marine Brigade was one of the most picturesque, unconventional fighting units in our history.

During the war river traffic was at a standstill. No boats were built except for war purposes. The necessities of war had given quite an impetus to railroad building, and after the war the railroads had most all the river traffic. The reasons for this were first, the steamboat owner had depended entirely on his boat to carry the cargo and the capacity of his boat was so small compared with what a train could carry that the railroad got the bulk freight. Second, because of the unsatisfactory stage of the river a great many days of the year, the railroads were the most reliable. It was not long, however, until the rivermen realized that smaller and more powerful boats could be built and the cargo carried in barges fastened to the head of the boat. The Government began to realize that many of these great streams must be slackwatered in order to be profitably used the year around.

In 1885 Davis Island Dam was finished, the first lock and dam in the Ohio river. This made navigation in the Pittsburgh harbor the year around. Later other dams were built below large cities on the Ohio, providing harbors, but because of the shortsighted policy of our Government in withholding the appropriations the shippers will be deprived of the use of this river for year round service until 1929, when the system of locks and dams will be completed to Cairo, Ill. This will give a minimum stage of nine feet of water at all times from Pittsburgh to the gulf.

It will have cost the Government $88,000,000 to build these fifty locks and dams, but when you consider that the total amount our Government has spent on the Monongahela river up to date; including maintenance, is around $11,000,000, and in one year (1924), just a little over two years ago, this river saved the shipper $14,000,000—in the one year saving $3,000,000 more than the entire cost of improvements and maintenance to date. When you consider these facts, you will agree with me that it will not be long after the Ohio is slackwatered until the expenditure of every dollar on improvement will have been justified. The saving on the Monongahela river rate over the railroad was about sixty-eight cents per ton.

River tonnage in the Pittsburgh district was greater in 1926 than in any previous year of record, according to figures compiled by the Pittsburgh Chamber of Commerce.

The sum total was 36,342,668 tons, an increase of 152,489 tons over 1925. The importance of this figure is apparent when it is considered that the annual total tonnage passing through the Panama Canal is between 25,000,000 and 30,000,000.

Since 1913 the tonnage of the three rivers has almost doubled. There has been nothing spectacular or sensational in the growing importance of Pittsburgh's water-borne traffic; rather the increase has been gradual and steady, reflecting an industrial development and expansion of the soundest proportions.

From 18,000,000 tons in 1913, the river traffic increased to 21,000,000 tons in 1917; 23,000,000 tons in 1919; 33,000,000 tons in 1920; 35,000,000 tons in 1923, and 36,000,000 tons in 1926. There is a certain duplication in the reported tonnages, due to the fact that some freight is carried on more than one river, but as the duplications appear in the report for each year, the figures are comparable.

In 1927 this water-borne commerce on all rivers of the United States amounted to 540,500,000 tons, with a value of $26,722,000,000. In the past seven years, the total commerce carried by water was 3,061,800,000 tons, with a value of no less than $145,316,000,000. It is interesting to note that the value of the commerce carried in the past seven years is more than one hundred times greater than the total expenditure on rivers and harbors, both for construction and maintenance.

General Jadwin, chief of engineers, says: "The rivers of the United States are paying back to the people every year an amount equal to the entire cost of all improvements and maintenance to date."

As fast as a river is improved, new industries spring up, new floating craft are built and a saving is effected to the consumer which more than justifies the expenditure. In the last ten years with the Government extending the slackwater system farther and farther south, river transportation has taken on new life.

Pittsburgh today boasts of fifty-four pool boats with a value of $6,180,000. Of this fleet, thirty are of the modern steel construction and were built within the last ten years. There are more than 600 steel barges in use in this district worth $9,600,000. There are eleven steel tugs worth $333,000. This river equipment represents over sixteen million dollars in the Pittsburgh district alone.

You ask, "Is river traffic dying?" In the Pittsburgh district from January first to October first of this year, 1,995,822 tons have been shipped on the Allegheny river—18,374,954 on the Monongahela river and 7,217,740 on the Ohio river. As the rivers are improved the tonnage increases. With the obstructive bridges across the Allegheny river removed, the Government is proceeding to slackwater this river and it is a safe prediction that within a few years after this river is improved the saving on freight will justify every cent that has been spent on its improvement.

Coal is the greatest tonnage on the river at this time, with sand and gravel next and then steel. It is interesting to know that last year in four summer months, there were 2825 passengers left Pittsburgh by packet and 2801 came into our city. The excursion boats carried 51,000 people in the same months. Freight tonnage handled in 1926 on the Ohio river from Pittsburgh was 22% above that handled in 1925.

The aggregate tonnage on the Ohio river in the Pittsburgh, Huntington, Cincinnati and Louisville districts last year totaled over 19,000,000 tons as compared with fifteen and one-half million in 1925, and it is estimated by Col. Kutz, the Division U. S. Engineer, that the first year after the completion of the canalization of the Ohio river, the tonnage will reach 30,000,000. The surprising thing about our lower river shipments, the Federal Barge Line handles more freight upstream than down. The savings effected by the use of the Ohio river, in reduced transportation costs in 1926 were estimated at $6,600,000. This was using the river only part time due to its incomplete state. The near approach to completion of the nine-foot waterway from Pittsburgh to Cairo, Ill., should cause us to ask the question, "Is Pittsburgh ready to take advantage of this great floating highway?" The Government will have finished its job of providing all year service from the rivers, the rivers interests are building as rapidly as possible. On March 1st of this year there were on the boatyards on all inland rivers 197 pieces under construction which had increased to 250 pieces by April first, costing approximately $2,250,000, and the end not in sight. It is safe to say that by the end of this year boats and barges costing more than ten million dollars will have been constructed in this one year alone for inland rivers. The Carnegie Steel Company launched their fourteenth new boat in May, boats of the type of the "City of Pittsburgh" which landed at New Orleans on the second day of June with 15,000 tons of steel—300 railroad carloads—and started back with 4000 tons of sulphur. The Jones & Laughlin Steel Corporation has sent its fifty-fourth tow of manufactured steel products to southern markets via Ohio and Mississippi rivers. This same company has recently built two transfer barges on which they ship eight loaded freight cars on each barge from the Monongahela Connecting railroad on the south side to the A. & S. railroad at Aliquippa. These cars are taken by water down the Ohio river for twenty miles at a saving of approximately $.50 per ton.

What is Pittsburgh doing to take care of the great river traffic which will be here in two years? The Carnegie Steel Company is now building a two million dollar warehouse at Houston, Texas, to take care of its down river shipments. Warehouses and terminals have been built at Louisville, Memphis, Nashville, Baton Rouge and Galveston. Why, don't you know that New Orleans is closer to Pittsburgh than New York, that greater tonnage can be shipped by water to New Orleans for foreign shipment quicker and cheaper than by any other method of transportation or to any other port?

The Steel Corporation, Jones & Laughlin and others realize this and are getting ready. What is the city of Pittsburgh doing? The great obstacle that lies in our path is partly physical and partly mental, lying in the minds of our business men, manufacturers and tax payers.

We must be aroused from fifty years' sleep, fired with ambition to make our city an important link in the vast chain of middle western navigation and urged to start immediately on the work of providing suitable river terminals. This takes time and time cannot be wasted if terminals are to be ready for the opening of the river in two years.

These terminals should be standardized as should all river floating equipment. This means economical operation. When the last city budget was made up for Pittsburgh $50,000.00 was appropriated for a survey for wharf and terminal improvements. This was certainly a liberal amount, though not a penny too much when the size of Pittsburgh and the immeasurable importance to it of its river traffic is considered. Under this appropriation Public Works Director Lang and a party of engineers visited several southern cities to inspect wharves and terminals. A river improvement commission has been appointed and we hope great improvements will be on their way in a short time.

Furthermore, we should continue our efforts strenuously to bring a canal from Lake Erie to Pittsburgh that we may enjoy the low-water rates on our bulk freight to and from the lakes.

Herbert Hoover says, "We must envisage our inland waterways as great unified transportation systems, not as isolated units. And thus it is that we need to take a re-inventory of our waterway opportunities in the light of new needs, new facts, new tools. On them we can safely build a new and enlarged conception of opportunity." Pittsburgh's problem industrially is now and for some time to come will be that of distribution.

Henry Ford says, "We are locating our branches on navigable waterways. The Memphis and St. Paul plants are on the banks of the Mississippi river; the Jacksonville plant is on St. John river, with docks for ocean freighters; the Chicago plant is on Calumet river which flows into Lake Michigan; the Green Island plant is at Troy, near the confluence of the Hudson and Mohawk rivers. This plant connects with the Kearney, N. J., plant by boats on the Hudson.

"It is less expensive to load boats than freight cars, and transportation by water, in this case, is not only faster than rail but also is cheaper. A further development has been serving the Atlantic Coast plants at Norfolk, Va., Jacksonville, Fla., New Orleans, La. and Houston, Texas, directly going out through the Great Lakes and canals. These vessels deliver on the coast about as quickly as do the railroads and have added advantages."

The Honorable Cleveland A. Newton says, "The farmers, merchants and manufacturers of the Ohio & Mississippi valleys are suffering from exorbitant freight rates, which the railroads cannot afford to reduce. The average rail freight rate of the country now is eleven mills per ton-mile, while freight is being carried upon the Great Lakes at one-tenth the average rail rates. Experience upon the rivers in this country and in Europe has proven conclusively that when our rivers are improved, freight can be carried upon them at one-fifth the average rail rate of the country. This would be a great blessing to agriculture, commerce and industry located far from the seashore in the interior of the United States." And let me add—settle Pittsburgh's problem of distribution.

The rivers have no quarrel with the railroads. The aim of every transportation agency should be to carry freight as cheaply as is consistent with good business principles, and if the waterways can carry freight through a certain territory cheaper than the railroad, then that freight belongs distinctly to the waterways. By cooperation between rivers, railroads and highways, the three great transportation agencies can all profit and continue to grow.

Our rivers should be protected. From pollution millions of dollars are lost annually by the acids and acid forming refuse that is poured into our rivers. Pittsburgh is paying for the encroachment on its rivers by ever recurring floods. It has neglected its waterways and favored land greeds. The constant creeping of its shores riverward by filling is the chief cause for each succeeding flood being higher than the preceding one. Our wharves should be improved immediately keeping in mind first, the interests of navigation which are paramount to that of any other interest.

When shall the people of our city grasp the value of this great, free highway which is theirs to use? Flowing past our doors are the waters of the mightiest river system of the world. It is so near we disregard its wonders yet our rivers are wonderful, awe inspiring in size, rich in beauty and replete with historical lore. These mighty rivers are ours, ours to use and profit by, ours to enjoy, they offer recreation, rest and entertainment in an ever-changing variety.

On Memorial Day of this year, Mr. and Mrs. Kemple of Marblehead, Mass., arrived at St. Louis on their sea-going yacht, "Ambra". They were on their way to the Great Lakes by way of the Wisconsin Portage rivers route. At the Sesqui-Centennial in Philadelphia on the Pittsburgh building we read these words, "As long as the Monongahela and Allegheny shall flow to form the Ohio, as long as the English tongue shall be the language of freedom in the boundless valleys which these waters traverse, Pittsburgh shall stand as the Gateway of the West." This being true, it behooves us to protect our rivers and beautify our wharves to make this gateway both useful and beautiful.

PITTSBURGH AND THE IRON INDUSTRY

J. FREDERIC BYERS

J Frederic Byers, iron manufacturer and co-author with Prof. James Aston of the address on "Pittsburgh and The Iron Industry" in the series on "Pittsburgh and The Pittsburgh Spirit", was born in Edgeworth, suburb of Pittsburgh, the son of Alexander MacBurney Byers and Martha Fleming Byers, on August 6, 1881. He was educated at St. Paul's School, Concord, New Hampshire, and at Yale University, graduating from Yale in the class of 1904. In 1905 he married Caroline Mitchell Morris, daughter of Effingham B. Morris of Philadelphia. On his graduation from Yale Mr. Byers entered the firm of A. M. Byers Company and has been connected with it ever since, at the present time being vice president. He is a director of the Union Trust Company of Pittsburgh, the Union Savings Bank, the Union National Bank, the Westinghouse Air Brake Company, the Union Switch and Signal Company, and the Sharon Steel Hoop Company. He is a member of leading clubs in Pittsburgh, New York, and Philadelphia, and in 1922-23 was president of the United States Golf Association.

Pittsburgh and the Iron Industry

BY J. FREDERIC BYERS

TO the stranger in our midst, there is wonder at the industrial activity centered in this city of Pittsburgh; wonder particularly that this hive of industry should have conquered the obstacle of rugged topography. The bee in the hive recognizes that it was predestined that our city should become great; situated as she is at the confluence of great waterways, at the gateway to the west of our Colonial regime; and with a wealth of natural resources—timber, coal, oil, gas—in her dooryard. Such industries as coal, oil, glass, aluminum, or machinery, would be sufficient to insure her a place in the sun. And yet to the world at large, Pittsburgh is synonymous with iron and steel; it is the master forge of the universe. The very booklet which announces the series of talks of which today's is a part, portrays the Pittsburgh Spirit:

"In Pittsburgh one sees man's finished products, the product wrought by the masterful, metal-conquering type of man."

"Everyone knows that you have great questions to ask, and nobody knows the answer. But your problems are worthy of your steel."

It is fitting, therefore, to consider the interlink between Pittsburgh and the iron industry; and to ask ourselves, "What has the iron industry contributed to Pittsburgh, and what has Pittsburgh contributed to the iron industry"?

The birth of the industry in our district was in 1792; at that time George Anshutz, built a small furnace on Two-Mile run, in what is now the Shadyside district. It was the expectation that ores were obtainable in the vicinity; but this expectation was not realized and the project was abandoned in 1794, since the expense of bringing ores from other localities was too great. During the brief period of operations, the enterprise appears to have been given over to the casting of stoves and grates.

It was the sole undertaking in iron manufacture in Pittsburgh prior to the year 1800. While an ill-starred venture, it marks the beginning of our narrative; moreover, it is of epoch-making significance, since it is the starting post of the race in which Pittsburgh has outstripped the world in the attainment of supremacy in the iron industry. It is fitting, therefore, that we pause sufficiently to briefly review the history of the industry and the world situation up to the period when our city began to be a factor.

The knowledge and use of iron, probably of meteoric origin, goes back to prehistoric time, and the Egyptians were no doubt familiar with its use in the building of the pyramids; however, iron appears to have been nowhere plentiful prior to 1500 B. C. At the advent of the Christian era, its use had become general for tools, weapons, etc., among the nations of Asia, Africa and Europe which formed the centers of early civilization.

In the early Christian era, India was in the forefront of iron manufacture. An outstanding example is the noted Pillar of Delhi, erected about 310 A. D., in a period when columns, gates, beams and other massive sections were produced in that country. In this era, the use of iron became general throughout civilized Europe at the time of the Roman conquest. Not only was extraction from the ores generally practised; but the artisans were quite familiar with the hardening of steel by quenching in water, and edge tools were prevalent.

It is to Britain and Germany, the former in particular, that the iron industry is indebted for many of the revolutionary steps which have been interspersed in the progress of the past several centuries; and to them also we may attribute a large part of the influence and skill which have hewn the path by which our country and our city have marched to the goal of achievement in the industry. The German stuckoffen of the fifteenth century was the forerunner of the blast furnace, and brought the dawn of a new era, destined to largely extend the use of iron. Hitherto iron had always been produced in some simple kind of hearth or forge, directly from the ore in a single operation. The development not only brought forth a non-malleable product—cast iron or pig iron—but though this agency marked the beginning of the two-stage process of manufacture which characterizes the mammoth iron and steel operations of today.

England had pioneered in the development and use of coke as a blast furnace fuel, and at the end of the eighteenth century charcoal had been virtually supplanted for metallurgical purposes in that country. About the middle of that century, also, Newcomen and Watt had so developed the steam engine that more powerful blowing appliances became available to replace the water power and crude bellows of the past. The invention in 1783 of grooved rolls, and of puddling in 1784, both by Cort, were of outstanding importance; the former in marking a great advance in the mechanical working of wrought iron; and the latter because it enormously expanded the possibilities of production of wrought iron from pig iron, and this enabled full utilization of the great potential output of the blast furnace.

At the time of the colonization of our country, Great Britain was the leader in the iron industry. Being mother of the colonies, we might expect her dominant traits to be fostered in her offspring. It is not surprising, therefore, to note that in 1619, workmen were sent to Virginia to set up iron works. The enterprise existed only a few years, being destroyed by the Indians. The first really successful undertaking in this country was in 1643, at Lynn, Mass. The small furnace produced eight tons of iron per week from neighboring bog ore, and was later augmented by a forge to refine the iron.

From this beginning, iron manufacture spread throughout the colonies. The first recorded production in Pennsylvania was in 1716, from a bloomery forge near Pottstown; and in this same district, the first blast furnace in the state was erected in 1720. Ten years later the iron industry of Pennsylvania may be said to have become fairly established on a firm foundation; with the seat of production in the eastern part, chiefly in the Schuylkill valley. Erection of forges and furnaces proceeded with great rapidity. The inevitable westward drifts early brought activities to and beyond the Susquehanna; thence into the mountain districts; and finally beyond the Alleghenies.

Dating from the first enterprise in 1790, the Juniata valley became an important factor in the industry; and particularly so to Pittsburgh, due to the fact that from there considerable amounts of pig iron and blooms were transported to supply our iron industry. Pack animals, boats, and conestoga wagons played an important role in the upbuilding of our city's early activities in the iron trade.

Western Pennsylvania entered the lists late in 1790; the production being from a blast furnace and forge on Jacobs creek in Fayette county. This was the first furnace west of the Alleghenies. Several other furnaces and forges were built in the Uniontown-Connellsville district prior to 1800, and the iron industry was definitely established in the western portion of our state. At that time, a few scattered iron enterprises are noted in Kentucky and Tennessee; but Pittsburgh marked the western outpost of the trade, and entered the field as the purveyor to the growing needs in the development of the western domain.

While relatively speaking, Pennsylvania was somewhat slow in getting launched into iron manufacture, in the sixty years intervening before the commencement of the Revolutionary war, she outstripped the other colonies in the rate of progress. At the outbreak of hostilities with the mother country, about sixty blast furnaces and forges had been built. The progress was not entirely without its vicissitudes and failures; but the iron masters were almost feudal lords in the centers of activity, and the virtual rulers of the destinies of the community dependent upon their industry.

The dawn of the nineteenth century marks the beginning of the local iron industry; as noted at the outset of our narrative, it is virtually coincident with Anshutz' pioneer effort. The Revolutionary war had come to an end, and we were launched on our career as an independent nation; out from under the guidance and the dominance of the mother country. The steam engine was just coming into fairly extended application for pumping and other stationary power uses; but there were probably not more than four or five in the United States. For vessel propulsion the application was only in the preliminary stages of experimentation; while for railway locomotion it had not yet emerged from the chrysalis of an idea. Communication between Pittsburgh and the east was by boat and wagon; and water transportation was an important factor in its trade with the west. Pittsburgh had just been incorporated as a borough with a population exceeding 1000. Our community was the most important town in what was the western agricultural district, and the gateway and outfitting point for the tide of emigration to the Blue Grass region of Kentucky and to the Great Lakes and the west. The coal trade from local seams had become established and the industrial activity of the town was in the formative stage.

While coke had come into general use as a blast furnace fuel in England, and to some extent in continental Europe, iron production in America was entirely with charcoal for fuel. The recently developed, but revolutionary puddling process, which in importance was second only to Bessemer's later development, had as yet no place in our colonial iron industry. Production statistics were not a matter of record at that early date; but the output of a blast furnace was about 20-30 tons weekly, and of a forge two tons weekly. Much production was in forges or bloomeries direct from the ore to the malleable product. Water was the universal power source. Operations were naturally on a small scale, due to difficulties of transportation; and were in general to supply a restricted contiguous need from local supplies of fuel and ore.

At the period upon which our attention is focussed, iron was the dominant material of utility. The generic term covered the pig iron from the blast furnace which was used in the manufacture of pots, stoves, and other cast forms, or refined to a malleable bloom which was hammered or rolled to desired shapes. Steel was a relatively minor commodity, so made and treated that it became hard and was adapted for use in knives, weapons, and tools. Wrought iron, the malleable product, was the keystone of the industrial arch; the product of universal application in the building of our bridges and our railroads and our structures. The above generic classification remained in effect for three decades until the advent of the Bessemer and open hearth processes and the birth of the "Age of Steel" upset the old order of understanding and of utility.

We have come in our narrative to the dawn of the nineteenth century, Anshutz' pioneer venture had come and gone. Pittsburgh was ready for her real induction into the iron industry and for her march to the position of dominance. An iron foundry was established in 1805 by Joseph McClurg on the site of the Park Building. It became a source of supply of cannon and shot to Perry's fleet on Lake Erie and Jackson's army at New Orleans during the War of 1812. In 1807 there were three nail factories in Pittsburgh—Porter's, Sturgeon's and Stewart's, "which make about forty tons of nails yearly."

A writer in "The Navigator" thus sums up the condition of the town's iron industry in 1810. "The manufacture of iron mongery has increased in this place beyond all calculation. Cut and wrought nails of all sizes are made in vast quantities, about, we think, 200 tons per year. Fire shovels, tongs, drawing-knives, hatchets, two feet squares, augers, chisels, adzes, claw hammers, door hinges, chains, hackles, locks, door handles, plough irons, flat-irons, etc., tons of these, together with a number of other articles in the iron way."

The Pittsburgh Rolling Mill was established by Christopher Cowan in 1812. The "Pittsburgh Almanac" for 1813 refers to the enterprise as follows: "C. Cowan is erecting a most powerful steam engine to reduce iron to various purposes. It is calculated for seventy horsepower which will put into operation a rolling mill, a slitting mill, and a tilt hammer, all under the same roof." The products were nails and various tools and utensils. The mill stood at the intersection of Penn street and Cecil alley. The "Almanac," for 1819 notes a rolling mill installation for manufacture of bar, rolled, and sheet iron at the works of the Pittsburgh Steam Engine Co., owned by Wm. Robinson, Jr., and Joshua Malen.

The Union Rolling Mill was the next to be built in Pittsburgh, in 1819. It had four puddling furnaces, the first in our city, and therefore marks the inception of raw materials manufactured to supply mill operations. It was built by Baldwin, Robinson, McNickle and Beltzhoover, and was probably the first mill in the district to roll bar iron; also it was the most extensive mill of the kind in the western country.

On the site of the present works of Spang, Chalfant & Co., at Etna, the plant of Belknap, Bean and Butler was enlarged in 1824 from a more modest beginning, and equipped to roll blooms. In 1828 the mill was acquired by H. S. Spang to roll bar iron from Juniata blooms; it was the nucleus of the present Spang, Chalfant and Co., works. A rolling mill was built on Grants Hill in 1821 by William B. Hays and David Adams.

The Juniata Iron Works (not to be confused with the operations of the Juniata valley) were built in 1824 by Dr. Peter Schoenberger, on Penn avenue; the recently dismantled Schoenberger works of the American Steel & Wire Co. In 1825 the Sligo Rolling Mill was erected by Robert T. Stewart and John Lyon.

Cramers "Magazine Almanac" for 1826 summarizes as follows the status of the iron industry in Pittsburgh for the first quarters of the nineteenth century.

"The manufactures of Pittsburgh, particularly in the article of iron, begin to assume a very interesting aspect. Not less than five rolling mills are now in operation, and a sixth will soon be ready, for the various manufactures of iron. Four of the mills are capable of making iron from the pig, besides rolling, slitting and cutting into nails. The other is engaged only in rolling bar and boiler iron and cutting nails. The fuel to supply the engines, the metal and other materials required in conducting the operation of these works, and their repairs, it is computed afford employment to upwards of 1500 people, the value of whose labor may be estimated at $1500 each per annum, or $2,250,000, while the total product may be estimated at $3,000,000. How important an addition to the national wealth in this section of the Union! Great credit is due to Messrs. Baldwin, Robinson and McNickle for their perseverance in establishing this important business, and for bringing it to the perfection which it has attained. Great facilities are afforded to mechanics in all the various branches of smith work and hardware by the preparation of iron into whatever shape that may be required for any particular description of work. It is generally believed that no other place in the Union affords greater advantages for the extensive manufacture of anvils, vises, and all kinds of iron work. The competition which at present exists, and which is increasing by the erection of new works, will insure a plentiful supply of iron and nails for the western states, of an improved quality on better terms than they can be procured from the seaboard."

Our giant is coming into being. We have passed through the formative stage and are entering the period of ascendency of the industry. This period may logically include the half century to 1875, in which year Pittsburgh and the nation were definitely noting the transition from the old order to the new "Age of Steel." The formative period of the first quarter of the century had not seen Pittsburgh emerge from her sole dependence upon neighboring counties and the Juniata valley in particular for her pig iron needs; and to the latter source for a large part of the blooms. River and wagon or sled remained dominant factors; as adequately portrayed in the price of $200 per ton at Pittsburgh for English bar iron which sold for $100 at Atlantic ports.

The half century under discussion marks the rising tide of the iron industry in Pittsburgh. It is most interesting to follow the chronological birth and development of works in the district, and their equipment, production and executive personnel. It would, however, form a too lengthy narrative and we shall limit ourselves to noting some of the galaxy of names which are indelibly written on the page of Pittsburgh's industrial expansion; and which are bywords in a recital of her progress. We have already focussed attention upon the pioneer efforts; they were closely followed by other enterprises, and throughout the epoch we note the rise of works with which are linked the names of Oliver, Jones, Laughlin, Byers; of Dilworth, Woods, Lloyd, Porter; of Wharton, Murdock, Painter, Zug; of Nimick, Phillips, McCutcheon, Walker; of Dalzell, Lewis, Brown, Chalfant; names which are recognized as an integral part in the upbuilding of the industry, and many of which are still to be identified in contemporary organizations.

The great Carnegie organization had its humble inception in the forge works of the Kloman brothers in Millvale, started in 1858. With Henry Phipps as partner, increasing business necessitated the erection of a greatly enlarged mill at 29th Street and the Allegheny river in 1862. Andrew Carnegie entered the partnership in 1863, and the

Union Iron Mills became the nucleus of an organization the history of which reads like a romance. A later paper of this series will unfold the tale. The bed was not always one of roses, as is manifested by the reproaches expressed by Carnegie in the early days, for having been drawn into a most hazardous enterprise.

In 1829, Allegheny county had eight rolling mills, using 6000 tons of blooms and 1500 tons of pig iron, practically all of which was brought from other localities. The iron rolled was 6217 tons. At the end of 1875, the number of rolling mills was thirty-one, out of a total of 137 for the state, and 331 for the country. Almost without exception, local works were producing blooms from puddling furnaces—a total of about 700, with an aggregate annual capacity of about 400,000 tons. The largest of these were the Allegheny and Monongahela Iron Works, Lewis, Oliver and Phillips, sixty furnaces; American Iron Works, Jones and Laughlin, seventy-five furnaces; and the Pittsburgh Iron Works, Jacob Painter and Sons, fifty-two furnaces. A number of works were producing steel for springs, saws and other tools, and for general uses. The names of Park, Singer, Anderson, and Hussey are prominent in the role.

That woman's influence was not confined solely to art and politics, is shown by the citation of the big business developed in crinoline wire —1500 tons annually about 1860.

Credit goes to Graff, Bennett and Co., for the first blast furnace in Allegheny county, sixty-five years after the Anshutz trial. This was the Clinton furnace on West Carson street; it was put into blast in October, 1859, with coke as fuel. Between this time and 1875, eleven stacks were completed in the country, all using coke. Although coke had long before displaced charcoal or other fuels in Great Britain, and although we had a coking coal in our Connellsville field which was not surpassed in quality by the celebrated Durham coke of England, it is significant of the courage of the Pittsburgh operators that coke was chosen as the sole fuel. Furnace men of the time were apparently quite reluctant to use this fuel, and in general employed it in mixture with raw bituminous coal.

Charcoal had been displaced from the front rank in production in this country by anthracite in 1855; the latter being an important factor in the growth of the blast furnace industry in the Lehigh valley and eastern Pennsylvania. In 1875 bituminous fuel took rank over anthracite, the former including coke, raw coal, or mixtures. In that year, of a total of 2,266,581 net tons, bituminous fuel accounted for

47,545; anthracite for 908,046; and charcoal for 410,990. Frick & Company had made its entry as a coke producer a few years before.

The two Isabella furnaces at Etna and the Lucy furnace of the Carnegie interests were astonishing the world in tonnage produced, and there was an intense rivalry between them to lead the way. Daily outputs in excess of 100 tons, and annual production of 24,000 tons per furnace were almost unbelievable. These furnaces represented at that time the acme of achievement in construction and operation. The average annual rated capacity of the 713 blast furnaces of the country was 7600 tons; of the fifty in the Lehigh valley, 11,000 tons; of the thirty-two in the Shenango valley 10,000 tons; and of the eleven in Allegheny county, 22,000 tons. The Pittsburgh spirit of big undertakings was manifesting itself, and was already putting her iron industry into a dominant position.

Contemporaneous with this epoch in the rise of our city's iron industry, and playing important roles in the expansion, were numerous outstanding developments; some having a direct bearing on works processes, and others by creating additional need for the products.

The application of hot blast to furnaces had been developed by Neilson, and improved by Whitwell. Closed tops for furnaces had made its utilization most effective. The masonry stack had given way to the iron shell furnace. The puddling process had been improved by Hall, and this method of refining became a fit adjunct to the increasing output of the blast furnace. Greatly improved blowing equipment was being built.

The Baltimore and Ohio railroad had installed English rails on parts of its line in the early part of the epoch; the Pennsylvania railroad had been completed from Philadelphia to Pittsburgh in 1852; railroad building was progressing at an accelerated rate. The demand for iron rails had grown in conformity, reaching a maximum of 905,930 net tons in 1872, from an initial 24,318 tons in 1849.

The early efforts of Fitch, Stevens, and Fulton had borne fruit; steam vessels with iron hulls were crossing the Atlantic. Pittsburgh had become an important shipbuilding point, producing iron barges for the Ohio and Delaware Canal and its Portage railway over Allegheny mountains; also barges and steamboats for the western river trade.

Iron was finding increasing use in bridge and building construction. Oil and natural gas production was being developed, and pipe was needed for the distribution of water and gas. Agriculture, the keystone in the arch of our country's development was showing the broad vision and a desire for labor saving equipment, paralleling the progressive trend of all industry and manufacture of the nation. The United States was becoming the largest per capita consumer of iron in the world; from 55 pounds in 1854 to 107 in 1875, 320 in 1892, and close to 900 today.

The close of the period marking the rise of Pittsburgh's new industry, witnessed two events of epoch making significance in shaping her destiny and her future. Anshutz' pioneer effort failed for want of ore in the immediate vicinity. The Clinton furnace and the others which followed were erected with a recognition of dependence upon outside supplies, and grew to record making proportions in the face of transport of ore and because of the development of the needed carrying facilities to a magnitude and efficiency which have been an achievement in engineering and management. Missouri ore supplies were an early contributing factor; but the entry of ore from the recently discovered reserves of the Lake Superior district has been of more far-reaching influence than any other incident in our history. This began about the time of cargo shipments from the district to lower lake ports in 1856 and was parallel with the development of the several old ranges from that year to 1885; culminating with the opening up of the Great Mesabi range in 1892. From our vantage point of retrospect, it is amusing to note that Andrew Carnegie advised A. M. Byers against investment in mining ventures in the district in association with Messrs. Oliver and Kimberly because of the hazards of the undertaking. What would be the position of the Carnegie Steel Company and of Pittsburgh without the Lake Superior ore supply?

The second event of significance was the inauguration of Bessemer steel making in the Pittsburgh district at the Edgar Thomson Steel Works at Braddock. The first blow was made under the supervision of Capt. "Bill" Jones on August 22, 1875.

Pittsburgh, through Edgar Thomson Works, was in no sense a pioneer in the development of steel making in this country. Production by the pneumatic process had been successfully launched in the United States ten years before; and the local entry into the field was almost a decade after Bessemer's pioneer efforts in England. Domestic production of Bessemer steel had already reached 375,517 tons for the year. Its inception had been delayed for several years after England had made her start, because of controversy over priority of patent rights between Kelly and Bessemer.

Edgar Thomson, however, meant the inaugural of a new era in Pittsburgh's dominant industry. It marked the inception of our contribution to the "Age of Steel;" a contribution which grew with accelerating rapidity, and brought us to the pinnacle of achievement in the industry. The romance of this development is fittingly given a separate niche in the series of which today's narrative is a part; and thus it need not be dwelt upon here. To our present narrative, however, it is of momentous importance since in the rising tide of steel production it gradually became the commodity to fill the country's need for rails, for beams, for plates, for bars; and wrought iron was forced to the secondary position as a specialty product. The transition did not come over night; as indicated by the fact that such a great concern as Jones and Laughlin did not enter the ranks of steel producers until late in 1886. This company and the Carnegie organization also, were operating puddling plants in 1890; many works had increased the number of puddling furnaces and the output of wrought iron over that noted in 1875. The 700 furnaces of 1875 had been increased to over 1,100 in 1890.

The heyday of wrought iron production appears to have been reached about 1887, with an output for the country of somewhat over 2,000,000 tons for the year. At this date also, most of the primitive forges and bloomeries had become idle. It was inevitable that the vast production and lowered costs obtainable by the Bessemer and open hearth processes, should cause steel to become the dominant material for our bridges, for structures, for railroads, and for general engineering uses. Predictions that this meant the passing of wrought iron have not, however, been fulfilled, since it possessed some qualities which are not present in steel. In spite of the laborious effort in production, following in general, the methods which prevailed in the heyday of the industry, and with necessarily high costs, the activity among those firms which have remained in this specialty field has remained unabated. More than ever before, attention is being given to methods which will preserve the recognized quality characteristics of wrought iron, and yet afford a magnitude of production and lowered cost in keeping with steel processes. With this goal attained, the wrought iron industry should assume an importance other than that of parent of a giant offspring. It will supply a demand which will grow to the extent that the material fits the special needs on an economic basis.

Blast furnace operations in Pittsburgh have grown in entire conformity with the growth of steel manufacture, and this phase of our topic thus becomes interwoven with the story of steel. In 1875 there were eleven stacks in Allegheny county; now there are forty-five. But this is only a part of the tale. Isabella and Lucy furnaces of the earlier period startled the world with daily productions in excess of 100 tons; ten years later furnaces at Edgar Thomson Works constructed by Julian Kennedy were establishing astounding records of treble or quadruple the earlier record outputs. Today some blast furnaces in the district are producing in excess of 1,000 tons of pig iron per day; and contemplated outputs of 1,200 tons are not viewed with the astonishment which greeted the feats of fifty years ago.

Through many centuries of effort, the iron industry has undergone an evolutionary transition from the primitive methods and trivial production of the ancients, to a ponderousness of equipment and an enormity of output which is one of the wonders of the age. Interspersed throughout the era, as landmarks in the march of progress, we find developments of a revolutionary character which have served to accelerate the pace with which our industrial monument has arisen. It is a surprising fact that the iron and steel industry of Pittsburgh should have arisen in a century to a position of preeminence in an art which goes back to prehistoric times. Little wonder that her contribution has been dominantly in the evolutionary development and in engineering features rather than through processes of a revolutionary character.

She has missed that romantic and picturesque phase which is associated with the old hillside masonry stock, with the primitive forge or bloomery, with the feudal lordship of the old iron master. She has abetted the industry through a wealth of natural resources and through geographical position, which form the foundation upon which the structure is built. She has contributed the captains of industry, the men of brawn and the men of brains, the men of nerve and the men of big ideas, the metallurgists, the engineers and the financiers for whom no problem was too hard to tackle, and who have set the pace in the utilization of principles and the extension of machinery and plants to a colossal degree.

The contribution of the iron industry to Pittsburgh needs no elaboration; it is apparent in her prosperity, in her commanding position, in all that is emblematic of the "Pittsburgh Spirit."

B. F. JONES, JR., STEEL MASTER

B. F. JONES, JR.

B. F. Jones, Jr., Steel Master*

ONE of the dominating figures in the American steel industry the first quarter of the present century was the late B. F. Jones, Jr. On account of his avoidance of publicity and his preference for steady, concentrated application to his work, the public did not know him to the extent that it has been aware of some of the other men prominent in the industry. But within the industry itself, no man was respected more highly as a successful steel master or accomplished greater results with his properties than did Mr. Jones.

It is generally conceded that there is not a better managed organization among the independent steel producers than the Jones & Laughlin Steel Corporation, of which Mr. Jones was the directing genius for more than a quarter of a century, during which time the business was expanded by growth several times beyond its size when he took over its direction. The mills in Pittsburgh were enlarged and extended; the great modern works at Aliquippa, extending several miles along the Ohio river a few miles below Pittsburgh, were designed and constructed, in which works the company extended its products to cover practically the entire range of the steel industry, including tin plate, wire products and steel pipe; the company's raw materials production was enlarged and developed in the most modern manner; its transportation systems were increased; its sales and distribution facilities broadened, and every development of the steel industry toward modernization was either initiated or quickly adopted by the organization of which Mr. Jones was the directing genius, so that today it stands in the forefront of going, successful and well managed properties.

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*The program of the "Pittsburgh and the Pittsburgh Spirit" series included an address by B. F. Jones, Jr. on the part his father had played in the development of the steel industry. Before Mr. Jones had finished the preparation of the address he died. In place of the address there is printed a sketch of the dominating rank as steelmasters of both Mr. Jones and his father. This sketch was prepared by an associate of B. F. Jones, Jr.

One of the outstanding characteristics of B. F. Jones, Jr., was his intuitive gift for selecting successful men as associates with him in the development of the business. It is said of him by his friends that few men had his gift for sensing not only what an alert, ambitious and energetic young man could do, but also what he could not do, so that in his long career as a steel master, by his judgment of men, he gradually developed around him an organization composed largely of comparatively young executives who today are fully trained and capably developed to carry on the vast industry which B. F. Jones, Jr. built upon the broad and solid foundation laid by his father, the founder of the business.

At the time he took over the direction of the organization which was shortly before the death of his father, B. F. Jones, who established the business in 1850, Mr. Jones was a comparatively young man. He had been brought up in careful training to succeed to the business. He went immediately into the firm after graduating from Princeton university in 1891, and devoted the remainder of his life to bringing the organization to the foremost position which it occupies today among well-managed steel properties and to fostering its growth and development into the third largest steel producer in the United States, a place attained by the process of growth alone, unaffected by the combinations and consolidations which occurred in the industry with such rapidity during his lifetime.

The corporation of which he was the dominating head at the time of his death on January 1, 1928, had been in business in Pittsburgh for more than three-quarters of a century and during that long interval in which it grew from small beginnings to its present commanding position in the industry, had but two directing heads, B. F. Jones, the founder, and his son B. F. Jones, Jr., who might properly be called the developer of the business.

When B. F. Jones founded the business he was a young man still in his twenties, who had made a success of operating the canal system connecting Pittsburgh and Philadelphia, but who foresaw the coming changes in transportation that would develop Pittsburgh into the center of the iron industry of America. Accordingly he withdrew from the canal business and invested his money in the then young and struggling iron business. Upon this industry he concentrated his energies and talents for a half century, so that when he turned the business over to his son in 1900 it had been developed into one of the foremost producers of the United States, and was also one of the oldest and most thoroughly established.

When Andrew Carnegie was a telegraph messenger boy in Pittsburgh, Jones & Laughlins was a well-established and leading industry in this community. Mr. Carnegie in later years, after he himself became a successful steel master, used to relate how he watched for messages directed to B. F. Jones and got them to deliver, if possible, because of his liking for the iron manufacturer and the latter's liking for the young messenger and also, he used to relate, being a true Scot, for the two-bit tip that Mr. Jones unfailingly handed him every time he came running with a telegram.

In addition to being a genius in the production of iron and steel, the elder Jones, on account of his early training in transportation problems, was keenly interested in the development of railroad transportation for the Pittsburgh district. He personally brought about the building of the present Pittsburgh, Virginia & Charleston railroad along the south side of the Monongahela river, in order to serve the rapidly developing mills, mines and quarries of the valley, and was himself its first president. He took a keen interest also in the establishment of the Pittsburgh & Lake Erie road and other rail lines, and was regarded in his time as a foremost authority on rail transportation as well as one of its staunch friends and patrons, and is remembered as such.

In somewhat similar fashion, his son, B. F. Jones, Jr., became deeply interested in water transportation and was one of the men who did most to bring about the rehabilitation of river transport for big industries. Seeing the cramped position into which the steel business in Pittsburgh had been forced during the World war under government operation of the rail carriers and realizing the value in the rivers flowing past his mills as low-cost carriers of their products to distant western, southern and southwestern markets, Mr. Jones had the experiment made in 1921 of shipping steel down the rivers to customers in cities along the Ohio and Mississippi and also in inland cities. This experiment led to the development of a regular river and rail delivery service by the Jones & Laughlin Steel Corporation, which today reaches into more than a dozen states with products of the corporation's mills, consisting of plates, shapes and bars, junior beams, steel pipe, wire products, fencing material, steel nails, concrete bars, tinplate, spikes, and many other steel products. Following the lead of

Jones & Laughlin the other steel producers of the district and of other districts on the rivers have since established similar services until today there are probably two score towboats and a thousand or more barges engaged in this tremendous revival in water transportation which has stirred the imagination of the whole business world and brought about an interest in the subject of coordinating rail and river transport with highways and even airways into a national distributing system not possible of attainment by any other nation, and which will ultimately result in reducing distribution costs on articles of general use throughout the whole country and in consequence will have a favorable effect toward lowering costs of living.

What these two men, father and son, have done for Pittsburgh in the matter of developing transportation facilities alone, can never be measured in dollars and cents, but will stand out for all time as accomplishments of tremendous significance to the entire district and its population, and of proportional importance also to the rest of the country.

What they accomplished in the iron and steel business resulted in establishing the city as the foremost producer of these products in the country and helped it keep its place in the forefront of the industrial life of the nation. The organization which they successively headed during more than three-quarters of a century, was not merely content with holding its place in the routine of manufacturing iron and steel products, but took the leadership in seeking for and discovering many new processes and improved products. The art of cold rolling and cold finishing of steel was a Jones & Laughlin discovery and invention of more than sixty-five years ago. The production of the new building product, rolled steel structural sections called junior beams, and the development of a special steel for machinery parts called Jalcase steel, are examples of recent Jones & Laughlin developments. In between these there have been many other improvements in processes and perfection of materials and uses which have served to make the name Jones & Laughlin synonymous with enterprise and progress in all matters pertaining to the industry all over the civilized world.

B. F. Jones, Jr. was a lifelong Republican, and took a keen and active interest in the affairs of the party. He was chairman of the electoral college of Pennsylvania in 1908 and could at one time have occupied a seat in the United States Senate, had he but chosen to accept, but preferred to concentrate his attention upon the development of the steel business. His father was a chairman of the Republican national committee in 1884 and a staunch advocate of the principle of the protective tariff, to which he attributed the wonderful development of the Pittsburgh district into an iron and steel center. B. F. Jones, Jr. was likewise a firm believer in the principles of the tariff and predicted that the day is not far distant when the necessity for universal consideration of a system of protective tariffs will again confront us as a nation, if we are to continue holding our world leadership in industry.

During the period of a quarter century in which B. F. Jones, Jr. was the active head of the Jones & Laughlin organization, his cousin, the late William Larimer Jones, was closely associated with him in the operation of the mills, mines and quarries. Steel men throughout the country say that there was never a greater operating man in the business, nor one more genuinely democratic and well-liked throughout the industry as well as within his own organization. He devoted his life to the producing end of the business and was a keen student of the industry and a watchful observer of all its trends and directions, so that he became known as a fearless leader in production methods, one not afraid to make new and extremely progressive steps toward greater perfection in production at lower costs—which is the constant aim of the steel maker—together with a parallel effort to procure the most widespread distribution at the lowest possible costs.

B. F. Jones, 3rd, grandson of the founder of the business, is a vice president of the corporation and its secretary. William Larimer Jones, Jr. is a director and member of the executive committee. George M. Laughlin, Jr., a grandson of the original partner in the firm of three-quarters of a century ago, is chairman of the board of directors. Willis L. King, vice president, cousin of the late B. F. Jones, Jr., and William Larimer Jones, is today the dean of the steel industry in America and could have been president of the American Iron and Steel Institute, succeeding the late Judge Elbert H. Gary, had he chosen to accept the honor. Thus the great business of the Jones & Laughlin Steel Corporation goes forward under the general direction of the families which established it so long ago, and gave it its honorable history in this community and favorable recognition all over the world for the quality of its merchandise, the efficiency of its service and its probity and fair dealing in all matters of business. W. C. Moreland, whom B. F. Jones and B. F. Jones, Jr. held in the highest esteem both as a friend and business associate, is a vice president of the corporation. Mr.

Moreland was originally private secretary to B. F. Jones and later secretary of the company.

In addition to the foregoing, the other officers of the Jones & Laughlin Steel Corporation are T. M. Girdler, president, a young man who served directly under the supervision of the late William Larimer Jones and whose operating skill and executive ability are recognized far and wide in the industry; S. E. Hackett, vice president in charge of sales, who obtained his training as the head of the district sales office and warehouse service of the corporation in Chicago; W. J. Creighton, vice president, in charge of the finance, a young man whose entire career was developed within the Jones & Laughlin organization; and J. C. Watson, treasurer, who likewise was trained within the organization.

ANDREW CARNEGIE'S CONTRIBUTION TO THE STEEL INDUSTRY

WILLIAM G. CLYDE

William G. Clyde, president of the Carnegie Steel Company, was born in Chester, Pa., the son of John Edward and Emma Bertha Ott Clyde. He attended the public schools of Chester and later entered the Pennsylvania Military College, from which he graduated with the class of '88. His first entrance into the business world was as a civil engineer with the firm of Ryan & McDonald, constructors, of Baltimore, Md., and later he became associated with Robert Wetherill & Company, machinists and founders of Chester.

While Mr. Clyde in later years has devoted his energies to the sales end of the steel business, he was, however, a practical steel man, having an unusual equipment for his chosen end of the work, by mill experience.

He started his mill training with the Wellman Steel & Iron Company at Thurlow, Pa., where he was superintendent of the plate mills, subsequently going to the Illinois Steel Company, at South Chicago, where he remained for six years Upon leaving the Illinois Steel Company, Mr. Clyde became sales manager for the American Steel Hoop Company at Philadelphia, remaining in that position until this firm was taken over by the Carnegie Steel Company.

After spending three years in sales work at the Cleveland office, Mr. Clyde was made assistant general sales manager of the Carnegie Steel Company with headquarters at Pittsburgh, and in March, 1918, he was made vice president and general manager of sales of the Company.

Mr. Clyde received the honorary degree of Doctor of Applied Science, from his alma mater, the Pennsylvania Military College, in June, 1924.

In 1890 he married Margaret Burns Johnson, daughter of Mr. W. W. Johnson, of Chester, Pa., and has two children, Wm. J. Clyde and Mrs. Emma Clyde Hodge of Pittsburgh.

On October 30, 1925, he was elected president of the Carnegie Steel Company.

ANDREW CARNEGIE

Andrew Carnegie's Contribution to the Steel Industry

BY WILLIAM G. CLYDE

IN any consideration of Andrew Carnegie, one cannot help but instinctively revert to the reason for his unusual rise to wealth and the almost super-human building of a great steel manufacturing business, and at the outset of this talk I offer to you the reasons as they impress me, reasons which actually are his greatest influence on the industry.

The most important factor undoubtedly was his consummate genius for organization, and almost on a par with this must be placed his remarkable insight into human nature. These two characteristics are most essential to the present day steel master, and I have no doubt have been developed through individual study of Mr. Carnegie's life and direction of his steel enterprises. These two traits of character to this day have their influence; we can see it all around us. The steel business has become so highly competitive that a director of such big industries as now constitute the steel industry, must ever be keen and alert to human, as well as business and industrial relations.

And yet when an individual has risen to a dominating position in any particular industry, if, in after years, the question arises as to this individual's effect or influence on that industry, I am inclined to have serious doubts as to whether he had any effect at all. Rather, I feel that the interrogation should be reversed, and we should ask, "What effect did the industry have on that individual"? To this there are two answers. The one has to do with his endeavors in a line that is expected to live after he has passed on; the other has to do with his personal development during the years of his activity, and its influence upon those with whom he came in contact.

Nearly every industry that becomes of great magnitude develops its giant, but whether it seeks a particular individual to become its giant I am not so ready to admit. I am more inclined to believe that the giants are developed from opportunists, from men who have alert and have vision, men who have faith in their works, men who are ever ready to make opportunities, as well as to seize them—men who are ever ready at the door to greet Dame Fortune. But certainly he who becomes the giant in the development of a great industry must be possessed of the qualifications which are required for a leading part in greater measure than any other. We might cite this in the case of an actor with an humble part to play, who—ever with his eye on the star, ambitious to get ahead—one day comes forward with the voluntary information that he knows the part, that he can take the place of the star who, for some reason, has been stricken down and cannot go on with the play. This fellow had vision, he had ambition, and he stood ever ready at the door of opportunity.

In the case of Andrew Carnegie, it was as natural that the iron and steel industry should have him as it was that he should seek that field for exercise of his peculiar business faculties. It is not necessary to admit a destiny in the affairs of an individual; that would be giving a human individual too much importance. But a law of natural philosophy seems to apply, in the sense that it is as natural for a great business to seek partnership with an especially endowed individual, to use him for developing purposes and to reward him in accordance with his agency powers, as it is for water to find its own level. We may see this in the Armours of beef fame, the Rockefellers of oil, and the Harrimans and Hills of railroads, the Sloans, Fords, Durants, Chryslers and Nash of automobiles, as well as many others.

And all things seemed to favor Andrew Carnegie, as step by step he progresses. A Scotchman, with the acumen, thrift and caution of a Scot; ambitious from boyhood, his job as a telegraph operator brought to him the advantage and necessity of steel bridges to replace the wood railroad bridges then used, and which were so hazardous as a fire menace. He had made a little money in an investment in an apparently visionary invention of the sleeping car, and later added to his funds through some oil speculation without the investment of a cent.

And so, along about 1864, when Captain Ward bought the Kelly and Mushet patents for making Bessemer steel, Mr. Carnegie took notice of the possibilities of wealth in the manufacture of steel. He organized the Keystone Bridge Company, placing the stock in the hands of J. Edgar Thomson, president of the Pennsylvania railroad, Colonel Scott (who later was vice president) and a number of minor officials. The company was successful from the first and paid dividends of twenty-five percent. In four years Carnegie had paid for his stock out of the profits. While the Keystone Bridge Company was by no means the first to build iron bridges, it became, with the powerful backing of the Pennsylvania railroad, the most prosperous bridge company in the United States.

Whether such a romantic tale of an industry could be enacted these days I have my serious doubts. Carnegie had no business ethics to hamper him. Might was right. There was no Sherman Law, there was no Interstate Commerce or Federal Trade Commission, no Esch-Townsend railroad bill and no Clayton act; while, as for rebaters, it was a season of high carnival for them. There was no such thing known as "government by commission" in those days. Had Mr. Carnegie to encounter these "brakes on business" I am inclined to believe he would have had many troubles.

But he did have troubles, and financial troubles, too. It is recited that on one occasion when he returned from an European trip, he found his Union Iron Works going into bankruptcy as fast as it could. He has told of this himself so we are betraying no confidences. One white haired puddler is quoted as saying, in some of the books on Carnegie, "I have seen the time when he would have to pawn a pile of pig iron to get ready money. Then we puddlers couldn't touch it until the storage company came and released it."

But he weathered all storms, and steel began to grow in favor and in number of uses. Just ahead of this era was to come the great railroad expansion, the building of the great White Squadron for the United States Navy, the development of the American skyscraper, besides all the many other uses of hardened steels that came gradually. Truly, Carnegie lived and worked in an opportune era.

To me, however, it is not so much a matter of world concern what the steel industry became through the personal efforts of Andrew Carnegie, as it is what Andrew Carnegie became—and what he did—through having accepted his opportunity with the great basic industry of the age. The basic industry had to grow. There was increasing demand for iron and steel. Every move of a human being, even to the twitching of a finger or the breathing of a sigh, tended toward the consumption of steel, in the final analysis. This you may think is rather far fetched, but every movement of the body requires energy; food is necessary to supply energy, and steel is necessary to produce food—steel and iron in thousands and thousands of parts and ways go into the preparation of a loaf of bread or a peck of potatoes. And even after a man dies, a certain amount of iron and steel continues to be worn out because of his having lived.

And so here is the steel industry at the point of its great expansion. Here was Pittsburgh in a strategical situation just at the time of the turnover from agricultural to urban development, when the demand was for iron and steel—steel and iron. And in Pittsburgh, come from Scotland as a boy, with the qualifications that were needed in the development of this basic industry, was Andrew Carnegie. There were other men, similarly cast for their parts, who practically were never heard of in the industry—those who were concerned with ore and fuel and fluxes. But Carnegie, beyond all of them manifested by his works that he was naturally endowed for eminent leadership in the transition of a basic industry from a casual necessity to a dominating specialty.

It is a curious thing that the men who knew Andrew Carnegie well during his active days in the industry, when asked concerning his influence on its development, grope about in an effort to form some sort of a picture and, to their surprise, fail. They are unable to put their fingers on any particular or outstanding evidence of genius. They will refer to tenacity, to untiring efforts and energy, and to faith in work, but all of these features come as close to analyzing the captain of industry as Mary Roberts Rhinehart's assertion that the faculty of industry is the highroad to success as an author. But industry Carnegie had—in abundance. Every man who has become preeminent in his vocation goes this road.

It occurs, however, that in this instance it is in a review rather than an analysis of Mr. Carnegie, that his dominant characteristics are most clearly seen. He himself has attributed his success chiefly to the group of smart, clever young men with whom he surrounded himself. He had an unbounded belief in young men, and he never was afraid to trust them with the most important duties. His method was to keep a keen lookout for young fellows of exceptionable ability, whether in his own employ or in the employ of others. And his judgment rarely failed him in this respect. Scores of wealthy men in this country today owe their station in life to Andrew Carnegie's timely encouragement.

Henry Clay Frick, who later clashed in business with Mr. Carnegie and gave the country a picture of a battle of business giants, was one of those whom Mr. Carnegie credited with the making of a first-class business man, and he took him from the employ of another firm and gave him a position in his own organization. Another instance is that of a young fellow who served behind a shop counter in Dunfermline.

He sent him to Pittsburgh and gave him the usual opportunities to distinguish himself. The young man rose rapidly, was taken into partnership, and became a rich man. Perhaps the most striking tribute to Mr. Carnegie's perceptive faculty is Mr. Schwab. He entered Mr. Carnegie's service as a boy; he had neither capital nor influence; but he had merit, and before he was thirty years old he was president of the company. Such men as these it was who formed Mr. Carnegie's cabinet—his colleagues.

It would have been a hopeless, even an impossible, task to analyze Andrew Carnegie while he was working to bring the steel industry into a position to meet the demands. Later on, however, his philosophy of life, expressed in conversation, interviews, and in his writings, made known what were his dominating characteristics, and his plans of procedure.

The steel business grew for Andrew Carnegie because he was able to see its greatness. He was able to convince himself at once, what was proved out to everyone later on—that the age of steel was swinging into full tilt; that the great ore beds were there to be converted into iron, thence into the shapes that were needed by mankind. The one great requisite was to produce. That meant work. And Carnegie worked.

If any one thing can be set up as the direct result of Carnegie's influence on the industry, it is that he clearly saw its greatness, which was all the more convincing to him because he was not of the imaginative type in business matters. He therefore established a goal. When he required men to go shoulder to shoulder with him, he picked those who could be made to see with him the greatness of the industry in the same gigantic proportions that he visualized it. This made for the peculiar character of enthusiasm that success feeds upon.

Andrew Carnegie had great faith—faith in the steel industry, faith in his own abilities, faith in his associates. He builded big and builded not alone in prosperous times, but when the business cycle looked blackest. At such times as these he would scrape together all the money that could be had to take advantage of low prices of materials and the available supply of labor. He kept men working thereby, when they needed work and aided the production of his own as well as allied industries. He never hesitated to scrap a perfectly good piece of machinery when something developed that was an improvement or an aid in cutting the cost of steel production. And so, in a period of approximately thirty-five years, he had builded such a gigantic organization as no one man had heretofore controlled.

At this period, the Carnegie Steel Company, which was reconstructed at the beginning of 1900 with a capital of $100,000,000, owned three immense works—the Homestead, the Edgar Thomson, and the Duquesne, and seven small ones. The company had an annual output of steel alone of 3,000,000 tons, of which about two-thirds was open hearth steel. When in full swing, the payroll had about 25,000 workmen, the works at Homestead alone covered seventy-five acres of land and employed nearly 15,000 men. Here was manufactured armor plate for shipment to the navy, and all kinds of structural material. It contained twenty open hearth furnaces and two ten-ton Bessemer converters having a daily production of 3,000 tons of steel ingots which were used in the manufacture of great varieties of shapes, from the steel frame of the bicycle to the 200-ton armor plates of the battleship. Here also were constructed the gigantic steel frames for many buildings, particularly for skyscrapers.

Electricity, which for manufacturing purposes had been developed along with the steel industry, played a most important part at this time. This valuable force was used as a motive power for moving the huge quantities of material and in a hundred and one other ways. Masses weighing 200 tons or more were handled with ease with the electric machines, all of which were fed from a single station whence wires extended, like the arteries of the human body, to the different departments. In every respect the machinery was of the most modern description and was supplemented in every possible manner by the latest devices of scientific discovery.

Across the river was the Edgar Thomson Works. This was chiefly devoted to the production of pig iron and the manufacture of steel rails. The furnaces here had a daily output of 2800 tons of pig iron, a large part of which was used on the premises and the remainder transferred to Homestead. The rail mill was perhaps the finest in the world and was capable of producing 1600 tons of steel rails per day.

At this point it seems most fitting to recall one who, without doubt, was the most spectacular character in the steel industry of all time—Captain William R. Jones. It was he who took the invention of Kelly and Bessemer and developed it into one of the wonders of the world. In my opinion, it was his work that gave the Carnegie Steel Company its first uplift from among many competitors. In fact, I really believe that it was his amazing energy, ability and daring that startled England, which for two decades had led the world in the making of Bessemer steel, and brought the United States to the forefront, outclassing all competitors.

For sixteen years Captain Jones had been with the Cambria Steel Company, from which position he resigned in a spirit of pique because he had been ignored in what he felt should have been a merited promotion. Here he entered the life of Andrew Carnegie, who was struggling under financial difficulties, result of the business panic—year 1872-73.

Carnegie was struggling to avert bankruptcy and to build his first steel plant. Heretofore he had made only iron, and not a pound of steel. Instead of being the first maker of Bessemer steel, as is often alleged, the fact is that Mr. Carnegie was the eleventh, and it was nearly twenty years after the Kelly and Bessemer process, that he joined the procession.

Carnegie heard of Captain Jones and hired him as superintendent of the new works at Braddock. This was a master stroke, as skilled Bessemer steel makers were very scarce, and in addition Captain Jones attracted to the Carnegie employ, many of the highly skilled steel workers of Johnstown.

In 1875, surrounded by these workers, Jones began his remarkable career at Braddock. Time does not permit here of the narrative of Jones' development of the steel rail, or his remarkable records, but it is note-worthy that while his efforts brought a stream of gold to the Carnegie coffers, he cared little for money or wealth. He was a shirt sleeve worker and took joy in his work. No task was too great for him, no obstacle was insurmountable. On one occasion when he was offered a partnership, he replied to Mr. Carnegie, "No, Mr. Carnegie, I am much obliged; I don't know anything about business and don't want to be bothered with it. I have got trouble enough here in these works. I tell you what you can do"—and these were his exact words —"You can give me a hell of a big salary."

Jones died as he had lived, like a true pioneer, in the midst of an industrial battle, and at the head of his men. He was killed in 1889 through the breaking out of a furnace at Braddock, when he stepped back to avoid the fiery stream and fell into a pit, striking upon the edge of a car. One of his workers, an Hungarian, fell beside him and was instantly killed. Jones died the next day in the hospital, never having regained consciousness.

The third large plant—Duquesne—on the Monongahela river, had furnaces that produced in one day as much as the largest furnaces thirty years previously produced in a week. They had a capacity of daily converting 2,000 tons of pig iron into billets, rails, sheets, and bars.

In addition to these vast works under Mr. Carnegie's control, there were the Wire and Nail mills at Beaver Falls, the Structural Works at Pittsburgh, Lucy Furnace, and the Keystone Bridge Works.

Another branch of the Carnegie combination was the Frick Coke Company, which was the largest of its kind in the world. It owned coal bearing land to the extent of 40,000 acres and in addition possessed more than two-thirds of the famous Connellsville coal fields. It had operating plants consisting of 10,500 ovens with the vast daily capacity of 20,000 tons. Every day a line of railway cars five miles long, conveyed the product to the various plants of the firm. These figures are computed for the time Mr. Carnegie was personally in control of the Carnegie Steel Company, several years previous to its being taken into the United States Steel Corporation.

The Carnegie combination also owned vast tracts of land, including the richest iron ore mines on Lake Superior, and possessed a special fleet of steamers for transporting the ore from the mines on Lake Superior to Cleveland on Lake Erie, a distance of over 700 miles, and had laid its own private railway to take the ore from Conneaut Harbor to its various works around Pittsburgh. The company possessed a large tract of natural gas bearing land from which the gas was conveyed by pipe lines to the furnaces. It had a private telegraph system with wires to all the important industrial centers of the country. The branch offices of the firm were to be found in all of the large cities of America, and its total clerical staff was so numerous that at the head office in Pittsburgh, 150 clerks could take a vacation at one time without causing any disorganization of the system.

Here are a few facts to illustrate the wonderful administration of this vast industry. It was possible to transport ore from the shores of Lake Superior to Pittsburgh,—nearly a thousand miles away—and convert it into steel in ten days, despite the fact that three separate shipments had to be made. Some of the open mines at Lake Superior were capable of special treatment and for digging the ore seam, shovels were used. One of these shovels could load a twenty-five ton car in two and one-half minutes. The shovel dug up five tons of earth at every stroke and filled a car in five operations.

At Duluth, the western head of Lake Superior, there were two loading docks, each 2,000 feet long, and rows of ore bins built into these, each holding from 150 to 170 tons. The railroad ran over these bins and dropped down their loads of twenty-five tons to be subsequently shot into the holds of the ships. At these docks, ore was shipped at the rate of 1,000 to 1,600 tons per vessel per hour; a 6,000 ton vessel equal to the capacity of 750 eight-ton cars, could be loaded with ore in six hours, at least. From the Lake Superior district, seventeen millions of tons were shipped in 1899. The railway traffic from the ore receiving ports to the furnaces, in some cases, extended to 700 miles and was carried on by locomotives which were then considered mammoth, some weighing 127 tons each, hauling 1,600 tons of ore in thirty cars—great steel trucks specially built to carry about fifty tons apiece.

At the mills, the blast furnaces were served by a hoisting engine controlled by a single individual. At the open hearth furnaces, great electrical charging machines were used, the latest mechanical triumph of its kind, relieving human sinew and muscle of the strain and tension of heavy work amid the terrific heat. This machine traveled on rails past the rows of furnaces and the attendant, comfortably seated, merely moved the electric switch which actuated the powerful arm of steel. This took charge of pig iron, scrap, ore, and limestone, which it deposited inside the furnace. The machine fed furnace after furnace with their requirements of one-half ton at a time, in a few seconds each. The doors of the furnaces were opened and closed by water power.

And so one might continue to enumerate the vast resources and the wonderful armory of this industrial king.

Reiterating that it is in review that an old man makes plain the policies which he employed in making his business a success, and in developing a project, we recall a particular incident recited to us in discussing our subject; an incident which throws some light on the convictions Carnegie had during the days of his activity in the industry.

He was returning to this country from his place in Dunfermline, Scotland, in 1907. It was just at the time that the panic of that year held the business world in terror, and heroic efforts were being made to stabilize conditions. Of course, Mr. Carnegie had nothing to worry about, nor was his visit necessitated by the panic; his affairs were in order. As he paced the deck of the steamship, discussing various phases of the panic, he exhibited unusual emotion when referring to the unfortunate experiences George Westinghouse was having at the time, and at the same time laid bare the one dominating characteristic he applied in conducting his own business:

"I feel very, very sorry that George Westinghouse should have trouble and I want to see him get out of the woods," he said. "Fine fellow, George is—splendid fellow. And a great genius. But he is a poor business man. A genius and a business man are seldom found in the one individual. Now Westinghouse is of too much value to the world, in originating ideas and developing them, to have one whit of energy wasted in business work and worries. You see, all of his business activity would never get him individually a noticeable success, whereas his genius, at full play, would keep him an outstanding figure in the world. He should have a good business man, so that he never would have to bother about business details."

Mr. Carnegie's auditor ventured to say, "You have been referred to as the genius of the iron and steel industry, and no one has any idea that you are a poor business man." "Well, it is very nice to ascribe genius to me," he replied, wrinkling his small, round cheeks in a broad grin, "but it is all wrong. What I said, I mean, genius and business do not rest in the same shell."

Here, then, was a good idea of Carnegie's procedure. He knew how to analyze men and how to set them to tasks. Often it has been said that Carnegie surrounded himself with brains. In this he was no different from any of the big men in various fields of human endeavor, who required the efforts of others to be joined to theirs in developing a project.

Carnegie would have kept George Westinghouse inventing all his days. He never would have assigned him to a business task. But this does not always suit an inventive genius. Sometimes he wants to run his business affairs himself and does fairly well.

But Carnegie made no compromises when weighing and judging individuals for their special endowments and capacities. He made specialists of those who were around him keeping in mind the requirements of the task he was engaged in. Himself, he considered in the capacity of general superintendent. His job was to keep on holding up the steel industry as a child, ready to grow into a giant, and to enlist and direct others in tireless efforts to bring about this growth. It is hard to define in exact terms the power Mr. Carnegie had of stimulating his subordinates and infusing them with his own consuming enthusiasm. No favoritism of any kind was allowed, all promotion being solely by merit. His first partner David A. Stewart, and his brother, Tom Carnegie, had grown-up sons, but none of these young men were admitted to the concern and at death, their parents' interests were bought out. "Dead heads" were a luxury never tolerated in the Carnegie Steel Company. Having worked his own way in the world, Mr. Carnegie knew how best to encourage a deserving youth On the other hand, hard work, and conscientious work were promptly and handsomely rewarded and when a subordinate was appointed to a position of manager, Mr. Carnegie maintained that the test of his ability was not what he did himself, but what he could get others to do in cooperating with him.

That pretty nearly explains Mr. Carnegie and the effect of his connection with the industry of the development of iron and steel. He was a superintendent of men, one who knew precisely the greatness of the industry—the possibilities. And he knew men. Of six men who would express an opinion on a given subject, he would accept that of the man he had measured as an authority on that particular subject. He placed dependence in native equipment. He knew that some men, by resolution or by sensing, could reach the truth on certain matters, where others would have to concentrate and analyze. He would always choose the individual naturally equipped on special matters. And while these may be grouped as his duties as a superintendent of the steel industry, yet what a great thing for that industry it was that this faculty of correctly choosing men who were naturally needed for its development was so unerring as to be almost uncanny.

If there was any genius about Carnegie, it was his genius for seeking out and applying the men who were needed by the steel industry for its development. A glance at how far the "Carnegie boys" have gone, and what they did in the way of organization and execution, supports this contention. Sometimes he modified his judgment for some special reason, as every man does on occasion, but not often.

When recognizing that a needed thought in connection with the development of the business came from one of his associates, Mr. Carnegie could set aside his own actual convictions. He could admit to himself that someone else could think as well, and perhaps better, than himself,—a most important attribute in the makeup of a business man, a developer, or a pioneer.

Mr. Carnegie sold his vast interests to the Steel Corporation at practically his own figure, two hundred and fifty millions in bonds on the corporation properties, and bearing interest at five percent. Two hundred and fifty millions is a stupendous sum, but when one considers the unique position Mr. Carnegie had attained in the greatest industry in the world, it is not surprising that he succeeded in amassing even such a colossal fortune. He appeared with his magnificent manufacturing facilities just at the period when the great prosperity of America was in its infancy. The unparalleled railway extension in the country had scarcely commenced; great towns were springing up on all sides, and in every direction enormous quantities of iron and steel were needed for structural purposes. He had reduced the cost of production to a minimum. By means of his railway and steamboat services he had brought his mineral resources within easy access of his mills, and acquired every tool and process to manipulate with his own materials and by his own workmen, the crude ore into the finished product. He thus was well able to defy competition from any quarter, and having secured the home trade, he stepped forward to invade the markets of the world. He extended his trade on all sides; but vast as his volume of business was, and rapid as his progress had been, he was able through his wonderful organization to keep his business thoroughly under control, so that his profits leaped ahead at a corresponding rate. It was a glorious triumph for skillful organization and daring enterprise.

It is difficult for even steel men of today to realize the full extent of this mighty achievement and the influence it has exerted on the progress of the world, and I am in hearty accord with the sentiment of Mr. Bernard Alderson as expressed in his book, "Andrew Carnegie, The Man and His Work." Mr. Alderson says:

"No one can deny such a man a tribute of the highest commendation. He used his gifts and powers to stimulate to a remarkable degree the forward march of civilization. Mr. Carnegie must be accorded a place among those giants of humanity who, by the heights of their attainments, have lifted to a higher plane the possibilities of man, and have forced a point upward the human standard of excellence from which succeeding generations will start forward to further progress."

PITTSBURGH AND PETROLEUM INDUSTRY

GEORGE S. DAVISON

George Stewart Davison, civil engineer, was born in Pittsburgh September 21, 1856, the son of Edward and Isabell Kennedy Davison. He graduated at Pittsburgh Central High School and the Rensselaer Polytechnic Institute. The University of Pittsburgh made him a Doctor of Science in 1926 and in the same year Rensselaer Polytechnic Institute gave him the degree of Doctor of Engineering. He married Clara Elizabeth Lape of Troy, New York, May 19, 1891.

Mr. Davison began his practical engineering experience with the Pennsylvania Lines West in 1878. He was with the United States Engineering Corps in 1879 and with the engineering department of the Santa Fe and the Pennsylvania Lines West 1880-82. He was chief engineer of the Pittsburgh, Chartiers and Youghiogheny railroad in 1882 and its general superintendent from 1883 to 1890.

He was a member of the firm of Wilkins & Davison 1890-1900; general manager of the Monongahela, Pittsburgh & Birmingham Railway lines in Pittsburgh in 1900-02; has been executive vice president of the Pennsylvania Water Company since 1902; assistant to president subsidiary companies of Gulf Oil Corporation 1905-11; since 1911 president of Gulf Refining Co., Gulf Refining Co. of Louisiana, the Gulf Pipe Line Company, the Gulf Pipe Line Company of Oklahoma, the Gulf Production Company, the Gypsy Oil Company, the Mexican Oil Company, the South American Gulf Oil Company, Venezuela Gulf Oil Company, the Panama Gulf Oil Company, and the Indiana Oil and Gas Company.

He has been vice president of the Gulf Oil Corporation since 1921. Since 1914 he has been president of the Allen S. Davison Company, the Basic Products Company, and the Sharpsville Furnace Company.

He is a director of the Pittsburgh Chamber of Commerce and the Pennsylvania State Chamber of Commerce, chairman City Transit Commission, president of Flood Commission, director of West Penn Hospital, member of the Citizens Committee on City Plan, trustee of Rensselaer Polytechnic Institute, and past president of the American Society of Civil Engineers. Office: Frick Building Annex, Pittsburgh.

Pittsburgh and the Petroleum Industry

BY GEORGE S. DAVISON

FOR ages, there have been locked up in the bowels of the earth great stores of petroleum. It is but seventy years since the first successful demonstration was made that petroleum could be refined into products of commercial value. Within those seventy years, there have been extracted from beneath the earth's surface throughout the world, 14,500,000,000 barrels of crude petroleum, which at the wells had a value of about $30,000,000,000. Of this amount the United States furnished 9,500,000,000 barrels, and American producers operating in foreign countries produced approximately another billion barrels. These facts show that the industry is not only one of the more recent, but also one of the most important.

The first record of the occurences of petroleum in the United States was made in 1627 and was with respect to an oil spring at Cuba, New York, located at the northern edge of the water shed of the Allegheny river. During the following 200 years history mentions discoveries of petroleum at points all the way from the Genesee valley in New York to the Cumberland valley in Kentucky, in some instances as an exudation from the ground, and in others as an occurence in wells drilled for salt. There is some conflict as to the first experience with petroleum in salt wells, but it is an undisputed fact that some of the wells drilled as early as 1810 at Tarentum in this county encountered petroleum.

A German missionary visiting the North American Indians, wrote in his notes, which were published in Germany in 1789, the following: "One of the most favorite medicines used by the Indians is fossil oil (petroleum) exuding from the earth, commonly with water......It is observed both in the running and standing water. In the latter the oil swims on the surface and is easily skimmed off, but in rivers it is carried away by the stream......This oil is of brown color and smells something like tar. When the Indians collect it from standing water, they first throw away that which floats on the top, as it smells stronger than that below it. Then they agitate the water violently with a stick; the quantity of oil increases with the motion of the water, and after it has settled again, the oil is skimmed off into kettles and completely separated from the water by boiling. They use it chiefly in external complaints. Some take it inwardly and it has not found to do harm. It will burn in a lamp. The Indians sometimes sell it to the white people at four guineas a quart."

Rev. S. J. M. Eaton, of Franklin, Pa., writing in 1865, with respect to the collection of petroleum in 1815 says:

"A point was selected where the oil appeared to bubble up most freely, when a pit was excavated to a depth of two or three feet. Sometimes this pit was rudely walled up, sometimes not. Sometimes it was near the edge of the water on the bank of the stream, sometimes in the bed of the stream itself, advantage being taken of a time of low water. In these pits the oil and water would collect together, until a stratum of the former would form upon the surface of the latter, when a coarse blanket or piece of flannel was thrown in. This blanket soon became saturated with oil, but rejected the water. The blanket was then taken out, wrung into a tub or barrel and the operation repeated."

The elder Professor Silliman of Yale University upon visiting in 1833 the oil spring at Cuba, already mentioned, published an article in his "American Journal of Science," in which he states that the Seneca Indians at that time collected the petroleum in the manner just stated, and that the oil was used for sprains and rheumatism. One of the names adopted for petroleum was Seneca oil.

It would appear that the first use of petroleum for industrial purposes occurred in 1845, related in a book published about 1865 by J. H. Bone under the title of "Petroleum and Petroleum Wells." Mr. Bone said:

"In the year 1845, Mr. Lewis Peterson, Sr., of Tarentum, Allegheny county, Pennsylvania, brought to the Hope Cotton Factory, at Pittsburgh, a sample, in a bottle, of what is now known as petroleum. It came up with the salt water from his salt well at Tarentum, and gave him considerable trouble. Mr. Morrison Foster, then of Pittsburgh, in conjunction with the manager of the spinning department of the mill, Mr. David Anderson, experimented with the oil and soon found that by a certain process it could be combined with sperm oil in such a way as to form a better lubricator for the finest cotton spindles than the best sperm oil, which alone could previously be used for that purpose. The mixture costs about seventy-five cents per gallon, whilst the sperm oil alone cost $1.30. The saving was so great, in one of the heavy items of expense in a large cotton factory that a contract was entered into with Mr. Peterson by which the latter was to supply two barrels per week, and for ten years this oil continued to be used at the Hope Cotton Factory, unknown to anyone but the proprietors."

It will be noted in this last paragraph, which we have copied exactly as it was written, that Mr. Peterson was a resident of Tarentum. As a matter of fact, Mr. Peterson at the age of twenty-one came from Philadelphia and settled in Pittsburgh. The history of his life shows that he was a man of unusual energy and ability who had accomplished much. At the time of the fire of 1845 in Pittsburgh, his cotton spinning business was destroyed. He went to a farm at Tarentum, which he owned, and it was upon this property that he discovered oil while drilling for salt.

But the fact that Pittsburgh's connection with petroleum antedates Mr. Peterson's use of it is evidenced by the two following extracts taken from the Rev. Mr. Eaton's tales from which we have already quoted:

"The first shipment of petroleum was to Pittsburgh, and in this wise: Mr. Cary, one of the first settlers on Oil creek, possessing perhaps a little more enterprise than his neighbors, would collect or purchase a cargo of oil and proceed to Pittsburgh and exchange it for commodities needed in his family. This cargo consisted of two five-gallon kegs, that were slung one on each side of a horse, and thus conveyed by land a distance of seventy or eighty miles.......Sometimes the market in Pittsburgh became very dull, for a flat-boatman would occasionally introduce a barrel or two at once that he had brought down on his raft of lumber or logs. At other times the demand fell off, so that the purchase of a barrel was hazardous."

Continuing, Mr. Eaton says:

"At a period somewhat later than this, General Samuel Hays, who settled here in 1803, related that at one time he purchased all the oil produced in the country, and that the highest annual yield was sixteen barrels. This oil he sold at the time in Pittsburgh at about $1 per gallon."

The following letter from a correspondent was published in the "Pittsburgh Gazette" in 1828:

"I see that the corporation has at last determined to light the city. It is a very sensible determination; for, indeed, few places need it more. I fear that lighting with gas will be found troublesome and expensive, in spite of the vast supply and cheapness of coal; but I will tell you what is the cheapest, best and most economical light you can use; it is what is called the West Seneca oil, which is petroleum. This substance, were there a ready market for it, might be supplied at your very doors to an almost unlimited extent. At present it is almost useless, being used only as an ingredient in what is called 'British oil,' and as a horse medicine (in which, by the way, it is very useful). The price of it is very low, because a few barrels glut the demands of the apothecaries; but if the city would take a large quantity, or if it were brought into use otherwise, I think it could be supplied at twenty-five cents per gallon. The salt wells may be cleared of what floats by letting a blanket down every quarter of an hour, and this will also apply to the springs where it is discovered. Let anyone who doubts that it is a perfectly good oil for lamps send to the apothecary's for half a pint, and burn it one night in a lamp of any kind, precisely as fish or spermaceti oils are burned, observing only that to avoid smoke it is necessary that the length of the wick should be diminished. I have tried it, and found it to succeed perfectly, and there is no reason why it should not be clarified as well as any other oil (and then it will burn as free from smoke by filtering or precipitating the gross particles contained in what is now brought to market. If Seneca oil will supply more gas than animal oils, which I do not doubt, and if it can be produced at twenty-five cents per gallon, a fair trial of it in this way would assuredly be demanded by common prudence."

History relates that in 1847, Thomas and Samuel M. Kier leased a piece of land near Tarentum upon which to drill for salt. Upon this property they drilled two wells to the depth of several hundred feet. In the process of boiling the brine from these wells, a mineral oil would accumulate on the surface of the fluid in the vats. This oil would be skimmed off and thrown into the Pennsylvania canal that was hard by. Upon someone's throwing a lighted match into this scum, it burned on the surface of the water. Orders were issued to cease this practice with the waste material. For a time this material was accumulated, but the owners could find no market for it. Samuel Kier then submitted samples of it to a Professor Booth in Philadelphia, who advised distillation as a means of developing its illuminating qualities.

Samuel Kier, who it will be discovered as we proceed played an important part in establishing the petroleum industry was a Pittsburgher, who I remember lived in a house overlooking the Allegheny river near Ewalt, now Forty-third street. His descendants still reside hereabouts.

Among the authorities to whom we are indebted for an account of Mr. Kier's achievements as a pioneer of the oil industry was L. E. Stofiel, a well-known Pittsburgh journalist, who made a study of the petroleum industry for the "Pittsburgh Disptach" in 1892. We learn from Mr. Stofiel's articles that Mr. Kier and B. F. Jones were associated in Pittsburgh with the Mechanics' Line of canal boats running between Pittsburgh and Philadelphia. At one time the Hon. James Buchanan, afterwards, President of the United States, was associated with Mr. Kier and Mr. Jones. Mr. Jones left this association in 1851 and interested himself in the iron business, becoming one of the founders of the present Jones & Laughlin Steel Corporation. Mr. Jones was quoted as saying that Mr. Kier had given thought to the purchase of petroleum as early as 1846, and that Kier was the pioneer in the refining of petroleum.

Charles Lockhart, subsequently associated with the Standard Oil Company, informed Stofiel that on the left bank of the Allegheny river opposite Tarentum, a man named Isaac Huff operated a salt well. In 1852 it was producing quantities of petroleum. In that year he sold the oil produced to Mr. Lockhart, and Mr. Lockhart resold the oil to Mr. Kier.

In 1853 Lockhart, bought the Huff well, taking in a partner by the name of Kip. The oil from this well, as it was produced, was sold to Mr. Kier at a price sometimes as high as sixty-six and two-third cents per gallon, which price was equal to $28.00 a barrel.

Either while awaiting the advice of Professor Booth or procrastinating in following it, Kier embarked in a new venture with his oil. He established the business of putting it up in half pint bottles, the label upon which bore the following legend:

"Kier's Petroleum, or Rock Oil, Celebrated for Its Wonderful Curative Powers. A Natural Remedy. Procured from a Well in Allegheny, Pa., Four Hundred Feet Below the Earth's Surface. Put up and sold by Samuel M. Kier, 363 Liberty street, Pittsburgh, Pa."

And then followed this striking suggestion that the elixir of youth had been found:

"The healthful balm from nature's secret spring,
The flow of health, and life, to man will bring.
As from her depths the magic liquid flows,
To calm our sufferings, and assuage our woes."

I have suggested elsewere that this display in a show window on Broadway, New York, hastened the birth of the oil industry. No doubt this effort at merchandizing caused such a widespread interest in the subject of petroleum, that both enterprise and capital were standing at attention when it was found that petroleum was available in unmeasured quantities for those who would court Dame Fortune.

Kier, in advertising his petroleum for medicinal purposes, used a very unique circular. It was in shape and appearance that of a bank draft, in the center of which were the words in large letters of old English type, "Bank of the Allegheny river", and underneath in small cap letters "Allegheny county, Pennsylvania." In each of the four corners was the number "400", apparently representing that amount of money but in the center of the circular one could find that this number referred to the depth of two wells, the derricks of which were pictured upon the upper edge of the circular. At the left edge was the figure of a woman, standing alongside of a shield, which bore the word "Petroleum." At the right was the figure of another woman, with angel wings, holding high in her left hand a bottle, filled evidently with this great panacea for human ills.

This circular was dated Pittsburgh, January 1, 1852, and upon it are recorded two important events; one the discovery of the oil in 1848 while boring for salt, and the other the discovery of the medical properties of this oil in 1849.

We have dwelt in some detail upon this circular, first on account of its value as a record of history and second because, as you will see, it proved to be the inspiration for a great adventure.

In due course of time Mr. Kier followed the advice of Professor Booth and within 100 yards of where we are now gathered, near the corner of Grant street and Seventh avenue, adjoining the canal that extended from what is now Eleventh street, Mr. Kier set up a cast-iron still of one barrel capacity, for experimental purposes, and in 1854 followed it with a five barrel wrought iron still at the same place. Here occurred the first successful effort to refine petroleum, and this was the first refinery. The five-barrel wrought-iron retort is still doing active duty as a natural gas separator at the gas well of the Salina Brick Works on the Kiskiminetas river. This industry was established by Mr. Kier about 1873, and is operated by his family.

The original one-barrel still was lost to Kier by being stolen under the following circumstances: People in the vicinity of the Seventh avenue plant, fearing explosions and fires, appealed to the city council and the latter ordered the refinery removed outside the city limits. Following this order, all the apparatus was dismantled and set out on the side walk to await the hauling to the new location. When this material arrived, the one-barrel still was missing and although all the junk shops were searched for it, it was never recovered.

Associated with Mr. Kier at this time was John C. Kirkpatrick. Like Kier, Mr. Kirkpatrick lived in Lawrenceville, now a part of the city of Pittsburgh. The refinery operations, on notice from council, were removed to the bank of the Allegheny river at Ewalt street (Lawrenceville), now known as Forty-third street. This refinery, was successfully operated for many years.

Kier's idea that there were medicinal qualities in petroleum was not merely a dream, as will be understood from the fact that vaseline and many other products of a medicinal nature in widespread use at the present day are manufactured from petroleum.

Eventually Kier evolved a burner for oil and called his product "Carbon Oil." It may add some interest to this paper should I record that the writer, whose home was within a half mile of some of the refineries in Lawrenceville, retains a vivid recollection of an evening in the fall of 1865, when the members of his family gathered about and viewed with some astonishment and pleasure the first carbon oil lamp that was used in his home.

It might be well to state at this point that prior to the use of petroleum as an illuminant, successful efforts had been made to distil oil from shales and coal. As early as 1848 patents for such processes had been taken out both in this country and England. The product was called "Coal Oil" and "Kerosene." At the time when Drake drilled his famous well in 1859, there were some fifty such refineries scattered throughout the eastern part of the United States. Six of them were credited to the Pittsburgh district, the largest of all perhaps being that of the Lucesco Company at Kiskiminetas on the Allegheny river. Its distilling capacity was said to be 6,000 gallons per day. One such refinery was at Lippincots lane, now called Dinwiddie street, this city.

A review of the location of these plants show that they were either in the Appalachian coal basin where coal could be readily had, or at eastern ports, where imported coal could be secured. This industry was short lived, as petroleum, when once it was released from its hidden fastnesses, made short work of it. However, undoubtedly the experience gained hastened the successful refining of petroleum.

It is interesting to note that within the past year, sixty odd years after the early attempts to distill coal for the procurement of oil, a most noted convention of scientists met under the auspices of the Carnegie Institute of Technology in this city, to exchange ideas upon the question of how the distillation of coal can be turned to the prevention of what is believed to be an imminent shortage of crude petroleum. Surely there is nothing new under the sun.

The efforts of Lewis Peterson in 1845, and those of Samuel M. Kier following quickly thereafter, were scarcely more than the following of the dictates of a prudent mind, whose thought was to convert this bete noir of salt wells into a by-product whose value might compensate for the burden of getting rid of it. And yet their combined action which dealt with no more than four or five barrels a day, while it did not create the petroleum industry, established the necessity for it. Here, therefore, is the first part that Pittsburgh has played in the industry wherein two of her prominent citizens inaugurated the use of petroleum, both as a lubricant and an illuminant.

Before leaving the story of the recovery of petroleum from the salt wells at Tarentum, I will relate a few important incidents in relation thereto.

During a visit to Pittsburgh in 1857, Colonel A. C. Ferris, of New York, saw Tarentum oil being burned in a lamp in the cellar of the drug store of Nevins, McKeown & Company, then at 167 Liberty street (now Liberty avenue). This firm was the agent for the sale of this oil from the Peterson and Ferris well. It is quite probable that this lamp was the result of the efforts of Kier. Colonel Ferris saw the commercial possibilities, and the limited output of the Tarentum wells was before long being refined at New York, in a refinery that had previously been used for distilling coal. Meanwhile the refining of Tarentum crude was being carried on in Pittsburgh at a refinery in Allegheny, operated by McKeown of the above firm, and which is said to have been the second petroleum refinery in the United States. We assume that Kier's venture was the first. In the year 1858, which was probably the banner year for the refinery of Tarentum crude, the production of it was 1,008 barrels. This was valued at about $30.00 per barrel.

The first incident leading to the development of the oil regions of Pennsylvania, might be said to have occurred in 1853. A farmer in Cherrytree township, Venango county, in that year made a contract for the collecting, by a ditching process, of the oil from a spring on his farm, he to participate in half of the profits after being reimbursed for his expenses by the other party to the contract. This plan proved unprofitable and was abandoned.

On January 1, 1855, a farm of 105 acres near Titusville was purchased for the purpose of developing surface oil, the idea of drilling for a supply not having occurred to the interested parties. In the following April, samples of this surface petroleum were sent to Professor Silliman, the son of the man previously mentioned. His report, a classic upon the chemistry of petroleum, clearly showed that the mineral possessed great economic value, especially as an illuminant.

In the following year, that is 1856, Mr. George H. Bissell, one of the parties interested in this venture, while looking in the window of a Broadway drug store noticed the famous circular issued by Mr. Kier four years before, and to which I have already referred. Mr. Bissell thereupon conceived the idea of drilling as a method of exploiting the subterranean sources of petroleum. After extended discussions covering a period of about two years Colonel E. L. Drake undertook to carry out Bissell's idea. Drake, finding that the only men who had had experience in drilling were those who had followed that class of work in or about Tarentum, went there and succeeded in getting "Billy" Smith, a driller and blacksmith working for Mr. Kier, to assist him. Smith took his two sons with him to the site chosen for operations. I had the pleasure last December, of talking with one of these sons, who described their work upon the first well, which was finished on August 28, 1859. While history gave Drake the credit of creating the petroleum industry because he directed the drilling of the well that demonstrated that petroleum could be secured in commercial quantities, "Billy" Smith, of this county, was the man who actually did the work. So it might be said that the latter created the industry, the necessity for which was established by Kier and Peterson. This first well was very shallow, averaging scarcely twenty barrels per day, and was probably the only producer in 1859. It was quickly appreciated what even so small a well as this meant in contrast with the Tarentum supply of only two or three barrels a day. The mad rush for Oil creek field, from farms and cities everywhere, resulted in a production of over a half a million barrels in 1860, the year following the first well. From this well as a starting point, prospecting was carried gradually in a southerly direction through Venango, Butler, Allegheny, Washington and Greene counties, in Pennsylvania, and into southwestern Ohio and West Virginia. Pennsylvania reached its high mark in production of 33,000,000 barrels in 1891. Our state is still prominent in oil production. Last year among nineteen producing states it stood eighth, and is fourth as to the total barrels produced to January first, last. In the banner year of 1891, it was the county of Allegheny that was the greatest producer. Within twenty miles of city hall several pools were brought in, and the famous McDonald field capped the climax, making Pittsburgh for the time being the headquarters of the oil industry of the country. Today with the wonderful Seminole in Oklahoma producing 300,000 barrels per day, we recall that the peak in the McDonald field was nearly 100,000 barrels.

When the Oil creek field was opened, the most expeditious way of disposing of the crude was to boat it down the Allegheny river. The fact that Pittsburgh was already a refining center, operating in the distillation of coal, and that Kier and McKeown had experienced successfully there in the refining of Tarentum oil, made Pittsburgh the logical market for the production from Oil creek, and this city at once became the leader in the oil refining business. The Allegheny river literally became alive with freight, supplies going up to the field, and oil coming to the refineries. I have been told that at one time there were not less than eighty steamboats plying on the Allegheny river. We recall the names of some of them, such as the Monitor, Echo, Dick Fulton, Gray Eagle, Monterey, Allegheny Belle, Ida Rees and Hunter. From the "Oil City Derrick" of March 26, 1863, we learn that during the week previous to that date thirteen steam tow-boats and three passenger steamers had arrived, and that there were from 350 to 400 flats, barges, and bulk boats engaged in freighting oil to Pittsburgh.

It is said that the first cargo of crude oil from Oil creek boated to Pittsburgh, was sixty barrels brought here in March, 1860, by the steamboat Venango. This oil came from a well owned by five parties, among whom were Charles Lockhart and William Frew, of this city.

Before the use of pipe lines, the crude oil was barreled at the wells, and the barrels were teamed to points along the streams, where they could be loaded on barges for the trip down the river. Demands by teamsters engaged in this business for higher rates than operators were willing to pay, caused pipe lines to be built between the wells and the boat landings, through which the oil would be pumped and then barreled. It was customary to return the empty barrels from Pittsburgh for further use. In 1861, the method of bringing the crude to Pittsburgh in bulk boats of a capacity of four or five hundred barrels was adopted. Rail connection between Pittsburgh and the oil regions was not had until 1865, and then it was made in a round-about way through Greenville and Meadville. In January, 1868, the Allegheny valley railroad was opened to Oil City. The shipment of oil by the Allegheny river, which afforded cheap transportation, was a hazardous undertaking during the very high stages of water and impossible during very low stages, or when the river was frozen over. The railroad, which followed the river, gradually encroached upon the river trade, it being more reliable. The first oil cars were flats with a wooden tub of about eight feet in diameter and six feet high over each truck. The horizontal tubular tank mounted on car trucks came into use about 1871.

As already related, pipe lines were first used in the oil regions to replace teaming. They were of two and two and a half inches diameter, and but a few miles in length. After the railroads had built their lines into the main valleys of the oil fields, more ambitious pipe lines were built for the purpose of delivering the crude oil direct from the wells to the cars. The success of these local ventures eventually suggested the idea of building pipe lines of large diameter and much greater length that would compete with the railroads and carry the oil directly from fields to refineries. As methods of terminal operation, the railroads welcomed the pipe lines, and in many cases owned them. But as competitors they opposed them, which for a long time they managed to do successfully, because this new service was not recognized as a public utility and did not possess the right of condemnation of land. The approach of a pipe line to the crossing of a railroad meant a legal battle. A pipe line of much interest to this community was the Columbia Conduit Pipe Line, under the control of Dr. Hostetter of this city, planned to bring oil from the Butler county fields to Pittsburgh. This line was built late in 1874. The General Pine Line Act of Pennsylvania, conferring the right of condemnation was not enacted until 1883, some nine years too late for use by this enterprise. When the line reached a point upon the West Penn division of the Pennsylvania railroad above Montrose, Allegheny county, and an attempt was made to lay its line under the railroad and in the bed of Powers run, its workers were met with a large force of railroad employes, armed with all sorts of weapons both offensive and defensive, and the "Powers Run Riot" passed into history as one of the outstanding incidents of the oil industry. The pipe line company appealed to the courts in vain for relief, but six months later the interested companies settled their dispute, the line was put in operation, and the delivery of 3,000 barrels a day to the Pittsburgh refineries was accomplished by means of it.

During the boating days in the Allegheny river, the Duquesne way wharf was the terminal for Pittsburgh traffic. To be in as close touch as possible with what was happening in the river trade, the refiners had offices on Duquesne way between Seventh and Ninth streets. The telegraph companies maintained offices in the heart of this throbbing district.

The requirements of the refiners for crude oil and the activities of traders in the commodity caused the establishment of a curb market, the operations of which at times so interferred with traffic between Seventh and Eighth streets in office hours as to cause Duquesne way to be abandoned for other purposes. This led to the formation of the Pittsburgh Oil Exchange, perhaps the first exchange of that character in the country. Its shares of capital stock had a value of $25.00, the possession of one share entitling the holder to transact business on the exchange. About 1878 the exchange was occupying rooms on the second floor of the Germania Bank Building, corner of Wood and Diamond streets, afterwoods occupied as the home of the Chamber of Commerce. By that time there had been a complete readjustment in refinery locations. The pipe line had become the real factor in transporting crude from the well to the refinery wherever the latter might be located. Therefore, the refineries were located with respect to the demand for finished products rather than with reference to the supply of the raw materials. To Pittsburgh were left only such operations as could be supported by local demands. The trading in crude oil on the exchange became less and less necessary for the supplying demands of the refineries. An era of combinations of refineries began. To secure crude oil for them a merging of the interests of pipe line companies was effected. The latter adopted the policy of what is now known as "running the oil." That is to say, that the producer had no concern about what was to become of his oil beyond delivering it into his own working tanks. The pipe line companies relieved him of it by running it to its own storage tanks. Receipts for the oil were evidenced by certificates. These certificates were issued in 1,000 barrel amounts. They designated the place where the oil was stored, and were transferable. Under the conditions under which these certificates were issued there was a period of free storage provided at the end of which time storage charges were made. When the holder of certificates desired the delivery of the quantity of the oil represented by his certificates he paid accumulated storage and advanced the pipeage charges to the point of delivery desired.

It can be readily understood that the value of such certificates fluctuated with the market. Dealing in certificates on the exchange was therefore an alluring game. Incidentally these certificates were accepted as collateral for loans by the banks on a safe margin. Thus the trading upon the floor of the Pittsburgh Oil Exchange became centered in oil certificates. The trading privilege represented by a single share of exchange stock with an original or par value of $25.00 became so important that these shares sold as high as $3,000. The quarters of the exchange in time proved to be too small, and a removal to old city hall in the Diamond market was made in 1883.

About that time a new organization, the Pittsburgh Petroleum Exchange was formed, with a capital of $150,000.00, and with headquarters in a new building erected especially for it. It started off with 300 members each owning five shares of stock. It opened for business in April, 1884, with a set program that began with an invocation. The story is told that the news of the bringing in of a big well in the Bradford field had arrived in Pittsburgh shortly before the opening. During the prayer, which seemed long even though it wasn't, orders were being rushed upon the floor from brokers' offices, and the important floor men, with these orders in their hands, were praying for something fatal to happen to the Rev. Maxwell. No one heard the amen, for by that time the race for position was on.

The popularity of the new institution proved a death blow to the older organization.

When the interest in trading in oil certificates fell off, the charter was amended and the institution became the Pittsburgh Petroleum Stock and Metal Exchange. It was the parent of the present Pittsburgh Stock Exchange, which remained until 1895, in the location on Fourth avenue, now occupied by a building recently vacated by the Union Trust Company.

In 1860 there were seven oil refineries in this city. History credits Pittsburgh with fifty-eight in 1867. The principal product of these plants was "refined oil," that is, the "kerosene" of the present day. It is to be remembered, however, that with no "flash point" having been established by law at that time the practices of that day, while producing a greater yield, resulted in an inferior quality. With the exception of what was needed for local use, this oil went east from Pittsburgh for consumption there or for export. Solid trains of cars loaded with the famous blue barrels went eastward daily. The banner year for this business is said to have been 1867.

We recall the names of some of these refineries, such as the Iron City, Radiant, Riverside, Star, Liberty, Peerless, Citizens, Crystal, Brilliant, Cosmos, Vesta, Bear Creek and Central. And there are familiar names of individuals and firms, pioneers of their day, all of whom passed to the great beyond without realizing that the day would come (and is actually here) when benzine, the great hazard of their operations, would, as gasoline, become the basis of perhaps the greatest revolution in commerce and industry the world has ever seen. There were, for instance, Andrew Miller, Dave Reighard, Wormser, Meyers & Company, Elkins, Flack & Company, John C. Kirkpatrick, Ralston and Waring, J. A. McKee & Sons, Ben Campbell, McKelvy & Company, W. G. Warden, Holdship & Irwin, Andrew Lyons & Sons, Livingston Brothers, Lockhart, Frew & Company, Braun & Company, H. S. A. Stewart, Brooks, Ballantine & Company, not to mention many others. The low flash of the crude oil and the careless handling of naphtha products resulted in many fires in the refineries, and it seemed none were immune from such losses. I have, within the past few days, had my attention called to the fact that the Allegheny Valley Railroad Company, whose tracks served all the refineries on the east side of the Allegheny river, had a flat car, fitted with a chemical contrivance that was hurried to every blaze among the refineries. This was used to subdue the flames, as the city fire department could do nothing more than attempt to save buildings in the vicinity of the burning oil.

One of the outstanding incidents of the local refining business occurred on June 28, 1870, and succeeding days. On the first date the oil in tanks of every plant from the present Fifty-seventh street to beyond the Sharpsburg bridge was afire, and for several days a pall of black smoke hung over that great collection of refineries. The burning oil flowed to and destroyed the Sharpsburg bridge. Dr. Henry Foster, a brother of Stephen C. Foster, was caught and burned to death, as the fire enveloped his office.

When the era of extensive pipe lines arrived and it became possible for crude oil from the oil regions of Pennsylvania to be delivered through them to the seaboard refineries at a transportation charge equal to or less than the charge on the crude to Pittsburgh, the local refining business settled down to merely the proportions needed for local consumption, and continued at that capacity until the advent of the motor car, since which time the demand for gasoline has increased refinery activities here. The amount of crude per day charged in the refineries of Pittsburgh at this time is about 10,000 barrels, which is undoubtedly as great as in the times when Pittsburgh was the leader in refining.

The drilling of wells and the storage and pipeage of oil have created a great demand for pumps, boilers, tanks, pipe and tools that must be fabricated out of wrought and cast iron and steel. The proximity of Pittsburgh to the first oil fields proved to be of great advantage to the oil industry in that its necessities could be easily supplied, and an advantage to Pittsburgh in that it was able to add greatly to the output of its mills and factories. The trade of our Pittsburgh iron and steel manufacturers has not only been maintained with the oil industry since its beginning, but has been increased. The late John Eaton, of this city, was said to be the father of the oil-well supply trade. He was connected with it from 1861 until his death. From the day of the Drake well, petroleum has been produced in large quantities in many states of the Union, Mexico, South America, and the Far East. During the almost seventy years of the development of the industry, Pittsburgh has followed the flag of the American driller wherever it has been carried. For the past six years the Pittsburgh and Youngstown mills have furnished upon an average of ninety percent of the tubular goods used in the industry. If to this be added the machinery, tools, tanks and other equipment furnished by local concerns, it will be found that Pittsburgh's sales to the industry total over $100,000,000 annually. That amount in 1926 was equal to ten cents a barrel upon the world's production of crude oil in that year.

While Drake's well was being drilled in 1859, this community manifested a deep interest in its progress. What was more natural than that Pittsburgh enterprise should make a rush for this Eldorado, which Drake's success proclaimed?

Among those who became prominent in the producing business in those days, and who were Pittsburghers either before or after their initiation into oil were J. J. Vandergrift, P. M. Shannon, Thos. B. Simpson, Richard Jennings, E. H. Jennings, W. J. Young, John H. Galey, John McKeown, Jas. S. McKelvy, Wesley I. Guffey, David Wirk, John Pitcairn, S. D. Robison, Theo. Barnsdall, Col. J. M. Guffey, and John D. Barbour and the Fisher Brothers, John J., Frederick, and Henry.

Speaking of the Fisher Brothers, we are reminded that these three entered the oil business in 1862. This concern, in recent years known as the Fisher Oil Company, has continued as a single entity, and is undoubtedly the oldest concern engaged in the oil industry.

Pittsburgh operators followed the drift of drilling from the upper fields of Pennsylvania into Ohio and West Virginia, and some became active as far away as the California fields. After the California developments came Colorado, whose annual production never exceeded a half million barrels, then Indiana and Illinois. Pittsburgh capital added greatly in the development of oil in the last two states.

There had been a few unimportant developments in Texas prior to 1901, in which operators from this vicinity participated. In the year mentioned Guffey and Galey of this city brought in the famous Lucas gusher at Spindle Top, rated at 80,000 barrels per day, and this started Texas upon a career that has maintained it ever since among the first three states in point of volume of production.

In 1904 Kansas and Oklahoma began to look interesting to oil prospectors. Within two years these two states were producing as much petroleum as Pennsylvania and West Virginia, and from that time the mid-continent field has been most prolific. Experienced field men flocked there from the eastern fields, and Pittsburgh capital has been much in evidence there ever since. An old Pittsburgher will find himself much at home on visiting Tulsa, as he will meet many of his old neighbors there.

Mexico became important as an oil producing country about 1910. Two American companies operating there, backed by Pittsburgh capital, have produced large quantities of oil. One of these ranks second among all American companies in the total barrels of oil produced to January first, of this year.

Colombia is one of the latest countries to become important in the oil game. Pittsburghers were the first to develop production there.

Venezuela has produced large quantities of oil during the past few years. On the shores of Lake Maracaibo, Pittsburgh interests are among the leading producers.

It would be impossible to show with any degree of accuracy the composite interest that Pittsburgh holds in the petroleum industry. Local refineries have always furnished a considerable percentage of the petroleum products required hereabouts. Many of our fellow townsmen are engaged in the production of oil in different sections of the world. To take a concrete case, the gross production of one Pittsburgh organization was five and two-tenths per cent of the world's production in 1926. The gasoline output from this company's refineries in 1926, (one of them the largest in the world) was sufficient to have met the combined consumption of the states of Pennsylvania and West Virginia in that year.

So far as is known, Pittsburgh was the first market for American petroleum. More than a century ago, Nathaniel Cary rode into town from Oil creek with ten gallons of the fluid strapped to his horse's saddle. As already shown, a half century later quantities of it were coming by water not only by the Allegheny river, but also by the Pennsylvania canal, along which the Tarentum salt wells were located. Afterwards the railroad handled this product, and finally the pipe lines, as we have seen. Perhaps that cycle of transportation has not been equaled at any other time or place, or with any other commodity. In order, there was the horse, the canal, the river, the railroad, and the pipe line, and the evolution from the first to the last of the first distinct modes of transportation was achieved with striking rapidity.

It was here in Pittsburgh that petroleum was first used as a lubricant and as an illuminant. Here was built the first refinery, the location of which can be viewed from the building in which we are gathered. From Pittsburgh in 1860 went the man, Charles Lockhart, who first interested foreign trade in American oil. Doctor Tweddle, a noted chemist of Pittsburgh in the early 70's made the first lubricating oils by the method of steam and vacuum distillation. His process has not been materially improved upon to this day. From Pittsburgh went the tools and equipment for early Oil creek operations, and today from our mills and shops goes the larger part of the equipment necessary for production and refining operations both in North and South America.

During the years that have passed since "Uncle" Billy Smith drove the bit to the bottom of the Drake well, Pittsburgh spirit, Pittsburgh courage and Pittsburgh capital have been conspicuous in the development of the oil resources of the world. Surely she had a major part.

In conclusion, I would express the hope, that as the interesting story of the accomplishment of Pittsburgh in commerce, industry, science and art, is unfolded through the medium of these weekly talks we shall all catch the spirit of those pioneers who perceived what nature held in store for humanity, who developed her resources here, and whose genius and industry have made the whole world marvel at and do homage to Pittsburgh.

PITTSBURGH AND THE GLASS INDUSTRY

W. L. MONRO

William Loftus Monro, author of the address on "Pittsburgh and The Window Glass Industry", was born in Pittsburgh on October 20, 1866, the son of George Nugent Monro and Sarah Ann Morgan. He graduated from the Central High School, Pittsburgh, in 1885 and from Harvard University in 1889. He married Miss Violet Kennedy Bedell in 1892.

In 1891 he was admitted to the Allegheny County Bar and practiced law until November 1906. In 1901 he organized the Pittsburgh Window Glass Company of which he was president until November 1, 1906, when he resigned to become general manager of the American Window Glass Company. On July 17, 1919 he was elected president of the American Window Glass Company, Western Pennsylvania Natural Gas Company, and the American Window Glass Machine Company.

He is a member of many societies and clubs, as well as of the Community Fund Committee, the Pittsburgh District Advisory Board of the War Department's Industrial Mobilization Plan, and the Pennsylvania State Commission to Study Municipal Consolidation in Allegheny County. He is also a member of the executive committee of the American Tariff League, and a director of the Pittsburgh Chamber of Commerce.

His present business connections include: president and director of the American Window Glass Company, Western Pennsylvania Natural Gas Company, American Photo Glass and Export Company, American Window Glass Machine Company, and Empire Machine Company, and director in the Fourteenth Street Bank, Farmers Deposit National Bank, Dollar Savings Bank, Reliance Life Insurance Company, Westinghouse Air Brake Company, Union Switch and Signal Company, Pittsburgh Railways Company, Equitable Gas Company, Pennsylvania Manufacturers Association, and the Electrical and Chemical Ebonite Company, Ltd. of London, England.

Mr. Monro is the author of "Window Glass in the Making", published in 1926.

Pittsburgh and the Glass Industry

W. L. MONRO

THE center of the glass industry as far back as the early part of the nineteenth century, was Pittsburgh. The fame of its products extends not only throughout the United States, but all over the world. Even in the early days the term "Pittsburgh Glass," became a sort of slogan adopted by the trade to designate the best quality of glass produced in this country. Glass made by manufacturers outside this district was always compared with the Pittsburgh standard.

Not only in the quality of the glass produced did we excel, but also in the artistic designs of our tableware and other flint glass specialties, and in the fine skill displayed in its manufacture. Consequently, glass made here found a readier sale at better prices than glass made in other parts of the country. Buyers became accustomed to visit Pittsburgh regularly to purchase the latest designs. A survival of that custom is seen in the exhibit of flint glass manufacturers still held annually in Pittsburgh. These exhibitions are now confined solely to the manufacturers in this district. They are attended by prospective buyers from all over the country. An enormous quantity of glassware is purchased during these exhibitions.

The reputation of Pittsburgh for its glass products in turn brought about the establishment of additional glass factories of various kinds in this district. This served to maintain our early supremacy in glass-making, and today, in the variety and volume of its glass products, Pittsburgh excels any other place in the world.

This supremacy has not been brought about by mere chance. It has resulted from our natural resources, and from the indefatigable energy and enterprise of our early glass manufacturers, who not only attracted skilled workmen to the district from other parts of the country, but also educated and trained new workmen in the knowledge and skill of the art.

No history of the "Glass Industry" in its relation to Pittsburgh would be complete without a recital of the origin of glass, a description of its composition and the requirements for manufacturing it. All these are necessary to understand why so many of the early glass manufacturers located in Pittsburgh and its vicinity, and why they were able so soon to demonstrate the superiority of this district for glass making.

The origin of glass is still in doubt. Many theories have been advanced by ancient and modern writers to explain its discovery, but they can, at most, simply recount what tradition tells. Some writers say that the Egyptians discovered glass; others claim it was a discovery of the Chinese. Probably the most accurate account of its origin, and certainly a very plausible one is that related by C. Pliny, the Second, in his "History of the World," Volume 36, Chapter 27. According to Pliny there was in Phoenicia a short river, called Belus, that flowed from Lake Candeboea to the sea. Its waters were muddy and unwholesome, and nothing was to be found on its banks but sand. This had been cast up by the sea, and from frequent washing by the waves was pure and white and suitable for making glass.

One day some traders, who had been gathering a cargo of nitre, sought, along the banks of the river, stones on which to mount a tripod to cook their food. Not finding any, they were obliged to use blocks of nitre taken from their cargo. Under the heat of the fire, the sand coming into contact with the nitre, which acted as a flux, formed a vitreous substance—"glass."

Though there is room to doubt that this is the true account of the origin of glass, there are certain basic features in it that make it appear not only plausible, but easily possible. From our later knowledge we know that sand alone may be fused into a vitreous mass by applying a very high degree of heat; and that by mixing with it a quantity of soda, the temperature required to do this is greatly lessened. By using nitre, which contains a large percentage of soda, these ancient traders used an ingredient that materially lowered the melting point of the sand and made possible its reduction into glass.

To demonstrate the possibility of the discovery of glass in some such manner, we recently caused a wood fire to be made in the open air. Small logs were laid on a bed of glass sand mixed with an equal quantity of carbonate of soda. In order to secure accurate information of the degree of heat that could be obtained from such a fire, a standard pyrometer couple was inserted into the bed, and frequent readings taken. The fire was kept burning about two hours. The highest reading, 2210 degrees Fahrenheit, was obtained, when the fire had been reduced to a mass of burning charcoal. After the fire had completely burned itself out, the wood ashes were removed and a portion of the bed was found to be fused into a vitreous mass—the same kind of glass discovered by the Phoenicians. In a similar demonstration, with a bed of glass sand mixed with an equal quantity of nitre, a like result was obtained; but when a bed of glass sand unmixed with any other ingredients was used and subjected to the same kind of a fire, there was not the slightest trace of any fusing of the sand.

It seems quite plausible, therefore, that glass was first made somewhere along the shore of the sea. Many centuries after Pliny, it was found when seaweed was burned its residual, called "kelp," contained a large amount of carbonate of soda. Subsequently this was used in making glass, and there became known to the trade the term "kelp glass."

It requires no great stretch of the imagination to think that at some time there had been kindled along a sandy shore a great bonfire of dry seaweed, with perhaps a lot of driftwood, which left amid its charred embers the vitreous mass we now call glass.

Owing to the impurity of the raw materials and to the cruder methods of manufacture, the glass made by the ancients was not the bright, clear, transparent article in use today, but was much darker and contained many bubbles and foreign particles, which made it more translucent than transparent. Saint Paul refers to this feature when he says "For now we see through a glass darkly"—1 Cor., XIII, 12.

Centuries elapsed before this discovery by the Phoenicians was put to any practical use. In fact, we may say that glass really had to be rediscovered before glass articles of any kind could be produced.

Originally, the composition of glass was a great secret, known only to the alchemists, who guarded it with jealous care. Subsequently, some knowledge of the ingredients and their proportions spread to others, who put it to practical use; but all of these early manufacturers guarded with care the secret of their formulas. This is proven by the evident lack of exact information shown by the old writers from the time of Agricola, A. D., 1556. This secrecy has been maintained by glassmakers down through the centuries and continues to a considerable extent to the present time.

In a general way it may be stated that glass is made from silica (i. e., sand), mixed with some form of alkali such as carbonate of soda (i. e., soda ash), sulphate of soda (i. e., salt cake), potash, or some other fluxing compound, or with a combination of them. To these ingredients is added lime, either in the form of ground limestone, burnt lime, or dolomite.

Sometimes arsenic, manganese, or other decolorizers, in small quantities, are introduced into the mixture, whenever it is desired to obtain glass free from the usual greenish tint which is caused by a small percentage of iron in the materials or in the clay of the pots or blocks of the furnace.

In the manufacture of tableware and some kinds of bottles, various other ingredients are used for the purpose of producing glass of various tints and colors, or glass entirely free from color, or glass of a special nature and properties.

The ingredients, thoroughly mixed together, must be heated to a very high temperature, approximately 2600 degrees Fahrenheit, and they must be held at that temperature for some time to permit the completion of the chemical actions that convert the mixture into molten glass.

Upon the purity of the materials, their degree of fineness, and the proportion in which they are used, depend the color, quality, toughness or brittleness, and density of the glass produced.

Generally speaking, there are four different kinds of glass, viz: window glass, plate glass, bottle glass and flint glass. These differ from each other, not only in the composition, but also in the method of manufacture. The proportions of the different ingredients used in the composition affect materially the nature and properties of the glass produced. Consequently, the composition must be varied according to the kind of glass desired, and the process by which it is to be made.

In making window glass by the old hand blowing method, the usual composition used was sand, salt cake and limestone, to which a small amount of ground coal, or charcoal, was added. But if the window glass is to be made by a mechanical process, different proportions of the alkali and the lime must be used. Sometimes additional ingredients are added to assist in securing glass of a satisfactory nature.

In making plate glass a composition is used that is easier to melt, and which will produce a softer glass than the ordinary window glass composition. Instead of using the alkali in the form of salt cake, most of the alkali used is in the form of soda ash, with a small amount of salt cake. To this is often added a small amount of arsenic or manganese to serve as decolorizers. Some window glass processes require glass with a composition practically identical with that used in making plate glass.

For making hand made bottles a different composition is used than for making machine made bottles, which requires glass of a special nature. For this purpose additional ingredients were used. If bottles of particular colors were required, colorizers were used. Bottles made on one type of automatic machine will require a slightly different mix than bottles made on another machine.

Flint glass is the name generally used, though not always correctly, in describing the very clear glass, brilliant and free from color, that is made into different forms of tableware, and for a host of other useful and ornamental purposes. It derives its name from the fact that the silica first used in England in making clear glass was obtained from flints, which had to be treated to make them available for glass making. Subsequently all clear tableware glass made from a potash-lead mixture is known as "flint glass," or "crystal." These terms were adopted also in France, Germany and the United States.

Tableware is also made from a soda-lime mixture, and from a potash-lime mixture. In the making of tableware the character of the glass desired, the design of the piece, and the method of manufacturing it, all determine the various ingredients required in the composition and the proportions in which they shall be used. In making glass of different colors, various chemicals are introduced in the composition to produce the desired result.

The principal factors in determining the location of a glass factory, from the standpoint of natural resources, are its proximity to a source of fuel, sand, and limestone. Of these three, the fuel is the most important, as it is usually the largest item in the cost of production except the labor. It may be used in the form of wood, coal, gas and oil; and glass is now also made with electricity to supply the necessary heat. Some idea of the amount of fuel required in the operation of a glass factory may be gained from the fact that a modern hand-blowing window glass factory consumes about 180 pounds of coal in producing a box of window glass weighing fifty-eight pounds.

Sand is the next most important factor in the production of glass, as it constitutes about sixty percent of the total composition used in making glass. Glass sand is found more extensively in this country than any other mineral. There are many deposits of very high grade sand suitable for making the finest kinds of glass, in many parts of the country. To have any great value these deposits must be located convenient to a supply of fuel, as the cost of transporting it long distances to a point of consumption renders its use in glassmaking well-nigh prohibitive.

Another important factor is limestone. It constitutes about twenty percent of the total composition. A large number of deposits of very good limestones are also found in many parts of the country.

The remaining ingredients, though essential in the manufacture of glass, are of smaller volume and consequently can be transported from greater distances to the point of consumption without incurring prohibitive costs for transportation.

The natural resources of Pittsburgh and its vicinity offered unusual advantages for the location of glass factories, as was subsequently demonstrated by the inability of glass factories located in other parts of the country to compete with the factories here.

There was to be found here an unlimited supply of wood, which was the fuel used in the early factories; but the existence of our wonderful veins of coal was very well known. In fact, it is stated that while the French held Fort Duquesne they dug coal from the hills opposite the fort. As early as 1770 Col. Burd, while constructing a road to old Redstone Fort, now Brownsville, refers to the coal he found; and even Washington examined some coal on the Frazier farm on the Youghiogheny in 1770. The possibility of the substitution of coal for wood in the operation of the glass factories must have been foreseen and reckoned upon by those early glassmakers.

Adequate deposits of sand and limestone suitable for glass making were available practically alongside the fuel.

In order to secure the best glass, it is necessary that the sand should be very free from loam and all other impurities. In the early days it was quite difficult and expensive to prepare the sand with a minimum of these impurities. About 1838 L. M. Spear invented a new washing process that enabled the sand to be freed of most of its impurities, at much less expense. A few years later N. Q. Speer devised an improved method of washing it through a series of screens, which still further reduced the cost of washing the sand.

The first glass factory in this country was built at Jamestown, Virginia, in 1607, to make bottles, and a second factory was built there in 1620, to make glass beads that were used for trading with the Indians. About 1639 another factory was erected at Salem, Massachusetts, to make bottles and other products. William Penn, in one of his letters, refers to a glass factory being in operation in 1683 in Pennsylvania, but does not give its exact location. Other factories were subsequently built in the following states,—New York in 1732, New Jersey in 1738, Connecticut in 1747, and New Hampshire in 1779.

It remained for Albert Gallatin, the former Secretary of the United

States Treasury, a business man of courage, knowledge and sagacity, to be the first to take advantage of our wonderful natural resources, by establishing the first glass factory west of the Allegheny Mountains, at what is now the site of New Geneva, in 1794. He had as his associates a Mr. Nicholson and some Germans by the name of Kramer. An interesting story is told of how Gallatin came to be associated with the Kramers in this undertaking. It is said that once when traveling in the vicinity of Wheeling, he stopped for the night at an inn, and found quartered in the inn a number of German glassblowers from Frederick Town, Maryland, who were on their way to Louisville, Kentucky, to examine the prospects for starting a glass factory at that point. Gallatin mingled with these travelers, and through his ability to speak their language was able to gain their confidence and urged them to accompany him to George's creek, near the present site of New Geneva, to examine its availability as a site for a glass factory. Evidently the resources of that vicinity, namely, the wood for fuel, the sand, and the limestones were so readily available that these German workmen were convinced of the wisdom of locating a factory there. Accordingly, they built an eight-pot window glass factory, using wood for fuel. They made the alkali required for the making of the glass from wood ashes themselves.

The name of the company was "Gallatin & Company," but it was subsequently changed to "New Geneva Glass Works." In 1807 the company erected another factory at Springhill, in Greene county, and also built houses for the workmen. Although the glass factory has long since been demolished, the houses are still occupied today by coal miners.

The first glass factory in what is now Pittsburgh, was built by Gen. O'Hara and Maj. Isaac Craig in 1797, on the south side of the Monongahela river, nearly opposite the Point. It was a frame factory with an eight-pot furnace for the production of window glass and bottles, and Maj. Craig was the managing partner. Wood was used for fuel. Some idea may be formed of the courage, resourcefulness, and the indomitable perseverance of these pioneers, from the fact that by the time they had produced their first bottle it had cost them $30,000.00—an enormous sum of money in those days. But some time in 1798 the factory was leased to Eichbaum, Wendt & Company. Peter Wm. Eichbaum, of this firm, was a man of considerable reputation, a glass cutter by trade, who understood the cutting of prisms for chandeliers. He was the grandfather of Joseph Eichbaum, who was one of

Pittsburgh's foremost citizens, and a very prominent Mason, well known throughout the United States.

This firm operated these works until 1803, when Maj. Craig again took charge of it.

In 1800, one William Price, of London, carried on some experiments in making flint glass at this factory, which, however, did not prove successful.

On April 29, 1800, Gen. James Wilkinson, Dr. Hugh Scott, John Wilkins the younger, and others formed a partnership and built a window glass factory on the south side of the Ohio river. This became known as the factory of Denny & Beelen, though they were really only commission men, who furnished the supplies, paid the workmen, and sold the glass.

This enterprise was not successful and it was abandoned in 1802, and a portion of its tools and equipment was sold to O'Hara and Craig.

About 1807, one George Robinson, a carpenter by trade, and Edward Ensel formed a partnership under the name of Robinson and Ensel, and built the first flint glass factory in this part of the country. Owing to some disagreement between them, they sold out in 1808 to Messrs. Bakewell & Page, who continued the manufacture of flint glass for many years. This was the first really successful flint glass factory in the United States. The name was subsequently changed to Bakewell, Pears & Company. It was located on the Monongahela river at the foot of Ross street, in this city. The first furnace held six twenty-inch pots, but in 1810 this was enlarged to a ten-pot furnace. In 1814 the firm built an additional ten-pot furnace. These works were burned down in the great fire of 1845, and immediately rebuilt. During its existence, which continued until 1882, this firm made a great reputation for itself by the quality and design of its wares. It was favorably known not only throughout the United States, but in foreign countries. Instead of confining its operations to the production of table glass, it produced flint ware of almost every description, ranging from toothpick holders to wonderful cut glass chandeliers, and from simple vials to decanters of rare design and beautiful workmanship. Many of its patterns were so artistic, and so beautifully executed, that they were pronounced equal to the finest productions of the best European factories. Lafayette, when in Pittsburgh, in 1825, visited the factory, and was greatly pleased by the excellence of its products, and the beauty of the cut glass vases which were presented to him as a souvenir of his visit. President Monroe was so greatly impressed by the beauty of its productions that he gave an order for a service of this glass, to exhibit as a specimen of the high state of the art of making glass achieved by this firm. President Jackson also purchased some of its wonderful productions. The success of this firm did much to establish the supremacy of Pittsburgh as a glass producing center.

In the sketches of Anne Royall, who traveled extensively throughout the country we find an interesting description of her visit to Bakewell & Page's plant in 1829, as well as some rather sarcastic comments on Pittsburgh, as she found it at that time. She pronounced the glass made here by this firm equal, if not superior to the "Boston" glass. By the term "Boston" glass, she doubtless referred to the well-known Sandwich glass produced by the flint glass factory established at Sandwich, Massachusetts, in 1825. That factory had the reputation of experimenting with every new process, and acquired distinction as the producer of many designs still regarded as the best of their several kinds. It was finally forced out of business because of its inability to compete with the industrial advantages of the glassworks located in the Pittsburgh district. At the time of her visit to Pittsburgh, she commented on the fact that Pittsburgh contained twelve churches and sixteen grogshops, and sarcastically claimed that "they convert the heathen here with brandy."

Subsequent to the establishment of a window glass factory by Bakewell & Page in 1812, a partnership was formed by Daniel Beltzhoover, George Sutton, John McMickle, Edward Ensel, Sr. and Jr., Frederick Wendt, Charles Ihmsen, and Peter Hain, under the name of Beltzhoover, Wendt & Company, to build a window glass factory in Sydneyville, Lower St. Clair Township. It was built on what is now Muriel street, between South Thirteenth street and South Fifteenth street, in the city of Pittsburgh. This factory was the second successful glass factory established in Allegheny county. It produced window glass and bottles. Through many changes in the partnership its ownership finally centered in the Ihmsen family, and the name of the firm was changed to the Ihmsen Glass Company, Ltd. Some members of that family still retained their interest in the factory until it was sold in 1899 to the American Window Glass Company. While portions of the factory burned and were rebuilt from time to time it continued as an operating window glass and bottle factory from 1812 to 1899.

It was to the writer's being retained as attorney for this company in 1893 that he owes his present connection with the window glass industry in this country. No additional factories were built in Pittsburgh until 1824, when Wm. McCully built what became known as the Sligo Works, and in 1829 The Union Flint Glass Works was built by Hay & McCully. Through successive changes in ownership this plant became the property of Wallace, Lyon & Company in 1849. James P. Wallace of that firm was a very aggressive and progressive man, who aroused very great rivalries between the Pittsburgh flint factories in the quality and designs of their ware; and thereby added to our city's fame as the greatest glass center.

After 1829, at intervals of a few years, additional glass factories continued to be built down to very recent years. Since 1797 over fifty factories have been built for the manufacture of different kinds of glass, and many of these factories had a number of furnaces. Old furnaces were torn down, remodeled, and enlarged, so that Pittsburgh still held her place as the greatest glass producing city.

In those early factories window glass, bottles and even flint glass were sometimes made on the same furnace. Frequently if the glass was not considered good enough for window glass, it was worked up into bottles.

No great improvements were made in any of the glass making processes in this country for many years, although the size of the furnaces, and the number and size of the pots used in the furnaces were increased, and wood firing gave way to direct coal firing.

The early glass furnaces built here were of two types,—the circular furnace, and the oblong-shape furnace. These furnaces were built with a clay bench on the sides of the furnace, on which the glass melting pots were placed. In front of the clay benches was a trench, having an iron grille on the bottom. It was on this grille that the fire was built to melt the glass. At first wood was used for fuel; subsequently, coal.

The raw materials were melted in clay pots that had previously been made with great care, thoroughly dried, and then burnt, so as to withstand the heat of the furnace when placed on the bench. These pots were about twenty inches in diameter and would hold approximately 500 pounds of glass.

Through the sidewalls of the furnace, directly over each of the pots, was constructed an opening, through which the workmen gathered the molten glass from the pot, on the end of a hollow blowpipe. The gathering end of this blowpipe had been previously heated to about a cherry red color, as molten glass will not adhere to cold iron.

After the workmen had worked out all the glass in the pot they ceased work, and the pots were charged anew with a fresh supply of raw materials. It required many hours of heating to reduce these materials into molten glass sufficiently refined and ready for working. The workmen accordingly returned to their homes to wait until the new charge of glass in the pot was ready. As there was no uniformity about the time required to make the melt, they were obliged to hold themselves in readiness to return to the factory whenever they should be notified that the glass was again ready. This was usually done by the factory watchman, frequently in the middle of the night, by going around to the workmen's houses, knocking at the doors, calling out in stentorian tones, "The glass is ready!" Woe betide the unfortunate worker who failed to obey the summons and turned over for another wink of sleep. If he reported late for work he was greeted with an outburst of profanity, sarcasm, and scurrilous denunciations that made his life miserable for the balance of the turn.

The discovery of natural gas and its application to glass making worked a great change in the glass industry in this district. At first the manufacturers were very loathe to adopt the new fuel; and it was not until after the genius and prophetic vision of George Westinghouse, had organized and put into operation the Philadelphia Company in 1884, that they began to change from coal to natural gas. The new fuel proved to be ideal for glass making. It was clean, easily applied, and very high in thermal units. It eliminated many of the difficulties of glass making, and made possible a great increase in the production and quality of the glass. If Pittsburgh's supremacy as the glass making center had ever been seriously challenged, the advantage of being the first to use natural gas as fuel rendered its position unassailable.

About this time window glass manufacturers began to adopt the Siemens regenerative continuous tank system. This proved a great success, and made possible the production of better glass with a much smaller consumption of fuel.

The first real improvement in the method of making window glass for nearly 500 years was successfully worked out by John Lubbers, a resident of this city. He was a window glass flattener by trade, and in 1894 he conceived a method of blowing window glass cylinders mechanically. He interested in his ideas his employer, James A. Chambers, the most prominent and progressive window glass manufacturer of his day, who agreed to furnish the money to carry on the experiments. Experimenting in glass making is probably the most difficult and expensive undertaking in which one can engage.

After some years and with the results still in doubt, the expense became too heavy for Chambers to bear alone; and he was obliged to appeal to some of his friends to help in the enterprise. T. H. Given and M. K. McMullin, the former well known bankers, and others of this city furnished the additional money required to enable Lubbers to bring the experiments to a successful conclusion. When completed, the right to use the invention was sold to the American Window Glass Company whose factories use the machines so successfully worked out by Lubbers.

With the Lubbers process it is possible to make much larger cylinders than can be made by hand. Some idea of the magnitude of this invention may be gained from the fact that, at the time it was perfected, the largest cylinders that could be made by a hand blower were not over twenty inches in diameter and ninety inches long, while the machines regularly make cylinders thirty inches in diameter, and 518 inches long, and have the capacity to make much larger ones. One hand blower can make about twenty boxes of single strength, each containing fifty square feet, in an eight-hour turn. With the machines one blower operating four machines can make 360 boxes in the same time.

In recent years another process of making window glass has been worked out, viz: by the drawn sheet method. In this method the glass is drawn in a continuous sheet or ribbon vertically from a tank, and then horizontally after passing over a bending roll, or it is drawn vertically between successive pairs of rolls.

The credit for being the first to conceive the idea of drawing window glass in sheet form belongs to William Clark, of this city, who patented the process in 1857. While he was not successful in his efforts, and some of his disclosures were impracticable, yet his ideas and methods formed the basis for the successful working out of the sheet drawing process some fifty years later.

The plate glass industry was one of the last to get started in this country. Although the first rolled plate glass was made in 1688 at Saint Gobain, in France, it was not until about 1881, after years of unsuccessful efforts that plate glass was successfully produced in this country. In 1872 Capt. E. A. Ford started a small plate glass factory at Louisville, Kentucky, but it was not until he built the plate glass factory at Creighton, Pa., in this district, in 1881, that the business became profitable. This factory was afterwards acquired and is still operated by the Pittsburgh Plate Glass Company.

The methods of making plate glass have undergone very little change. For centuries it has been melted in pots, and then poured on a casting table, where it was rolled. After being annealed it was ground and polished on both sides. Until 1900 the annealing was done in special kilns built for the purpose; a tedious, slow, difficult, and expensive process. About that time mechanically operated rod-lehrs were substituted for the annealing kilns, and a great saving in time, labor, fuel, and breakage was effected thereby. The first successful application of these lehrs to the annealing of plate glass was made by the Pittsburgh Plate Glass Company.

To that remarkable genius of the twentieth century, Henry Ford, of Detroit, must be given the credit for having developed a new method of making plate glass. About 1921, at the Ford Motor Company's Detroit plant, was placed in successful operation a factory for making small plates, using a continuous tank, with continuous rolling, annealing, grinding, and polishing. Subsequently, the Pittsburgh Plate Glass Company built several units of an improved design of this new method, which are in successful operation.

In the making of bottles, the old hand blowers have given place to automatic, or semi-automatic machines. In 1882 Philip Arbogast, who resided at the time on the south side, in this city, pressed a blank including a finished neck of a bottle. This was the pioneer accomplishment that resulted in the perfection of the bottle blowing machines.

These machines have effected great economies in labor, and greatly improved the quality of the ware produced. In this branch of glass making, practically all the old pot furnaces have been replaced by the regenerative tank system of melting.

The manufacture of flint glass kept pace with the basic improvements in other lines of glass making. Their furnaces were enlarged and improved, and the so-called "deep-eye" furnaces replaced the old construction. Some of the manufacturers have also adopted the tank method. In addition they worked out a large number of mechanical improvements for the making of the countless variety of products embraced within this branch of glass making. The list of these is too long to be enumerated in this paper. It suffices to say that many of them are the most ingenious creations that the human mind can conceive for producing automatically and mechanically various kinds of ware. In the making of objects of special design, however, the skill of the workman is still a most important factor, though it is aided by all the mechanical devices possible.

Among the outstanding improvements made in the flint industry was that made by John Adams, of this city, of the firm of Adams, Macklin & Co., who built a factory in 1851. Adams began experimenting in the use of lime as a substitute for lead in making tableware, with a view to cheapening its production and at the same time securing the same brilliancy as the glass made with the lead. How successful he was may be judged from the fact that the greater portion of all the flint glass made today uses lime instead of lead. This was an outstanding achievement that contributed much to retaining Pittsburgh's supremacy in the flint glass trade.

To another resident of this district, Mr. H. C. Fry, now of Rochester, Pa., belongs the credit of being the first to put into successful operation the making of cut glass from pressed blanks. Previously cut glass was made from solid blanks which were then cut into the designs desired, a very difficult and expensive process, but with the adoption of the pressed blank the work required to turn out the finished cut glass article was greatly reduced.

Another invention in its day, made by a Pittsburgh workman whose name has not been inscribed on the roll of fame, was the invention of a machine to cut crimped tops on lamp chimneys. This invention practically revolutionized that trade. It is said this modest inventor received the magnificent sum of $100.00 for his invention.

One cannot speak of the success of Pittsburgh's glass factories without mentioning the great contribution to that success made by Mr. George A. MacBeth and Thomas Evans, whose factories, merged into the MacBeth-Evans Glass Company, today are a monument to the foresight, industry, and genius of those two men. It is interesting to know that Evans, when a boy, worked in the old Bakewell, Pears & Company's factory.

In the production of glass for scientific purposes, Pittsburgh has also taken a prominent place, not only in the production of glass for lenses, but in turning out those lenses. Our own beloved Dr. John A. Brashear, with his factory for grinding and polishing the largest lenses that have ever been cast, won for himself undying fame as an astronomer and maker of astronomical instruments.

One of the first large industrial combinations ever made in this country was the formation of the United State Glass Company, of this city, in 1891. This company acquired seventeen different flint glass factories, the majority of which were in the Pittsburgh district.

From this modest beginning in 1797 the industry has grown with the development of the country. Today there is produced or sold here annually from factories owned by Pittsburgh corporations glass and glassware to the aggregate value of $50,000,000. With such a volume of business Pittsburgh fairly earns its supremacy in the glass industry of the world. Let everyone take pride in these achievements and enjoy the happiness to which Euripides referred when he wrote: "The first requisite to happiness is that a man be born in a famous city."

PITTSBURGH AND THE NATURAL GAS INDUSTRY

JAMES H. REED

James Hay Reed was born on the north side of Pittsburgh (old Allegheny) September 10, 1853, son of the late Dr. Joseph Allison and Eliza (Hay) Reed, the former a native of Washington County, Pa., the latter born in Washington County, New York.

James Hay Reed's elementary education was obtained in the public schools of his native city, which was supplemented by study in the old Western University of Pennsylvania (now the University of Pittsburgh), whence he was graduated in 1872. He was admitted to the Allegheny County Bar in 1875, and soon afterward the firm of Knox and Reed was formed, the senior member being Philander Chase Knox, who was afterward Attorney-General of the United States and Secretary of State, and closed his career as United States Senator from Pennsylvania. Later, when the Hon. Marcus W. Acheson, judge of the United States District Court for the Western District of Pennsylvania, was elevated to the circuit bench, Mr. Reed was appointed to succeed Judge Acheson. He accepted with great reluctance, having little inclination for judicial work. Judge Reed resigned within a year, and the firm of Knox and Reed resumed its activities. This firm was finally dissolved when Mr. Knox became Attorney-General under President McKinley, and the firm of Reed, Smith, Shaw & Beal, now Reed, Smith, Shaw & McClay, was formed by the remaining partners.

Judge Reed was for many years general counsel and vice president of the Pittsburgh & Lake Erie Railroad Company, one of the most important parts of the New York Central system. Later he became general counsel for the Carnegie Steel Company, having been counsel for many of the constituents of this corporation for years before their general merging.

Judge Reed in 1899 prepared the charter and other preliminaries to the organization of the Consolidated Gas Company of Pittsburgh, and after this and other companies had been acquired by the Philadelphia Company he became president of the consolidated interests. He retired as president in 1919, but continued his connection with these enterprises as senior vice president and director. At the time of his death he was a director of a large number of industrial, financial, and charitable institutions.

JAMES H. REED

Pittsburgh and the Natural Gas Industry

BY JAMES H. REED*

NATURAL gas is preeminently the best fuel for supplying heat, in which field its superiority is unquestioned. The Pittsburgh district has been particularly fortunate in its supply of natural gas. Just how much it has contributed to the district's development and industrial supremacy is quite difficult if not impossible to figure accurately, but undoubtedly natural gas has been an important factor contributing to the making of the district.

We commonly speak of coal, wood, and other substances as burning, but this is erroneous—only gas burns. Other combustibles are changed into a gas by the effects of heat, and it is the gas thus developed that burns. In a sense, every flame is a gas fire. The convenience of applying heat to combustibles at a central retort and piping the so formed gases to other points for burning is, in essence, the manufactured gas industry. The American Gas Association reports that almost 460,000,000,000 cubic feet of this manufactured gas were burned in the United States last year—an increase of forty percent in the past five years, which is evidence that gas is a popular fuel.

Years before measured time began, Nature was preparing stores of infinite value to us of today. Among other works, she grew vegetation and animals in abundance, sealed them underground, and left them there to rot. From such deposits come three of Nature's most useful gifts, coal, oil, and natural gas. Supremely fortunate is the Pittsburgh district in finding itself underlaid with all three—a rare combination. At first attracting industries through its coal deposits, Pittsburgh later unearthed a startlingly better fuel that proved of great value to local manufacturers. But natural gas was nothing new

*This paper, on the natural gas industry, for the Chamber's notable series of addresses on "Pittsburgh and the Pittsburgh Spirit", was prepared by Judge Reed not long before his death. It was read to a deeply interested audience in the Chamber on Tuesday, December 20, 1927 by James Francis Burke.

to the world when it was first found in Pittsburgh.

For ages natural gas had escaped through earth fissures and caused the wonder, even the worship, of man. An outcropping in Persia became ignited some 6000 years ago and was worshipped by the Magi as the god of fire. Later, the Delphic oracle of Greece was at another natural outlet which had made the early Greeks light-headed, and they agreed it must be from a god living there. A priestess was appointed to communicate with this god, and a temple erected in its honor. The Royal Philosophical Society of London was advised of an English gas spring in 1667 "where the water did burn like oyle and did boyle and heave like water in a pot." The Chinese have used natural gas since before authentic history began. A missionary there in 1833 described great salt mines where bamboo pipes led natural gas to the evaporating boilers. The pipes were tipped with earthenware as a burner to keep the bamboo from burning.

In America, George Washington's burning spring was among the first local evidences of natural gas. He was camping at a spring in the Allegheny mountains on his first trip to Fort Duquesne. As his camp fire crackled, a burning ember dropped into the bubbling water. The spring immediately burst into flames.

A more famous spring was in Freedonia, New York and was walled up in 1821 because its odor was offensive. But that spring was the source of the first illumination by natural gas in America. In 1824, the town was to honor Lafayette and a venturous citizen had the gas piped to the hall as a novelty. It probably was as the gas flared from holes in the wooden pipe around the walls. A span of thirty-five years followed with no developments. Natural gas was as yet a curiosity, seldom found, of no value.

Then, as a disappointing by-product of oil drilling, came abundant natural gas. There was no desire, use, or demand for it; it was allowed to blow into the air, free and disregarded. Finally some of the well drillers, ingenious, turned the gas directly into their steam lines, as the pressure in many cases was greater than their field boilers could give. Excess gas was lighted for night operations—simple flares that burned day and night because there was no need of conservation for a thing that had no use.

Nevertheless, uses were to come for natural gas and the excessive waste of so valuable a commodity in the early days now appears unbelievable. Moreover, so far as we know, nature is making no more natural gas, and what we use should be handled efficiently.

A student of Pittsburgh history may be surprised at finding manufactured gas first used in this center of the natural product. Such was the case, however, for Pittsburgh was the seventh American city to have gas. A city ordinance of 1827 called for gas lights but it was not until April 5, 1837 that the manufactured gas was turned on by the Pittsburgh Gas Company.

Other companies served outlying sections until the Consolidated Gas Company incorporated in 1871 later absorbed them into one gas system. Practically no industrial service was ever supplied by these companies, as the cost of manufactured gas in those days was prohibitive to large consumers. The arrival of natural gas marked a decrease in the sales of manufactured gas and it was not long before the gas utilities began replacing it by the cheaper fuel.

The first recorded gas well in Pittsburgh was sunk in 1820 by the proprietors of a salt works. The well was intended to increase their supply of salt water but instead it discharged gas. This soon became ignited and burned down the works. The well was then plugged and the plant rebuilt. Industry was not benefiting from gas that year, even with a well on the factory premises.

In 1860 natural gas was used in East Liverpool, Ohio for street lighting and some as fuel. This came about because gas was struck instead of oil. The first commercial use of natural gas seems to have been at Olean, New York at about 1870 and at Tidioute, Pa., another oil town. Its first use in iron working was at the Leechburg, Pa. works of Mercer, Rodgers & Burchfield in 1873. Here for a six months period all puddling, heating, and steam generation were done with gas, not one bushel of coal having been used. Two years later Spang, Chalfant & Company piped gas from their well in Butler county to their boilers at Etna.

In glass manufacturing the Rochester Tumbler Works at Rochester were probably the pioneers, and in plate glass, the Pittsburgh Plate Glass Company at Creighton used natural gas in 1883. The finding of gas in large quantities in the Murraysville field at Westmoreland county caused great activity in the attempt to bring gas into the city of Pittsburgh and some hand to hand battles were fought in the effort to control leases and routes.

It appears that the first gas utility to reach Pittsburgh was in 1883, when the Penn Fuel Gas Company had a line from the Murraysville field to Sixteenth street. At that time there was no statute in Pennsylvania under which natural gas companies could be incorporated, so efforts were made to obtain charters under the Manufactured Gas Act, which included a monopoly feature; and a great deal of litigation resulted between different bodies of promoters, resulting in a decision by the Supreme Court that natural gas could not be furnished under manufactured gas charters. This resulted in the passage in 1885, of the Natural Gas Act by the Pennsylvania Legislature declaring the furnishing of natural gas to be a public use and providing for the incorporation of companies for that purpose without any exclusive rights. The corporations operating under color of exclusive charters were given an opportunity to surrender their charters and obtain new charters under the Natural Gas Act. In this way the industry was regulated and eventually the many smaller companies which had been formed were gradually absorbed into larger ones until today the city of Pittsburgh is served by the Equitable Gas Company, the Peoples Natural Gas Company, and the Manufacturers Light and Heat Company. These three companies now sell about 50,000,000,000 cubic feet of gas annually in Pennsylvania, a considerable part of which is used in industry. At the time of the formation of these companies, and of the Philadelphia Company's chartered organization of its natural gas business, now prosecuted by the Equitable Gas Company, gas was so plentiful and the means of controlling it so primitive that large stand pipes were erected to blow off the surplus gas. No doubt some of the older members of the Chamber will recall a battery of stand pipes that stood on the hill over the Union Station which were lighted on Saturday and remained lighted until Monday morning, carrying off the surplus gas which resulted from the shutting down of the mills over Sunday.

In 1886 the use of natural gas was new in Pittsburgh and approached with great caution by the gas companies and trepidation by the householder.

A pamphlet was published by the Philadelphia Company which illustrates this. It starts with wood cuts of the house regulators which were intended to control the pressures which at that time had a pleasing habit of changing from zero to roaring out of the chimney. Then follows a list of company surgeons to be called in case of explosions and the public is notified that cotton and oil are kept at the company's stations for first aid in case of burns. Then follows a treatise on natural gas and what it is. There is a page on the advantages of the use of natural gas; its cleanliness, uniformity of temperature and convenience, and a paragraph which ought to be quoted to remind the people of Pittsburgh of their blessings, which, like air and sunshine, are now taken as a matter of course—"The use of gas allows people who have to rise early, at least half an hour more sleep owing to the fact that there is no delay in lighting fires. The Philadelphia Com· pany thus contributed 5000 extra hours of sleep to its customers."

In the early days gas was brought into the city by its natural pres sure. Wells often came in with a bang, blew out the drilling tools, carried away the derrick, and roared into the open, until connected to a pipe line. Pressures of seven and eight hundred pounds and often more were developed in some of the early wells. It was not until considerably later that it became necessary to build compressing stations for the purpose of supporting the waning pressure. Today almost all gas used in the city is pumped in under compression. As is well-known, many of the wells were exhausted in the past and new wells had to be sought at a greater and greater distance from the city of Pittsburgh, involving the expenditure of large sums of money for extension of lines, additional compressing stations, etc. One of the largest fields found was at Grapeville, in Westmoreland county, where the supply seemed to be inexhaustible and resulted in the building by H. Sellers McKee of the glass plant at Jeannette, which is now owned by the American Window Glass Company.

Others who were interested in the early development of the natural gas industry in the Pittsburgh district were Dr. David Hostetter, who, as the owner of the Pittsburgh Gas Company, saw the advantages of natural gas as a fuel; H. Sellers McKee and his associates in glass manufacturing; J. N. Pew, whose company, the Peoples Gas Company, predecessor of Peoples Natural Gas Company is one of the most important companies supplying Pittsburgh; and James A. Chambers, whose company, the Chartiers Gas Company, was subsequently acquired by the Philadelphia Company.

Any account of the natural gas industry should include the activities of George Westinghouse. The many things that interested him included natural gas, and in 1884 he drilled the first really useful gas well in Pittsburgh. This was at his home near Thomas boulevard, between Murtland and Lang avenues. The well was a considerable producer, and natural gas soon replaced the manufactured product on the Westinghouse premises. As the well supplied more gas than any one house could possibly use, a stand pipe was erected to pass off the excess. The waste gas was lighted, making a mighty flame and a great roar, so that many people were attracted to it as the first public exhibit of burning natural gas, and the entire neighborhood lost much sleep. Mr. Westinghouse's faith in gas led him to organize the Philadelphia Company that we know today, the largest gas utility in Pittsburgh. This was in 1884.

With Mr. Westinghouse as the first board of directors of the Philadelphia Company were associated Robert Pitcairn, John Dalzell, John Caldwell, C. H. Jackson, H. H. Westinghouse, Dr. Hostetter, and A. M. Byers. John R. McGilley was secretary and T. A. Gillespie general superintendent. All were well-known Pittsburghers. All had the faith and the courage in experimentation which have so often been shown by our manufacturers and business men as to have become a tradition. They are the traits which have helped most to make Pittsburgh what it is.

Before leaving this part of the subject it would be well, from the historical point of view, to refer again to the deplorable waste of the new fuel which marked the earlier stages of the natural gas industry. Not only in western Pennsylvania but in Ohio and Indiana enormous quantities of gas were consumed in the most reckless manner and in extravagant display that only too often turned night into day. As Richard Ferris says in a treatise on the industry, "the effect upon witnessing mile after mile illuminated by the burning of escaping wells and torches produced an impression long to be remembered". How improvident it all was did not seem to be suspected until many of the then known fields began to show a serious decline in their rock pressure. Knowing the original pressure, it was a simple calculation to show that a large percentage of the quantity of natural gas originally contained in the natural gas reservoirs had been withdrawn and that something must be done to stop the waste. Even after this realization arrived, reform was slow and many companies became bankrupt. It was not until the general introduction of the gas meter in 1890 and 1891 that economy in the use of the gas by consumers was inaugurated. Formerly the gas was sold by the month, according to the size of the orifice through which it was delivered without regard to the manner of its combustion and use. The meter made it to the interest of the consumer to consume economically. It is estimated that consumers soon secured the desired results with only one-half as much gas as they formerly burned. Another measure of economy which was shortly afterward introduced consists of shutting in the wells when their flow is not required. The closing or opening of wells is regulated by telephone from a central office. Wells are more carefully watched in the present day, and the salt water is removed by pumps instead of by blowing out as formerly. The pipe lines were thoroughly overhauled for leaks and the new pipe afterward adopted was heavier and of larger diameter, being supplied with improved rubber packed joints. In the cities and towns larger distributing mains came into vogue and a greater number of regulators was secured, thereby maintaining a more even pressure throughout all the variations in consumption produced by changes in seasonal temperature.

As might perhaps have been anticipated, new uses for natural gas began to appear just about at the same time that headlong waste in the original natural gas fields brought about serious diminution of supplies and forced producers to go farther and farther away in the search for new fields. In an enumeration of its modern uses one of the technical experts finds that industrial establishments have introduced it extensively in the generation of steam; in the puddling of iron; (we have already mentioned its use in glass manufacture); in roasting ores; in heating furnaces, china kilns, and water stills; in the manufacture of steel and pottery; and it has also been utilized as a source of power in the gas engine used in drilling and operating oil and gas wells and in pumping oil. The heat value of natural gas is greater than that of any artificial combination of carbon and hydrogen and it is a perfect fuel as it issues from its original rock sealed reservoirs. No preparation other than supplying necessary oxygen at burners is necessary for its combustion. No residue is left. It is not affected by ordinary temperature and its distribution by pipes is exceedingly easy. Carbon black and gasoline are the principal commercial articles made from natural gas.

The economy in the use of natural gas is manifest. The mere fact that it dispenses with the costly and troublesome boiler has brought it into great favor for all sources of power from a one horse-power up to 1500 horse-power engines.

Since 1911 a considerable industry has been built up in the production of gasoline from casing-head gas—that is, the gas which comes up between the casing and the tubing of an oil well, collecting in the casing head. This gas is known as "wet" gas, carrying a certain proportion of the vapor of petroleum. The process is also applied to gas from gas wells if it carries as much as six pints of gasoline vapor to the 1,000 cubic feet. The common process is to pass the gas through a tank of heavy oil which absorbs the gasoline vapor, and the gasoline is afterward distilled out. By the year 1915 there were in the United States no less than 414 plants given over to the production of gasoline from natural gas. The total recovery was 65,364,665 gallons, nearly half of which was gained in Oklahoma. The highest percentage was secured from the gas of the Glenn Pool in Oklahoma which yielded eight gallons of gasoline per 1,000 cubic feet.

There does not seem to have been any large quantity of gas under the city of Pittsburgh. Wells have been drilled at many points in the city and its immediate vicinity, but those that were productive were short-lived. Even the famous Westinghouse well gradually declined until it played out. The tragic story of the McKeesport field is still fresh in our memories. The drilling of the Foster well, with its enormous flow and tremendous pressure, brought on an old-fashioned boom. Companies were hastily formed and stock sold by the thousands of shares to persons who were not familiar with the business and who ultimately lost their entire investment. A great number of wells were drilled in the neighborhood, some of which were productive for a short time, but it was noticed that each new productive well took a little off the pressure and flow of the original well until, as was expected by practical gas men, the flow practically ceased, the wells were abandoned and their fittings and machinery sold for junk.

There are doubtless other pockets of gas to be found from time to time in or near the city, but they are probably walled in and not connected with other fields, and the production and supply of gas will in the future be, as it has been for twenty years past, a prosaic systematic business, requiring a large investment and expert knowledge.

As to the duration of a sufficient supply of natural gas one would be foolish to prophesy. In the annual report of the Philadelphia Company for 1894 the statement was made that owing to the apparent short life of natural gas, the company had bought Brunot Island on which to erect a manufactured fuel gas plant. The Philadelphia Company that year had less than 15,000 consumers and in 1926 had 169,000 consumers and the Brunot Island plant is not yet constructed. Twenty-five years ago an eminent eastern banker refused to consider natural gas or oil company securities because of their uncertain future. He declared that he would as soon lend money on the fish on the Newfoundland banks. But the fish continue to run and to be an important source of food supply. There have been at times fears that America's supply of oil might be exhausted but today there is, if anything, too much oil in sight. Similarly, we have had periodical anxieties about the country's natural gas supply but the exhaustion of one field, or the arrival at harder conditions of production in that field, have quickly been succeeded by the discovery of unexpected new fields of even greater wealth than their predecessors and even some of the old fields are still producing gas in very considerable quantities.

The main thing that has continued the life of the older fields has been the development of the compressing stations already alluded to, by means of which natural gas can be carried to any distance. The Philadelphia Company built and operated a number of these stations under the management of Mr. E. D. Leland who is still with the company. If this method of conserving the supply of gas in southwestern Pennsylvania had been discovered in the early years, Brunot Island would not have been bought as a life saver.

The larger steel plants, which used enormous quantities of natural gas in the early days, have now discovered that coke-oven gas with which they polluted the innocent air in those days can be turned by by-product ovens into a valuable fuel. Here is a hint that we are not dependent upon the discovery of distant new fields or the replenishment of old ones. In other words, invention and research will probably forestall exhaustion or then will have taken the sting out of the day of exhaustion by providing a substitute.

As far as at present discovered, there have been seven great gas fields in the United States, all of which are still producing. They are the Pennsylvania and West Virginia fields, considered as one; (two) the Indiana field; (three) the Kansas field; (four) the Oklahoma field; (five) the Louisiana field; (six) the California field; (seven) Texas. By the year 1915 there were twenty-three states in which varying quantities of natural gas were produced, although there were only nine of these in which the yield was notably large. The system of distribution by pipe lines has been so perfected that in many cases the natural gas consumed in a town is produced over 200 miles away.

In many localities the yield of gas is incidental to the production of petroleum and the gas has frequently been sacrificed for the more stable fuel. This is particularly true of the Caddo Field in Louisiana, where billions of feet of gas have been allowed to escape unhindered. The loss of gas which occurs in boring for oil has been an avenue of very serious waste. It is a waste, however, that has been to a large extent overcome by sealing the gas sands with clayey mud when they are encountered in the search for oil.

There is one fact that must restrain the pessimists who prophesy. That fact is that in 1916 the volume of natural gas produced in the United States jumped to 753,170,253,000 cubic feet, or 125,000,000,000 feet more than was produced in 1915, although the 1915 production had been regarded as sensationally large.

Even the Pittsburgh district, (thirty miles radius) although among the pioneers of natural gas production, still had a yield in 1924 of 44,000,000,000 cubic feet per annum. This is admittedly not much more than one-third of the district's annual consumption. It would have required, however, the maintenance of production in the wonderfully developing industrial center upon a huge scale to keep pace with our natural gas consumption. There are now more than 400,000 domestic and commercial consumers of natural gas in Pittsburgh and its industrial environs. The great difficulty with which a heating company has to contend is the maintenance of a sufficient supply of gas to meet the enormous demand during the winter months and the peak load of generally only a few days, as against which the company has several months of minimum demand. This difficulty is formidable enough, combined with the constantly diminishing pressure of the nearby wells. Yet it is safe to say that people of Pittsburgh, having had the use of natural gas with its remarkable conveniences for more than a generation, will not be satisfied to revert to coal for domestic use.

The prices of natural gas when first introduced were so low, owing to the supply and economy in furnishing, that it rapidly became a popular fuel in the manufacturing plants of the city. At that time the gas companies were glad to sell on yearly contracts regardless of measurement. This encouraged the use of gas as fuel, and was one of the causes of the rapid expansion of Pittsburgh's industries. (The charge for gas used in puddling iron was $1.00 a ton.)

The furnishing of gas on unlimited contracts led to great waste by its users. It was a common sight to see fires going at full speed and the windows of the room opened to let out the surplus heat. One gas company, it is said, introduced an ingenious method of controlling the consumer. The company would contract to furnish gas at a fair monthly rate for a fixed number of fires or stoves; and then by some means of manipulation they fixed it so that the customer would be greatly mystified if he attempted to use additional fires.

This was the time when natural gas was being acclaimed by industries as the one fuel. Glass manufacturers preferred gas as infinitely better than coal. It gave them more nearly perfect control of glass melting, and in the annealing lehrs saved them a fifty percent breakage coincident with coal-fired annealing. In iron and steel manufacture, Park Bros. & Company stated their savings with gas were so great they wouldn't use coal as a gift.

In 1887 the Chamber of Commerce printed a report on the "Occurence and Application of Natural Gas in Pittsburgh, and its Influence in the City's Industries." This had been delivered by a German, Herr Sorge, before an iron and steel association of that country. It is a lively picture of those times and shows Pittsburgh's exceptional advantages in having natural gas.

As already remarked, the introduction of meters naturally resulted in more economical methods. Economy, through the most efficient use of gas became increasingly apparent as the growing costs forced up the rates, for natural gas exists only in limited quantities and the normal average life of a gas well is said to be about eight years.

The last few years have witnessed decided improvements in the use of natural gas industrially. These improvements are partly through improved devices—burners and furnaces—as well as through more scientific combustion control and methods of heat application.

Research and the development of equipment to take advantage of the high heating qualities of gas, have made possible its use for new purposes. The result of such study has been that quite revolutionary changes have been made in many of the heating processes involved in many steel mills for annealing and heating purposes, the use of which results in a much improved quality of the product in comparison with some of the methods heretofore used.

In the manufacture of wire, natural gas has replaced coke and producer gas for annealing, patenting and tempering. It is reported that in one instance the use of natural gas doubled the output previously yielded by a producer gas installation.

In one glass works, improved equipment has reduced the gas consumed almost one-half and at the same time lowered the melting time from thirty to twenty-two hours.

In bread baking the cost of fuel was reduced from seventy-six cents per 1,000 loaves to fifty-two cents, and the product was greatly improved.

These are all actual results accomplished by Pittsburgh natural-gas engineers, and represent but a few of the many improved applications of natural gas in the district.

Gas as required in the glass and iron and steel trades has done much to retard their decentralization when compared with other products of national demand, and Pittsburgh has remained the center of both these trades. The unquestioned leadership Pittsburgh has retained in these industries is a striking illustration of the practical advantages natural gas bestows. For gas when compared with other fuels has certain inherent advantages such as quality of product, spoilage, control, availability, performance, flexibility, convenience, and freedom from smoke.

Our local electric company often uses the slogan "Making Pittsburgh Smokeless." Cannot natural gas utilities claim an earlier right to this expression? By its cleanliness; by its absence of all smoke, soot, and disagreeable combustion products; and by its elimination of ash and disposal problems, natural gas has led among the fuels in freeing the city of its unbecoming name. Indeed, the pamphlets of the '80's and '90's all exclaim at the increasing clearness of Pittsburgh's sky. Even then the still present wonder over "when the gas supply would fail" had started. For, as before mentioned, natural gas is no longer being made in the bowels of the earth; and as the nearby fields are emptied, other fields at greater distances must be tapped.

Pittsburgh, so long accustomed to this convenient fuel, would be handicapped greatly were the supply to fail. From 1906, Pennsylvania's natural gas production figures showed a downward trend, until Pittsburgh's war activities called for all available fuel. The consumption peak in 1917 of 202,000,000,000 cubic feet in western Pennsylvania will probably not be equalled for a while, if ever; but it shows what this industry, as often called "dying," can do in an emergency.

The Pittsburgh district is served by twenty natural gas utilities, and in addition several manufacturers find their requirements large enough to direct their own gas operations. About 128,000,000,000 cubic feet of natural gas are annually distributed through these agencies. Fed from about 5,000,000 acres of gas lands through a network of 30,000 miles of pipe lines, the natural gas consumption of the Pittsburgh district is about one-eighth of the country's consumption.

Great effort has been expended in supplying Pittsburgh's natural gas demands. As the gas lands in Pennsylvania became drained, other fields in West Virginia were acquired in the 1890's. In the near future gas will be brought to Pittsburgh from fields more distant. Of course, more distant gas fields have forced increases in rates, and undoubtedly the time will come when natural gas per cubic foot will be no cheaper than manufactured gas is in other sections. The price being equal, Pittsburgh will even then have tremendous advantage in natural gas, as it yields more heat per cubic foot than manufactured gas.

Much has been written of the merits of the different fuels, and power forms. As each new form is developed or a new process appears, it is tried in actual operation, and experience soon shows whether it is well suited. Thus electricity has proven best where power or light are desired; and gas has found its big field where heat is required. Where gas is wanted, natural gas will be used if available.

The superior heating qualities of natural gas show in the following:

1,000 cubic feet of natural gas furnish the same amount of heat as 2,000 cubic feet of manufactured gas. It takes over 300 kilowatt hours of electricity to produce the heat contained in 1,000 cubic feet of natural gas.

In the country as a whole, the production of natural gas has really experienced a huge increase in the last two decades. It was 388,842,562,000 cubic feet in 1906 and 1,164,000,000,000 cubic feet in 1925. As far as Pittsburgh is concerned, its problem is simply the problem of supplying its vast consumptive demand from ever remoter fields. It is now receiving the larger portion of its supply of gas from West Virginia and Kentucky wells at a distance of 220 miles. Deep drilling has been resorted to, a well at McCance, Pa., within forty-five miles of Pittsburgh, having been sunk to a depth of 7,756 feet or five times as deep as the Haymaker well at Murraysville which delivered gas to Pittsburgh forty-four years ago.

Already domestic consumers are confronted by an approaching choice between doing without this incomparable fuel or consenting to pay the gas companies a price for domestic use sufficient to permit the companies to maintain their large plants with only a minimum of industrial business.

Considerable as the handicap of the companies is, a recent technical review points out that on a single day last winter a year ago they supplied the district with 560,000,000 cubic feet of gas. The situation today would seem to be, therefore, one in which a serious problem is being envisaged by exceedingly energetic and resourceful men who, aided by skilled scientific research, have mastered all their problems of the past and draw from their success a faith in their ability to cope with whatever necessity overtakes them in the future.

PITTSBURGH AND THE CORK INDUSTRY

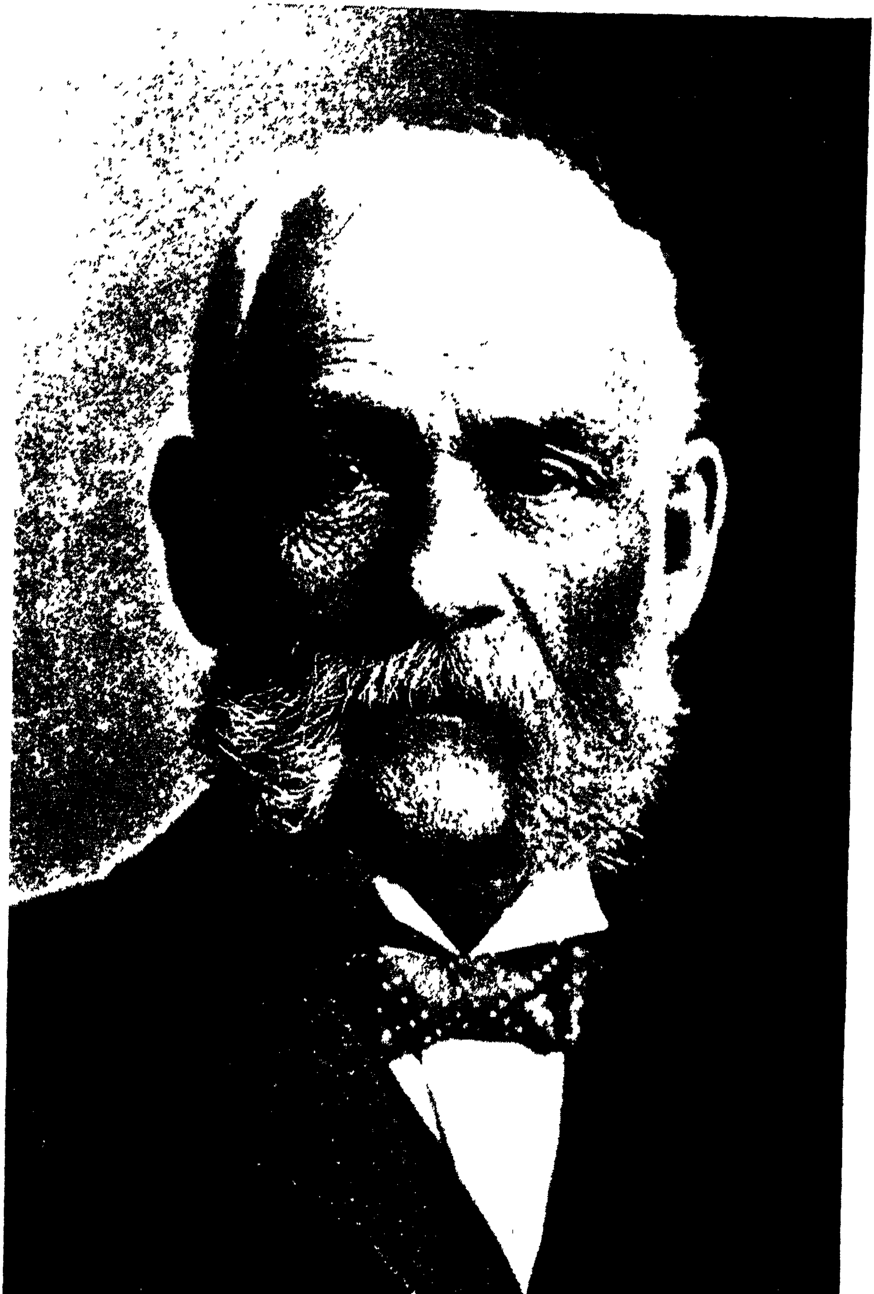
C. D. ARMSTRONG

Charles Dickey Armstrong, president of the Armstrong Cork Company, was born in Pittsburgh, North Side, October 12, 1861, the son of Thomas Morton and Martha Jane Armstrong. He was educated in Pittsburgh, graduating from the Central High School in 1878, and commenced his business career two months later as clerk with Armstrong, Brother and Company, of which firm his father, Thomas Morton Armstrong, was the head. He gradually made himself familiar with the industry in its various departments, and when the business was incorporated in 1891, he was chosen vice president, and on the death of Mr. Thomas M. Armstrong in 1908, succeeded to the presidency, which office he has held since that time.

The company owns and operates six manufacturing plants, the original or parent factory being located in Pittsburgh, the others being at Beaver Falls, Pa., Oakdale, Pa., Lancaster, Pa. and Camden, New Jersey.

The company also owns numerous stations in Spain, Portugal, and Algeria for the collection and preparation of corkwood, cork-waste, and similar materials. It operates two plants in Spain—one in Seville and one in Algeciras, for the manufacture of corks and cork insulation.

Mr. Armstrong is identified with the Armstrong Cork Company as president and director; Armstrong Cork and Insulation Company as president and director; Armstrong Cork and Insulation Company Ltd., of Montreal as president and director; Armstrong Cork Company of Spain as president and director; Union National Bank as chairman of board of directors; Consolidated Lamp and Glass Company as director; Western Pennsylvania Hospital as director and member of executive staff; and the Pittsburgh Citizens Committee on City Plan as president.



THOMAS M. ARMSTRONG

Pittsburgh and the Cork Industry

BY C. D. ARMSTRONG

THE cork, or corkwood, of commerce is the bark of a live oak tree, quercus suber. The production of cork is confined to the southwestern portion of Europe and the northern coast of Africa. Spain, Portugal, and Algeria are the leaders in production. Morocco has large undeveloped forests which are now being exploited under French control. Cork is also produced in southern France, Corsica, Sicily, and Sardinia. In olden times the mountains of Italy had extensive cork forests, but they have almost disappeared owing to the demand for firewood and charcoal. The total area of the world's cork forests is estimated at 3,760,000 acres, approximately the same as the Spanish olive or grape acreage, and almost as large as the Brazilian coffee plantation area. Algeria leads, with twenty-eight percent of the total, followed by Portugal, Spain, Morocco, France, and Tunisia. The total acreage is almost equally divided between Africa and Europe, but at least seventy-five percent of the commercial production comes from Portugal and Spain.

The acorn crop from cork forests is a source of considerable income, and it is estimated that in Portugal alone more than 300,000 swine are reared on acorns of the holm and cork oak. The hams from such swine are reputed to have a very piquant flavor and bring high prices.

The cork tree in general contour resembles the live oaks we see in the south of our country and in California, but rarely exceeds two feet in diameter and forty feet in height. The leaves are small, evergreen, of a leathery texture, dusty green in color, lanceolate in shape, with serrate edges. The cork oak will grow in almost any kind of soil, will stand considerable cold without injury, and would probably thrive in California and many parts of our southern states. The character of the bark depends greatly on the fertility and moisture of the soil in which the tree grows. If the ground is fertile and damp, the tree grows vigorously and the cork bark is thick and generally poor in texture. The best cork bark comes from trees grown in rather sterile soil without too much moisture, being closer in grain and thinner than that from trees grown under more stimulating conditions.

The bark of the cork oak is peculiar in that the outside portion is pithy and elastic and can be removed during the summer without injury to the tree, if care be taken not to damage the cambium or inner layer of bark which carries the sap. In well-regulated practice, it is the custom to remove the bark at intervals of from eight to ten years. In some districts, the trunk is stripped one year and the bark removed from the larger branches four or five years thereafter. When the eight to ten year period is completed, the operation is repeated in the same manner. When the young tree reaches a diameter of four or five inches, the first, or virgin, bark is removed. This is employed to a slight extent by florists and others for decorative work, but most of it is ground and utilized in making corkboard and packing grapes. The second stripping is used for making corks, but the bark is generally cracky and the waste in cutting is greater than that from cork of subsequent strippings.

After the tree has been peeled four or five times, the bark usually begins to deteriorate, becoming more grainy, with little knots or hard spots which lessen its value for cork making.

It is interesting to note in passing that when the bark is removed the trunk of the tree is a light cream in color, but after a short time it becomes red, and then brown.

After the bark is stripped from the tree, it is boiled, and part of the back, or outside, is scraped off. It is then assorted to the thicknesses and qualities required for its various uses.

In cork-producing countries, cork manufacturing was originally done by hand, and many handcut corks are made today. The sheets of cork were sliced or stripped to a width equal to the length of the stopper desired. These strips were cut into squares or quarters from which the corks were rounded by hand. A good workman could produce from 2,000 to 2,500 corks per day. The Catalans became very skillful, and are today the most adept cork workmen in Spain.

Cork manufacturing spread gradually from Catalonia to Andalusia, which now produces a much larger quantity of corkwood than Catalonia. Portugal is also a most important cork-producing and manufacturing country, exporting a much larger proportion of its output in unmanufactured form than Spain, which country consumes at least three-fourths of what it grows and in addition imports large quantities from Portugal and Algeria.

Cork manufacturing by hand was never carried on to any great extent in the United States, although in the earlier days prior to 1860, there were a few handcutters, mostly English, in New York and Philadelphia.

Cork bark has a number of peculiar qualities which make it very valuable in the arts. It is cellular in structure, and for that reason fluids do not pass through it as they would through ordinary wood. It is compressible and can easily be reduced to one-fourth or less of its natural volume without destroying its natural properties. It is resilient and has a strong tendency to resume its natural shape after the pressure is removed. It does not flow under compression or heat. For instance, if a cylinder of cork one inch in diameter and one inch in length is put under vertical pressure, the length can be reduced to one-fourth inch while the diameter will remain one inch, as it was at the beginning. A piece of rubber of the same size and shape can be reduced also to one-fourth inch in thickness, but its diameter will greatly increase, or will flow. Cork, on the other hand, will not flow, and for that reason cannot be molded in small shapes with the same facility as plastic substances. The value of cork as a stopper is due to its characteristics of impermeability, compressibility, and resilience. Its efficiency as a nonconductor of heat is largely due to its cellular structure.

The old method of hand manufacture of corks has been entirely superseded by machine processes. When the cork is stripped from the tree and goes through the preliminary preparations of sorting and sizing, the pieces will run from the size of one's hand to a sheet occasionally three or four feet in length and perhaps twelve inches wide, but the pieces are almost invariably irregular in shape and the back more or less cracked.

Cork varies in value on today's market from say three cents per pound to thirty or more cents, depending upon its quality.

The manufacturing process consists of first steaming or moistening the cork to make it workable. It is then stripped by circular knives, not saws, to the desired width, representing the length of the stopper. These strips are then punched or blocked and straight or cylindrical blanks are produced. These are sometimes sold in this form, but oftener are tapered to the well-known cork one sees in bottles.

The first person to manufacture corks on a commercial scale in this country was William King, of New York City, who died only a few years ago, having lived almost a century. A former workman of his, Harry Overington, came to Pittsburgh shortly before 1860 and began to cut corks by hand in a little room at the corner of Smithfield street and Diamond alley. In 1860 two young men, Thomas M. Armstrong and John D. Glass, seeing in this new industry a possibility of improving their condition, purchased the business. At that time Thomas M. Armstrong was shipping clerk for William McCully & Company, pioneer Pittsburgh bottle manufacturers. With money saved from his salary, he furnished the capital, and Mr. Glass agreed to devote all of his time and energy to the new business at a salary of $600 a year. The outcome of the venture being doubtful, Mr. Armstrong did not feel at the start that he would be justified in resigning his position with the bottle company, but after a short time, during which he had invested practically his all in the business, it became a question of making the enterprise a success or losing everything. With characteristic energy and faith, he devoted himself to the work, and the little firm began to make headway. The first machinery was bought in 1862 from a Philadelphia cork manufacturing firm which retired from business ten or fifteen years ago. Mr. Glass died in 1864, and shortly afterwards his interest was purchased by Robert D. Armstrong, a brother of Thomas M. Armstrong, and by William L. Standish, the old firm of John D. Glass & Co. being succeeded by Armstrong Brother & Company.

The three partners of the new firm, all young men, took an active personal interest in the business, and their trade grew steadily. Their first place of business, or factory, was on Third avenue in the rear of the old St. Charles Hotel. From there they moved to larger quarters at 44-46 First avenue, and there they remained until 1878, when the premises were destroyed by fire. A new factory was built under trying conditions on a tract of land on Twenty-fourth street, 120 feet in width and extending from the Allegheny Valley railroad to the Allegheny river. The remaining portion of the land between Twenty-third and Twenty-fourth streets was subsequently purchased and is the site of the present Pittsburgh plant of the Armstrong Cork Company.

Frank L. Blair, who had been with the firm as superintendent in charge of actual manufacturing operations, deserves much credit for the successful and rapid completion of the new factory and for the development of special machinery suitable for the economical production of corks and various cork specialties.

Robert D. Armstrong, who was in charge of the financial end of the business, died in 1878, and his death was a great loss to the firm, as he was a very energetic, able business man and did much to pilot the firm through many financial straits during the early years of its history. His interest in the business was purchased by his brothers, Thomas M. and Andrew J. Armstrong.

William H. Pfahl, later to become secretary and treasurer of the company, was their first bookkeeper. Mr. Pfahl is still hale and hearty, takes a keen interest in the Armstrong Cork Company and its affairs, and retired from active duties only seven years ago.

Charles D. Armstrong entered the employ of the firm in 1878. William E. Evans, later to become vice president, began as a salesman. He contributed a great deal to the upbuilding of the business of the company.

In 1878 a policy of establishing branch distributing houses for the better service of the firm's patrons in different sections of our rapidly growing states was adopted. The first was established in New York and was under the charge of John Robinson, its business being conducted under the firm name of John Robinson & Company until the formation of the Armstrong Cork Company. A second branch was opened at Chicago and subsequently others in St. Louis, Boston, Philadelphia, Baltimore, and Cincinnati.

Prior to 1878 all the corkwood or cork bark was purchased from American importers or from English and Scotch merchants, but in that year an arrangement was made to purchase, prepare, and ship corkwood and corks directly from Spain. The Armstrong Cork Company now has a fine plant located in the suburbs of the beautiful old city of Seville, employing approximately 600 persons, and is well equipped to collect and prepare corkwood and cork waste to meet its needs.

In 1891 the firm of Armstrong Brother & Company was incorporated as Armstrong Brother & Company, Inc. The name was subsequently changed to Armstrong Cork Company, and at this time the business was expanded by the purchase of a number of small cork factories in Lancaster, New York and Chicago.

About the year 1900, one of our directors, Mr. George Gudewill, who was accustomed to spending a portion of his time in Germany, called the attention of the company to the large business being done in that country in corkboard for insulating purposes, and particularly for cold storage work. After investigation, negotiations with Grunsweig & Hartmann resulted in the purchase of their United States patents for a type of insulation known as impregnated corkboard. A five-acre plot of ground was purchased in Beaver Falls, and buildings were erected for its manufacture. This location was selected because it was close to Pittsburgh, and the expectation was to furnish cork waste to Beaver Falls from the Pittsburgh factory. James E. Quigley was chosen as head of this department.

Shortly thereafter it was found that impregnated corkboard was inferior in structural strength and insulating quality to corkboard made under the patents of John T. Smith, an American, and in 1904 these patents were purchased from the Nonpareil Cork Manufacturing Company, as well as their plant and business at Camden, N. J. Both the Beaver Falls and Camden plants have been repeatedly enlarged with the development of the business, and corkboard is one of the most important of the company's products. Armstrong's Corkboard for walls, floors, ceilings, and partitions of cold storage rooms in many industries and Armstrong's Cork Pipe Coverings are now standard, not only in America, but in all parts of the world where the cold storage industry has been exploited.

It is interesting to note in passing the death of the active men who founded the business. Charles M. Fay, a director of the company and manager of the Chicago office, was called by death in 1902. In the same year William L. Standish decided to retire from active business and in April his resignation as director was regretfully accepted, his son, Thomas A. Standish, now assistant treasurer and secretary of the company, taking his place on the board. Mr. William L. Standish died in 1904. His connection with the business dated from its infancy, and his genial disposition and spirit of wholehearted cooperation endeared him to all his associates. A month later the company was again called to mourn the loss of another beloved director and official in the person of Andrew J. Armstrong, its treasurer. Mr. Armstrong was the youngest brother of Thomas M. Armstrong, founder of the house, and had spent practically all his business life with the company. Mr. Armstrong is lovingly remembered by a host of friends in our business circles and in the community in which he lived.

In May, 1908, Thomas M. Armstrong, founder of the business and president of the company since its organization, passed away after an illness of ten days. Mr. Armstrong was sincerely mourned by his business associates and the employees of the company. His was clearly the moving and guiding spirit of the organization. He laid deep and wide the foundations of the company in upright, aggressive, and progressive methods, and the company owes much to the good reputation which his strong, able, and lovable personality was instrumental in upbuilding.

John Robinson, our first branch manager, died in 1911. He was a born salesman, a man of genial, jovial disposition, and an untiring worker. His optimism, energy, and good fellowship will always be a pleasing memory to his associates.

John J. Evans, now manager of the linoleum division, entered the employ of the company in a very minor capacity at the age of fourteen, and on the death of Mr. Robinson he was elected director to fill the vacancy on the board.

In 1907 it was decided to add a new line, linoleum, and a plot of ground of about thirty acres extent in Manheim township, just outside the city limits of Lancaster, was purchased. In July of the same year building was begun, and operations started in October, 1908. Since that time the plant has been repeatedly enlarged.

For convenience in operation, it has been found advisable to organize a number of subsidiary companies—Armstrong Cork & Insulation Company, a Pennsylvania corporation, Armstrong Cork & Insulation Company, Ltd., of Canada, Armstrong Cork Company of Spain, Armstrong Cork Company of France, Armstrong Cork Products Company, etc.

Our business naturally separates itself into three divisions—corks and cork specialties, cork insulation, and linoleum. It may be interesting to review hastily the changes in these businesses since their inception. When the cork business was started, stoppers for fruit jars were the important part of the business. With the coming of the Mason jar, a screwtop with a rubber gasket, the demand for the old-style corks diminished and in time disappeared. In the late 60's and during the 70's, the soft drink business developed rapidly and the demand for soda corks was very great, especially during the summer months. The invention of the spring stopper marked the beginning of the decline of the soda cork business. A soda bottle with a cork stopper is now never seen.

In the early 80's, great impetus was given to the bottling of beer by the use of the pasteurizing process. This gave rise to a large demand for corks of good quality, and the great brewers were by far the largest customers of the cork makers. Every keg of beer also carried a large tap cork. The invention of the crown cork marked the beginning of the decay of this business, and the old-style keg corks also disappeared, being superseded by the wooden tap bung which answers the same purpose better than cork and can be bought for a fraction of the price.

The manufacture of corks naturally divides into two general classes, straights and tapers. It is seldom one sees now a long, straight cork in a beverage bottle, while thirty years ago they were used in enormous quantities. With the advent of the crown cork, the production of which today reaches perhaps eighty to a hundred million gross yearly, the old-style straight corks gradually disappeared. The taper corks are used mostly by druggists and manufacturers of chemicals, perfumes, medicines, and toilet preparations, for whiskey flasks, and for general household purposes. In addition to these two classes of stoppers, a great variety of circular discs, washers, and specialties are made from natural corkwood and from various kinds of cork composition. Seine corks, life preservers, ring buoys, cork insoles, etc., may be mentioned, but the volume of consumption in these lines is comparatively small.

With the advent of the crown cork, the demand for fine cork bark suitable for its manufacture became so great that it was impossible to supply it. Research men began to look for a material to replace natural cork. A cork composition was developed which is now used not only for the manufacture of discs for crown corks and other commonly used metal closures, but also for various specialties for mechanical purposes, such as gaskets for automobiles. The use of these gaskets in motor cars started when the manufacturers began to cut their costs by using pressed steel parts or steel stampings. In the early years of the automotive industry, it was the custom to make many parts of cast iron or aluminum, machined to a very smooth finish where they joined with other parts. To lower production costs and at the same time reduce the weight of the finished machine, these materials have been replaced by manufacturers in recent years, in almost all cars made in large quantities, by pressed steel parts. As their name indicates, these are pieces of sheet metal died to shape in huge presses. They are almost never machined, and consequently are not perfectly smooth on the approximating surfaces. When the machined parts were used, it was necessary to place paper gaskets between them, these gaskets being shellacked to both parts, and although such joints are not absolutely tight, they are still used with most machined surfaces.

Gaskets of this kind will not do for unmatched pressed steel parts.

With them, it is necessary to have a resilient material, impenetrable to liquids, with some body to fill in the rough and uneven surfaces. Fine cork composition is the only material that has met this need satisfactorily. It is nonabsorbent, resilient, and does not set under compression. When the two parts are bolted tightly together, the cork is pressed into the rough, uneven spots in the face of the part. Its tendency to resume its original thickness causes it to press constantly against the metal, thus preventing leakage between the cork and the metal. Leakage through the cork itself is impossible. In this, cork differs from felt, which is absorbent and retards leakage only long enough for the oil to pass slowly through it from the inside to the outside of the gasket. The thick, treated paper fibers sometimes used are not always absorbent, but differ from cork in that after they have been compressed they soon set and become hard, allowing the oil to leak out between the gasket and the steel. This condition is sometimes made worse by hard spots in the fibers. Compression of a cork gasket pushes the particles into all the uneven places in the metal surfaces, but it does not spread or flow away from the point where the pressure is exerted.

From this beginning, the mechanical use of cork has spread to various other machines and mechanical devices, not only as gaskets, but for many and various uses. The most important among these adaptations are oil retainers for babbit, ball and roller bearings and friction devices of several kinds. One of the peculiar qualities of cork is that its efficiency as a friction medium is not lowered when oil or water is splashed on it.

Cork paper was formerly used to a large extent for the tips of cigarettes. It is not now in as great vogue as formerly, and its manufacture in this country has ceased, as it can be produced abroad and imported much cheaper than it can be made here.

The word "insulate" means "to place in a detached state or situation," hence it is apparent that heat insulation is the medium used to produce this detached state where heat is encountered or used. In cold storage warehouses, the walls, floors, and ceilings of the storage rooms are insulated to keep out the heat of the surrounding outside air so that the desired low temperature inside the rooms can be maintained with a minimum of refrigeration. In the case of steam lines, boiler settings, furnaces, or ovens, the opposite condition obtains. The temperature inside the pipes or apparatus is much higher than that of the surrounding air, and insulation is used to keep the heat from escaping into the atmosphere, where it does no useful work. No one insulating material is best suited for all conditions.

Corkboard insulation is manufactured by grinding up scraps of cork, cork waste so called, so that the large granules will pass through a three-quarter-inch mesh screen. Next it is sifted to eliminate all dust and fine particles. The granulated cork then passes from hoppers into steel molds, where it is compressed to eliminate the spaces between the different particles. The molds are then locked and carried slowly on conveyors through long ovens, where the heat brings out the natural gum or resin of the cork, which cements the whole mass firmly together. No pitch, glue, or other binder is necessary, since the natural gum answers this purpose.

As they are removed from the molds, the sheets of corkboard are passed through machines which trim the ends, faces, and edges, making boards uniform in size, twelve inches wide, thirty-six inches long, and one, one and one-half, two, three, four, or six inches in thickness. Because of its distinctive qualities, corkboard finds a wide field of usefulness wherever either mechanical refrigeration or ice is used for cooling or freezing purposes. Being an excellent non-conductor of heat, the heat of the atmosphere does not travel through it nearly so readily as it does through ordinary building materials such as brick, stone, lumber, hollow tile, concrete, etc. One inch of corkboard is as effective for insulation as fifteen inches of brick wall, twenty inches of concrete, or three inches of pine wood.

To understand why Armstrong's Corkboard is a non-conductor of heat, we must bear in mind the characteristics of cork. Under a microscope, it is seen to have a very peculiar structure, being a mass of tiny cells separated one from the other by thin walls of cellulose. Each of these contains a bit of entrapped air. Moreover, every cell is sealed up tightly, making it impossible for any circulation of this air to take place. In other words, the air contained in cork is still.

It is recognized that non-circulating air is the best non-conductor of heat known, except a vacuum; therefore it is easy to understand why cork is so successful in keeping heat out and cold in. It contains a larger volume of really still air than any other material available for insulation purposes.

In making corkboard, the cellular structure of the natural cork is in no way injured. In fact, the baking process actually enhances the heat-retarding ability of the raw cork in two ways. First, it drives off the moisture, and, second, it liquefies the natural waterproof gum of the cork, which spreads over the surface of each granule, thus providing an additional barrier to the entrance of moisture.

While the large cold storage warehouses, meat packing plants, ice storage houses, and ice cream and milk distributing plants take the bulk of the corkboard, a surprisingly large amount is used in the construction of small cold storage and chill rooms in dairies, creameries, fruit and produce warehouses, poultry and egg packing plants, wholesale and retail markets, and, last and one of the most important, in the insulation of the small household electrical refrigerators now being so generally used. Business in this line is becoming exceedingly competitive. There is a tendency to cheapen the construction of the icebox itself, and some manufacturers are using insulating materials for lining boxes which have been found unreliable and unsatisfactory in large cold storage work. Competition to produce cheaper machines almost invariably leads to the use of cheaper materials, which oftentimes are not the best.

Another specialty use for corkboard is the insulation of roofs in textile and paper mills and other buildings to prevent the condensation of moisture on the inside, to conserve heat in cold weather, and to afford protection from excessive heat in summer. In paper and textile mills and in other plants where the humidity of the atmosphere is high, moisture condenses on the ceilings whenever the temperature of the ceiling surface falls below the dewpoint. By applying the proper thickness of corkboard on the roof deck, the ceiling surface can be kept at practically room temperature and condensation minimized or, in most cases, entirely prevented. This is a great advantage as it stops drip and consequent damage to goods and machines and greatly prolongs the life of roof timbers.

The use of insulation in residence construction has, in recent years, opened up another field. As can be readily understood, insulated houses are cooler in summer and warmer and more economical to heat in winter. Our investigations show that outside walls and roof should be insulated with 1-inch, 1½-inch, or 2-inch material, depending on the temperature conditions with which we have to deal and the price of fuel. The efficiency of corkboard is certainly not less than that of any of the numerous fibrous insulating materials on the market, of which it is the custom to use a sheet ½ or ⅝ inches in thickness. One can readily see the relative value of an insulation of that type compared with one several times as thick of an equally efficient non-conducting medium. One represents the result of serious study of what is needed for conditions to be met, and the other is a cheaper and less efficient installation. It might be compared to putting on a summer coat when one really needs an ulster.

Corkboard can be erected in any type of building, and has the particular advantage that plaster or stucco can be applied directly without the use of lath.

While corkboard represents the largest output of the insulation division, it is only one of a number which, singly and collectively, make up a large volume of business.

Cork pipe covering is an all-cork product similar to corkboard except in shape. It is molded into the necessary shapes to cover pipe runs and pipe fittings and is used to insulate cold lines such as brine, ammonia, ice water, etc.

Machinery isolation corkboard is placed under fans, motors, and other machinery to absorb vibration and deaden noise.

Circle A Cork Brick find a wide use in dairy barns for flooring the stalls.

Cork tile is a floor made entirely of cork. Its comfort and quietness underfoot make it especially desirable for floors in bathrooms, banks, libraries, churches, public buildings, and offices.

Another floor tile, the sale of which is handled by the insulation division, is Linotile, a composition of cork with linseed oil, gums, and pigments. Linotile has many desirable features lacking in most flooring materials, being resilient, quiet and nonslippery. It is made in a great variety of plain colors and marble effects and in many sizes and shapes, and affords an almost unlimited range of designs.

The insulation division also manufactures a number of high-temperature insulations such as Nonpareil and Armstrong's Insulating Brick for furnaces, ovens, etc., and Nonpareil High Pressure Covering and Blocks for steam lines and power plant equipment.

The linoleum of commerce is a flooring material having a foundation or back of burlap on which is imposed a body composition having as its principal binder oxidized linseed oil incorporated with finely ground cork or wood flour, rosin, various gums, and pigments. There are five chief kinds of linoleum made at the present time; namely, plain, printed, jaspe, straight line inlaid, and moulded inlaid, each of which is made by different process and requires a different combination of ingredients in its manufacture.

Jute burlap is the foundation or back on which the mix is rolled. It is usually painted or coated on the under side to make it less susceptible to the influence of varying atmospheric conditions. Linoleum burlap is made from jute grown in India and is generally woven in or near Dundee, Scotland. This district has had a virtual monopoly on the production of that class of burlap for many years, but before the war Germany was becoming a factor, as she produced most of the burlap needed for her domestic consumption and had a small surplus for export. Burlap manufacture in Germany is now increasing again. For years India has been out-stripping Scotland in the production of the more ordinary narrow burlap used for bagging and similar purposes, and it seems reasonable to believe that the wider and more carefully woven Hessians will be eventually made in the land which produces the raw material, and from which it can be distributed with the minimum of expense.

Cork, in the form of cork flour, is the most desirable ingredient in linoleum on account of its lightness, toughness, resiliency, and resistance to water. The cork waste from which cork flour is made comes from Spain, Portugal, and North Africa, although some is, of course, obtained from the company's factories in the United States, as well as other plants in this country.

The binder used in linoleum is linseed oil, which may be oxidized by various methods. This oil is obtained from flaxseed, being expressed from the seed in a large way in this country. Argentina produces an even greater amount of flax than the United States, and the importations of seed each year are very large. Flax is also grown in Russia and India, but soon after the beginning of the World war production in these countries was greatly curtailed, particularly in the Baltic districts. Flax production has not reached the prewar quantities in the Soviet countries since the close of the war.

The processes of manufacturing the several kinds of linoleum differ greatly. In the manufacture of plain linoleum, the oil, after being previously boiled and oxidized, is thoroughly mixed with the resins or gums and cooked until it forms what is known as cement. A given quantity of cement is then weighed out and worked with the proper proportion of cork and other ingredients to produce the mix or dough. Among the ingredients are the pigments necessary to give the required color. Each piece of plain linoleum is of one shade only, and the color is the same all the way through to the back. Hence, the pigment must be mixed right in with the cork and cement before the combination is pressed on the burlap. A thorough blending insures the complete incorporation of the various elements. The mix then passes to the calender where it is fed on to the burlap as it passes between the calender rolls, the thickness of the resulting linoleum being regulated by the distance between the surfaces of the two heated rolls. The calendering operation forces the linoleum mix into the interstices of the burlap and keys it there. All plain linoleum is identical in its general make-up, the only differences being in color and thickness. Particular care is taken with every piece of linoleum to make certain that it is rolled to the proper thickness. An average tolerance of only five one-thousandths of an inch is allowed either above or below the standard.

An important part of the production of our linoleum plant is printed linoleum. This is the ordinary, everyday linoleum, whose sphere in the past has been confined primarily to bathrooms, kitchens, corridors, and the like. The first step in the process of making it is to produce a plain linoleum of the proper thickness. This is then stoved and partly dried, after which it is run through the printing machine, which carries a number of blocks, generally speaking one for each color in the design. After printing, it goes back into the stove, where it remains for a sufficient time to dry the paint thoroughly and to oxidize the oil in the body of the cloth.

We now pass to inlaid linoleum and begin with the moulded type, which is made by first mixing thoroughly the ground cork or wood flour and cement, as in the case of plains and prints, but with the difference that enough color pigment is also added to give the mix the shade required in one color of the design. As many colors are thus mixed as are required in the finished pattern. After each color is thoroughly mixed and pulverized, it is cooled to prevent its becoming sticky and also to retard too rapid oxidization. When cool, the mix is brought from the cooling room and applied to the burlap. This is done by rubbing the dry, sandy mix through metal stencils onto the burlap underneath. One of these metal stencils is prepared for each color, there being thus required as many stencils as there are colors in the pattern.

The burlap travels along until all the colored mixes are imposed upon it, and it is then carried under a hydraulic press which sets the mix solidly and gives it a smooth, even face. The goods are then matured, after which they are trimmed, carefully inspected, and put into the warehouse as finished stock.

Straight line inlaid is similar to moulded in that here also the colors go all the way through to the back. In moulded inlaid, however, the border or margin of each particular figure is not clearly outlined. When the piles of the several colors are all pressed together, there is a tendency for each to flow a little into the one next. The margins of straight line linoleum figures, on the other hand, are sharply defined. This result is obtained by rolling out sheets of the various colors required and dieing out pieces from them to conform to the pattern to be made. These pieces are automatically assembled into a design on the burlap. They are then subjected to calendering pressure which keys them into the interstices of the burlap and also binds them to each other. The goods are next stoved, matured, trimmed, and inspected. Marble inlaid linoleum is made in the same way.

There is no logical reason why the cork industry should have been started in Pittsburgh except that it is the outgrowth of years of energy and hard work on the part of the aggressive and progressive men who started the business. Geographically, Pittsburgh is not the most favorable place to manufacture corks or corkboard. The raw materials come from abroad, and the freight from the seaboard to Pittsburgh could be largely saved if the factories were located at the seaboard. Pittsburgh also has a drawback for cork manufacturing in the large number of dark days, which makes the sorting process very difficult and uncertain. The atmosphere is also dirty, which makes it difficult to keep the manufactured corks clean and in acceptable condition to the buyers. In spite of these handicaps, the Armstrong Cork Company secured and held against competition practically one-half of the cork stopper and cork specialties business of the country.

The same remarks apply to perhaps greater extent in the case of cork insulation, as it is a cheaper product and the freight is a large factor in the cost. By the purchase of a factory in Camden in 1904, the Armstrong Cork Company fortified itself somewhat against this handicap. We now supply the bulk of the corkboard, cork pipe covering, and similar products manufactured at Camden to the eastern trade, and use the Beaver Falls factory for shipments to central and western points.

Of late years Spanish competition has become aggressive and serious, and the company now operates a corkboard factory in Seville, Spain, and one in Algeciras. The Seville factory is now being enlarged. It is possible to produce corkboard in Spain and deliver it to any points on our Atlantic seaboard, including Montreal, at practically our cost at the seaboard in Camden. This means that it is impossible to manufacture corkboard in this country and ship to those points which are reached by direct steamer from Spain and Portugal. Practically all of the corkboard we distribute in the south and on the Pacific Coast comes in via the Gulf of Mexico, and it seems quite probable that ere long it will be necessary to make direct shipments by way of the Panama Canal from Spain or Portugal.

The same remarks are true in regard to cork stoppers. The duties at the present time are as high as they have ever been, but they appear to afford very scant protection against corks of medium and high quality which can be produced much cheaper abroad than they can in this country. The Spanish labor is less than one-fourth of what we pay here, but it is not all a question of labor. To prepare corkwood and cork waste for export, it is necessary to bale it. The baling charge on cork waste sometimes amounts to fifty percent of the first cost. It is not so much on corkwood, but at the same time enough to give the foreign manufacturer a decided advantage. On this account, it looks as though the manufacture of corkboard and also cork stoppers will gradually, but surely, drift to the other side, as the tendency is strongly in that direction.

When the linoleum factory was planned, it was our thought that we would have a production of approximately 50,000 yards per week. At the present time, the output frequently reaches 100,000 yards per day, and our Lancaster plant can and does turn out enough linoleum in a day to make a strip a yard wide from Pittsburgh to Johnstown.

After a few years' experience in the linoleum business, we reached the conclusion that the people of the United States did not know enough about linoleum, and we, therefore, began a campaign of education to the consumer. Our first appropriations for this purpose were small, but we found that if we wished to get results we would have to show enough courage in our product to tell as many of the people about it as we could. To make a long story short, the Armstrong Cork Company is now one of the largest national advertisers of the country, and our outlay for publicity will average $7,000 per day.

It has been our policy to make a good product, tell the people about it, and give them as good service as possible. Mr. Thomas M. Armstrong began with that idea when he commenced the manufacture of corks, and following in his footsteps we are doing the same thing today on a vastly larger scale.

The cork industry is a monument to the foresight of those who initiated it, and its expansion has been natural with the growth of the population and the purchasing power of the people.

The Armstrong Cork Company has extensive waterfront facilities at Gloucester, N. J., and almost all of our raw materials for the manufacture of cork and corkboard come up the Delaware river.

While our linoleum plant was begun as a branch of the Armstrong Cork Company, the capital investment in Lancaster, where the linoleum plant is located, now exceeds that of all the other factories put together, and the working capital required is about sixty percent of that used by the company. The original industry, corks and cork specialties, is now the smallest division of the company's business. Our company employs approximately 6,000 people, and our payroll in 1926 was about $9,500,000.

Raw materials for making linoleum come from all parts of the world—jute from India, finished burlap from Scotland, cork from Spain and Portugal, some colors from Persia and Spain, gums from New Zealand, Borneo, and the Congo Free State.

Our linoleum and felt-base floor coverings are now being sold at retail in Naples, Paris, London, Oslo, Rio de Janeiro, Buenos Aires, Montevideo, and Valparaiso. Recent shipments have also gone to China.

Among the army of people served by the Armstrong Cork Company are 30,000 users of refrigeration, 40,000 retail floor covering merchants, 50,000 retail druggists, not to mention automobile users, shoe manufacturers, bottlers, textile makers, etc.

We have eight factories in the United States and seventeen factories and packing plants abroad—four in Portugal, five in Spain, two in France, four in Algeria, one in Tunisia, and one in Morocco.

One of the great troubles in a large industry is to maintain a satisfactory relationship between the management and the men. We have been singularly fortunate in this respect as, since our business was started in 1860, we have had only one serious labor dispute, which occurred in 1891, a few months prior to the great Homestead strike.

It is difficult in operations conducted on a large scale to maintain the personal relationship possible in smaller groups. It has been our endeavor at all times to have our superintendents and foremen maintain a perfectly fair and square attitude with our work people so they would be absolutely sure any promise given would be kept, and we have succeeded in building up a healthy morale which has contributed much to our success. Our relations with our Pittsburgh force have always been of the most satisfactory character and measure up to those in Lancaster, Camden, and other points where we operate.

We have also found that in Spain, where we have two large factories, the men respond satisfactorily to this kind of treatment, and the production per man in these factories, where we use the same kind of machinery, is equal to that obtained in Pittsburgh.

Management, of course, is a prime factor in the success of any large business. We have been able to develop strong men from inside our own organization, and our leaders today are men mostly from Pittsburgh who began with the company at ages ranging from fourteen to twenty-five. When we have gone outside to bring in people to help, we have not always been so successful.

One of the live problems of modern industry is to maintain a proper interest in the community in which it operates, for the improvement of the condition of the working class. If the factory is located in a small city and the management is actuated by the right spirit, the problem is not difficult, but if the factory is only one of many operating in a district where the interest in the community among the factories is not general or deep-seated, it results in conditions which are not helpful to the community and which engender an attitude that is a threat to stable society.

I have the strong conviction that it is the duty, and should be the pleasure, of a corporation operating in any community, to take a real interest in whatever is good, uplifting, and for the benefit of the working classes. We should lend our aid to orderly municipal growth, to education, to hospitalization, sanitation, recreation, and all other activities which must be conducted on a community scale to make a city a worth-while place in which to reside or to conduct a business.

We must not and cannot overlook the fact that many of the community problems which trouble us are the outgrowth of modern industry. A strong, continuous effort, accompanied by a firm determination to study and remedy these conditions, should be carried on, and I am sure a wonderful improvement can be made if industry as a whole will devote to the problem a little of the energy, ability, and enthusiasm it puts into the commercial side of its work.

PITTSBURGH AND THE FOOD PRESERVING INDUSTRY

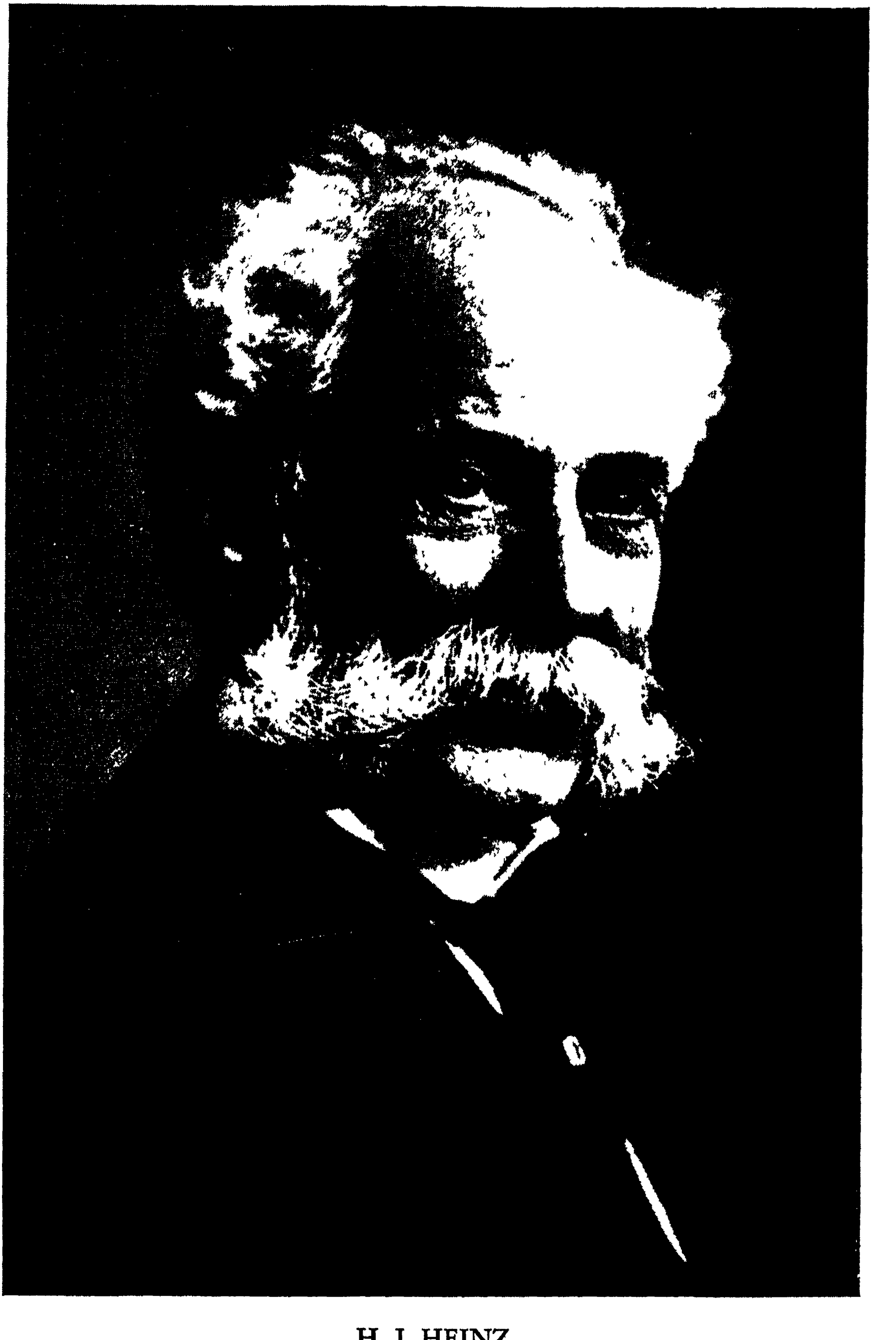
HOWARD HEINZ

Howard Heinz, manufacturer, was born in Pittsburgh, August 27, 1877, the son of Henry John and Sarah Sloane (Young) Heinz. He got his preparatory education at Shady Side Academy, Pittsburgh, and graduated from Yale in 1900. He married Elizabeth Granger Rust, of Saginaw, Michigan, October 3, 1906.

In 1900 he entered the food product manufacturing business established by his father in 1869; became advertising manager, 1905; sales manager, 1907; chairman of the board, 1915; president, H. J. Heinz Company, 1919.

He served during the World war as a member of the National Council of Defense of Pennsylvania, also as follows: U. S Food Administrator of Pennsylvania; chairman food supply committee National Council Defense, Pennsylvania; zone chairman U S. Food Administration for Pennsylvania, Ohio, Virginia, West Virginia, Maryland, and District of Columbia; member War Industries Board of Philadelphia and member executive committee American Relief Administration (European children's relief). He was director general of the American Relief Administration for Southeastern Europe and Asia Minor, with headquarters in Constantinople, January-June 1919.

Mr. Heinz is a director of the Pennsylvania Railroad Company, the Mellon National Bank, and of the Pittsburgh Chamber of Commerce. He is president of the Sarah Heinz House, Pittsburgh; member of the board of trustees University of Pittsburgh, Carnegie Institute, Shady Side Academy, Western Pennsylvania Hospital, Western Pennsylvania Institution for the Blind (Pittsburgh); trustee of the Carnegie Endowment for International Peace, vice president of the Bureau of Governmental Research, Pittsburgh; director and member of the executive board, Citizens Committee on City Plan, Pittsburgh; member of the Budget Committee, City of Pittsburgh.



H. J. HEINZ

Pittsburgh and the Food-Preserving Industry

BY HOWARD HEINZ

PRECEDING papers in the series now being presented to the Chamber of Commerce have dealt with various industries and institutions that contribute to the fame, the general progress and influence of Pittsburgh. They are notable chapters in the history of a community that has accomplished much and still retains a position where it can do more.

The descriptions of the development of Pittsburgh's industrial and educational institutions must arouse in us new visions of the city's greatness and give us sustained pride and confidence in our community.

The story is told of an old farmer who had decided to sell his property and listed it with a real estate agent, who wrote a very good, but merely a true description of the farm. When the agent read the proposed advertisement to the farmer for his approval, the old man said: "read that again."

After a second reading, the farmer sat for several minutes in a thoughtful mood, and finally declared: "I don't believe I want to sell. I have been looking for that kind of a place all my life and it never occurred to me that I had it until you described it to me. I don't want to sell."

Some of us, even the most loyal, upon learning the facts concerning our city and its possibilities, may be convinced that it is even a better place in which to work and to live and rear our children than we had ever realized or imagined.

I am called upon to discuss a specific company and its part in an industry that has been almost as revolutionary in its effect upon home life as the radio, the motion picture, the automobile, electrical appliances and other great inventions of the age. I have not used the word "revolutionary" without thought. It has been a comparatively short time since the housewife was compelled to prepare all the food that was served at her table. Morning, noon and evening meals kept her in the kitchen. Hot summer days found her working over a stove preserving foods to fill her storehouse with supplies for the winter. It was truly said that "woman's work is never done." Now she is no longer dependent upon her own efforts to supply her household with nourishing foods. Most of them are being placed before her in pure and wholesome form, all ready to serve. The revolution has only begun and each day will reduce the work that is necessary to a well-regulated household. The time seems near at hand when the preparation of food, the most important task of the housewife, will be the least burdensome of all her duties. With more time to devote to other things, who can predict what woman will accomplish in her new freedom?

I am timid in approaching my subject because of a fear that in discussing the work of the founder of this enterprise I may appear fulsome, and in describing the development of the business with which I am connected, you may assume that I am boastful. I am neither. It is my aim in presenting this paper to point to the possible development of our beloved city by drawing a verbal picture of what has been accomplished here by those who cut paths that we might follow. If seemingly I depart from my immediate subject, it will be for the purpose of giving major consideration to the first part of it, or food preserving, in the broadest possible sense.

It has been rightly said that food preparation and preservation form one of Allegheny county's prime industries. The Pennsylvania Department of Internal Affairs assembles statistics to show the industrial progress of the state and also of its counties. It groups the products of Allegheny county into a dozen classifications, and food and its kindred products rank second in value, following only metals and metal products. The value of the products of the food industry in 1926 was $130,000,000. In capital invested, it ranks fourth, with a total of $76,000,000.

The great tonnage and huge output of the Pittsburgh district attracts the attention of the world. The basic reason for the enormous quantity is quality. The successful industrial pioneers of this district gave primary consideration to quality, the theory being that quantity production would take care of itself if the quality were right. These pioneers took more pride in quality than in quantity. In fact, they were so proud of their products that they stamped them with their own names. They may have had trade marks, slogans and brands, but most conspicuous were the names of the makers. Carnegie was stamped upon steel, Westinghouse upon electrical appliances and air brakes, Armstrong upon cork, O'Hara upon glass and Heinz upon packages containing pickles and other food products. These names were so deeply stamped that even to this day they are synonyms of the products upon which they appear.

The most important science in the world is food chemistry, for without proper food we could not live, and a nation's health is dependent upon its dietetics. Woman was the first chemist. The Garden of Eden was still occupied when woman began an intuitive study of chemistry to determine the edible foods of the earth, combinations that might be eaten with safety and how they should be prepared to provide the largest amount of nutriment. I do not know whether Eve knew what the food value of the apple was, but at least she made it attractive to Adam. We may picture primitive woman preparing food in an earthen utensil or on a spit over an open fire, for she soon learned that certain foods should be cooked. Her crude methods have been steadily developed to present standards and customs, more and more definitely controlled and governed by scientific principles, and today woman is interested in vitamins, fats, calories, etc.

It was natural that woman should devise ways to preserve foods, for she realized that the season of plenty should provide for the season of famine when nature was passing through the non-productive period. And so, through the activity of the mother-mind of woman, food preparation and preservation had their origin.

The Civil war apparently awakened thoughts of food preservation in the minds of many, for within a few years after that conflict, the canning and preserving industry rapidly expanded.

It was shortly after the war, or to be exact, in 1869, that my father, Henry J. Heinz, founded his business. As one writer expressed it, to him "life meant growth. He had a great love for all things that grow, the seed that mysteriously sends its shoots up through the soil, the child in whose face shines the promise of manhood or womanhood, the soul that ever aspires upward toward great fulfillment." I quote this descriptive paragraph because without an interest in humanity and an aim to develop men, his venture would not have led to the success that it did.

My father was a typical American boy. He was born on the South Side, Pittsburgh, Pa., in 1844, and while still a lad, his parents moved to Sharpsburg, Pa. It was at the age of twenty-five that he founded the business that bears his name. In planting a small patch of horseradish at Sharpsburg, he sowed the seed from which has sprung an international business. He leased a small building near the garden, and there, with the assistance of two women and a boy, he grated, prepared and bottled horseradish, the first of the 57 Varieties of pure food products.

Handicaps and obstacles were many, but my father's venture, based upon quality, rather than quantity production, was a success and stimulated his ambitions. In 1871, pickles were added to the products bearing Heinz labels, and steady growth in the business followed.

The business outgrew its Sharpsburg home in two years, and was moved to Second avenue, in the trade center of Pittsburgh. By 1876, the capacity of the new plant was doubled. But by 1889, so many people had come to like the products, that central Pittsburgh no longer afforded space for an establishment that would meet their demands. Therefore, the plant was moved to the north side of the Allegheny river, where it now stands, but, of course, it is much larger than in its original form, for there are now twenty-four buildings that cover more than fifteen city blocks, while its branch factories and distributing warehouses are spread over the whole commercial world.

As the enterprise developed, it was found that Allegheny county could not produce all the crops that the company needed. This accounts for the string of plants that extends across the continent and into Canada, as well as England and Spain. The founder had resolved "to protect the consumer by owning the product all the way from the soil to the table, free from chemical, coloring matter or other substitute," and this led to the propagation of seeds and plants that would produce the best tomatoes, pickles and other raw materials, the building of greenhouses and nurseries, and the operation of experimental farms.

The business which began in Sharpsburg almost fifty-nine years ago, with one variety, is now represented by more than 57 varieties of pure food products. In assembling raw products, more than 300 receiving stations and salting houses are maintained. The company operates twenty-five branch factories and kitchens in this country, England, Spain and Canada. The industry is really one of diversified interests, for the company operates its own bottle, box and can factories, and also many of its own railroad cars. More than 1,000,000 square feet of glass were used in the construction of its greenhouses and nurseries.

The supply garden, which once consisted of less than an acre, now comprises approximately 150,000 acres, the fields and gardens being located in many parts of America and in foreign lands, for each crop is grown where soil and climate unite to produce the best-flavored fruit and vegetables. These crops are planted, cultivated and harvested by 150,000 or more people.

To distribute the products in the way that is most advantageous to the dealer and consumer, seventy-nine sales branches and warehouses are maintained in the United States, England and Canada, and there are more than 175 agencies in foreign countries. More than 1,400 traveling salesmen are regularly employed. The company's products are virtually as well known in some foreign countries as in the United States. In England, for instance, the company maintains a force of approximately 200 traveling salesmen, or more than any British food concern.

The company's representatives travel through all channels of trade, buyers and salesmen circling the globe. Spice buyers recently returned from a 40,000-mile trip through the Orient. Heinz products are distributed to every civilized country of the world. Incidentally, wherever the 57 Varieties are known, they are associated with Pittsburgh.

And right here it may be well to tell how that slogan or trade mark came into existence. In the words of my father it had its origin as follows:

"For a long time I had been casting about for some word or phrase that would aptly convey a true idea of our line of goods. We did not want to be known as the pickle people, because we were packing many kinds of food that could not be classed as pickles. We needed a phrase that would comprehend them all.

"One day while I was riding on the Sixth Avenue Elevated Railway in New York, I noticed a sign of a concern which announced that it had twelve styles of shoes. That gave me an idea. I thought of styles of our products, but that did not sound right. Then I thought of kinds, and then the word 'Varieties' came into my mind.

"I counted them up. The idea of 57 Varieties gripped me at once, and I stepped off the train at the next station and took the first train going downtown, went to my hotel, telephoned for our lithographer to send his man over, and began work at once on an advertising card. Soon thereafter, the green pickle with the '57 Varieties' began to appear in street cars, on billboards and wherever it could be used."

Standards and principles have stimulated the growth of the business. The founder firmly believed that anyone who furnishes food for the public is in a position of trust, and honor-bound to see that the food is absolutely pure and wholesome. This position has led the company to engage in extensive research work, maintaining the largest private food research laboratory in the world.

The part played by science in the selection and preparation of our foods is of primary importance. Discoveries and progress have not been spectacular, or dramatic, as in the case of electricity, the radio, the telephone and other wonders of the age, but they have been consistent and of great benefit to mankind. The underlying principles of nutrition are being discovered, and because of our new knowledge, we are eating more rationally, which will prolong life and prevent much illness.

To the organized food industry must go much of the credit for our advances in this knowledge. Such research is costly and it is principally through the willingness of the industry to underwrite the expense of such inquiry that it is possible to carry it on. Some of the knowledge so gained is profitable to the industry, but all of it is profitable to the world at large.

Early in the last century, science made its first distinct contribution to the food preserving industry when Nicholas Appert, at the behest of Napoleon, evolved a method of preserving food by sealing it hermetically and sterilizing it after sealing by exposing it to a heat treatment. Food was preserved before this time, but always by some change in its nature, which was not always desirable. Drying of food has been practiced as long as we have any records, and it is the method used by nature itself in preserving seeds and various plants. The process of salting dates back to antiquity and the use of fermentation is mentioned in the Old Testament. These methods, satisfactory for centuries, have been greatly improved upon and superseded during the last hundred years by the discoveries of science.

As soon as science determined the cause of the spoilage of foods, chemists set to work to prevent such spoilage by the use of what are now called "artificial preservatives." Benzoate of soda, salicylic acid, boric acid and such compounds were found to be very effective and came into use in the food industry during the latter part of the nineteenth century. Some unscrupulous manufacturers began to use low grades of raw materials and with the aid of such preservatives, put out adulterated goods that were positively harmful to the health of the consumer. Other manufacturers who had at heart the interests of the people, and the future of the industry, along with women's clubs and government chemists headed by Dr. Harvey W. Wiley, led a crusade against the use of harmful preservatives and coloring matter and brought the Pure Food Act of 1906 into being.

H. J. Heinz Company was very active in its efforts to secure the enactment of this pure food law. The company believed, first, that the health of the consumer should be protected, and, second, that the production of pure foods would be beneficial to the industry. This has proven to be the case, for the food manufacturing industry has made greater strides in the past twenty years than it made in the previous century.

One of the most important steps in the preparation of good food is proper sterilization and its success depends upon the quality of the containers. H. J. Heinz Company, early in its history, applied itself to the perfection of bottles and cans to meet all requirements. It established its own bottle and tin can factories. Sanitary cans have been developed. They are so made that no solder can come into contact with the contents of the can, thus preventing contamination. Lacquered and protective coverings have been produced to prevent the action of the food on the metal of the cap or can. Methods of sealing packages under a vacuum have been perfected, resulting in better preservation methods. Science is still at work on new and improved processes and products.

Peanut butter offers an example of a process improvement entirely due to what might be termed "pure" science. Every year, since the World's Fair at Chicago, peanut butter has been a popular addition to the American diet, especially of children. As peanuts are half oil, a large quantity of this oil usually separated itself from the butter when it stood awhile after grinding, and as much of the flavor and goodness of the product is in the oil, this was a serious defect. Several years ago, Sabatier, while working in his laboratory in France, succeeded in hooking an atom of hydrogen into a molecule of oil, causing the oil to change its texture and appearance, but otherwise remain the same. By applying the Sabatier theory, a process patented and controlled by H. J. Heinz Company has been worked out, and the separation of the oil is prevented. The product is thus given a finer, creamier body than before, and it does not have the sticky quality.

Time is no barrier to research work. We have recently introduced a new cereal product, Heinz Rice Flakes. The development of this product covers a period of ten years or more. The prevalence of intestinal disturbances and sluggishness has been a generally recognized fact and science has attributed much of this trouble to the methods followed in preparing food. If the cause of this trouble could be removed, a distinct advance could be claimed for the food industry. It must be done in such a way that people would welcome it, however, for their habits of eating are firmly fixed and a change comes slowly.

The company has been interested in this problem for a long time and set about to solve it through its research department and its fellowship at the Mellon Institute of Industrial Research. Starting with the fact that cellulose is nature's own best aid in overcoming this difficulty, an interesting product has been developed, which meets with all requirements. Cellulose, or moisture-absorbing roughage, is that part of everything which grows in the vegetable kingdom and gives it form and structure. It is not digestible to any great degree, but is a moisture-absorbing element in food. Man was made by nature, however, to subsist mostly on vegetables, cereals and fruits and requires a certain amount of cellulose or roughage, which is not digested and absorbed by the body, to maintain the proper functioning of the digestive tract. The harsh taste and dark color of whole grain cereals caused people to desire such refinement of these foods that the cellulose is lost in the milling. Large supplies of green vegetables and fruits are not always available. The result is an actual deficiency of cellulose or roughage in the diet, and failure of the intestinal tract to properly function, causing illness, both serious and minor.

Research produced a proper method of obtaining from food materials, cellulose in a purified state, in which it is tasteless and odorless and lacks harshness. In this state it can be incorporated in other food products without detracting from their value in any way and the consumer has an essential constituent of diet without eating anything distasteful. By this process, Heinz Rice Flakes, a prepared cereal with a new flavor, have been produced.

Every product of the company shows the effects of the scientists' work and knowledge. Much time might be allotted to a discussion of vitamins. Research has determined that the heating and cooking of foods in hermetically sealed containers cause less destruction of vitamins than would occur if the foods were exposed to the same heating and cooking operations in an open vessel. These and many other facts have been determined and scientists are still working daily to improve the nation's food supply.

H. J. Heinz took as much pleasure in building men as he did in building his business. He seemed to have a power to inspire men to do things they themselves did not know they could do. His intense interest, sympathy and understanding bound men to him. His sense of fairness, of helpfulness, and his great capacity as a teacher soon developed leaders who were capable of helping him direct his entire organization, and he never stopped until he made his business the greatest of its kind. So strong did he build and develop his assistants, that he was enabled, for many years before his death, to spend more than half of his time in civic, charitable and religious affairs. His entire board of directors was and is composed of men who started as boys in the various departments of the business.

He was a pioneer in industrial relations with his employes. He believed that every laborer was worthy of his hire, but believed that an employer owed an employe more than mere wages, namely, a sincere interest in his welfare and development. Before such a thing had been heard of, he built an auditorium in the midst of the main plant for the recreation and entertainment of his employes. He established dining rooms when they were unknown in factories, sewing classes and cooking schools for girl employes (for over half of his employes were women). A gymnasium and a swimming pool, roof gardens and educational evening classes were only a few of the many things that were instituted. More than thirty years ago he established a factory newspaper to keep the employes all over the world in some kind of relationship with each other. In the early days premiums were paid on increased output in many departments of the business, and years ago group life insurance was procured and benefit associations established. Employes' clubs were organized in every part of the world. He did not call this "charity," but "good business," the proof of which is found in the fact that in its more than fifty-eight years of existence, the company has been involved in no dispute or controversy with its employes respecting wages or working conditions. A few years ago an international radio banquet, the first of its kind, was given on the occasion of the dedication of a memorial statue presented through the gifts of employes to the board of directors in memory of the founder and their love for him.

The founder believed that heart power is mightier than horse power, and therein lay one of the secrets of his success.

The question has been asked: What have his successors done to carry on the work of the founder, the beginning of which we have just recited, for, as he himself said, the business was only in its infancy when it reached fifty years of its existence. It now employs more than 11,000 employes, almost double the number it had at the time of his death eight years ago, and its invested capital is two and a half times as much as it was then, but the successors do not take credit to themselves for these accomplishments, but rather pay tribute to the teaching of their former leader. His foundation principles were so good, his policies so right, his vision so big, that it was only natural for success to continue.

The growth of the business has demonstrated the value of sound principles and high standards.

All of the affairs of the company are directed from Pittsburgh. There must be a good reason for the growth of the Pittsburgh plant and for continuing our main factory in this city.

When the plant was moved from Sharpsburg to Pittsburgh, it might have been rebuilt at Chicago or some other point that is more central from a geographic measurement. Or again, when it was moved from the heart of the city to the north side, it might have been rebuilt in the central west. But it was not. It remained in Pittsburgh, and has grown and expanded. Pittsburgh presented advantages which no other city could offer.

We are aware that within twelve hours' ride of Pittsburgh, there are 78,000,000 people, a great consuming public. Could anyone ask for a better distributing point? On one side of the plant is the Pennsylvania railroad, and on the other the B. & O. The Allegheny river flows along the southern boundary, and now offers shipping facilities of high value.

The officers of the company were recently called upon to determine the location for a plant for the making of the new cereal product, Rice Flakes. The plant might have been located where the raw materials are produced, or some other place, but Pittsburgh was selected. The product is being made here, in the newest and largest building we have, and Pittsburgh thus has an entirely new industry.

Pittsburgh offers adequate banking facilities. Dependable power is as cheap here as any place, and there are various other reasons for the progress of industry in this district.

I would pay tribute to Pittsburgh for the advantages it offers to all industrial enterprises. Its spirit of progress is more dominant now than in bygone years. Its past is merely an indication of its future, and I believe the present generation will give a good account of its use of the district's great resources.

I have briefly reviewed the past of an industry. But it is not living in or on its past—it could not do so; it would die. It is living in the present and future, building today and planning for tomorrow, for it must have vision. Carnegie, Westinghouse, Jones, Laughlin, Armstrong, Heinz, and other pioneer industrialists had great vision, but it is doubtful whether even they foresaw Pittsburgh and its industries in their present greatness. Our vision cannot be too broad, for the future holds limitless possibilities of development and progress.

The past is fixed. We honor those who have gone before us. We record their accomplishments and achievements, their faith, their vision. The present is ours to make of it what we will.

PITTSBURGH AND THE ALUMINUM INDUSTRY

A. V. DAVIS

Arthur Vining Davis, president of the Aluminum Company of America and author of the address on "Pittsburgh and The Aluminum Industry" in the series on "Pittsburgh and The Pittsburgh Spirit", was born in Sharon, Massachusetts, May 30, 1867, the son of Perley B. and Mary Frances (Vining) Davis. He graduated from Amherst in 1888 and married Elizabeth Hawkins of New York City, March, 1912. Besides being president of the Aluminum Company of America he is a trustee of the Mutual Life Insurance Company of New York; a director of the Mellon National Bank of Pittsburgh, Union Trust Company of Pittsburgh, Water & Power Company, Ogdensburg (New York), Railway Company, and a trustee of the Mellon Institute of Pittsburgh. He has residences in Mill Neck, Long Island, New York, and Pittsburgh. Office: 120 Broadway, New York, and Pittsburgh.

Pittsburgh and the Aluminum Industry

BY A.V. DAVIS

ALL of you have been told that in a nation of blind men a one-eyed man is king, and so it may be true that in past times when practically everyone was blind to the facts and possibilities of aluminum that I, who devoted many struggling years to the development of aluminum, gradually became a one-eyed man with respect to the knowledge of this metal. I am afraid, however, that when the president of this Chamber asked me to make a speech upon aluminum that he was still under the impression that I was a sort of a king in this industry. The fact is, however, that even to my one eye, it long ago became apparent that we must raise up a race of two-eyed men. We now have connected with our corporation a large number of men who can see the facts of aluminum with both eyes and who can truly be said to know something of the metal. The Aluminum Company of America is fortunate in having among these men Mr. Churchill of our research department and it will be he who will speak to you a little later and tell you the real facts regarding the aluminum industry.

However, there are a few things which even Mr. Churchill does not know about aluminum. He does not know about the beginning of this industry because that date was before he probably had ever heard of the metal, and so I will venture to take a bit of his time just to tell you of the early days of the aluminum industry, which I think will be interesting to you because those early days were strictly Pittsburgh days. When I say that we started in Pittsburgh, I do not just mean that the Aluminum Company of America started in Pittsburgh. In those days there was no aluminum industry. It is, therefore, equally true to say that I am to speak of the beginnings of the aluminum industry which are synonymous with the beginnings of the Aluminum Company of America.

We started in a small plant in the city of Pittsburgh on Smallman street near Thirty-second street. We were so anxious to get started and had been delayed so long, that finally, getting the plant finished on Thanksgiving day, we did not wait for that holiday to pass, but started on Thanksgiving day. I regret to state that that operation was but short-lived, however, for we broke down on Thanksgiving evening. In those days we had three employes. Mr. Hall, who was the inventor of the process, and I used to take turns—two weeks about—running the day turn and then the night turn. We were always very proud when we were on the day turn because then we had a man under us. Whichever was on nights used to divide his two weeks' period into four parts, which we used to know respectively as addition, subtraction, multiplication and division. It was our theory that in the first half of the first week, we could add, subtract, multiply and divide, but as the lack of sleep began to benumb our intellects, the last half of the first week we could only do three of the operations, and so on until the last half of the second week all we could do was to add.

The employee to whom I have referred was an Irishman by the name of Mike, who used to show up sometimes on Tuesday morning and sometimes on Wednesday morning, but never on Monday morning. Mr. Hall and I were both minister's sons and had no experience in manufacturing or business and it never occurred to either of us that it was possible to fire Mike. We thought he was wished upon us for life. However, the crowning act which finally resulted in the severance of relations was when we suspected that Mike was not properly weighing out the hydrofluoric acid which had to be used in exact quantities in a certain mix which we used to make. We discovered Mike pouring the hydrofluoric acid from the lead carboy without weighing it and when he was reproached with his negligence, he said in his inimitable Irish brogue that it was not necessary to weigh it because he had discovered a system, which was that there was a pound to every gurgle and a gurgle to every pound.

I am afraid that few of the men who are now with our company realize that in addition to the many chemical and electrometallurgical problems which we had to solve in the process itself, we were particularly handicapped by the inadequacy of our machinery. In these days when dynamos will operate regularly and engines seldom break down, it is difficult to realize that in the early days of the electrical development it was very much of a gamble from hour to hour whether the electrical apparatus would continue to function. It should be borne in mind that aluminum is made by electrolysis and that electricity is, therefore, the main spring of the process. I am quite sure that if we had had suitable apparatus we would have gotten on much faster. Practically every time that we would get underway before we could solve the problem in hand or make proper deductions, we would be compelled to stop on account of the breakdown of machinery.

The first aluminum which we made we sold at $8.00 a pound and we made about thirty pounds a day. You will get an idea of the value of aluminum and the small amount of production when I tell you that every night we used to lock up in a safe all the aluminum which we had. Since that time aluminum has become a worldwide product and an everyday necessity. Probably few of you realize how constantly and frequently you are in contact with aluminum. You probably had your breakfast cooked in aluminum utensils and served on an aluminum tray. I kept track of the time at which I was to come here by an aluminum watch and when I did come, I came in an aluminum automobile. I read an article not long ago by one of our men in which he described the constant contact with aluminum through one's whole day and whole life and finally ended by saying that when one finally died, he was buried in an aluminum casket, and inasmuch as we make aluminum guitars and banjos and other such musical instruments, it is probable that we would be equipped with aluminum harps. He also added that if anyone was so unfortunate as not to be equipped with a harp, it still remained true that we manufacture aluminum griddles and stewpans.

The most interesting thing to this Chamber, however, is that the Aluminum Company of America is a Pittsburgh industry. In the early days when there were only six partners in the business they were all Pittsburgh men connected with the steel companies and other companies of this city. Later on when it became necessary to get in more money, the Messrs. Mellon, Mr. Thaw and one or two others joined us, but they were all Pittsburghers. Since that time we have had practically no money put into the company so that it is as true today as it was then that the money of the company is Pittsburgh money.

If, therefore, we can congratulate ourselves that Pittsburgh backed us, I hope it is equally true that Pittsburgh can congratulate itself that one of its enterprises has grown to considerable magnitude. I hope it is a cause of congratulation to Pittsburgh when they think that despite the fact that our manufactories are scattered over the country and over Europe, and that our fabricating plants are to be found in nearly every country and our selling organization circles the globe, that nevertheless all these activities wherever they may be located eventually reach back to Pittsburgh.

MR. H. V. CHURCHILL'S ADDRESS

Before Charles M. Hall, the inventor of the modern method for producing metallic aluminum, was born, a notable banquet was held in a famous salon in Paris. The guests at this banquet were the flower of French aristocracy—holding their place by the accident or privilege of birth. The banquet was aristocratic in personnel and not the solid democratic gathering such as is here today where place is held not by blood or pedigree, but by achievement and common consecration to the cause of making Pittsburgh a better place in which to live and do business.

The tables at this French feast were covered with the finest linen. The food was prepared by the best Parisian chefs for the most epicurean set of that nation. The china was of that superlative quality for which Limoges and Sevres are famous. The knives, forks and spoons were of silver and gold. However, at one table where sat those who were most important for the moment, the day, or the occasion were a scant dozen forks and spoons of a new metal, as bright as the silver, but with a characteristic sheen particularly its own—a blue color like the first blue of the morning sky. The new utensils attracted much attention. Their sheer appearance was much admired. Dukes and princes marveled at their lightness—at least half a dozen were needed to balance one of the massive silver forks with which the less honored guests ate.

These forks and spoons were made of aluminum, then a metal so new and so rare that only the very rich could afford it. This was not the first use of the metal, however, for before this a watch charm of aluminum had been made for the king of Siam. Aluminum forks and spoons made by the famous Parisian jeweler, Christofle, were the first practically usable articles made from this new metal—aluminum.

The forks and spoons probably cost fifty or one hundred dollars each. Those aristocrats of that not so distant day would have been shocked to think that in less than seventy-five years aluminum forks and spoons would be considered fit only for kitchen or camp use. The answer is that today aluminum has become economically a cheap metal. Gone are the halcyon days when an aluminum fork would bring fifty dollars. Gone is the day when a princely monarch would use it as a chaste bauble to adorn his regal waistcoat. Aluminum no longer an aristocrat has become a yeoman of this world, doing the work of the world along with his heavier brother metals iron, zinc, copper and lead.

This relative cheapness is more than mere economy. Here is a new metal in the hands of man. Think for a moment for how long iron, copper, tin, lead, zinc, silver and gold have served man and then turn to this light weight metal, which is the gift of American science and American enterprise to the world.

Specially fitting is it that we should today tell the story of aluminum to the Chamber of Commerce of Pittsburgh because this gift of aluminum to the world was made a fact by the courage, the vision, the enterprise and the industry of Pittsburgh citizens.

Aluminum always has been plentiful enough in the world. It is indeed the most abundant of all metals in the earth's crust. Every clay bank contains many tons of aluminum. As far back as 1825 Oerstedt had proved this fact and had extracted from the components of clay a tiny button of this light metal—then isolated for the first time by a human being. Twenty-five years later Deville, a French chemist, succeeded in making enough aluminum to provide the King of Siam with his trinket and a little later to make the forks and spoons for the aristocrats to admire.

Here aluminum remained for a generation. The fact of its existence had been demonstrated. It had been isolated, some of its essential properties had been investigated. But aluminum in clay does not exist in metallic form. To extract the metal required the work of many chemists, well equipped laboratories and expansive chemical reagents. The application of all this produced a few buttons of the precious substance.

It seemed impossible to extract aluminum on any commercial basis. The situation which confronted science was as though the only ores of iron known to us would not yield to any kind of metallurgical treatment. But scientists dreamed of a happier day—they wrote books and journal articles with predictions and speculations as to the values of aluminum, its possible utilities and the possibility of a coming "Aluminum Age." All that was needed was a method that would set free a fraction of the vast stores of aluminum in clay and make it available for human use. The method, however, eluded these savants of former generations.

However, over in Oberlin, Ohio, there lived a family by the name of Hall. This Hall family had that most valuable adjunct of any

American family—a wood shed. In the past much of the glory and success of America has been ascribed to the school house. As a matter of fact without the accessory aid of the woodshed it is doubtful if the school would have been so successful. The woodshed—where our fathers solved the disciplinary problems of the then younger generation. Invitations to accompany father to the wood shed were turning points in many lives. But the woodshed had other functions—there an ingenious curious American boy would go to do his various and necessary constructional work—there he would go to perform his chemical experiments. Charles Martin Hall was the fortunate son of a family that had a woodshed. He was past the age when the woodshed was a corrective institution. However, he made full use of it as a laboratory. He had been a student at Oberlin College and his scientific eagerness made him bring many problems home to the family woodshed. Among these problems was the making of metallic aluminum.

In 1886, when Hall began his woodshed researches, a new and powerful tool of research—electricity—was coming into use. So when the youthful investigator had tried and failed in his attempts to use chemical processes he turned to electricity. One afternoon he attained success. From the small crucible containing his materials and into which dipped the wires connected to his crude batteries, he fished out a lump of silvery metal about the size of a pea.

This was the beginning of the aluminum industry. This was the end of aluminum jewelry. This was when aluminum became a servant of mankind. From one pea weight in 1886 the production has grown to the extent that the world produced in excess of 400,000,000 pounds in 1926.

The jewelry age of aluminum has come and gone. Not that this condemns aluminum—for there are worse metals for jewelry than aluminum—perhaps some of these worse are worn by you. Aluminum is beautiful, it is easily worked, it is strong and hard enough for rings and chains—nor will it make black marks as does some jeweler's gold —nor will aluminum collar buttons adorn your neck with a characteristic blemish. Besides this think of the labor saving if some of the over-jewelled members of the weaker sex could only replace their heavy gold, platinum and silver with aluminum.

The jewelry age has gone. From a use as a trinket it has undertaken a real work in the world. It cooks the world's dinners, it builds the world's airships, it carries the world's power, it paints the world's factories, it washes the world's clothes, it shields the world's radio receivers, it even makes the small metal tubes from which the world squeezes its tooth paste.

From a time when it took weeks to make enough metal for a dozen knives and forks we have come to a time so that if the world's production of aluminum had been spilling out on this table since I began to talk I would now be hidden by a wall over five feet in height.

Much of the first aluminum made by the Hall process went into jewelry and novelties, but if today watch charms were the only outlet we would have the problem of disposing of 13,000,000,000 of them a year. It might be a task to find enough vests. One of Mr. Hall's early problems was a market for the metal. Yesterday I saw a letter written by Mr. Hall in which he was advocating a change in the sales department because the metal was piling up in his office at the rate of thirty pounds per day.

But new uses have been found for aluminum. The day is approaching when engineers designing any construction work where metal is employed must consider aluminum. One very interesting recent use of aluminum is as the diaphragm of the Orthophonic Victrola. The vibration of this aluminum diaphragm, which cannot be made from other metals, is what enables the home to be flooded with the golden tones of a McCormack. Another interesting use is as the almost weightless pointer on delicate electrical measuring devices. Another use is as the shanks of surgical instruments where the deftness and skill of the operating surgeon must not be interfered with by heavy or unbalanced instruments.

Aluminum rods serve as the essential element in many of the chemical rectifiers now used by radio enthusiasts to keep their hard worked storage batteries charged. Much of the package candy now sold to the American child is protected by aluminum foil. A larger use is as structural material for the great airship, the Los Angeles. Here is a tooth paste tube drawn from this ductile metal.

Admittedly the 400,000,000 pounds of the world's annual production is not being entirely used in orthophonic diaphragms, rectifier rods, and tooth paste tubes—important as such are. Most of the aluminum goes into those larger uses with which you are familiar.

About half of the American production goes to the automobile industry for panels, roofs and complete bodies, for frames, for crank cases, for pistons, and many other accessories. The all-aluminum automobile is a future certainty.

The introduction of aluminum to various railroad uses has been accomplished. Passenger coaches on which aluminum is the principal metal have seen their years of satisfactory service. Passenger coaches consisting wholly of aluminum above the sills have been run by the Pennsylvania railroad for over six months. Almost all parts of a street car that can be built of metal have been made of aluminum and applied to car construction in Cleveland, Ohio. Those cars have seen months of service without any failures whatsoever.

Millions of pounds of aluminum are annually consumed by the steel industry, where it is a valuable metallurgical aid in producing sound steel.

Thousands of miles of electrical transmission lines employ aluminum cable.

The remarkable development of aluminum paint during the past five years has surpassed all expectations. Aluminum cooking utensils are known to all of us. Aluminum is widely used in the construction of chemical plants where specific corrosion conditions are encountered. But to this audience I need proceed no further in my enumeration. Aluminum is with us and becomes more evident every day.

Before the Hall invention was made, which greatly lessened the cost of production, competent engineers felt sure that aluminum, if made cheap enough, would be of great practical utility. Aluminum is the lightest metal which has ever been made available in quantity. It is an excellent conductor of heat. Its high heat conductivity is paralleled by a high electrical conductivity.

Perhaps the greatest advantage of aluminum as an industrial metal lies in the fact that it does not rust. Rust is the great handicap of iron. Millions of dollars are lost annually by the rusting of rails, bridges and roofs. Millions of dollars are spent annually for paints to combat this rusting of iron. Aluminum like platinum and gold, is largely free from this corrosive disease. The metal does yield to certain types of corrosion. Alkalis attack it fairly readily, but in general aluminum will stand exposure to weather and use far better than does any other common metal. It may interest you to know that the Washington monument in Washington, D. C., is capped with aluminum.

Sometime ago we left young Mr. Hall in the Oberlin woodshed with a small piece of aluminum the size of a pea which he had produced.

The invention had been made—the papers had been sent off to Washington and Charles M. Hall found himself in the predicament of many young inventors. He had no money. The family resources were not large. Mr. Hall approached local friends and bankers. They were lavish with encouragement and praise, but shy, very shy and reluctant about putting any real money into the hands of the inventor. So Charles M. Hall went to search for tangible aid and assistance to further his invention.

Finally he reached Pittsburgh. Here he got into touch with a now famous Pittsburgher—Captain Alfred E. Hunt—then with the Pittsburgh Testing Laboratories. Mr. Hunt listened and acted. A small amount of capital was furnished and the work began. Mr. Hall had too much work to do so a young man fresh from college was hired to help Mr. Hall in commercializing his invention.

Many new enterprises grow slowly, particularly at first. Indeed it is possible that the sounder they are the more slowly they grow. You can't produce an oak in five years. For six months business was very bad for the new concern. By drastic effort they had gotten production up to thirty pounds a day. But the metal could not be sold. The users of metals would have nothing to do with this new material. The young man who was hired to work with Charles M. Hall stuck to his job for months without pay. He was Mr. Arthur V. Davis, who today is president of the Aluminum Company of America, and its directing genius.

The other Pittsburghers, Captain Hunt and his associates however, were equally tenacious in their enthusiasm. They refused to let go. They had seen demonstrated that the Hall method would work. The problem now was to convince the great American public that they had made something which the public ought to know about and which once it was known the public would demand.

To solve this problem the infant industry had to get out of the bounds of chemistry. They had to make something besides metallic aluminum. They had to take this metal, which the public would not buy, and put it into something that it would buy. So they turned to cooking utensils, to tubing, to sheets. Their efforts were gradually successful. Finally Mr. Davis was paid his back salary. Thirty pounds a day was too little. Production had to be increased. Mr. A. W. Mellon and Mr. R. B. Mellon and their associates joined the group fathering the industry, now no longer an infant, but in the first throes of adolescence.

I need not recount to you the ever steady and rapid growth of the industry which now is an essential part of Pittsburgh. The industry soon outgrew during those first few months the Smallman street location. It went to New Kensington from whence it has now grown until it spans the world.

While the first problem, that of manufacture, was solved by Mr. Hall's invention, and the disposal problem by launching a sheet and utensil business, there were two other major problems to be considered. Hall discovered a process for making aluminum, but not from clay. He started from pure aluminum oxide. The problem then was to secure a cheap source of pure aluminum oxide. By expensive methods aluminum oxide can be made from clay, but investigators of the growing industry located sources of aluminous material less refractory to handle than clay. They located bauxite in the southern states, and it is from this ore that the world's aluminum is made today. These bauxite deposits are not specially plentiful. Nor when found do they always prove of a grade suitable for conversion to metal. Even the best of the bauxite undergoes treatment and refining before it goes into the electric furnace whence it will emerge as metal. This refining and purification of bauxite was solved and today the immense plant at East St. Louis, Illinois, of the Aluminum Ore Company supplies refined ore to all of the aluminum plants in North America.

The second great problem was that of power. The aluminum industry was one of the first to use power from Niagara Falls. Thence, it has gone to the hills of western North Carolina, eastern Tennessee, northern New York, into the Three Rivers district of Canada, and now has under construction one of the world's largest aluminum plants, part of which is now in operation on the Saguenay river in Canada.

Time will not permit a fuller record of the story of aluminum and its uses. The present day uses were foreseeable, but only with prophetic vision. It was the scientific genius of Charles M. Hall upon which the aluminum industry was founded, but the structure that has been reared on that foundation was made possible and actual by the courage and vision of citizens of Pittsburgh.

Aluminum is a Pittsburgh product—not because Pittsburgh has abundant supplies of bauxite ores, for she has not; and not because Pittsburgh has abundant of hydroelectric power for she has not. Aluminum is a Pittsburgh product because Pittsburgh, despite its reputation for smoke and grime, is primarily interested in men. Here in Pittsburgh as in no other community of the United States does creative genius get a hearing and sound backing. It was Pittsburgh that gave opportunity to Carnegie with his age of steel, it was Pittsburgh that listened to Westinghouse when he dreamed of stopping a train with air. It was Pittsburgh that listened to Brashear with his vision of astronomic achievement and it was Pittsburgh that listened to an Ohio college boy with his vision of the possibilities of a new and light metal. Not only did it listen, but it gave substantial assistance so that today the aluminum industry, nurtured by Pittsburgh capital and fostered by Pittsburgh control, has grown to touch almost every field of endeavor. A famous slogan says "Pittsburgh Promotes Progress" —and one of the striking examples is aluminum.

PITTSBURGH'S PUBLIC UTILITIES

J. D. CALLERY

James Dawson Callery, banker and street railway president, was born in Pittsburgh, November 11, 1857, the son of James and Rose (Downing) Callery. His first wife was Marcella Hawley, who died January 6, 1899. His second wife was Julia W. Callery, of Charleston, West Virginia, whom he married June 4, 1902. He began business life in his father's leather manufacturing business and then became identified with the banking and street railway interests in Pittsburgh

He is now president of the Diamond National Bank, chairman of the board of the Pittsburgh Railways Company, vice president of the Equitable Coke Company. Director: Philadelphia Company, Duquesne Light Company, Allegheny County Steam Heating Company, Westinghouse Electric & Manufacturing Company, Westinghouse Air Brake Company, Punta Alegre Sugar Company, American Window Glass Company, American Window Glass Machine Company and numerous other corporations.

Pittsburgh's Public Utilities

BY J. D. CALLERY

THE subject assigned to me, "Public Utilities, Their Development and Relation to Progress of the Pittsburgh District" is so far reaching that I can only take the time allotted to this subject for the early transportation of street railways and the development of electricity in a practical way and its phenomenal growth.

My first experience dates back to 1888 in the horse car period and beginning in 1898 with the Allegheny County Light Company.

All of the original capital for the construction of the railways, horse, cable and electric lines, was supplied by Pittsburghers with the exception of a small portion supplied by Philadelphians for the construction of the Pittsburgh Traction Company (Fifth avenue line).

As the electrical lines became standard, many competing lines were constructed which led to over-building in the sparsely populated districts, which proved uneconomical and was a severe burden on the older lines which served a more densely populated district, but time has eliminated this difficulty. The intervening territory has rapidly built up and many business districts have been established, making for short hauls. Nearly all of the various lines operated by the Pittsburgh Railways Company center in the downtown district, which has been of great benefit to the merchants in this district.

The phenomenal growth of the use of electricity has been of great importance to the development of the Pittsburgh district.

Mr. Owen Kraft, assistant to Mr. A. W. Robertson, president of the Philadelphia Company, has consented to read the "Historical Review of the Development of Street Railways Transportation and Electricity" for me.

The subject assigned to me "Public Utilities—Their Development and Relation to Progress in the District," would naturally include gas, telephone, railroads, street railways, electric light and power, and other public utilities, but as others are to deliver addresses covering some of those subjects, I am only going to speak to you in regard to street railways and electric light and power companies and their development and relation to progress in this district.

It is well nigh impossible to give even a brief review of these subjects within the time I will be permitted to speak, when it is appreciated that the railway systems in this district are made up of properties, rights and franchises originally acquired by more than two hundred railway and traction companies, and the light and power systems by almost that number of electric light and power companies.

We will first consider street railway transportation.

In the early stages, street passenger transportation was done by omnibuses traversing the main highways into the city proper.

Prior to 1874 all charters for street passenger railways were granted by special acts of legislature. The powers usually granted by these charters were very broad, and, where the route of the street railway company covered all or a portion of the route then served by omnibus routes for the horses, harness, omnibuses, wagons, carriages, sleighs and other equipment used in their service, the value to be assessed by appraisers.

The first charters for the construction of street railways in Pittsburgh were granted by the legislature in 1859.

By an act approved March 22, 1859, a charter was granted to the Citizens' Passenger Railway Company for the construction and operation of a railway from Market and Fifth streets, along Fifth street, Cecil's alley, Penn street and the Greensburg and Pittsburgh turnpike road, to Butler street in the borough of Lawrenceville, and thence by Butler street and the Lawrenceville and Sharpsburg plank road to Sharpsburg. The incorporators of this line were rather prominent citizens at that time. Among the names we find those of James Verner, Alexander Speer, Richard Hays, W. M. Darlington, Joshua Rhodes, Richard L. Ewalt, Nathaniel Holmes, O. H. Rippey, James P. Barr and William Coleman.

The Pittsburgh, Allegheny and Manchester Passenger Railway Company was chartered by an act approved April 12, 1859, to construct and operate a railway between Penn and St. Clair (now Federal) street, in the city of Pittsburgh, and Woods Run. Among the incorporators were Thomas Bakewell, Joseph S. Brown, William Bagaley, John E. Parke, H. Brady Wilkins, Robert S. Hays, Charles H. Paulson, Joshua Hanna, James Holmes, William Kunkle, William Robinson, Jr., Robert McKnight, Joseph Kirkpatrick, Eccles Robinson, and J. O. Bennett.

The Pittsburgh and East Liberty Passenger Railway Company was also incorporated by an act approved April 8, 1859, to construct a street railway from Market street in the city of Pittsburgh to the village of East Liberty. This is what is now known as the Fifth avenue line. Among the incorporators were J. W. Hailman, Thomas Clarke, L. R. Livinstone, William B. Negley, John B. Semple, Nathaniel Holmes, Joseph Woodwell, William M. Lyon, John Fleming, Springer Harbaugh, John Murdock, Jr., Christian Zug, James P. Sterrett and R. H. Hartley.

The Pittsburgh and Birmingham Passenger Railroad Company was incorporated by an act approved April 13, 1859, to construct a street railway from the intersection of Fifth and Smithfield streets, along Smithfield street to the Monongahela bridge, across said bridge to Carson street in the borough of South Pittsburgh; thence along Carson street through the boroughs of South Pittsburgh, Birmingham and East Birmingham, to Brownstown. Among the incorporators were John Evans, R. B. Carnahan, James Blackmore, Oliver Ormsby, Alexander Chambers, James Barr, John McDonald Crossan, R. Biddle Roberts, Benjamin Singerly, Robert McKnight, Andrew Fulton, William M. Hirsh, Wm. Lauffman and Nathaniel Holmes.

The Pittsburgh and Minersville Passenger Railway Company was incorporated March 22, 1862, and authorized to purchase from the Pittsburgh and East Liberty Passenger Railway Company, that portion of its road, now constructed, lying on Fifth street, Wylie street, Fulton street, and Center avenue, in the city of Pittsburgh, and, also, that portion lying from the eastern line of the city of Pittsburgh (Devilliers street) to the village of Minersville.

The incorporators were E. P. Jones, Abraham Ackright, James Johnston, Jr., and James M. Sinclair.

The Federal Street and Pleasant Valley Passenger Railway Company was incorporated February 20, 1868, to construct a street railway from Market square, in the city of Allegheny, to any point within said city or McClure township upon any public road now opened or which may hereafter be opened between said point and the Perrysville plank road. By supplement approved March 25, 1870, the company was authorized to extend its road from Federal street via Diamond square, Gay alley, Union avenue, Church avenue, Anderson street and the Pittsburgh and Allegheny bridge to the city of Pittsburgh, and over and along such streets in the city of Pittsburgh as the councils of said city may permit.

Among the incorporators were W. McCreery, Bernard Gray, W. S. Bissell, John Kirkpatrick, Thomas Nuttall, W. McKendry, John Birmingham, John E. Parke, Hugh S. Fleming, William Dilworth, Jr., and W. M. Claney.

The Central Passenger Railway Company was chartered February 18, 1869, to construct a railway from the corner of Fourth avenue and Market street, and by Fourth avenue, Grant, Fifth, Wylie and Fulton streets and Center avenue, to East Liberty, and to purchase from the Pittsburgh and Minersville Passenger Railway Company the franchises and privileges which it purchased from the Oakland Passenger Railway Company.

Among the incorporators were C. Hanson Love, R. McEldowney, R. G. Herron, H. W. Oliver, A. H. Miller, J. K. Moorhead, F. H. Eaton, A. G. McCandless, H. P. Ford, A. C. McCallum, Wm. M. Gormley and Samuel Ewart.

The Pittsburgh and Ormsby Passenger Railroad Company was incorporated April 6, 1870, to construct a railway from any point in the borough of Ormsby via Sarah street, in the borough of East Birmingham, to Seventeenth street, borough of Birmingham; thence via Washington street and Tenth street to the Birmingham bridge, and over said bridge to Second avenue, in the city of Pittsburgh; thence by such streets as may be granted by the councils of Pittsburgh, to a suitable terminus on or near Market street.

Among the incorporators were Domenec Ihmsen, John Pears, A. Garrison, Charles Evans, Henry Lloyd, John Phillips, George Black, T. B. Atterbury, D. B. Oliver, Clifton Wharton, Harvey Chess, John P. Beech and D. O. Cunningham.

The Pittsburgh, Oakland and East Liberty Passenger Railway Company (a successor of the Pittsburgh and East Liberty Passenger Railway Company) was organized January 15, 1872, to operate the railway constructed on Market street; Third and Fourth avenues; Grant street; Fifth avenue; Denniston avenue and Highland avenue.

The incorporators were C. Hoeveler, Thomas Mellon, Erasmus Hoeveler, Attes V. Cole, Matthias Roe, Wm. A. Hoeveler, and F. H. Bussman.

Second Avenue Passenger Railway Company was chartered July 6, 1881. The route was from Glenwood via Second avenue to Market street.

The incorporators were George Fawcett, George W. Fawcett, Wm. J. Fawcett, Wm. H. Collingwood and James F. Fawcett.

James D. Callery was elected president and director of the company in November, 1888.

The Pittsburgh and West End Railway Company was chartered March 27, 1879, and re-chartered May 15, 1889. Its route was from a point on Fifth avenue near Union street, thence along Fifth avenue, Liberty street, Fifth street, Penn avenue, Water street, the Point bridge, Carson street, Main street and Walnut street to a point at or near Washington turnpike with the privilege of constructing a branch along Carson street southeastwardly from the Point bridge to the Monongahela bridge.

Among the incorporators were John C. Reilly, Wm. J. Burns, John Burns and Wm. H. House.

James Callery was elected a director January 11, 1886, and James D. Callery was elected a director January 9, 1888.

The West End Traction Company was chartered November 15, 1897. This company operated the properties of the Pittsburgh and West End and other passenger railway companies.

The incorporators were J. C. Reilly, W. J. Burns, Thomas S. Bigelow, J. D. Callery and W. V. Callery.

In 1875 the people of the commonwealth of Pennsylvania, grateful to Almighty God for the blessings of civil and religious liberty, and humbly invoking His guidance ordained and established the present constitution of this commonwealth, which became effective on the first day of January, 1874.

As Section 7 of Article III of the constitution provided that the general assembly should not pass any local or special law creating corporations, or amending, renewing or extending the charters thereof; granting to any corporation, association, or individual any special or exclusive privilege or immunity, or to any corporation, association or individual the right to lay down a railroad track, no street railway companies were chartered between the date the constitution became effective and May 23, 1878, as there was no law authorizing the chartering of such companies between those dates.

On May 23, 1878, an act providing for the incorporation and government of street railway companies in cities of the third, fourth and fifth classes, and in the boroughs and townships in this commonwealth, was approved by Governor Hartranft, and, on March 19, 1879, an act was approved by Governor Henry M. Hoyt providing for the incorporation, and for the government and the regulation of street railway companies now incorporated or which may hereafter be incorporated, in cities of the second and third class, in this commonwealth.

A great many companies were incorporated under these acts, which acts were later declared unconstitutional by the supreme court of this state.

On the fourteenth day of May, 1889, Governor James A. Beaver approved an act providing for the incorporation and government of street railway companies in this commonwealth, which provided that any company theretofore incorporated under the provisions of the acts of 1878 and 1879, or existing under color of any charter or letters patent of the commonwealth, upon accepting the provisions of the act of 1889, should thereupon become and be a body corporate under that act, and the companies incorporated under the acts of 1878 and 1879 accepted the provisions of the act of 1889 and were re-chartered under the latter act.

On March 22, 1887, an act providing for the incorporation and regulation of motor power companies for operating passenger railways by cables, electrical or other means, was approved by Governor Beaver, and under the provisions of that act a number of traction companies were chartered and later acquired the capital stock or leased the properties and franchises of street railway companies and rebuilt and operated their railways.

The first rapid transit by street railway was furnished by the Pittsburgh Traction Company which, in June, 1887, leased the properties and franchises of the Pittsburgh, Oakland and East Liberty Passenger Railway Company and the Central Transit Company and constructed a cable line over that portion of their routes beginning at the foot of Fifth avenue and running out that thoroughfare to Shady avenue to Penn avenue, to Highland avenue and thence to Fifth avenue, a distance of about five and one-half miles. This system was opened for traffic September 12, 1889.

In September, 1887, the Citizens Passenger Railway Company leased its property and franchises, including the property and franchises leased by it from the Transverse Passenger Railway Company, to the Citizens Traction Company, and the latter company constructed and operated a cable line over that portion of the route between Cecil alley, in the downtown portion of the city, and East Liberty, and also from Penn avenue via Butler street to Sharpsburg.

In December, 1888, the Central Traction Company entered into an agreement with the Central Passenger Railway Company for the operation of its properties and constructed a cable line along Sixth avenue, Wood street, Fourth avenue, Grant street, Wylie avenue, Fulton street and Center avenue to Thirty-third street.

The cable lines were operated until 1897.

The first electric line was constructed from South Thirteenth and Carson streets to Knoxville borough over a very heavy grade. It was believed that this line would relieve the Knoxville and Mt. Oliver residents from depending on the inclined planes, and, from experiments made, that this electrical installation would be able to carry passengers safely on these heavy grades. The art had not progressed far enough to warrant the continuance of its operation. This line was installed on what was known as the "Daft System" by Thomas Noble and was the first electric system with a power station.

The second electric railway in this district was constructed in Allegheny city and was known as the Observatory Hill Passenger Railway, starting at the city hall on Federal street and continuing over this street to Observatory hill. As the trolley pole was unknown then, the trolley was hung over the trolley wire and was connected to the car by a limp cable. This line was fed by contact with an underground conduit and is known as the Bentley Knight System. This line was first operated in February, 1888. On account of the heavy grades on Federal street and the impractical way of transmitting the current, this line was doomed to failure.

The first successful lines of electric street railway were those of the Federal Street and Pleasant Valley Passenger Railway Company and the Second Avenue Passenger Railway Company, which were equipped in 1889 and began operations in 1890, with the overhead trolley, known as the Vanderpole System.

Considerable difficulties were encountered in the operation of these first electric lines by the failure of the motors, which were double reduction motors enclosed in canvas covers, as the suction from the operation of the motors drew in the snow, rain and mud, which caused the burning out of field and armatures. The Pleasant Valley road was equipped with Sprague motors and the Second avenue with the Thompson Houston motors.

At this time Albert Schmid, chief engineer of the Westinghouse Electric & Manufacturing Company, designed and constructed a single reduction motor, enclosed in a steel casting, and after considerable experimentation it became standard and was used by those railways and many others.

A period of exploitation followed these electric railway operations. From a total of 87 miles of electric lines in 1891, the mileage grew to 337 miles in 1896.

About 1892, the Second avenue line was extended from Glenwood along Second avenue and the Braddocksfield plank road through the boroughs of Rankin, Braddock and East Pittsburgh to Wilmerding. In 1894, the Second Avenue Traction Company acquired the properties of the Glenwood and Dravosburg Street Railway Company, constructed the Glenwood bridge from Glenwood to Hays station, extended its lines through Forward township to a connection with the railway of the McKeesport and Reynoldton Passenger Railway Company in the borough of Dravosburg, the latter company having franchises over the prinicipal streets in McKeesport, and from a point at Hays station, through the Homestead Street Railway, to and through the borough of Homestead, to the entrance gate of the Homestead Steel Works. The Greenfield Avenue Railway Company constructed a line of railway on Greenfield avenue from a point of connection with the railway of the Second Avenue Passenger Railway Company on Second avenue to the eastern entrance of Schenley park.

The Federal Street and Pleasant Valley Passenger Railway Company extended its lines along California avenue to Bellevue and Avalon; the Ben Avon and Emsworth Street Railway Company continued the line to Avalon and Emsworth, and the Allegheny, Bellevue and Perrysville Railway Company constructed a line from Thomas street, in the borough of Bellevue, along Lincoln avenue, Forrest avenue and private property, by a loop line through what is now West View, to a connection with the street railways on Perrysville avenue, Allegheny.

Competing lines were built in many sections, such as those of the Monongahela Street Railway on Forbes street from Woodlawn avenue to Wilkinsburg, Edgewood, Swissvale, Braddock and East Pittsburgh; and from the intersection of Forbes street and Murray avenue, along Murray avenue and over a new bridge constructed by Captain S. S. Brown, known as the Homestead bridge, to Braddock avenue in Homestead, thence with the joint use of the Glenwood and Dravosburg Electric Street Railway Company's tracks, to a point of connection with the West Braddock bridge; thence along Centennial avenue in Braddock to Thirteenth street; also over a new boulevard from Rankin bridge to Kennywood park and Duquesne, and by a connection with what was known as the White Traction Company, along the main street in Duquesne to and across the Duquesne bridge to

McKeesport and thence via Jerome street to the Baltimore and Ohio station.

In 1892 the Millvale, Etna and Sharpsburg Street Railway was constructed from a point on Chestnut street, on the north side of Ohio street, along Ohio street and the Butler plank road, to and through the borough of Millvale and from an intersection at Millvale of the Butler plank road, continued along this road to the boroughs of Etna and Sharpsburg. This railway also extended over Chestnut and Main streets on the North Side to a connection with the tracks of the Federal Street and Pleasant Valley Passenger Railway. In 1894 this railway was leased to the Allegheny Traction Company, which was leased to the Fort Pitt Traction Company.

In 1895 the Consolidated Traction Company was chartered and in 1896 secured control of the Pittsburgh Traction Company, Citizens Traction Company, Central Traction Company and Duquesne Traction Company and equipped those roads for electric operation. On January 1, 1902, it leased the property of the Monongahela Street Railway Company, whose lines had been further extended from Wilkinsburg to Verona and Oakmont.

In 1897 the United Traction Company leased the property and franchises of the Pittsburgh, Allegheny and Manchester Traction Company and purchased the property and franchises of the Second Avenue Traction Company and the North Side Traction Company, which latter company held a controlling interest in the Federal Street and Pleasant Valley Passenger Railway Company.

In 1894 the West End lines were extended to Crafton, Mansfield (now Carnegie), McKees Rocks and Woodville. In 1897 the West End Traction Company was chartered and acquired control of the Pittsburgh and West End Railway Company, Pittsburgh, Crafton and Mansfield Street Railway Company, the Pittsburgh, Neville Island and Coraopolis Railway Company, the railway of which latter company was operated over the entire length of Neville Island to and through Coraopolis, and afterwards, by private right of way and the Sewickley bridge to the borough of Sewickley.

In the winter of 1899 the Philadelphia Company acquired control of the stock of the United Traction Company.

On October 1, 1900, the Southern Traction Company (now Pittsburgh Railways Company) acquired by lease all of the property and franchises of the West End Traction Company.

January 1, 1902, the United Traction Company acquired by lease all of the property and franchises of the Pittsburgh & Birmingham Traction Company.

Since January 1, 1902, the Pittsburgh Railways Company has been operating the properties of the Consolidated Traction Company and the United Traction Company under operating agreements. At that time the Pittsburgh railways system embraced 400 miles of single track, carried 178,703,000 passengers and had a revenue of $6,758,000 per year, while in 1926 it operated 590 miles of single track, carried 396,679,675 passengers and had a revenue of $21,727,230.29.

When the Pittsburgh Railways Company took over the operation of practically all the railways in this district on January 1, 1902, the directors were T. H. Given, J. H. Reed, Joshua Rhodes, James D. Callery, A. W. Mellon, M. K. McMullin and P. A. B. Widener, and the officers were James D. Callery, president; J. H. Reed, vice-president; W. B. Carson, secretary; C. J. Braun, Jr., treasurer, and C. S. Mitchell, auditor.

When the receivers were discharged February 1, 1924, the directors were A. W. Thompson, J. H. Reed, James D. Callery, E. W. Smith, Geo. E. McCague, M. B. Starring, Moritz Rosenthal, Geo. S. Davison, W. B. Carson and E. W. Washabaugh, and the officers were James D. Callery, chairman of the board; A. W. Thompson, president; J. H. Reed, vice-president; W. B. Carson, secretary; C. J. Braun, Jr., treasurer, and C. S. Mitchell, controller.

In 1904, Senator William Flinn, Peter Shields and others acquired a large tract of land in the South Hills, now known as Beechview, and planned the Mt. Washington tunnel. The franchises and rights were afterwards acquired by the Pittsburgh Railways Company, the tunnel was built through Mt. Washington and the railway was constructed through the tunnel and what is now Beechview to West Liberty avenue. Another connection was built to Mt. Washington, the engineers having pointed out the advantage of operating all the hilltop cars through this tunnel and over the Smithfield street bridge.

In 1905, a long lease was acquired of the Pittsburgh and Castle Shannon railroad, a narrow gauge steam road; the gauge was widened to standard street railway gauge, the road was electrified and the cars of the Pittsburgh & Charleroi Street Railway Company from Library, Monongahela City, Charleroi and Belle Vernon and those of the Washington and Canonsburg Railway Company from Washington and intervening towns were brought into the city via that road, the Mt. Washington tunnel and other street railways.

In 1905, the Pittsburgh and Butler Street Railway was constructed from Butler to a connection with the tracks of the Pittsburgh Railways Company at Etna, and afterwards a line known as the Pittsburgh, Harmony, Butler and New Castle line, was constructed by R. H. Boggs, from a point of connection with the tracks of the Pittsburgh Railways Company on East street, on the northside, to Evans City, Zelienople, Butler, Ellwood City and New Castle.

The original horse car tracks were constructed by the use of longitudinal wood stringers on ties five feet apart. On these stringers were spiked light rails, weighing about thirty pounds per yard, but this construction did not prove serviceable for the heavier electric equipped cars, and the Johnson Company of Johnstown designed and patented a rail four and one-half inches in height, weighing sixty pounds to the yard, supported on chairs spiked to the ties.

This design did not prove practicable and a six inch rail weighing seventy-two pounds per yard was designed which did not give sufficient height for satisfactory paving between the tracks, and then a seven inch rail was designed weighing ninety pounds per yard. This weight was further increased until now the rail of standard construction of the Pittsburgh Railways Company, known as the Trilby Rail, weighs one hundred and thirty pounds per yard.

When the Consolidated Traction lines were rebuilt, a modern direct current power house was constructed at Twentieth and Smallman streets, which had every improvement known, and which, in time, eliminated two or more power houses.

In 1903 the Brunot Island power house was built to provide current for the operation of the combined traction companies and to reinforce the supply of the Allegheny County Light Company. This was a modern and up-to-date station at the time of construction. The equipment has been changed, from time to time; steam turbines have been adopted and it is now considered a first class and economical station. By the construction of this station, it practically eliminated the Pleasant Valley station on Charles street and the Pittsburgh, Allegheny and Manchester station on Juniata street, those stations being held for a time for emergency purposes only.

In the first operation of the horse cars, fourteen and sixteen foot cars were used, drawn by two horses and reinforced by an extra horse on the heavy grades. Some of these cars were operated by one man, the passengers depositing their fares in a fare box either by a nickel or a token. On many of the lines, six tokens were sold for twenty-five cents. The heavier traffic lines had a driver and conductor.

The cars were not heated and in the wintertime straw or hay was used on the floors in an endeavor to keep the feet of the passengers warm.

The cable lines were equipped with double truck cars, about thirty feet in length, seating thirty passengers.

The first electric cars were twenty feet in length and operated by single truck, one motor to the car. Afterwards two motors were used. Some cars of this type were operated up to five or six years ago.

For awhile the Fifth avenue line was equipped with double deck summer cars. While these cars appeared to operate with safety, sufficient speed could not be made and they retarded the other cars operating over the same line.

In 1900, the Southern Traction Company installed a double truck car which worked very satisfactorily over lines without much grade. A continued improvement in the electric features, such as motors, controllers and brakes, enabled a larger car to be used and these cars were very heavy, weighing about 55,000 pounds.

Mr. P. N. Jones, general manager of the Pittsburgh Railways Company, assisted by Mr. F. R. Phillips, who, at that time, was master mechanic of the Pittsburgh Railways Company and is now vice-president and general manager of the Duquesne Light Company, invented the first low floor and low wheel car, and motors to operate that type of car.

These were placed in service on the Pittsburgh Railways lines on July 10, 1912. He also designed, by the remodeling of four summer cars, a double deck car, and these cars were put into operation on April 27, 1913. Considerable difficulty was encountered in distinguishing the routes shown by the electric signs on the cars and in 1915 the present system of showing route numbers was adopted.

No period in the company's history was so trying as the winter of 1917-18, when we had the heaviest winter storms recorded in the operation of street railways in this district. The snow being continuously fanned into the motors burned out the fields and armatures.

The resultant effects of this trying winter compelled the company, from lack of funds and credit, to have the United States Court appoint receivers for it. On April 24, 1918, the court appointed J. D. Callery, H. S. A. Stewart and Charles A. Fagan, receivers. The first two resigned after about one year of service and S. L. Tone and W. D. George were appointed in their places.

During the receivership the Public Service Commission, with the assistance of the Philadelphia Company, undertook to put a valuation on the property. A detailed inventory was made and the commission finally agreed on a valuation of $62,500,000, but the company fully believed and showed that the value at that time was much larger.

The car fare was increased to enable the company to earn a reasonable rate on this valuation.

Negotiations were taken up by Mr. A. W. Thompson, assisted by E. W. Smith, Esq., A. W. Robertson, Esq., and Hon. J. H. Reed, with the mayor and city council for an adjustment of the rates and operating regulations and greater incentive for service. These negotiations terminated on December 20, 1921, in a satisfactory agreement with the representatives of the city, and similar agreements have been approved since by thirty-six other municipalities in Allegheny county and the county commissioners, up to December 31, 1926. On the strength of these agreements, confidence was restored and the bankers agreed to advance $5,000,000 credit and out of these funds new up-to-date cars were purchased and a general improvement to the system was made, which greatly improved the service.

During the receivership, large expenditures were made in the reconstruction of tracks of the most modern and standard type and the purchase of improved types of cars. The receivers were discharged on February 1, 1924, and the property turned back to the company. Great credit is due the receivers for the operation of the properties during the period of the receivership. Results were accomplished by them which could not be accomplished while the properties were operated under private ownership. The services of Mr. S. L. Tone, one of the receivers, were particularly of value in this regard. Mr. Tone, as engineer, had to do with the building, construction and operation of the lines of many of the original companies composing the Pittsburgh railways system and his great knowledge and experience in this respect enabled the receivers to intelligently work out many of the difficult problems of the receivership.

It might be interesting to note that the platform labor in the cable car period was sixteen cents an hour and in January, 1902, when the Pittsburgh Railways Company took over the operation of all the lines in the city, it was twenty cents an hour which has been increased until it is now sixty-eight and one-half cents an hour for two men cars and seventy-three and one-half cents an hour for one man cars.

Many inducements for street car patronage and goodwill have recently appeared. Outstanding among them are the Sunday 25c pass and the $1.50 weekly pass, which appeared in the summer of 1925. These experiments are still in effect.

So much has been accomplished by the Pittsburgh Railways Company that it received the Coffin Prize in 1925 and the second prize Forbes Award in 1926, both honors of national importance in the street railway industry, acknowledging the leadership of the Pittsburgh Railways Company in the national traction system.

While transportation over the streets of the cities of Pittsburgh and Allegheny began in the early days before horse cars, with busses, it is a singular proof of how things travel in circles in that, after seventy-five years' development of rapid transit, transportation by busses has returned and is rapidly growing everywhere. But the modern automobile bus, whether for long or short distance, is a strange contrast in luxury and speed to the old bus of 1850. It is indeed fast coming to be a strong competitor for business with the street railway and the railroad.

Any history of street railway transportation would be incomplete without some reference to its influence in the development of the outlying districts of the city, but that is a subject which can only be suggested in this paper.

As the street railway lines were extended into a new territory many people who had theretofore lived in the city proper purchased property and constructed homes along the new car line, thus increasing the growth of those districts, and at the same time greatly bettering living and housing conditions. One illustration will be sufficient to show the wonderful effect the construction of street railway lines have in the development of suburban districts; when the Mt. Washington tunnel and the Mt. Washington street railway were constructed about twenty-three years ago, West Liberty borough and Union and Scott townships, through which the street railway runs, were mainly farm lands. Since then thousands of buildings have been erected in and around Beechview and Dormont and some of our most beautiful homes are in that district.

We will now consider the electric light and power company.

In 1879, a group of Pittsburghers which had been watching the development of the electrical art, approached Mr. George Westinghouse to obtain his aid in organizing a company to generate and distribute electricity for lighting the streets of Pittsburgh. Mr. Westinghouse had been conducting some experiments in the secrecy of his laboratory, and was glad of the opportunity to demonstrate the practicability of electric lighting. After a number of conferences the first electric light company in the Pittsburgh district, the Allegheny County Light Company, was chartered on March 6, 1880, with a capital stock of $90,000. The original subscribers and directors of this company were James S. Rutan, Andrew Fulton, Geo. T. Oliver, C. L. Magee, W. B. Rodgers, F. M. Magee, James A. Chambers, James A. McDevitt and Hugh McNeill.

At meetings of the stockholders and directors held April 19, 1881, the following directors and officers were elected: H. H. Westinghouse, president; C. L. Magee, vice-president; John Caldwell, treasurer; John E. Riddall, secretary; George T. Oliver, Ralph Baggaley, Eugene Ingold, P. H. Hacke and A. D. Armstrong.

For a short period following the organization of the company, its apparatus was located in various parts of the city. The first machine installed was a forty-light Brush arc machine located at the former works of the Westinghouse Machine Company at Twenty-fifth street and Liberty avenue. This machine was used to light the Pennsylvania railroad yards between Union station and Thirty-third street. The lights were mounted on sixty to ninety foot poles scattered at various intervals, the idea being to give a general illumination over a large area.

Another machine was placed shortly thereafter at the plant of the Union Switch and Signal Company, at that time occupying a building at the corner of Garrison alley and French street, while another was operated in the plant of the Westinghouse Air Brake Company on Robinson street, Allegheny. The old exposition grounds and buildings in Allegheny were also lighted by similar machines operated by the company on the grounds.

The first permanent station of the company was located on Virgin alley (now Oliver avenue) on a lot 50x90 feet, back of what is now Hardy & Hayes Company store. An old building standing on this lot was remodeled to adapt it to the requirements of the light company. The machinery installed consisted of Munroe boilers, Westinghouse standard engines and forty-light Brush arc machines.

The demand for arc lights increased rapidly, until within a short time there were ten forty-light machines in operation. Up to this time electrical energy was only used for arc lights.

It is interesting to note that Joseph Horne's store was one of the first customers to use arc lighting for illumination instead of gas. The stores in those days kept open in the evening and the arc lights were turned on as needed. The floorwalker in charge would count the number of lamps burning during the evening and so inform that man who trimmed the lamps the next day. The lamp trimmer notified the company and the store was then billed in accordance with the number of lamps burned. This was a pretty loose business arrangement even in those days. The first arc lights were the so-called open type, and were supposed to burn one night. Because of their construction they cast a large, heavy shadow directly under the lamp, and were in general, rather unsatisfactory.

The next development was the Adam Bagnal so-called inclosed arc. These lights burned for a period of one week without trimming, and were so constructed that they cast very little, if any, shadow. These lamps were so superior to the old style open type arc, that the company went to considerable expense to completely equip its system with the new style lamps, which caused considerable favorable comment, and did much toward promoting more general illumination.

Following Thomas A. Edison's invention of the first practical incandescent lamp in 1879 and his successful operation of the first direct current central station at Pearl street, New York, in 1882, the first incandescent lighting installation was made in Pittsburgh in 1884 when current for this purpose was furnished from a 75 light, 110 volt D. C. compound Brush machine.

The first incandescent lighting service in Pittsburgh was furnished to a restaurant and cafe at 52½ Fifth avenue. Just as in the case of arc lighting, the demand for incandescent lights increased very rapidly and it became necessary from time to time to install additional machinery. The new direct current machines were manufactured by a Pittsburgh concern, the Westinghouse Company, and had a capacity of 500 16 C.P. lights, each at 110 volts.

The first customers using incandescent lamps were charged on a flat-rate basis and these incandescent lamps were considered such a good advertisement that they were never turned off, even during the daytime. Accordingly the company lost money on this proposition and it became necessary to devise means of proper charging for this service. The Westinghouse Company finally developed a satisfactory meter which was then installed and immediately the light company was able to reduce the number of machines in operation by fifty per cent, as the customers then turned the lights off in the daytime.

In 1886 the company located an arc light plant in Allegheny on

East Diamond street, two doors below South Diamond street, to supply customers in that district with arc lighting. This plant was enlarged a year after its installation. By the latter part of 1886 the business of the Pittsburgh Virgin alley plant had increased to such an extent that it became necessary to enlarge the plant very materially. Additional ground was purchased and a four-story brick and steel building was erected, including the old plant within its walls, so that the service during the time of construction was not interrupted. When the building was completed it was equipped with new boilers of the Heine make and two Wetherill Corliss Engines of 500 horsepower each. These machines were placed on the first floor and belted to the line shafting on the second floor, from which the generators were driven.

Up to this time direct current was used for both arc and incandescent lighting.

Following the developments of early investigators Mr. George Westinghouse and his associates conducted an epoch making experiment in 1886 that was destined to make possible to a great degree, the electric light and power industry of today. During October of that year in a small room on the top floor of an old house in Lawrenceville, 300 incandescent lamps burned constantly for two weeks, being supplied with alternate current transmitted over two miles. This test proved conclusively that the alternate current provided a practical method of transmitting electrical energy over distances, which practice has now become practically universal in use. In fact, in Pittsburgh there is very little, if any, direct current service remaining.

Previous to this time the majority of prominent engineers advocated the use of direct current, which as Mr. Westinghouse realized had its limitations, in that it was not practical to transmit electrical energy by direct current over long distance as is now done with alternating current.

Following this experiment, in 1887 the first alternating current incandescent lighting dynamos were installed in the Virgin alley plant. These machines were of the Westinghouse make and among the first machines of this type to be used in the United States.

The capacity of these first alternating current machines was 1,000 lights each. Within a year additional alternating current machines of 2,500 light capacity each were put in operation, illustrating by this great increase of capacity, the very rapid development of alternating current work even at this early period. At this time all the lighting was commercial except that of the Monongahela wharf, where 20 arc lamps had been operated from the machine installed at the works of the Union Switch and Signal Company in Garrison alley since 1881. This installation had been made to demonstrate to the city authorities the great advantage of arc illumination for city streets over the gas lamps then in use.

This experiment was made at the earnest solicitation of a steamboat captain who had suffered great losses in loading and unloading his goods upon the wharf from thieves who were enabled to pursue their vocation in safety, owing to the poor illumination of the wharf. It was not, however, until many years later that the city was induced to adopt arc lighting generally on its streets. The Allegheny plant of the company also enjoyed a degree of prosperity similar to that of the Pittsburgh plant. Shortly following the introduction of the alternaing current system in the Virgin alley plant, six alternating machines were installed and operated with great success in Allegheny.

The advantages of lighting by means of electricity were materially recognized in Pittsburgh and the growth of both arc and incandescent business was very rapid.

Some little motor load was then developed, the customers placing the motors in the shop windows. These motors were belted to shafting which ran out through the store or factory and drove fans, machines, etc. Great crowds gathered around the windows to watch these motors run and this remarkable development created considerable interest and was considered quite an advertising feat.

In 1892, the number of incandescent lamps had increased to almost 40,000 and the arcs to over 1,000. Such an increase demanded a still greater enlargement of the company's plant. As further expansion on Virgin alley was impossible, the property of the Brady Foundry Company on Etna street between Twelfth and Thirteenth streets was purchased, and the old buildings on this site were remodeled to suit the needs of the light company.

The machinery installed in the new station consisted of four 1500 K. W., two phase, A.C. generators, direct connected to vertical compound Westinghouse engines of suitable size. These machines were the largest built by the Westinghouse Company up to that time for central station work, and this generating station constituted the principal plant of the Allegheny County Light Company until it acquired the Brunot Island plant from the Pittsburgh Railways Company in 1913.

Owing to the limited range of economic distribution of current during the early periods of the electric lighting industry, many central stations were required to supply the needs of the Pittsburgh district. This condition brought about the organization of numerous small electric light companies, each serving a small district within the economic range of its generating station. The first of these was the Electric Light & Power Company on Diamond street. This company was chartered July 14, 1882, and after operating a number of years its entire stock was sold to Mr. George Westinghouse in 1894. Shortly thereafter it became a part of the Allegheny County Light Company holdings. The next company organized was the Pittsburgh Light Company, of the southside, which was incorporated August 27, 1885. This company constructed a generating station where the Sarah street substation is now located. It belonged to the Oliver interests and after a limited period of usefulness passed into the control of the Allegheny County Light Company during the early part of 1887.

The most formidable competitor of the Allegheny County Light Company was the East End Electric Light Company, incorporated January 20, 1886. The first officers of this company were E. B. McAbee, president; Sam Heppenstall, vice-president; W. R. Kuhn, treasurer; J. B. Van Wagener, secretary; and the directors were E. B. McAbee, H. P. Kuhn, Sam Heppenstall, G. W. Baum and J. B. Van Wagener.

This company first operated a five-arc light machine in the basement of a confectionery store at 6202 Penn avenue, East End. After a short period of operation additional machinery was installed in the rear of this store, part of the installation being for incandescent lighting at 110 volt, direct current. During the year of 1887 the company adopted the Westinghouse alternating current system which enabled it to include a much larger area of distribution than had been possible with its old direct current system. At this time the station was moved to the location of the present East End substation at Broad and Beatty streets. The lines of this company extended from the plant through some of the best residential territory in that part of the city.

This company went what was considered a great distance at the time, about four and one-half miles, making a nine-mile circuit from the central station. Quoting from an annual report:

"The energy required to furnish the lights of the company at that great distance would be over twice sufficient for the number of lights nearer the station."

That was a four and one-half mile transmission and they thought it was altogether too far to go.

Now we transmit electrical energy 200 to 300 miles and think nothing of it.

The Allegheny County Light Company furnished electric light in Johnstown in 1887, a distance of about 100 miles, but not by the usual present methods of transmission. During the Johnstown flood the entire lighting system of that city was put out of commission. The Allegheny County Light Company hurriedly equipped a special four-wheel steel wagon with a standard arc machine driven by a small engine and this was rushed to Johnstown with all possible speed and did much towards establishing order and relieving suffering during that terrible catastrophe.

As an illustration of the lack of information of the public generally in regard to electric lighting, the board of directors of this company found it necessary to give a considerable part of their time in explaining the merits of electric lighting to their friends and neighbors in order to induce them to make a trial of the new light.

Among the first patrons of the company to use electric light for illuminating their residences was Mr. Herman Westinghouse, who resided in Edgewood, a distance by the lines of almost five miles from the plant. Among others, the residences of Mr. George Westinghouse and Mr. H. C. Frick were supplied with light from this plant. The current was distributed at a pressure of 1,000 volts, except the Edgewood circuit, on which the pressure was raised by transformers to 2,000 volts.

There was considerable rivalry between the Allegheny County Light Company and the East End Electric Light Company, especially as to the contracts for city lighting: first one securing the contract for a period and then the other. In both instances, however, the successful company sublet that portion of its territory, most inconveniently situated, to be lighted by its rival. Finally, early in 1896, the control of the East End Electric Light Company passed to the Allegheny County Light Company, where it has remained ever since. The central station at Broad and Beatty streets was subsequently dismantled and a substation was established in the old building, current being supplied from other generating stations.

After the absorption of the smaller companies within the limits of the city, the territory of the Allegheny County Light Company was still further enlarged by securing control of the various light and power companies which had been operated in the surrounding suburban districts.

Among the first of such companies may be mentioned the Rural Electric Light Company of Wilkinsburg, which passed into the hands of the Allegheny County Light Company in 1898. In 1902, the territories of the Southern Heat, Light and Power Company and the Monongahela Light Company were added to that of the Allegheny Light Company, and in 1903 the Oakmont and Verona Light, Heat & Power Company and some other companies passed into the control of the Allegheny County Light Company.

Each of these companies had operated central stations, some of which were remodeled, while others were dismantled and in their place substations were established, the substations being supplied with current from the large central station and each supplying its own district.

The Allegheny County Light Company was one of the pioneers in the electric light and power business, and much of the present day efficiency can be attributed to the foresight and engineering ability of its executives and engineers. Many of the early developments, and as a matter of fact, even the present day developments, were installed and tested out on its system by the Westinghouse Electric & Manufacturing Company.

It is to Mr. R. S. Orr, the general contracting agent of the Allegheny County Light Company and later the vice-president and general manager of the Duquesne Light Company, that we are indebted to a great degree for the application of electricity to industry. Mr. Orr, with his characteristic vision and engineering ability, realized that electricity was destined to play an even more important part than lighting, and that its greatest use would eventually be found in its application to power in the industry. At that time practically all of the central station load was used for lighting, and this load, of course, came at night.

Mr. Orr obtained what was perhaps the first electric furnace contract in the United States and along in 1906 assisted in the installation of the first electric furnace at the Firth-Sterling Steel Company. Experimental work on this furnace was conducted at the company's Rankin power plant. He also did much toward developing the motor load, which was the prime factor in changing the old night load of the company to a more consistent twenty-four hour load, thereby utilizing to better advantage the electrical equipment, with a material reduction in rates.

One of the first large motor contracts was for a motor application at a plant in the Lawrenceville district, and it required considerable effort on the part of Mr. Orr to convince other officials that the necessary expenditure of about $2,000, to extend an 11,000 volt line several miles was a paying proposition.

Mr. Orr not only developed electric power in industry, but proved satisfactorily that central station steam heating was a necessary adjunct to the electric light and power business, and it was largely through his efforts that the Duquesne Light Company later organized the Allegheny County Steam Heating Company, which not only furnishes approximately forty per cent of all the steam used in the downtown district, but does much toward the elimination of the smoke nuisance in Pittsburgh.

The Duquesne Light Company was incorporated August 5, 1903, and operated a gas engine plant in East Liberty where the Equitable Auto Company garage now stands at 6302 Penn avenue.

The original incorporators, directors and officers of this company were E. W. Hatfield, president; E. B. Fritz, secretary and treasurer, and C. A. Gabig.

On December 14, 1903, the original incorporators, directors and officers resigned and the following directors and officers were elected: Robert C. Hall, director and president; H. McSweeney, director and vice-president; R. H. Binns, director and treasurer, and Shirley P. Austin, director and secretary.

On November 25, 1912, the Monongahela Light Company and the Oakmont and Verona Light, Heat and Power Company were consolidated and merged with the Duquesne Light Company. This was followed by the purchase of the properties and franchises of other companies until today, the Duquesne Light Company is in reality a combination, by merger, lease, or otherwise, of more than 150 electric light companies originally organized in this district.

On January 1, 1913, the Duquesne Light Company took over the Brunot Island plant of the Pittsburgh Railways Company, which was at that time considered one of the most modern plants in the country. This generating station had been constructed in 1904 and its installation consisted of Rice-Sargent, Corliss Cross Compound Engine driven D.C. generators with a total capacity of 12,500 K.W. So rapid was the development of the art at that time that in 1907, only three years later, these engines were replaced by the newly developed turbo-generators manufactured by the Westinghouse Company and were rated at 5,000 K.W. In 1914 these machines had outgrown their usefulness and five 15,000, and later one 40,000 turbo-generator was installed. This indicates the tremendous growth in the industry during these few years, for in less than ten years, in a space less than eighty per cent of that required for the original engines, turbo-generators were installed which increased the capacity of the plant almost one thousand per cent, a truly remarkable growth.

While the electrical end of the business had been highly developed in recent years, the steam end had not been neglected. This is evidenced by the fact that at present the Allegheny County Steam Heating Company with two boilers in the Stanwix heating plant, has as much boiler capacity as the Duquesne Light Company had in fifteen boilers in the Rankin plant, which were used up to only a few years ago.

While some 150 independent companies were combined under the control of the Duquesne Light Company, the major portion of these companies are no longer in existence, so that the Duquesne Light Company at present controls only six active companies.

These companies are:

1. The Allegheny County Light Company, chartered March 6, 1880.

2. Southern Heat, Light and Power Company, formed by consolidation and merger of the Southern Heat, Light and Power Company and the Ohio Valley Electric Company under agreement dated October 28, 1912.

3. Monongahela Light and Power Company, chartered April 28, 1899.

4. Sewickley Light, Heat and Power Company, chartered June 22, 1909.

5. United Electric Light Company, formed by consolidation and merger of the United Electric Light Company, et al., under agreement dated September 18, 1907.

6. Beaver County Light Company, chartered March 29, 1910.

The Duquesne Light Company which operates in the major portion of Allegheny and Beaver counties, is rated as tenth in output among some 5,800 electric utility companies in the United States. The metropolitan area of Pittsburgh is surrounded by a 66,000 volt high tension transmission power ring, some eighty-nine miles in circumference with a twelve mile tap extending down the Ohio river.

Located on opposite points on this ring are two modern, super power generating stations, Brunot Island, and Colfax, that feed energy into the ring for distribution to points of utilization. Colfax is reinforced by a high tension tie line from a similar plant located only a few miles distant.

At strategic points on the circumference of the present 66,000 volt power ring are located large substations which reduce the pressure from 66,000 volts to 22,000 volts and feed the energy into the congested districts like the spokes of a wheel, converging toward the center. At the end of these radiant transmission lines in the congested district, another group of smaller substations, likewise connected to an inner 22,000 volt ring, transform the energy to still lower voltages for industrial, commercial and residential use as required.

Completely surrounding the 66,000 volt transmission ring is another gigantic ring around the entire Pittsburgh district, some 350 miles in circumference, the major portion being operated at 132,000 volts and fed by other modern power plants. This gigantic outer ring is so connected with other electric utility companies that it is possible to connect together systems from Boston to Chicago and St. Louis and to feed into the Pittsburgh district some 1,500,000 horsepower of electrical energy.

The Duquesne Light Company was the pioneer in this so-called ring system of transmission which has made this district famous for its reliability of electric service. The ring system provides practically 100 per cent transmission capacity to every customer looped on the system, inasmuch as the various rings may be out at any one point and portions isolated without interrupting the service to any of the customers. With the older so-called radiant transmission lines radiating from a point, an interruption to any line caused a complete outage to the customers from the isolated point to the end of the transmission line. This feature, together will elaborate relay protection, duplicate equipment, skilled personnel, etc., makes possible a continuity of service which is indeed remarkable and which has contributed much to the great industrial development of Pittsburgh during the past decade.

And so, from a humble beginning, the organization of the Allegheny County Light Company in 1880 and the operation of several arc machines feeding a few hundred electric lights, has grown the Duquesne Light Company—the tenth largest electric utility in the United States, which has done much in contributing toward the growth of our wonderful city. Today the Duquesne Light Company serves a metropolitan area of approximately 1,000 square miles, containing a population of 1,360,000 people, represents a capitalization of $102,640,000, has a capacity of 317,500 K.W., is installing 80,000 K.W., has 908 miles of high tension transmission lines, 19,000 miles of distribution wire, 214 substations and 248,307 customers.

Through its system of interconnected transmission and distribution circuits over 1,500,000 horsepower of electrical energy is available for instant use to turn the wheels of industry, transport countless thousands of people to and from work, provide safety by night in the form of illumination, and make life more enjoyable in the homes by the application of electrical devices.

PITTSBURGH AND THE ELECTRICAL INDUSTRY

E. M. HERR

Edwin Musser Herr, electrical and mechanical engineer and president of the Westinghouse Electric and Manufacturing Company, was born in Lancaster, Pennsylvania, May 3, 1860, the son of Theodore W. and Annie (Musser) Herr; Ph.B., Sheffield Scientific School (Yale) 1884; D. Sc., Franklin and Marshall College, Pennsylvania, 1911; A.M., Yale, 1915. He married Mary Forsyth, of Northumberland, Pennsylvania, June 14, 1900.

He was engineer of tests, superintendent telegraph, and division superintendent C., B. & Q. railway, 1886-1900; division master mechanic, C., M. & St. P. railway, 1891; general superintendent Grant Locomotive Works, Chicago, 1892-93; general manager, Gibbs Electric Company, Milwaukee, 1894; assistant superintendent motive power, Chicago & Northwestern, 1895-96; superintendent of motive power, Northern Pacific railway, 1896-98; general manager, Westinghouse Air Brake Company, 1898-1905. From 1905 to 1911 he was first vice president, and has been president since August, 1911, of the Westinghouse Electric and Manufacturing Company.

He is a member of the American Society Mechanical Engineers, American Institute Electrical Engineers, American Civic Federation, Berzelius Society (Yale).

Pittsburgh and the Electrical Industry

BY E. M. HERR

THE development of the electrical manufacturing industry in Pittsburgh began in 1886 when Mr. George Westinghouse started to make apparatus on the top floor of the Garrison alley factory of the Union Switch & Signal Company. This was not simply the beginning of another factory to make existing types of apparatus, but, conforming to a policy to which Mr. Westinghouse steadfastly adhered throughout an eventful career, it was the beginning of an entirely new and revolutionary development.

It is interesting to note that this undertaking had much of the ethical and but little of the ordinary commercial incentive back of it. Why should Mr. Westinghouse engage in an electrical enterprise? He was an air brake man. His contacts were largely with the railroads. This project involved a radical departure from all his previous activities. The answer is plain. He foresaw in the development of the electrical manufacturing industry a great new instrument that would benefit mankind, and that would help build up his own and many other communities, and he wanted to do his part in this great work. The results, as far as Pittsburgh is concerned, certainly justified this vision.

Prior to 1886 central station electric lighting was by continuous or direct current only, and because of fundamental design limitations, the territory which could be served by a central station was very restricted. In 1885 the attention of Mr. Westinghouse was attracted to a foreign invention which seemed to point the way to a removal of these limitations. With the promptness and energy which characterized so many of his acts, he at once acquired this invention and undertook its development. The invention was no less than an application of the well-known principle of electric induction by alternating currents, which affords a ready means of changing current of small volume and high pressure into current of large volume and low pressure, or vice versa.

By brilliant invention and ingenious design, Mr. Westinghouse's engineers soon removed some of the commercial limitations of the English devices and shortly there resulted an alternating current electric light system which today is fundamentally the basis of the enormous and incalculably important light and power industry of the world.

As soon as the practicability of the new system was demonstrated, a new company—the Westinghouse Electric Company—was organized for the purpose of manufacturing this apparatus. The articles of association were signed by George Westinghouse, H. H. Westinghouse, John Caldwell, John R. McGinley, John Dalzell, Robert Pitcairn, C. H. Jackson, and F. L. Pope.

The business expanded rapidly and additional factory facilities were soon needed. These were at first secured by moving the Union Switch and Signal Company out of the Garrison alley building, thus enabling the Westinghouse Company to occupy all the space. Within a short time this building also proved inadequate. By erecting adjoining buildings, the floor space was more than doubled. But this was only a start. Another factory was soon acquired in Newark, New Jersey, by the purchase of the United States Electric Lighting Company. By 1895 the Garrison alley facilities had been completely outgrown. The company then built and moved to the first of its shops at East Pittsburgh, Pa., at which location is still found the most important single manufacturing unit of the Westinghouse Electric & Manufacturing Company, consisting of a large group of shops as well as adequate office buildings.

The revolutionary feature of the alternating current system naturally aroused the most determined opposition from those who were exploiting the continuous current system and who saw their market in danger of material curtailment, if not of complete destruction. Commercial competition became keen and even bitter. Incandescent lamps were naturally essential for every installation. It was, therefore, made very difficult for stations equipped with Westinghouse apparatus to obtain the necessary supply of these lamps. To overcome this difficulty, the Sawyer-Mann Electric Company, which operated a large lamp factory in New York City, was acquired. Sawyer was the inventor and the company owned many lamp patents, some of them fundamental. Although the patent position of the Sawyer-Mann Company seemed to be strong, it was attacked in the courts and after protracted litigation, which lasted for some four years, priority was awarded to a patent of Mr. Thomas A. Edison, and the product of the

Sawyer-Mann Company was adjudged an infringement.

Edison's patent covered the use of an "all glass" container for the heated filament. The announcement that it had been sustained came like a bomb to the Westinghouse Company as well as to the many central stations that were then depending upon Westinghouse for their supply of lamps. Today it is hard to picture the consternation which followed this announcement and the subsequent statement by the owners of the Edison patent that all other lamp factories must close. It was strongly intimated at the same time that users of lamps must thereafter buy their lamps, as well as the rest of their apparatus, from those who controlled the Edison lamp patents.

It was a very critical situation for Mr. Westinghouse, but he met it with the courage and resourcefulness which he so often exhibited throughout his career. What followed is one of the most interesting chapters in the development of the electrical manufacturing industry, and of the electric light and power industry as well. Sixty cents was the retail price of the carbon filament sixteen candlepower incandescent lamp at the time of the announcement of the patent decision in favor of Mr. Edison; fifty-five cents was the price, if purchased in quantity, while some large users, who were given specially favorable terms, could buy lamps for fifty cents each. Mr. Westinghouse, with his characteristic energy, at once began to experiment with a lamp that would not infringe the Edison patent. In an incredibly short space of time he succeeded in developing the "Stopper Lamp," so-called because the container was made in two parts instead of one, and its leading-in wires were brought through a small piece of glass shaped like and ground in the same manner as the familiar bottle stopper. This stopper was sealed in place by a liquid cement which, although it constituted but a very minute part of the container, nevertheless was not glass and did not infringe the sustained patent, which specifically described the container as "all glass." No sooner was Mr. Westinghouse satisfied that he had produced a lamp that did not infringe than he offered it for sale to any and all purchasers at twenty-five cents, regardless of quantity, and advertised this price broadly throughout the land.

If the sustaining of the Edison lamp patent was a bomb in the Westinghouse camp, the announcement of the invention of the stopper lamp, to be retailed at a price of twenty-five cents, was most certainly a bomb in the camp of the opposition.

To make matters worse, about this time Mr. Westinghouse took a contract to light the World's Fair in Chicago, then in course of construction, for approximately $1,000,000 less than the price quoted by his competitors, who were confident that they had a monopoly on the incandescent lamp.

As a commercial product, the stopper lamp was a failure, because the co-efficient of expansion of the cement seal was not the same as that of glass, so that when subjected to wide temperature variations, the seal would sometimes crack. When this occurred, the lamp would leak air and burn out. Nevertheless, Mr. Westinghouse succeeded in satisfactorily lighting the World's Fair with this type of lamp, and the opposition found it to be such a potential competitor that they were willing to negotiate a license agreement which permitted Mr. Westinghouse to use the Edison patent on a royalty basis. Thus, as a commercial expedient, the stopper lamp was a huge success and saved the day.

The incandescent lamp as first developed, although well adapted to commercial service, had its limitations. Light was produced by heating to incandescence a tenuous and somewhat delicate piece of carbonized silk, and the limitation of design referred to was in the temperature to which the filament could be raised. As the temperature went up, the tendency of the carbon to combine with the residium of oxygen remaining in the lamp bulb increased to such an extent that the filament was rapidly destroyed. As a consequence the temperature had to be restricted and more energy was required than would have been needed at a higher temperature. In trade parlance, an incandescent lamp required three and one-half to four watts of energy per candlepower. Continuous research over a long period yielded but meager results until a German chemist discovered a special clay which was practically non-oxydizable at very high temperature, even in the open air. Mr. Westinghouse promptly acquired the patents on this invention and immediately proceeded to incorporate it in his lamp. The use of the clay filament cut the per candle energy consumption about sixty per cent—that is, it increased the capacity of every lighting plant 150 per cent. What the ultimate results might have been will never be known because this device had not been long on the market when the present-day tungsten filament came into use. The much higher melting temperature of tungsten—more completely taken advantage of later by filling the lamp with a neutral gas—permits of the manufacture of a practical commercial incandescent lamp which takes only one watt per candle, a saving of at least seventy-seven per cent of the energy needed by the old carbon filament. This phenomenal saving nearly quadrupled the capacity of all existing lighting systems and gave a tremendous impulse to the expansion of the lighting field.

Closely following the development of electric lighting came electric power, but it was from the relatively small motor used locally. No such thing as power transmission in the modern sense was then possible or even dreamed of. The continuous current dynamo could be readily reversed and used as a motor, but the same fundamental limitations which restricted the radius of continuous current electric light distribution restricted the territory which could be served from a central power station. There was no satisfactory alternating current motor, a fact of which Mr. Westinghouse's competitors were not slow to take commercial advantage. Much effort was devoted to the design of a motor which would run on alternating current, but without success. When the skies looked darkest an accidental occurrence in the laboratory of the Westinghouse Company at Garrison alley furnished a clue to a then unknown principle, which looked as though it might lend itself to the construction of an alternating current motor. While experiments were in progress the Tesla alternating current motor was brought to the attention of Mr. Westinghouse. Prompt investigation indicated that this invention was along the line of the developments then being carried on at Pittsburgh. With characteristic energy, Mr. Westinghouse lost no time in acquiring the now famous Tesla patents, which became the basis of the alternating current induction motor.

It is difficult to estimate the effect which this development has had on the fortunes of the Westinghouse Electric & Manufacturing Company and the part it has played in the industrial development of Pittsburgh.

Pittsburgh had again made a significant contribution to progress. Another milestone had been erected along the road to success. Thousands upon thousands of horsepower of these alternating current motors have gone into Pittsburgh's mills and factories and have done their part in putting this city in the leading position in industry which it now occupies.

A beginning in alternating current power transmission was made in 1890 at Telluride, Colorado, where there was a small water power on one side of a range and a mine several miles away on the other side. As the transportation facilities were limited, fuel was very expensive. This was the first undertaking of the kind and its success demonstrated the possibilities which up to that time had only been dreamed of.

This installation was followed by an extensive demonstration at the World's Fair of the possibilities of a complete distribution system by alternating current. But it was not until 1893 that the real epoch-making enterprise was undertaken, when the Westinghouse engineers designed, built, and installed the first alternating current generators at Niagara Falls, this installation taking three years to complete. The daring of this step, the resourcefulness, the ingenuity and the skill required to make it a success is a romance which rivals the poet's vision and merits the pen of a gifted writer. The generators were the largest ever built up to that time—5,000 horsepower each. They were equipped with vertical shafts driven direct by turbines located 140 feet down in the rock. They employed a new frequency of alternations, since adopted as a standard all over the country, and they were part of a system which for the first time transmitted a large amount of power over a long distance—twenty-six miles, to Buffalo.

It may fairly be said that this pioneer installation, which was successful, gave the first great impetus to the power development of this country, which easily surpasses that of the rest of the world and is the insurance of our country's present and future prosperity.

Another epoch-making event was Mr. Westinghouse's venture into the traction field. Prior to 1890 the company's attention had been confined strictly to electric light and power products, mostly electric light. While up to that time there had been some pioneering, comparatively little practical application of electricity to traction had been made. The largest street car motors used were rated at seven and one-half horsepower each and the speed was so high that two sets of gears and pinions had to be used to bring the speed of the motors down to that of the car axles. All of the auxiliaries were crude and clumsy. The first products of the Westinghouse Company followed closely the design of existing types, but soon thereafter the pioneer instinct again asserted itself and the single reduction motor with one gear and one pinion made its appearance.

It is interesting to note that the type of motor then produced not only marked such a distinct advance in the art as to be universally copied by other makers, but with only minor fundamental modifications, it has remained and is today the standard form of electric motor used on street and interurban railways.

The traction branch immediately became a substantial and increasing part of the company's activities and the company assumed and has since maintained a leading position in this field.

Let us imagine, if we can, Pittsburgh without electric traction. We can scarcely conceive what it would mean to eliminate the wonderful system of street and interurban railways which carry the people to and from their daily tasks and furnish a means of rapid communication between the big central hive of industry and the many outlying thriving communities which surround it. Without electric traction Pittsburgh's progress would have been spelled in very small letters—her present development would have been absolutely impossible.

In the natural course, as interurban railways were operated over longer and longer distances, as cars grew larger, speeds higher, and motors of greater and greater capacity, the attention of the steam railroads began to be attracted toward the new motive power. Every steam railroad official knew and respected Mr. Westinghouse through his wonderful achievements with the air brake. It was natural, therefore, that inquiries regarding the possibilities of electric traction should come to him.

It is interesting to note the lasting effect of this psychology, as it has undoubtedly been largely responsible for the outstanding position which the Westinghouse Electric & Manufacturing Company has occupied in the field of steam railroad electrification from that day to this, regardless of the excellence of its product. This is shown by the fact that to date Westinghouse equipment has been used on more than seventy per cent of the railroad electrification projects in this country.

Because of his familiarity with railroad problems, Mr. Westinghouse recognized early in his career that there was a great deal more to the art of steam railroad electrification than merely making electrical apparatus. Brilliant minds had devoted many years to an intensive study of the science and art of railroading. In order to reap the benefits of this experience and to avoid dissipating its energies in other fields than its chosen one, the Westinghouse Electric & Manufacturing Company many years ago allied itself with the Baldwin Locomotive Works, one of the two leading builders of steam locomotives in this country. This alliance has continued with uninterrupted cordiality to the present day, and its merit is best shown by the phenomenal success of the combination. Westinghouse builds the electrical equipment and Baldwin the mechanical.

Following more or less closely the history and development of the electric light, all street and interurban railway development was by means of the direct or continuous current. Vehicular propulsion required widely varying speeds. The variable speed, continuous current, motor was of simple design and could be readily adapted to this service. Steam railroad electrification, on the other hand, presented new conditions and problems. Much more powerful motors were required. The distances to be covered were greater, and the problem of transmitting power over these longer distances and supplying it to these larger motors emphasized the limitations of design of the continuous current system in a way similar in many respects to what had happened in the growth of the electric light business. It was, of course, natural to try to solve the problem in the way that the lighting problem had been so successfully solved, that is, by the use of alternating current. This was not easy. Although alternating current motors had been brought to an advanced state of development and were rapidly supplanting continuous current motors in many fields, they were practically all constant speed motors and no one had as yet been able to design a commercially satisfactory variable speed alternating current motor, although much effort had been expended on it for a long time. It remained for a Westinghouse engineer to solve this problem.

In about 1901 a single-phase alternating current, variable speed motor was produced which followed closely the fundamental characteristics of design of the continuous current motor. While the fundamental characteristics of design indicated steam railroad electrification as its primary field, this motor was first used on interurban service, and it was not until 1907 that the first steam railroad adopted it. In that year the New York, New Haven and Hartford railroad installed single-phase locomotives on part of their most congested division—that between New York and New Haven—and later equipped this entire division with single-phase locomotives for both freight and passenger service. The success of this new type of motive power led to its adoption by other roads in this and other countries.

A major branch of the activities of the Westinghouse Electric & Manufacturing Company is the manufacture of prime movers. Through the acquisition of the Westinghouse Machine Company—a Pittsburgh corporation controlled by the Westinghouse family and organized to build reciprocating steam engines—the Westinghouse Electric & Manufacturing Company obtained facilities for manufacturing that engine's successor—the steam turbine.

This is another instance where Mr. Westinghouse displayed rare vision and energy. For many years he had experimented with a rotary steam engine, but was never successful in developing it commercially. When the steam turbine was invented in England he watched its development with keen interest. He realized that it held out a promise of accomplishing what he had for so long been trying to do. He at once set out to acquire the American rights, which he obtained in 1905.

The steam turbine did revolutionize steam power generation. It was not only cheaper and more efficient, but its design called for higher rotating speeds, closely corresponding with and essential to the best designed generators, thereby facilitating direct connection. It has now been developed to a point where units from twenty to thirty times as powerful as the largest possible reciprocating steam engine can be built without increasing the dimensions. The effect has been to practically run the reciprocating engine off the market as far as large power stations are concerned.

To provide for market demands, the Electric Company some years ago found it necessary to expand the facilities for this class of product far beyond the works of the Westinghouse Machine Company at East Pittsburgh. As a result, in 1916 it purchased a large tract of land near Philadelphia and erected thereon a modern turbine plant.

This brings us to the period of the Great War. Here the Westinghouse spirit reflected a great deal of credit on the entire organization. Although, in common with other loyal American corporations, its ranks were seriously depleted by the loss of employees who entered the service of the Government, it nevertheless established a record in the production of supplies needed for carrying on military operations. A factory near East Pittsburgh was erected in record time for the manufacture of shells, and several other plants were quickly equipped for this work. I need make but brief mention of the vast stores of munitions which were turned out in these plants in record time.

At Springfield, Mass., two large plants were acquired and equipped for the manufacture of Russian rifles for the British Government. Subsequently, when our Government entered the war, these factories were used for the manufacture of the heavy Browning machine gun, and produced more of these guns than all the other factories in the United States combined, thereby earning the commendation of the Government of the United States.

When we entered the war in 1917, the South Philadelphia plant was nearing completion. The Government quickly sensed its value for the production of marine propulsion machinery. Before the close of the war many hundred naval vessels and ships of the merchant marine type had been equipped with machinery turned out by this plant.

The proximity of our South Philadelphia works to the Hog Island ship yards, to the extensive Baldwin undertaking near Chester, and to the many other factories which were erected in that locality, created a very acute labor problem. To meet this, the Westinghouse company built a small town for its employees on land adjacent to the plant. This project was put through in record time and materially lessened the labor problem. The entire number of houses was ultimately sold to the employees at reasonable prices.

As the business of the company continued to grow and expand, it became evident that the supposedly limitless facilities at East Pittsburgh would not long be adequate to care for the needs of the company. On the principle that all our eggs should not be in one basket, further expansion was undertaken at widely scattered points. Time will not permit a recital of the details of this expansion. I can say, however, that today the company owns and operates, directly or through its subsidiary companies, twenty-five separate and distinct groups of factories, located in seven states and in Canada. It operates thirty-six service stations in as many different cities. It maintains 107 offices in cities throughout the country, and in addition operates through thirty agent jobbers. This large organization centers in Pittsburgh. The control is here. Pittsburgh is the nerve center. And, of course, the treasury is here, with all that implies. $187,000,000 of business of the Westinghouse Electric & Manufacturing Company in the past year paid tribute to Pittsburgh—and yet in 1886 this company did not even exist.

It was natural that after the early success of the Electric Company in Pittsburgh, the attention of Mr. Westinghouse should be directed toward foreign fields. He conceived a chain of Westinghouse factories, each one located in a different part of the world, all under one control, and each getting the benefits of advances in the art made by all. Factories were established in quick succession in England, in France, in Russia, and in Italy. The conception was superb, but because of the rapid development of the business in the United States, which taxed the energies of the parent organization, it was necessary for the foreign companies to depend to a great extent on independent management. The results were not satisfactory. Before the war the

Russian company had been sold, and during the war the remaining companies were consolidated and then sold to an English group, so that today the Westinghouse Electric & Manufacturing Company has no interest in any European factory.

In 1920 a new child was born to Westinghouse—the radio. Attracted by the possibilities of this new agent, the Electric Company, in that year, acquired control of the International Radio Telegraph Company, a Pittsburgh enterprise, which owned a large group of patents, some of them fundamental, and which operated several coastal radio telegraph stations, conducting a ship-to-shore communication business. As a direct result of this acquisition, the Westinghouse Electric & Manufacturing Company later acquired a participation in the Radio Corporation of America, and now manufactures radio apparatus for it.

It is interesting to note that at the time the International Radio Telegraph Company was acquired, the entire thought and attention of those who gave consideration to radio questions were confined to radio telegraphy and the possible application of high frequency currents for power purposes. It remained for the Westinghouse Electric & Manufacturing Company to develop in Pittsburgh and to popularize the now universally used broadcasting service, thus again running true to form and demonstrating that Westinghouse success has been made in pioneering, in producing something that was never produced before, or in offering something to fill a hitherto unsatisfied need.

And now, in 1927, comes the latest baby, not yet out of its swaddling clothes, the new Diesel engine. For many years this type of heavy oil-burning internal combustion engine has been slowly gaining in popularity, its very high fuel economy bringing it favor in spite of its unavoidably clumsy construction and consequent high cost. What a triumph it would be if someone could make the Diesel engine lighter and cheaper than was thought possible. It remained for Westinghouse to again do the seemingly impossible. In the new engine that is being developed not only are weight, size, and cost a little less —they are but a fraction of what they were in the old design of Diesel engine. The field is far-reaching. Its first exploitation will be in the railroad and transportation lines. The baby is born, but it has not yet been introduced into society. Much time, effort, and expense has been put behind this development, and much more will be needed before it can be offered to meet all commercial demands.

This briefly is the story of the part played by the Westinghouse

Electric & Manufacturing Company in the development of Greater Pittsburgh. We face the future confident that we can continue to serve the ever-increasing needs of the public in our line and hope to share in the prosperity which should accompany the growth of Pittsburgh and of the nation.

This sketch outlines some of the outstanding achievements in the forty years of growth of the Westinghouse Electric & Manufacturing Company. What has this meant to Pittsburgh? It has meant three things:

First. The obvious benefit that is derived from the operations of a corporation doing an annual business of more than $180,000,000, which necessitates the collection from the world at large, and the disbursement in Pittsburgh, of large sums of money.

Second. The increase in the comfort and convenience of the citizens of Pittsburgh brought about by the development of electric lighting and transportation.

Of course Westinghouse makes no sweeping claim for credit in this development, which has only been made possible through co-operation with other men of vision and enterprise, but it has undoubtedly played a leading part in the invention and development of electrical machinery and appliances, without which the efficient lighting and transportation systems of the Pittsburgh utilities would have been impossible.

Third. Unquestionably more far-reaching and more significant than either of the first two contributions named has been the development of the application of electric power to industry. Pittsburgh's phenomenal and outstanding progress has been as an industrial center. The part which has been played by the application of electric power to industry can perhaps be better realized when I say that carefully compiled statistics for the United States show that such application has multiplied the output by manual effort more than twenty-five times. No statistics are available which are confined to Pittsburgh alone, but because of the character of its industries and the progressive spirit manifested by its industrial leaders, there is little question that Pittsburgh's factor of increased productivity is much higher than that for the country as a whole. This not only means that Pittsburgh has been able to far outstrip its rivals in the accumulation of wealth and the output of its industries, but at the same time its products have undersold competing products throughout the world, and its workmen have received the maximum rates of compensation. The Westinghouse Electric & Manufacturing Company, because it is a Pittsburgh industry, has given employment to more than 25,000 of its citizens.

This industrial progress has been due primarily to the intensive study given to the development of apparatus which makes possible the application of motors to production in mill, mine and factory, in which development Westinghouse is proud of the active and leading part it has taken.

PUBLIC SCHOOL SYSTEM IN PITTSBURGH

WILLIAM M. DAVIDSON

William Mehard Davidson, superintendent of the Pittsburgh Public Schools, was born in Jamestown, Pa., May 8, 1863, the son of Thomas Houston and Anna (Mehard) Davidson, and was graduated from the State Teachers College at Emporia, Kansas, in 1886, and from the University of Kansas in 1902.

He holds the honorary degree of Doctor of Laws from the following named institutions: University of Nebraska, Lincoln, Nebraska, (1909); Miami University, Oxford, Ohio, (1909); Bethany College, Bethany, West Virginia, (1916); and the University of Pittsburgh, (1917)

Doctor Davidson began his teaching in the rural schools of Lyon county, Kansas, in 1881. Since completing his apprenticeship in the rural schools, he has held the following positions: principal of the public schools, Atwood, Kansas, 1886-87; principal, Quincy school, Topeka, Kansas, 1887-88; principal, Lincoln school, Topeka, Kansas, 1888-92.

He was elected superintendent of schools, Topeka, Kansas, in 1892, and of those of Omaha, Nebraska in 1904. He was superintendent of schools, Washington, D. C, from 1911 to 1914, in which year he came to Pittsburgh.

Doctor Davidson has held many offices in the professional organizations connected with his line of work. He was president of the department of superintendence of the National Education Association at its Mobile meeting in 1911, and treasurer of the National Education Association itself, in 1903. He was president of the Kansas State Teachers Association in 1909; the Nebraska State Teachers Association in 1911; and the Pennsylvania State Education Association in 1923. He served as president of the Federal Schoolmen's Club in Washington, D C., in 1913.

He is the author of a history of the United States and editor of a series of historical and literary classics of wide circulation.

Public School System in Pittsburgh

BY WILLIAM M. DAVIDSON

THE phrase, "the little red school house" has become a figure of speech in our language! It is the symbol of an institution which today occupies first place in the heart of every worthy thinking citizen of this Republic. It is a terse, graphic, flaming word-picture so vivid and so colorful and withal so informing and illuminating that we stand uncapped and uncovered while these five short words flash upon our minds the thrilling story of the development of the greatest of all our institutions—the free-tax-supported public schools of America, as developed in the separate state school systems of the forty-eight states of the American Union.

From the hour of the founding of "the first little red school house" in that distant New England village, by the earliest of our colonists—down to the present time, it has silently though steadily spread across the continent until today we find it on every hillside, in every dale; in every hamlet, in every village, in every town; and at every convenient crossroads in the land.

From the day when that small group of Puritan villagers made their first investment in the first school established in the New World, through their individual contributions of a few bushels of corn and other products of their meager farms, down to the present hour, the business of education in America has so grown in volume and in importance and influence as to cause it to take rank today as the biggest single business in America, if not the world.

Mr. President, I venture to quote to this group of business men a few impressive statistics in support of this statement, from figures furnished by the Federal Government at Washington.

We learn from these statistics that in the year 1926 the total amount invested in all sites and buildings used for educational purposes in America, including the equipment of these buildings, was $6,800,000,000; the amount invested in this business and classed under the caption "productive funds" (that is to say, permanent funds derived from the sale or rental of state school lands, or other sources) was $1,400,000,000. This makes a grand total investment of $8,200,000,000 including only the four items of sites, buildings, equipment and state school permanent productive funds.

To conduct this business of education and man this vast school plant in America requires a staff of 1,000,000 persons on the instructional side alone, while on the non-instructional side a second million is required, making a total personnel staff of 2,000,000 people.

This $8,000,000,000 plant is called upon to house 28,000,000 boys and girls now under instruction in the schools of America. To maintain the plant and conduct the business of education in America requires a total annual expenditure of $2,400,000,000.

In this financial setting Pennsylvania takes high rank. In the year closing with June 1926, the commonwealth expended upon its public schools for maintenance and support $215,000,000.

The total amount invested by the commonwealth in school grounds, school buildings, and school equipment, including both lower and higher schools, is $600,000,000.

The annual capital outlay for new construction in the educational field in Pennsylvania has averaged $32,000,000 a year for the last four years. While Pennsylvania was not among the states which shared in the distribution of free public school lands, still it is interesting to note that at the present time it has a small beginning in a permanent or productive school fund which amounts to $1,100,000. This business in Pennsylvania at the present time requires a personnel staff of 55,000 persons on the instructional side and another 55,000 persons on the non-instructional side, making a total personnel staff in the commonwealth of 110,000 of the state's workers directly or indirectly concerned with the instruction of more than 2,000,000 children enrolled in the schools of the state.

Pittsburgh expends annually upon its public schools $13,000,000. It has invested in a school plant representing 145 distinct and separate school structures $40,000,000, including sites, buildings, and equipment. It enrolls each year in its public day schools more than 100,000 children and in its public evening schools nearly 20,000 of the grown-up men and women of the adult population of the community. This army of youth requires a teaching force of 3,300 teachers to direct the work of this great city school system.

The history of Pittsburgh and Pennsylvania parallel each other in the development of their schools. The first schools of the commonwealth were private schools; the first schools of Pittsburgh were likewise private schools. Provisions were amply made by Penn's frame of government and by the first State Constitution in Pennsylvania set up in the year 1790 for the schools of the people in which the children of the poor should be given an opportunity to develop into intelligent and useful citizens. This attitude toward the "common" schools, as they were called, unfortunately resulted in these schools being thought of by the parents of the children of the poor as pauper schools, which brought them under disapproval and later open attack by some of the outstanding political leaders in Pennsylvania. After a struggle of a third of a century and more the free public school idea for the children of all the people was fought out in heroic battle under the leadership of Governor Wolf and Governor Rittner, ably supported by Thaddeus Stevens, Pennsylvania's great commoner who perhaps more than any other single man in the commonwealth was responsible for the law being placed upon the statute books of Pennsylvania in 1834 which made it possible for Pennsylvania to begin the establishment and development of a great school system,—a system which, after the progress of one hundred years is entitled to be ranked among the leading state school systems of America and of the world.

The first "little red school house" planted in Pittsburgh under this law was established in a frame building near the corner of Eighth street and Penn avenue in the year 1835. The total enrollment in this first free-tax-supported school consisted of five pupils. After changing locations two or three times, this first structure found its final abiding place on the site now occupied by the old North School, at Eighth street and Duquesne way. In a sense, it can be properly claimed that the present North School (now occupied as a Continuation School and by the Department of Compulsory Attendance) represents in both the spirit and the letter the establishment of "the first little red schoolhouse" set up in Pittsburgh.

The rights of the children steadily grew in favor in Pittsburgh and the public schools soon came to hold first place in the hearts of its people. Twenty years after, this small beginning of 1835 with its five pupils and a single teacher, had expanded to twelve schools with a hundred teachers, calling for an annual expenditure of $40,000. These schools under state law were all ward schools, managed locally by boards of school directors. The need of consolidation was so strongly felt that in 1855 the State Assembly of Pennsylvania was persuaded to pass a law making a single school district out of the city of Pittsburgh with a Central Board of Education created to control the affairs of such district and sharing with the local ward boards the conduct of the schools. In that year (1855) the high school was made a part of the public school system of the city.

During the period of the next fourteen years, the schools of Pittsburgh doubled their teaching force from 100 teachers to 204 teachers. In the same period the buildings increased from twelve to thirty-two. The annual expenditure of the public schools in 1869 was $121,000. The enrollment had increased during the same period from 5,000 pupils to 12,000 pupils.

In 1869 the state school law was improved and strengthened by an act of the legislature, thereby enabling the Central Board of Education to place the schools under the direction of a superintendent of schools together with a staff of principals at the head of each of the thirty-two schools recognized as the free-state-tax-supported schools at that time.

No further change was made in the method of control of the schools of importance until the year 1911 when the whole state school system of Pennsylvania was reorganized under what is known as the State School Code of the Commonwealth of Pennsylvania. New and added powers were given to Boards of Education, higher standards for the certification of teachers were provided, better schoolhouses were made possible, the improvement in the curriculum was promoted and made to fit more nearly the needs of the present day, and in a score of particulars, schools of the state were promoted so rapidly that under this law they have come to rank as among the best schools in the Republic.

Under this school code the present Board of Public Education has been enabled to give to Pittsburgh a school system the equal of the best in the country. Kindergarten schools have been established, the elementary schools have been vastly improved, the whole high school system has been expanded to an enrollment of more than 20,000 students, calling for sixteen high school buildings, vocational trade schools have been set up and special schools have been organized to meet the particular needs of the handicapped children living within this school district.

It would be interesting to go into a full description of the essential details to a complete understanding of each and every department in the public school system, but the time set for this hour will not permit. I therefore shall call attention to but two of the units of the school system. I offer them as type-studies applicable to the interpretation of every other organized department in the school system. I have already referred to the fact that the first high school was organized in Pittsburgh in the year 1855 with a small group of students, numbering by 1860, 180 young men and women of high school age. This school grew slowly but surely during the next half century until we find in 1910 a total enrollment of 2,800 pupils. In the next five years, however, it had more than doubled in enrollment. In 1919, it claimed 10,000 boys and girls which has increased since that time to 21,000 students receiving instruction in sixteen public high schools. Of this last number, 15,000 students belong to the 9th, 10th, 11th and 12th year grades of the public schools. Nothing marks the progress of the public high school system more than the roll of its graduates which numbers in its yearly groups some of the most famous and distinguished citizens of Pittsburgh and of the world.

Between the years 1850-1859 thirty students were graduated. In the decade from 1900-1910, 2,300 students were graduated. In the year 1927, 2,600 boys and girls will have been graduated in a single year. The total number of graduates since the founding of the high school system in Pittsburgh in 1855 down to the present time will be 30,000 students. This is an army of young men and women contributed by the Pittsburgh high school system to the leadership of this city and the commonwealth in every line of work where leadership is demanded by the people. It is interesting to note that of the 30,000 graduates of the high schools of Pittsburgh, 6,000 of them were graduated between the year of the founding of the first high school in 1855, and the close of the school year 1910, a period of fifty-five years, whereas 24,000 students have been graduated in the last seventeen years. This tells the story of the growth of the modern high school in this community, which constitutes one of the educational romances of the city.

These figures speak eloquently of the demand of the youth of the city for advanced education. Hundreds and hundreds of graduates of the high schools enter not only the local institutions of the higher learning in Pittsburgh, but some fifty of the leading colleges of the country located in at least twenty different states of the Republic.

I submit the following on the city normal school as my second type-study. As a capsheaf to its public school system, Pittsburgh has developed a teachers' training school, in which it trains young women graduating from our public high schools for the calling of teaching. To be qualified to enter this school an applicant must be a graduate of a first-class four-year high school and at the same time be a resident of the city of Pittsburgh, that is to say the Board of Education has found it necessary to limit admission to this school to resident students.

About sixty per cent of the number of new teachers appointed to positions in the schools in any given year is recruited from the graduates of the Pittsburgh Teachers' Training School. The remaining forty per cent required to meet the demand for new teachers is recruited from outside the list of training school graduates in order to avoid too great an in-breeding in the schools, and at the same time to meet the needs of the system where teachers of riper experience are vitally necessary to the work. This policy has made it necessary for the Board of Education to limit the number of admissions to the training school each year, which practice has proved to be a very wise policy.

If the status of our training school were defined educationally it would be to classify it as a school of junior-college rank, due to the fact that the two years of professional training are considered by colleges generally as equivalent to the completion of the first two years of college work.

A new building to house the teachers' training school with its model group of elementary children, is now being erected in the Schenley district, facing on Thackery street just above Fifth avenue. This building, as a tribute to a former member of the Chamber of Commerce and a longtime resident of the city of Pittsburgh, will be known to Pittsburgh as the Henry Clay Frick Training School for Teachers.

It will be recalled by Pittsburghers that when the will of the late Mr. Frick was opened it was found that he had bequeathed to the Frick Educational Commission of this city the sum of $5,000,000 to be used by that commission in promoting the professional growth and improvement of the teachers now employed in the Pittsburgh Public Schools.

Since and before that bequest, Mr. Frick's beneficence has made it possible for the Educational Commission to award free scholarships to more than three thousand teachers connected with the Pittsburgh Public Schools. On these free scholarships teachers have been able to attend summer vacation schools conducted by the leading colleges and universities of the land. The commission has not only awarded scholarships to teachers, but it has paid either part or all of their expenses incurred while attending these summer schools. In the year 1927 the commission awarded 639 scholarships to members of the Pittsburgh teaching staff at a total cost to the commission of $96,000.

The commission has likewise brought from the fields of art and literature some of the most eminent and successful men and women in America to inspire the 20,000 boys and girls enrolled in the high schools of the city. The commission has generously encouraged the routine professional work being carried on with the teachers throughout the school year by making an appropriation to pay for the services of outside school experts who may be brought to the city to assist in the development of such work.

This gift of Henry Clay Frick is unique in the annals of America. I venture to say that no bequest has ever been made to an educational institution in this country that has ever accomplished so much in a given space of time as has been accomplished by the magnificent bequest of Henry Clay Frick to the uses of the public school teachers of Pittsburgh. Due to his beneficence this city is today among the foremost cities of America and of the world in all matters pertaining to the professional growth and the professional improvement of its teachers.

It is, and ought to be, a matter of pride to the Chamber of Commerce of this city that one of its members found in the cause of public education this substanial challenge to his deep interest and abiding faith in the schools in which he himself had received his earliest training. His action is surely an example to other men of wealth not only in Pittsburgh, but in every worth-while community in the land.

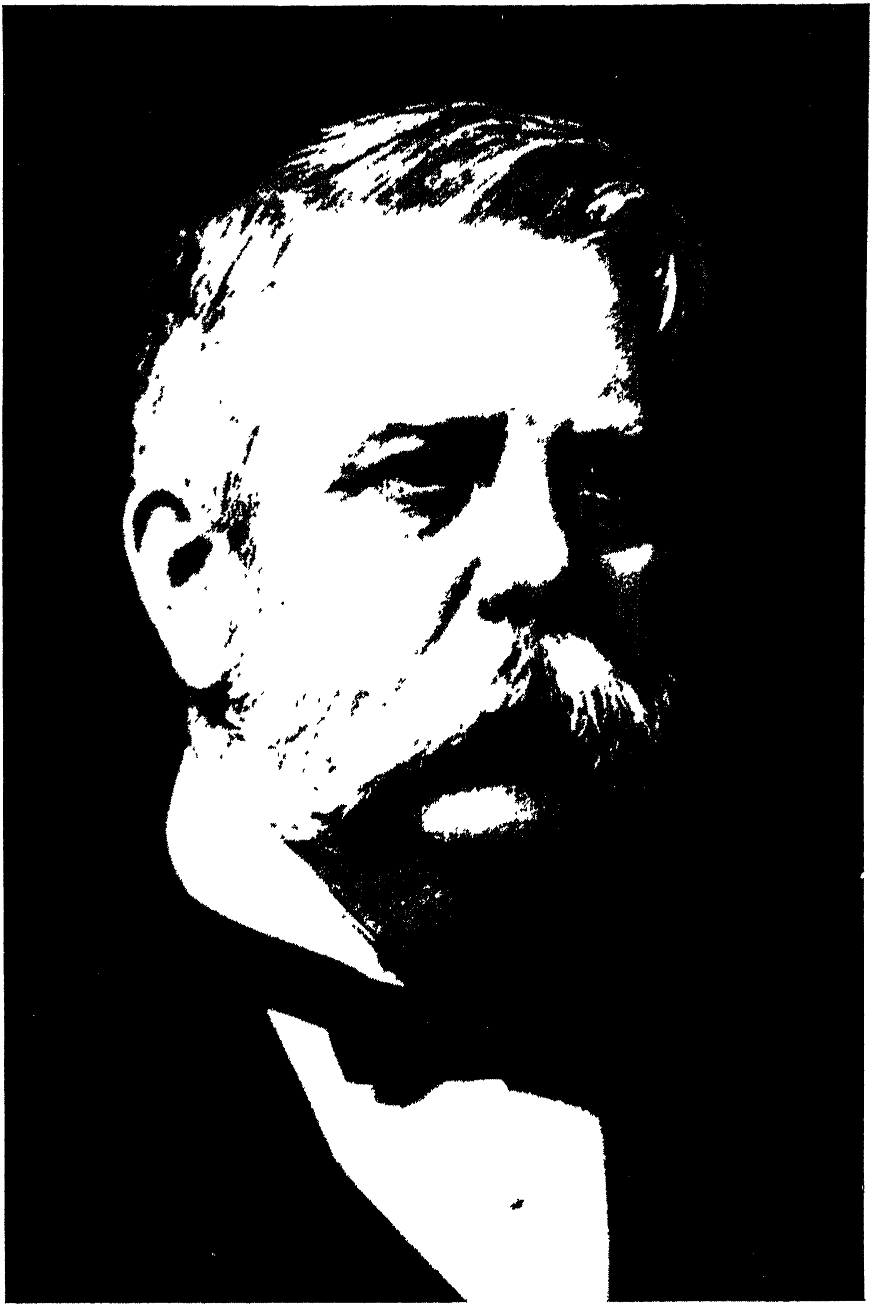
AIR BRAKE AND SAFETY-DEVICE INDUSTRY IN PITTSBURGH

H. H. WESTINGHOUSE

Henry Herman Westinghouse, chairman of the board of the Westinghouse Air Brake Company and author of the address on "Airbrake and Railway Safety Device Industry in Pittsburgh" in the series on "Pittsburgh and The Pittsburgh Spirit", was born in Central Bridge, Schoharie County, N. Y., November 16, 1853, the son of George and Emeline (Vedder) Westinghouse. He graduated from Union High School, Schenectady, N. Y., in 1870 and was a student of engineering at Cornell, 1871-72. He married Clara Louise Saltmarsh, of Ithaca, N. Y., June 20, 1875 He has been continuously with Westinghouse Air Brake Company since 1873.

Besides being chairman of its board (as also of Canadian Westinghouse Company, Ltd.) he is a director of the Westinghouse Brake & Saxby Signal Company, Ltd., (London), and president of Compagnie des Freins Westinghouse (Paris). He invented the Westinghouse single-acting steam engine, 1883, and founded the firm of Westinghouse, Church, Kerr & Company, engineers, New York, 1885.

He is a member of the American Society of Mechanical Engineers, and many other technical and scientific organizations. He is a trustee of Cornell University. Office: 150 Broadway, New York.



GEORGE WESTINGHOUSE

Air-Brake and Railway Safety-Device Industry

BY H. H. WESTINGHOUSE

SOMEONE once said that transportion represents the arteries of a nation, in the pulse of which throb the activities of its people, making for progress, prosperity and power. It is, therefore, a matter of just pride to us that in the development of the transportation systems of this country, comprising approximately 250,000 miles of railways, and 400,000 miles of tracks, Pittsburgh has been one of the major contributors in this development, through the air brake, the safety and signalling devices and the friction draft gear manufactured by one of its industrial interests.

I will make no effort to estimate in specific terms the value of these contributions, although a foreign diplomat representing his country in Washington is quoted as having said of the air brake: "It has saved more lives than were lost in the greatest battle that was ever fought."

A simple statement of facts will make it quite clear that even an approximate estimate is practically an impossibility. At the time of the invention of the air brake, 1867, the average speed of passenger trains did not exceed twenty-five miles per hour, and their length was from six to ten cars, with the cars weighing approximately 40,000 pounds. The average speed of freight trains was about twelve miles per hour, their length fifteen cars with a carrying capacity of 20,000 pounds for each car, making a maximum train load of 300,000 pounds.

Under present conditions, the speed of passenger trains averages forty miles per hour and the weight of each car is 120,000 pounds, with the number of cars in a train often being as high as fifteen. The average length of the modern freight train is approximately seventy-five cars, although a length of 150 cars is not unusual, with each car having a carrying capacity of 80,000 pounds, thus transporting the enormous total weight of 12,000,000 pounds at an average speed of thirty-five miles an hour. The reduction of distance in which passenger trains can be stopped today by the use of the air brake is reflected in the greatly increased speed with which they are now safely operated. When I say that these results in the transportation of passengers and freight, as illustrated in our modern transportation system, have only been obtainable through the use of the air brake, the friction draft gear and other safety and signalling devices, manufactured in this city, the statement is very conservative.

Our transcontinental lines, now traversing the United States in every direction, which have opened unexplored and unknown territory and brought the people of this country into quicker communion with one another, could not have been successfully operated if they had not been equipped with these devices, which assured safety, speed and economy of operation.

I have no doubt that all of us have at times been surprised, in reviewing past experiences, by the peculiar turns events will take, and how important results have grown out of trifling circumstances, or as Shakespeare suggests: "there is a destiny that shapes our ends, rough hew them how we may."

Mr. Westinghouse first entered the business world by marketing two of his inventions, one a device for re-railing derailed cars and locomotives, the other a substitute for the cast-iron frog then in use in general track construction. Both were steel castings made from crucible steel, as the Bessemer process was then still in its infancy in the United States, and the open-hearth process had not yet been heard of. The devices were of a simple character, and while successfully produced because of that fact, the making of steel castings was an entirely new art and established steel manufacturers were reluctant to undertake it. But with a courage that was characteristic, he built a steel casting foundry at Schenectady, N. Y., probably the first of its kind in this country. Although the plant was completed and put into practical operation, want of working capital militated against the success of the enterprise and it had to be abandoned.

This happened before Mr. Westinghouse was old enough to vote, and, while the experience might have discouraged many men, it disclosed perhaps more than any single event in his subsequent business career the qualities of self-reliance, indomitable will and tenacity of purpose, which he possessed to an unusual degree.

The failure of his foundry venture was a blessing in disguise as it was this episode that caused him to come to Pittsburgh in the autumn of 1867. Pittsburgh was then, as now, the largest steel producing center of the United States and with this knowledge in mind he recognized the advantages offered here as the most desirable place for his future activities.

His first association, after arriving in Pittsburgh, was with the firm of Anderson, Cook and Company, for the manufacture of his appliances. This connection proved of great future value because it provided the opportunity of forming a wide and favorable acquaintance with many leading railway men throughout the country, which subsequently served a valuable purpose in the introduction of the air brake.

The story of the invention of the air brake is an old one, particularly in Pittsburgh. To many of you, I have no doubt, it is a more than twice-told tale. I will, therefore, not attempt to relate it in detail. The original idea was conceived by Mr. Westinghouse while he lived in Schenectady, during a railroad journey from that place to Troy, N. Y., about the year 1867, when he was an eye-witness to a train collision. While he, with other passengers, was watching the efforts of a wrecking crew to enable the travelers to resume their journey, the thought came to him that the accident might have been prevented if the engineer in the cab of the locomotive had the power to control the brake apparatus of the train. From that germ of thought emanated the invention which has since proved itself throughout the world as the greatest railroad safety device yet produced.

But while the idea was conceived by the inventor in Schenectady, and its development carried on almost without interruption, a practical working device was not completed until after Mr. Westinghouse had become a citizen of Pittsburgh, and it is, therefore, quite correct to regard Pittsburgh as the city where the air brake was born and that it therefore is pre-eminently a Pittsburgh product.

In his original conception of the problem, his first thought suggested the use of steam as the source of power, but this idea was quickly abandoned.

The ultimate selection of compressed air forms one of the most interesting incidents during the early development process of the invention.

A young woman who was raising money to pay for her education sought to accomplish this by selling magazines, a copy of which in this way came into the possession of Mr. Westinghouse. In this publication, he read an article describing the operation of air drills over long distances in the construction of the Mt. Cenis tunnel through the Alps in Switzerland. That gave him the idea of using compressed air in the operation of his brake.

The substitution of air for steam as the operating power was the solution of the problem. The actual construction of a workable brake, embodying the principle of compressed air as the operating mechanism, was now only dependent upon the material means for its realization, and here again the location of Mr. Westinghouse in Pittsburgh was most fortunate, for soon thereafter he formed the acquaintance of Mr. Ralph Baggaley, a young man like himself, recently out of college, and who was engaged in the foundry business. Their acquaintance soon grew into closer friendship, and after Mr. Westinghouse explained to Mr. Baggaley the features of his air brake invention, the latter quickly recognized not only its practicability, but also its commercial possibilities, and agreed to supply the financial requirements for the construction of a trial set of the apparatus.

In the meantime, Mr. Westinghouse had brought his invention to the attention of a number of railroad men in this district. Among them were Messrs. Robert Pitcairn, A. J. Cassatt and Edward H. Williams of the Pennsylvania railroad, and George D. Whitcomb and W. W. Card of the Panhandle railroad. These gentlemen, including Mr. Baggaley and Mr. Westinghouse, formed, in July, 1869, the Westinghouse Air Brake Company with a capital of $500,000.00. They received their charter from the state of Pennsylvania the following September and arrangements for the erection of a factory were quickly completed, the site selected for the new enterprise being comprised of a lot fifty by two hundred feet at the corner of Twenty-fifth street and Liberty avenue. There were some old buildings on the place and these were utilized as a nucleus for the machine shop and foundry.

However, before this, the air brake had already made history for itself, inasmuch as it had been given a practical demonstration on one of the trains of the Steubenville accommodation of the Panhandle railroad, during which it not only proved its working practicability beyond any doubt, but in doing so its efficiency saved the life of a huckster who would have been run down by the train if it had not been equipped with the air brake.

This was certainly a most auspicious baptism for the new device and proved a good omen for its future.

To us, accustomed as we are to the marvelous facilities of our modern systems of railroad transportation and the revolutionary effect which the air brake has exercised upon the entire transportation industry, it is almost inconceivable, but it is merely stating a simple fact, that on that memorable day in April, 1869, when the first air brake train left the Union station in Pittsburgh to start on its journey to

Steubenville, there was started a new epoch in transportation and the railroad business entered upon an era which gave this country an impetus of development in commerce, manufacturing and industry which until then was unheard of.

The operating conditions surrounding the railroad transportation business previous to the advent of the air brake were naturally of a more or less primitive character because railways were still in the early stages of development and as far as brake appliances were concerned, they were correspondingly neither better nor worse.

The railways tracks and roadbeds were far from what they are today. The rails were much lighter, their weight averaging about forty pounds to the yard. The rolling stock was all constructed of wood. Trains were comparatively short, a seven-car train, for example, being of more than average length for passenger service and the average freight train from fifteen to twenty cars.

Taking these facts into consideration, it is not difficult to realize that the average speed of today would have then been unsafe. To form a conception of the prevailing traveling conditions of that time, it might be mentioned that the journey from Pittsburgh to New York would take at least twice as long as it does at the present time, and sometimes much longer.

Such, in short were the conditions existing throughout the field of transportation when the air brake made its appearance and its favorable acceptance was not surprising.

By the use of this device, the control of the speed of the train was placed in the hands of the engineer, assuring a measure of safety for the traveling public heretofore unattainable, for the braking power of the new apparatus was far in excess of that which could be obtained through the hand brake system and its application much quicker.

Yet, the air brake of that day, although greatly superior to the hand brake, was far from being a completed device.

As a matter of fact, the original brake of 1869, known as the straight air type, represented merely a first step, so to speak, and has been superseded by others of much higher efficiency and possessing many advantages not embodied in the original form.

It might here be of interest to give in chronological order a few of the high spots which marked the history of the development of this remarkable device from its original form in 1869 to the present.

In 1872 Mr. Westinghouse invented the automatic air brake which made the brake its own "tell-tale."

From 1873, and during the following thirteen years, numerous tests, including the famous Burlington freight train brake tests of 1886, on the Chicago, Burlington & Quincy R. R. at Burlington, Illinois, under the auspices of the Master Car Builders Association of America, were conducted, which resulted in many improvements of certain details of the air brake equipment.

In 1880 the first freight train air brake equipment was placed in service.

In 1887 the quick-action automatic brake was invented by Mr. Westinghouse, which made it possible to operate freight trains of fifty cars and more by the use of the air brake.

Likewise, in 1894, a type of brake better providing for the handling of high-speed passenger trains was brought out.

From 1895 to 1903 many minor developments were made. Transportation conditions of the railways changed so rapidly during the period from 1903 to 1913 that a constant development of air brake apparatus took place and no less than 112 new designs and modifications were developed during that period, the introduction of the quick-service type being especially noteworthy. The all-steel passenger and freight cars of a much heavier type and greater capacity were introduced, again making it necessary materially to change the air brake apparatus to meet the transportation conditions. In other words, the organization of the Air Brake Company was constantly engaged in such developments as were demanded by the steps of progress made in the transportation industry. The company did not overlook the field of utility for the brake in the surface, urban and interurban traction and the appliances introduced for this service have proved as advantageous as was the development of the air brake to the steam railway service.

Even in the domain of automobiles and motor trucks, the air brake has entered with marked success and many motor buses operating on our public highways, automobiles and motor trucks throughout this country are equipped with air brakes.

What effect the immediate success of the air brake produced upon the organization of the company is easy to realize.

The little factory on Liberty avenue, with its handful of operatives, very soon became a very bee-hive of energy and activity, which required constant additions of facilities in the manufacture of the company's product. In the meantime, Mr. Westinghouse, while always engaged in the creation of new developments and adding refinements to the apparatus, did not overlook the problem of marketing the brake. In this respect, he introduced methods which until then had never been practiced.

Among these selling features may be mentioned a demonstration train. This train consisted of a locomotive, tender and six coaches, all fully equipped with the new power-braking apparatus. This train was taken over all the principal railroad lines then running through the country, to give practical demonstrations of the brake to the managements and operating forces of the different roads. It was an ideal way of introducing the new device and familiarizing railroad men with the manner in which it operated. The results of this plan were most successful, and in less than two years, there was not a railroad of any prominence in the United States which not only knew all about the air brake, but most of them were trying it out in actual service.

Convinced that he had launched the business on the road of success in this country, Mr. Westinghouse went to Europe to introduce the new device to the railroads in England, France, Germany, Holland, Belgium, Italy, etc., and although he had to combat continental prejudice for many years, success eventually came to him. In 1878, a factory was built in London, in 1879 another was erected in France. Later, similar establishments were founded in Germany, Russia and Italy, and, to make a long story short, the Westinghouse Air Brake, which in the meantime had become a standard railway equipment on all railroads in the United States, was equally favored in many countries abroad, until today it may be safely asserted that this product has carried the name of Pittsburgh and its fame as the greatest industrial center in the United States to every corner of the globe, wherever railroads further the march of progress and civilization.

The factory on Liberty avenue outgrew its limitations, and in 1880 the works had to be moved into larger quarters in Robinson street on the north side of this city; but there again, the constant growth and expansion of the business forced another removal. This time, it was in 1890, the company transferred its activities to a new factory at Wilmerding, where the successful career of the organization has continued to expand.

Before leaving the subject of the air brake and its development, I feel it is due to Mr. Westinghouse that it should be known that during the period of his active direction of the Air Brake Company's affairs, which extended until 1890, he was the inventor and largely the designer of every important improvement made in the air brake system.

He welcomed all suggestions that would advance the art and purchased many inventions relating thereto; but the fact remains that his broad understanding of the subject, his vision and his capacity for producing the needed inventions practically anticipated every important improvement which has been achieved in the air brake art.

In closing my remarks with reference to the air brake, it is not out of place to make mention of the fact that the formation of the Air Brake Company was the beginning of the Westinghouse manufacturing interests. Almost from the beginning of its organization in 1869, additional companies were created until the name Westinghouse is known intimately throughout the world for its many active interests and is today an industrial factor throughout the United States second to few, with an army of employees aggregating approximately 75,000.

In order to complete the subject of this program, it now remains to refer briefly to two other Westinghouse activities that are in a manner related to the development of the air brake and which have also had an important influence upon the progressive advancement of American railway transportation systems. These are the Union Switch and Signal Company and the Friction Draft Gear Company, both of which are located in the Pittsburgh industrial district.

When we consider how deeply Mr. Westinghouse was interested in the development of the air brake, it is not difficult to understand his early attraction to the field of interlocking and safety signal devices, because both of these contributed largely to safe and expeditious railway transportation and are therefore natural coadjutors of power brakes. As a matter of fact, when Mr. Westinghouse introduced the air brake in this country, railroad safety devices and signalling apparatus were scarcely used anywhere. Indeed, only fifty years ago, the railroads in this country, for the protection of trains stopped between authorized stopping points, depended chiefly upon tail lights and the rear brakeman with his flag and torpedo. This, despite a general use of the telegraphic block system on all important lines, is significant of both the dependency of the period upon the human agency alone for protection, as well as of its distrust of that agency to meet its responsibilities.

The importance of the subject appealed to him so strongly that he gave it considerable attention. He became a member of the board of directors of the Union Electric Signal Company of Hartford, Conn., which controlled a most valuable signal invention in the form of an automatic circuit control, by which the track rail was utilized to transmit signals by means of an electric current. This company was later merged with the Jackson Manufacturing Company of Harrisburg, Pa., another pioneer in the signal field, the combination resulting in the formation of the Union Switch and Signal Company by Mr. Westinghouse in 1881, and as such it may be called the industrial pioneer in America to undertake for the first time systematically the development of railway safety appliances in the block signal fields, and also the construction of frogs, switches, switch stands and similar appliances essential to safety, protection and acceleration of traffic.

The new company was located on Duquesne way at Garrison alley, Pittsburgh, in the building formerly occupied by the Bidwell Plow Works, where a few years later, in 1886, the Westinghouse Electric Company came into being, and, expanding beyond the capacity of the building for both firms, it was found desirable to move the Union Switch and Signal Company to Swissvale, where it has been in operation ever since.

To Pittsburgh belongs the distinction of being the home of the first manufacturing enterprise in this country to enter upon the development of railway safety and signalling devices upon a scale and in a manner commensurate with the importance of the subject.

It may be interesting to mention here that the first interlocking signal apparatus operated by compressed air was installed in this country by the Union Switch and Signal Company in 1883 at Bound Brook, N. J., at the crossing of the Central Railroad of New Jersey with the Pennsylvania railroad.

But while the growth of the business was slow, the soundness of its foundation became more and more apparent as the railroad industry developed and operating conditions constantly arose which made the adoption of proper safety and signalling devices imperative.

In this development and in the introduction of these devices, the Union Switch and Signal Company has constantly maintained its position as the leader in that field, until at the present time the product of the company is installed on many railroads throughout the civilized world.

It should be mentioned in connection with the development of railway safety and signalling devices in this country, that, while England had the start of us in that activity, because it was in England where steam railroad transportation was first inaugurated, it is a significant fact that this country has since so far excelled in the development of safety devices that today English railroads make use of many improvements in signalling which are invented in the United States.

Before leaving this subject of safety and signalling devices, mention should be made of the latest achievement of the Union Switch and Signal Company, which has created considerable public interest, designated as the automatic train or speed control.

Briefly stated, automatic train control is a method of automatically applying the brakes to regulate and arrest the speed of trains when the engineer fails to observe or disregards safety signals. Its operation is such that two trains cannot approach each other dangerously without being either automatically stopped or reduced in speed sufficiently to insure safety.

The need for the train control system is based upon experience, which lamentably but unmistakably establishes the fact that locomotive drivers frequently fail to see or observe signals, resulting in many serious and some fatal accidents.

The friction draft gear is now practically standard on all of the railways of the United States as a substitute for spring gear used before its introduction. It is perfectly safe to say that trains of the length and tonnage that are now in daily use could not be operated with the type of gear that was displaced by the friction gear. Personally, I do not believe that trains in excess of sixty cars of the kind now in general use could be operated.

As is well known, Mr. Westinghouse was a prolific inventor, but of all his inventions that came into large practical use, the friction draft gear was the most original. Many attempts had been made in the air brake field before he entered it, but there was no past in the friction draft gear art to draw upon.

Mr. Cassatt, in considering its use by the Pennsylvania railroad, expressed the view that it would be of greater value to their railways than the air brake. Persistent experimenting, actively prosecuted, in due course received its reward and many thousand friction gears were manufactured and sold to the railways before competition complimented the Air Brake Company by adopting the friction principle and joined in manufacturing and selling other forms than those patented by us, thus helping to supply the demand.

The industry, which originated with the Westinghouse Air Brake Company, has had and still has an important place in its activities.

In drawing the picture as I have tried to present it to you, I have endeavored to illustrate how difficult it is to form a fair estimate of the value of the changes which have taken place in our transportation facilities coming within the activities of the Westinghouse Air Brake Company and its subsidiary organizations during the years in which the devices enumerated have been in operation, and which changes would not have been possible except for the part taken therein by these devices, but they are admittedly very great.

In conclusion, I would like to say that there is another contribution to the progress, prosperity and power of Pittsburgh that is being made by the associated Westinghouse interests, which is also of real and inestimable value to this district. I refer to that large body of executives, scientists, engineers and skilled craftsmen, who have become a potent factor in your civic, social, intellectual and artistic life, as well as in Pittsburgh's industrial activities. I am sure this contribution is appreciated, and the main purpose I have in mentioning it is to bring to your attention one phase of the Westinghouse activities that is not exhibited in the balance sheets or in tonnage production.

THE GROWTH OF BANKING IN PITTSBURGH

A. W. MELLON

Andrew W. Mellon, Secretary of the U. S. Treasury, was born in Pittsburgh, March 24, 1855, the son of the late Judge Thomas and Mrs. Sarah (Negley) Mellon. He was educated in the Western University of Pennsylvania (now University of Pittsburgh) in the class of 1873; resigned as president of the Mellon National Bank of Pittsburgh on March 1, 1921, and as officer or director of various financial and industrial corporations, to become Secretary of the Treasury in the cabinet of President Harding, March 4, 1921, remaining in that office under President Coolidge. He is chairman ex-officio of the Federal Reserve Board, Farm Loan Board, War Finance Corporation; honorary chairman, U. S. Section of the Inter-American High Commission; chairman, Rock Creek and Potomac Parkway Commission; member board of trustees, Postal Savings System; Director General of Railroads; member board of trustees, Smithsonian Institution; member of the Federal Narcotic Board.

A. W. MELLON

Banking and Finance in Pittsburgh

BY A. W. MELLON

THE history of banking in Pittsburgh may be divided into three periods. The first or foundation period ended with the close of the Civil war; the second or period of industrial expansion extended to the beginning of the World war in 1914, when banking entered upon its third or international phase during which this country has become a creditor, rather than a debtor, nation.

During the pre-Civil war period, the demands made upon our banking resources were relatively small, and the greatest undertakings, such as railroads, were partly financed from abroad. Industrial America, as we know it, hardly existed before 1865. Yet even then the Pittsburgh district was almost entirely manufacturing and industrial, and had been so from the very beginning. But production was on a small scale. Many of the great natural resources had not then been opened up; and such industries as coal and iron, when judged by their later development, were still in their infancy. It was a period of individual effort in which business and industry were carried on by a multitude of competing units, mostly controlled by individuals or co-partnerships.

Such were the conditions under which the banks in Pittsburgh operated during the first stage of their history. It was not strange, therefore, that the banking practices of that time differed so greatly from those that obtain today; nor is it to be wondered at that banking itself was on a relatively small scale compared with the great developments which came in later years.

In 1804 when the Bank of Pennsylvania, then located in Philadelphia, established a branch in Pittsburgh, there was no bank west of the Allegheny mountains. The Bank of Pennsylvania had been chartered by the Act of Assembly of Pennsylvania of March 30, 1793, as a bank of issue, to run for twenty years, with authority to establish branches and with an authorized capital of three million dollars. The directors of the Bank of Pennsylvania made a proposition to the business men of Pittsburgh with the object of establishing a branch there, and shortly afterwards the following notice appeared in the "Pittsburgh Gazette":

"Borough of Pittsburgh, 22nd of March, 1803"

"The freeholders and other inhabitants, householders, are hereby requested to attend a meeting of the corporation at the Court House on Saturday, the 26th of March, at 4 o'clock P. M. in order to take into consideration a proposition of the directors of the Bank of Pennsylvania for establishing a branch of this bank within this borough, providing it is approved by the corporation.

"By order of the Burgesses and assistants,

"William Christy, Town Clerk."

The borough corporation approved the proposition and on January 9, 1804, the branch bank opened for business in a two storied stone building on Second street (now Second avenue) between Market and Ferry streets, which at that time was the center of the borough's business district. General John Wilkins, Jr., was elected president, Thomas Wilson, cashier, and John Thaw, teller; the directors were General John Wilkins, Jr., Pressly Neville, Oliver Ormsby, James O'Hara, James Berthould, Ebenezer Denny, Joseph Barker, George Stevenson, John Woods, Thomas Baird, John Johnson and George Robinson. Notice was issued by the bank officers to the merchants that Thursday would be discount day for mercantile paper drawn for sixty days, secured by endorsement of two responsible persons; but the notes must be presented Wednesday, also that the rate of exchange for drafts on the parent bank would be one per cent. Many of the men associated with the organization of this branch bank were of great influence in the future business and social life of the borough, and of the city which a few years later succeeded it.

General Wilkins was the leader in the foundation of this branch bank. He was prominently identified with the business interests of the district, a man of forceful character, who had served as a boy through the Revolutionary war; was quartermaster general of the United States Army from 1796 to the outbreak of the second war with Great Britain in 1812, and had chosen Pittsburgh as the scene of his actions. At his death in 1816, James O'Hara succeeded him as president of the branch bank. In 1818, this branch bank, after a successful career, went out of existence, upon the suspension of the parent bank, and the United States deposits, amounting to over half a million dollars, were transferred to the Pittsburgh branch of the second Bank of the United States, which had been opened in Pittsburgh the year previous.

On March 28, 1808, a general banking law was passed by the General Assembly of Pennsylvania, and on February 1, 1810, under its provisions, the Bank of Pittsburgh was organized to do a banking business and to issue notes. Shortly afterwards the legislature amended the banking act in such a way as virtually to prohibit the new bank, and all others incorporated under its provisions, from lending money or receiving deposits or issuing notes. The directors closed its doors as a bank but changed its name to Pittsburgh Manufacturing Company; and a partial banking business under that name was transacted.

The state legislature, on March 14, 1814, passed a new general banking law which provided for the organization of forty-one banks of issue. Two of them were to be located in Pittsburgh; one was to be called the "Bank of Pittsburgh" with a capital of $600,000 and the other the "Farmers and Mechanics Bank of Pittsburgh" with a capital of $450,000. It was also provided that the subscriptions to the stock of the Pittsburgh Manufacturing Company should, on application, be considered bona fide subscriptions to the stock of the "Bank of Pittsburgh." The commissioners appointed to receive subscriptions to the stock of the "Bank of Pittsburgh" were John M. Snowden, D. S. Scully, John Speer, Thomas Cromwell, George Dawson, James Martin, Joseph Wilson and Robert Highlands, and those for the stock of the "Farmers and Mechanics Bank of Pittsburgh," Jacob Negley, John Neal, George Evans, John Feariss, Thomas Hazelton, George Steward and George Robinson, all of Allegheny county. On May 17, 1814, the stock of the Pittsburgh Manufacturing Company was transferred to the Bank of Pittsburgh.

An organization of the latter was effected November 23, 1814, by the election of William Wilkins, George Anshutz, Jr., Thomas Cromwell, Nicholas Cunningham, John Darragh, William Hays, William McCandless, James Morrison, John M. Snowden, Craig Ritchie, George Allison, James Brown and J. P. Skelton as directors; William Wilkins was chosen president, Alexander Johnston, Jr., cashier, and George Luckey, teller. Its business was at first conducted in a building on the corner of Wood street and Sixth avenue. The bank was re-chartered by the legislature in 1824, and again in 1834. It entered the national banking system in 1899, absorbed the Merchants and Manufacturers and the Iron City National Banks, January 1, 1904, and in all its long career has been of great and lasting benefit to the community.

The Farmers and Mechanics Bank of Pittsburgh, chartered under the Act of Assembly of March 14, 1814, with John Scull as president and M. Neville, cashier, suffered so seriously from a robbery on April 6, 1818, both from the actual money stolen and from the lack of confidence inspired by news of the robbery, that it never recovered and after languishing for years was finally deprived of its charter by an Act of Assembly of April 12, 1825. The second Bank of the United States was chartered by Congress in 1816 with headquarters in Philadelphia, and a year later a branch was established in Pittsburgh, with Adamson Tannehill as president and George Poe, Jr., as cashier.

In 1817, the unincorporated City Bank of Pittsburgh was established with its office on Wood street; Rev. Robert Patterson was president and Anthony Ernest, cashier. In 1822, Nathaniel Holmes established a private banking house on Market street under his name. The founder was a north of Ireland man, who came to Pittsburgh in 1807; later Thomas R. Holmes, his son, became associated with him; and in 1840, Nathaniel Holmes, Jr., was admitted to the firm, which was then known as N. Holmes & Sons. The founder of the house died in 1849, leaving the business to his sons who conducted it under the same name. Nathaniel, the second, who inherited the business capacity of his father, died in 1866 and in 1869 John G. Holmes, his oldest son, and later William R. Holmes and Nathaniel Holmes, younger sons, were admitted; in 1874, James J. Donnell and in 1900, J. Denniston Lyon, were admitted, William R. Holmes retiring. In 1905 it was merged with the Union National Bank.

Other banks which were established about this time were The Pittsburgh Savings Fund Society in 1834, later changed to the Farmers Deposit National Bank; the Merchants & Manufacturers Bank, chartered in 1833, and merged with the Bank of Pittsburgh in 1904; the Exchange Bank of Pittsburgh, established in 1836 and afterwards changed in 1865 to the Exchange National Bank of Pittsburgh. Among private banking or exchange offices established here in early years were: James and Gordon Gilmore, 1818; George A. Cook, 1828; Cook and Cassatt, E. Sibbett & Co., Sibbett and Jones, Samuel Jones & Co., Allen Kramer, about 1841; William A. Hill, 1844; William Forse and Hussey and Pettit about 1845; and R. Patrick & Co., 1850.

Such were the banks established during the early period of the city's banking history. In later years the number increased so rapidly that it is possible only to list their names, as is done hereafter.

In the early days when the first banks were established, Pittsburgh was the recognized gate-way to the south and west. Its flourishing trade in all pioneering goods conducted with Virginia, Tennessee, Kentucky and the southern and western territories, had been greatly augmented in 1803, when the United States purchased from France the territory then known as Louisiana and opened the lower Mississippi and New Orleans to trade. While banks here enjoyed many advantages, due to Pittsburgh's strategic situation and to the industries springing up in this region, they were obliged also to contend with the disadvantages of inadequate banking laws and unsound currency. During the first quarter of the nineteenth century, a shortage of specie prevailed throughout the country, caused principally by the War of 1812 with Great Britain and by the abundance of paper money afloat. It resulted in a depression in business and a fairly general suspension of specie payments by the banks. In 1818 and 1819 a severe depression in business occurred, culminating in 1820, in which Pittsburgh suffered severely. Manufacturing was almost wholly suspended and the banks were obliged to resort to a rather general suspension of specie payments. No such general depression in business operations had previously been known. Many banks throughout the country failed during this period, including the Bank of Pennsylvania, with its Pittsburgh branch.

Anticipating the refusal of congress to extend the charter of the second Bank of the United States, the management appealed to the Pennsylvania legislature, which in 1836 granted a charter to the "present stockholders of the Bank of the United States (except the United States and the Treasurer of the United States) and to such other persons as may become stockholders" with general banking powers and with an authorized capital of $35,000,000. It was given authority to establish two branches within the state, one at Pittsburgh, to exist until March 3, 1866. This was afterwards known as the Pennsylvania Bank of the United States. As anticipated, congress refused to renew the charter of the second Bank of the United States and its offices were closed in March, 1836, when its charter lapsed. After a rather hectic existence, political hostility and suspension of specie payments, this Pennsylvania Bank of the United States, after passing through the panic of 1837, failed on September 4, 1841, and carried down with it the Pittsburgh branch, which it had taken over from the second Bank of the United States.

The inflation in this country, which reached a crisis in 1836, was produced chiefly by over-extension of business and an excessive and disordered currency. Several banks in New York as early as January, 1837, refused to accept for deposit checks on other banks and on the 10th of May, 1837, all of the New York banks suspended payments in specie. The Philadelphia banks and banks in other cities immediately followed suit; and on May 15, 1837, having received word of the action of these banks, especially those in New York, Brooklyn, Philadelphia and Baltimore, all the Pittsburgh banks, viz: the branch of the Pennsylvania Bank of the United States; the Bank of Pittsburgh, the Merchants & Manufacturers Bank, the Exchange Bank and the Pittsburgh Savings Fund Company suspended specie payments. By 1841, all of these institutions were again paying coin.

The entire period from 1830 to the outbreak of the Civil war was one of more or less financial distress and uncertainty, in which the Pittsburgh banks were involved along with all the other banking institutions of the country. In 1854, there were some local bank failures; and in 1857, the great panic which had been smouldering for years under reckless banking and business methods struck the country with terrific force. In August members of banks and business undertakings over the country failed and by September banks in Philadelphia, Baltimore and other cities had suspended specie payments. On the twenty-eighth of that month, all the Pittsburgh banks, except the Bank of Pittsburgh, suspended specie payments "until such time as the Philadelphia banks resumed;" and by the Act of Assembly of October 13th, 1857, the operation of all previous acts declaring forfeiture of charters and the infliction of penalties for the suspension of specie payments by banks was declared suspended until the second Monday in April, 1858. Early in 1858, before the expiration of this suspension, the Pittsburgh banks resumed payments in coin and were followed shortly afterwards by resumption by banks in Philadelphia, Baltimore and other cities. There was not a single failure in Pittsburgh of a banking institution during this panic of 1857-58.

The approach of the Civil war period brought trouble for the banks of the country, their depositors and note holders. As early as November, 1860, banks in Philadelphia, Baltimore, Richmond and other cities took the precaution of suspending coin payments; the currency panic in New York was equal to that of 1857, but the banks continued payments. In Pittsburgh all the banks, except the Bank of Pittsburgh, suspended coin payments on November 28, 1860, and for some time thereafter business here was in chaotic condition. By October, 1861, matters had improved to such an extent that the Pittsburgh banks which had suspended resumed payments. The improvement, however, was of short duration. On the last of the year another suspension occurred which was not, however, participated in by the Bank of Pittsburgh, Mechanics Bank, and Iron City Bank. In 1863, legislative sanction was granted to suspensions of specie payments by banks organized under the free banking laws of Pennsylvania; and early in the summer of that year some of the Pittsburgh banks, fearing an attack from the Army of the Confederacy, shipped their money to Cleveland for safe-keeping.

Such were the conditions under which Pittsburgh banks were obliged to operate in the period prior to and during the Civil war. Their difficulties were due in large measure to the lack of a sound and continuous national banking policy, and in part also to the loose banking methods which then obtained throughout the country. This was particularly true as regards note issues.

Deposits, which with us constitute such an important factor as a basis for supplying credit to the banks' customers, were considered relatively unimportant before the Civil war. The banks depended for their profits largely on issuing notes, whereas today only a small proportion of banks exercise this function and, in order to do so, must hold as security assets of a value at least equal to the notes issued. Before the Civil war, neither deposits nor notes were adequately secured; and there was, of course, no common reservoir of credit such as we have today under the Federal Reserve System. Indeed, until the passage of the Federal Reserve Act in 1913, the average banker, no matter how conservative he might be or how vast his resources, lived in constant fear that, from causes remote or unforeseen, a financial crisis might develop at any moment and threaten him with ruin. It is necessary only to remember the succession of banking crises which swept over the country in 1819, 1837, 1857, 1873, 1893, and 1907.

So accustomed are we to the smooth functioning of our present banking structure that we are apt to forget the difficulties of that rather haphazard system under which American banking developed prior to the passage of the Federal Reserve Act. During most of the period preceding the Civil war, the country was flooded with bank notes, some good and some bad. There was no uniformity of note security; and one of the worst evils of the time was the buying at a discount of depreciated notes of banks, corporations and individuals, and using them in payment of wages and the settlement of commercial accounts. In Pittsburgh, the circulating medium at this time, in addition to coins, included U. S. Treasury Notes, notes of local banks and of firms and corporations. Gold and silver and the notes of specie-paying banks were at a premium, and brokers were necessary in order to achieve some semblance of parity among the variety of bills and notes that passed for currency.

It was the desire for a sound and uniform currency, as well as the financial difficulties of the Civil war, that enlisted popular support for the establishment of a national banking system and finally resulted in the Bank Act of 1864. This act, by founding a currency upon the securities of the Federal Government, not only increased the demand for government bonds, but also met the currency needs of the country. The enactment of this law and the ready response of the people to its advantages soon provided the Government with much needed cash and gave an impetus to manufacturing and merchandising here and elsewhere which was almost phenomenal in its effect and marked another epoch in the city's progress. In 1864 by the combined action of the local banks, as well as by banks in other centers, the practice of accepting and paying out as currency the notes of those banks over the country which were not kept at par in Philadelphia or here, was discontinued; they were bought and sold but no longer treated as currency. This action and the action of Congress in the following year in levying a tax of ten per cent upon any bank notes paid out by any bank, which were not national bank notes, after July 1, 1866, sounded the deathknell of unsound and depreciated bank notes in the circulating medium of the United States.

About this time, the Pittsburgh Clearing House Association was organized. It opened for business February 5, 1866, with John Harper as president and R. M. Cust as manager, and with the following original members: Bank of Pittsburgh, N. Holmes & Sons, Union National, German National, First National, Second National, Third National, Exchange National, Allegheny National, Tradesmens National, Mechanics National, Merchants and Manufacturers National, Iron City National, Citizens National, Farmers Deposit National, Peoples National, First National of Allegheny, and the Pittsburgh National Bank of Commerce. This number was not increased until 1884 when the Diamond National Bank was admitted. The association occupied a room in the building of the Bank of Pittsburgh on Fourth avenue until March 1, 1918, when it moved to its present quarters in the Mellon National Bank.

The establishment of the Pittsburgh Clearing House Association and the end of the Civil war brought to a close what may be called the first or foundation period in Pittsburgh banking. The war had marked an end of an era in the country's economic history. It had greatly stimulated industrial activity and had shown the country that American industry was capable of vastly increased production. Conditions all pointed to great changes. And yet no one at the close of the Civil war could possibly have foreseen the new inventions or the opening up of natural resources, the growth in population, or the vast increase in wealth which was to take place in the space of a single lifetime.

The great natural resources, which were to produce such untold wealth, were still lying largely undeveloped, and sometimes undiscovered. Such industries as petroleum, natural gas, aluminum and cement have grown up almost entirely in the last fifty or sixty years. In 1865, we were importing copper, whereas today we supply half the copper used throughout the world. The demand for copper, lead, zinc and aluminum was greatly increased by discoveries in the field of electricity after 1860. The water power, which was later to furnish the electric power for driving our street cars and lighting our houses, was going to waste. Until 1869, the Westinghouse air brake, which was so completely to revolutionize the transportation system of the country, had not been put on the market. There were, with one or two exceptions, no great corporations or vast industrial enterprises such as we know today. The great automobile industry, for instance, with an output in 1925 valued at $3,372,000,000 was unknown in 1870, and amounted to only about half a billion dollars in 1914.

Even the iron and steel industry was in its infancy in 1870. There had been, of course, a very considerable iron industry around Pittsburgh from the very early days. The presence of iron ore so near the vast coal fields of Western Pennsylvania made Pittsburgh the logical center of the steel and iron industry. But the rapid growth of that industry may be seen from the fact that the value of iron and steel and their products, except machinery, amounted to $438,000,000 in 1870; $2,138,000,000 in 1914, and had reached the enormous total of $6,462,000,000 in 1925.

Three circumstances were largely responsible for the rapid growth of this industry. The first was improvement in methods of production, such as the introduction of the Bessemer process; the second was the discovery of vast iron deposits on Lake Superior; and the third was the advent on the scene of such industrial leaders as Mr. Carnegie, Mr. Phipps, Mr. Frick, and Mr. Schwab, and later Judge Gary, who with Mr. B. F. Jones and others proved that, in spite of high wages and the high cost of living in the United States, they could make steel more cheaply than their foreign competitors.

It is true that there existed in this country a plentiful supply of ore, coke, means of transportation and skilled workmen. But it required something more than this to achieve success, and that factor was supplied by the business daring and organizing genius of that extraordinary group of men in and around Pittsburgh who, during the last quarter of the nineteenth century, welded into great, self-contained industrial organizations the thousands of competing units which were formerly engaged in producing steel. They achieved what has been called integration of industry. By that is meant the knitting together of all the related parts or processes, so that industrial organizations may contain all the factors required for the uninterrupted prosecution of their work.

This is what happens when, in an industry such as steel, corporate organizations acquire control of such operations as the mining of coal and iron ore, the operation of steamship lines and railroads and other means of transportation from mine to mill, the working of coke ovens and the manufacture of pig-iron and its ultimate transformation into rails, wire, nails and other finished material. The automobile industry has been organized in much the same way, and in almost every branch of industrial enterprise the operation of this principle of integration can be seen.

Industry has learned the value of organization. It realizes that efficiency in production is the price of success and that only by standardizing processes and by the use of new inventions and labor-saving machinery can it eliminate waste and increase the productive capacity per capita of labor. In this way it is possible to pay high wages and still reduce costs, so that the finished product can be sold for a price low enough to stimulate consumption. In the end, industry finds that it pays to achieve quantity production and to make a large volume of small profits.

The development of business and industry along these lines has brought about a complete change in banking methods today as compared with those of fifty years ago. The formation of great corporations has made necessary the concentration of vast amounts of capital.

Industrial financing has become a recognized banking function. And yet, I remember a time in the early nineties when this particular phase of banking development was looked upon as something new and perhaps not altogether conservative.

The banks of Pittsburgh, however, were among the first to adapt their methods to the requirements of industry. As a result, not only has impetus been given to the development of the iron, steel, glass, air brake and other great local industries, but at the same time the banks here have grown in importance and in resources at a rate commensurate with the growth of these industries. Their total banking capital had increased from $10,653,500 in 1867 to nearly $200,000,000 in 1926, and deposits increased to over $932,000,000, making the total banking resources of Pittsburgh today well over a billion dollars. This is more than one-third the capital and deposits of the banks of the entire country fifty years ago.

Another result of modern banking development has been that the banker, in supplying the capital for merging great industrial corporations, has found himself drawn more and more into industry. He finds that, where he must take so much financial responsibility, he must satisfy himself as to the soundness of the undertaking; and so he has become more and more involved in industrial enterprises.

At the same time, on the boards of banks are found industrial leaders who pool their combined knowledge and judgment for the benefit of both finance and industry. This close inter-relationship between banking and industry is bringing about not only a great increase in banking functions, but also a tendency towards a merger of large banking concerns into still larger ones.

During all this period of great expansion in industry and in banking requirements, the banks themselves were hampered by the inadequacy of our banking laws. Although the Bank Act of 1864 gave the country a sound currency, it did nothing to prevent the recurrence of financial panics. In fact, the banking system which it provided operated to aggravate rather than to relieve panic symptoms in periods of financial emergency. The system which was established consisted of a network of independent banks, with scattered and immobile bank reserves and a credit inelasticity which rendered it totally inadequate to the country's needs. National banks could issue currency only when secured by Government bonds; consequently they were unable to increase the currency in times of stringency. Banks outside of the great financial centers could expand their credit facilities only by borrowing from the larger metropolitan banks, with the result that all loans in the end converged on New York. Instead of a co-ordinated system of banks, with a common reservoir of credit, we had a large number of banking units, which in times of stress struggled against each other, and never worked together as part of one great financial structure.

These defects were cured by the establishment of the Federal Reserve System in 1913. The twelve regional banks, under the responsible co-ordinating influence of the Federal Reserve Board, can effect that prompt mobilization of reserves which is so essential in preventing panics. These banks are also able to provide the country with an elastic currency, which expands or contracts with seasonal and trade needs. It is possible to supply the farmers and the trade with adequate currency during the crop moving period and to effect the necessary contraction when the seasonal requirements have been met. The reserves of each regional bank are available, through the discounting privilege, to all other Federal Reserve Banks. The funds of the central reservoir can be diverted to any bank in the system which has need of them, so that the financing of an increasing or a decreasing volume of business can be accomplished with ease.

At the last session of Congress, the charters of the Federal Reserve Banks were extended for an indeterminate period. This act was one of the most important pieces of legislation that have passed Congress since the war; and the fact that it was passed by a large and united vote of both parties leads us to hope that banking is at last free of politics and that questions of banking policy, so vitally affecting the business of the country, will hereafter be decided on a basis of financial, rather than political, considerations.

In Pittsburgh, the banks suffered the usual hardships that recurred with seeming regularity prior to the passage of the Federal Reserve Act. During the panic of 1873 a large number of banks here failed or were compelled to suspend at least temporarily. The wild speculative fever which started at the close of the Civil war, together with the expansion of legitimate business far beyond actual requirements here as in other parts of the country, had brought conditions to the breaking point. On September 18, 1873, the failure of Jay Cooke & Co., in New York, brought matters to a head. In a few days runs on the local banks had caused the failure of many of the strongest and most conservative banking institutions in the city.

What was taking place in Pittsburgh was but a picture of what was happening all over the country. The panic had exceeded all previous financial convulsions and the effects of it on business and the wellbeing of the community lasted with but little relief until 1879, when specie payments were resumed by the Government.

The panic of 1883-4, while rather intense, was not prolonged; and by 1885, few traces of it were left. The next convulsion of a financial nature occurred in 1893. It was quite severe and far-reaching in effect and was produced, not so much by a loss of confidence in the financial stability of the merchants, manufacturers and bankers, as by a fear that the standard of values would be changed and silver and paper substituted for gold. The result was that sound money was hoarded, and to combat the situation many of the clearing houses of the country issued clearing house certificates to the members who applied for them for use as currency and to be tendered in settlement of their clearing house balances and to be paid by them to their depositors for pay roll and other purposes.

The panic of 1907 brought the country to a realization of the necessity for a thorough revision of the banking and currency laws. The National Monetary Commission was formed and did much hard and useful work in preparation for the reform of the banking and currency system that came later with the passage of the Federal Reserve Act. Fortunately, when the war came in 1914, the financial structure of the country was ready for the unprecedented strain which was to be put upon it. Although the Federal Reserve System had been put into operation only a short time before, it succeeded in establishing itself in public confidence during this period of strain and uncertainty in the financial world. Later, when this country entered the war in 1917, the demands upon the banking structure became even greater. It was necessary to support our military establishment and at the same time to make advances to the nations associated with us in carrying on the war. When the war was over and the nation was obliged to adjust itself to new conditions, it was the steadying influence of the Federal Reserve System that brought the country safely through the period of post-war readjustment with a minimum derangement and prevented the financial crisis from degenerating into a panic.

In the period since 1914, banking in Pittsburgh and throughout the country has entered upon a third phase of its development. Up to that time, we had been concerned largely with financing our own industrial and business enterprises. British, French, and German capital had helped to finance the building of our transcontinental railways and other great undertakings. But during the war Americans repurchased many of their own securities, as well as made loans abroad, so that today our credit position has been reversed, and America has become a creditor, instead of a debtor, nation.

Since the war, increasingly large amounts of American funds have found their way into foreign investments in all parts of the world. So great is the amount invested that the question has recently been raised as to whether such loans are safe and can eventually be repaid. As to the question of soundness, the test of security of a foreign loan is the same as in the case of a domestic loan. Certainly a loan is sound if out of the money borrowed the debtor can repay the principal and interest and make a profit for himself.

The investor, of course, must make his own decision as to whether the security of any particular foreign loan is ample and whether he wishes to take the risk. But the banker floating the loan in this country owes it to his client to exercise unusual care in investigating the security back of offerings which he may make. His success or failure in doing this will be the test of whether American banking can bring to the international field the same discrimination and judgment which it has exercised with such signal success in the field of domestic industrial financing.

The problems which have arisen after the war are so largely financial and economic in character that bankers have been called upon to help in their solution, even when these problems are of an international and semi-governmental nature such as were once left to officials and diplomats to settle.

Banking is finding that, just as it earlier became involved in industry and has been obliged to help in the solution of industrial problems, so it must now help in finding a solution for those international financial problems which must be solved if the world is to go forward. The future of both Europe and America will be largely influenced by the ability of bankers to meet their new responsibilities.

EARLY PITTSBURGH BANKS, WITH THEIR FIRST PRESIDENTS

Pittsburgh Branch of the Bank of Pennsylvania. Established 1804. General John Wilkins, Jr., President.

Bank of Pittsburgh. Established 1810. William Wilkins, President.

Farmers & Mechanics Bank of Pittsburgh. Established 1814. John Scull, President.

Pittsburgh Branch of Second Bank of the United States. Established 1817. Adamson Tannehill, President.

City Bank of Pittsburgh. Established 1817. Rev. Robert Patterson, President.

N. Holmes & Sons. Established 1822. Nathaniel Holmes, Founder.

The Pittsburgh Savings Fund Society (later Farmers Deposit National Bank). Established 1834. James Fulton, President.

The Merchants & Manufacturers Bank. Established 1833. Michael Tiernan, President.

The Exchange Bank of Pittsburgh (later Exchange National Bank of Pittsburgh). Established 1836. Wm. Robinson, Jr., President.

Pittsburgh Branch of Pennsylvania Bank of the United States. Established 1836.

Allegheny Savings Fund Society (later Allegheny National Bank). Established 1849.

PRIVATE BANKERS

James & Gordon Gilmore, Established 1818; George A. Cook, Established 1828; Cook & Cassatt, Established 1841; E. Sibbett & Co., Established 1841; Sibbett & Jones, Established 1841; Samuel Jones & Co., Established 1841; Allen Kramer, Established 1841; William A. Hill, Established 1844; William Forse, Established 1845; Hussey & Pettit, Established 1845; R. Patrick & Co., Established 1850; Patrick & Friend, Established 1850; O'Connor Bros. & Co., Established 1850; Arthur Rodgers & Co., Established 1850; William A. Herron & Co., Established 1850; Semple & Jones, Established about 1859; S. McClean & Co., Established about 1859; Ira B. McVay & Co., Established about 1859; A. Wilkins & Co., Established about 1859; Hugh D. King, Established about 1859; Hoon & Sargent, Established about 1859; Kramer & Rahm, Established about 1859.

Fifth Ward Savings Bank. Established 1852. James Laughlin, President.

Pittsburgh Trust & Savings Co. (later Pittsburgh Trust Co.; and afterwards the First National Bank of Pittsburgh). Established 1852. Organized by James Laughlin, B. F. Jones, et al.

Citizens Deposit Bank of Pittsburgh (later Citizens National Bank). Established 1853. George A. Berry, President.

Dollars Savings Bank. Established 1855. George Albree, President.

Mechanics National Bank. Established 1855. Reuben Miller, President.

Union National Bank. Established 1857. John R. McCune, President.

Iron City National Bank. Established 1857. Alexander M. Byers, President.

Iron City Trust Company (later Second National Bank). Established 1859. G. E. Warner, President.

The German Trust & Savings Bank (later German National Bank). Established 1860. Augustus Hoeveler, President.

The Pittsburgh Bank for Savings. Established 1862. James Park, President.

Robinson Brothers. Established 1863, by David and John F. Robinson.

The Real Estate Savings Institution. Established 1863.

Dime Savings Institution of Pittsburgh. Established 1862. James Park, Jr., President.

First National Bank of Allegheny. Established 1864. T. H. Nevin, President.

Third National Bank. Established 1863. Adam Reineman, President.

Fourth National Bank. Established 1864. James O'Connor, President.

Pittsburgh National Bank of Commerce. Established 1864. Alfred Patterson, President.

The Tradesmens National Bank. Established 1864. Alexander Bradley, President.

Second National Bank of Allegheny. Established 1865. John Brown, Jr., President.

Peoples National Bank. Established 1865. Samuel Rea, President.

First National Bank of Birmingham. Established 1865. B. A. Wolfe, President.

Pittsburgh Savings Bank. Established 1866.

Keystone Savings Bank. Established 1866.

Franklin Savings Bank of Allegheny. Established 1866. George R. Riddle, President.

National Trust Company. Established 1866.

Peoples Savings Bank. Established 1866. Thomas Mellon, President.

City Deposit Bank & Trust Co. (later City Deposit Bank). Established 1866. Dr. John O. Marchand, President.

The Safe Deposit Co. of Pittsburgh (later Peoples Savings Bank & Trust Co.). Established 1867. William Phillips, President.

The Coalmens' Trust Co. (later the Duquesne National Bank). Established 1867. W. G. Johnston, President.

The Fort Pitt Banking Co. (later the Fort Pitt National Bank). Established 1868. Samuel McClurken, President.

The Central Bank. Established 1868.

The Masonic Bank (later Lincoln National Bank). Established 1868. C. W. Batchelor, President.

The Fifth Avenue Bank. Established 1869. W. C. Robertson, President.

The Workingman's Savings Bank of Allegheny (later the Workingman's Savings Bank & Trust Co.). Established 1869. J. J. Hermann, President.

T. Mellon & Sons (later Mellon National Bank). Established 1869 by Judge Thomas Mellon.

The Germania Savings Bank (later The Citizens Savings Bank). Established 1870. Charles Meyran, President.

The Freehold Bank & Building Association (later the Freehold Bank). Established 1870. Edward House, President.

The Diamond Savings Bank (later The Diamond National Bank). Established 1871. James M. Cooper, President.

The Arsenal Bank. Established 1871. John W. Riddle, President.

The Temperanceville & West Pittsburgh Savings Bank (later the West End Savings Bank & Trust Co.) Established 1871. B. C. Sawyer, President.

The Penn Bank. Established 1873.

The Fifth National Bank. Established 1873. Robert Arthurs, President.

The Anchor Savings Bank. Established 1873. A. M. Brown, President.

Enterprise National Bank of Allegheny. Established 1870. William Dilworth, President.

International Bank. Established 1873. John Watt, President.

Artisans Bank. Established 1870-73.

Commercial Banking Co. (later First National Bank of McKeesport). Established 1873. William Whigham, President.

German Savings & Deposit Bank. Established 1871. John P. Heisel, President.

United Bank. Established 1870.

Nations Bank for Savings. Established 1870-73.

Security Trust Co. Established 1870-73.

Iron and Glass Dollar Savings Bank of Birmingham. Established 1871. Thomas Atterbury, President.

Farmers & Mechanics Bank of East Birmingham. Established 1870-73.

Odd Fellows Savings Bank (later Traders & Mechanics Bank). Established 1872. Henry Lambert, President.

Real Estate Loan & Trust Co. Established 1870-73.

Allegheny Homestead Bank. Established 1870-73.

Shoe & Leather Bank. Established 1870-73.

Monongahela Savings Bank. Established 1872.

Weekly Savings Bank. Established 1870-73.

Liberty Improvement Co. Established 1870-73.

The Peoples Bank of McKeesport. Established 1873. C. R. Stuckslager, President.

Bank of Industry. Established 1872. Jos. Ross, President.

Market Bank. Established 1870-73.

The Marine National Bank. Established 1875. W. H. Everson, President.

The German National Bank of Allegheny. Established 1875. A Weise, President.

The Metropolitan National Bank. Established 1875. C. A. Dravo, President.

The Farmers & Mechanics Bank of Sharpsburg. Established 1879. George A. Chalfant, President.

The Commercial National Bank (later merged with the Commonwealth Trust Co.). Established 1882. M. W. Rankin, President.

The First National Bank of Braddock. Established 1882. Philander C. Knox, President.

The Manufacturers Bank (later merged with the Peoples Trust Co.). Established 1889. Edward Hogan, President.

The Braddock National Bank of Braddock. Established 1882.

The Keystone National Bank. Established 1884. J. J. Vandergrift, President.

The Fidelity Title & Trust Co. Established 1886. William O'H. Scully, President.

The National Bank of McKeesport. Established 1887. James Evans, President.

The Monongahela National Bank. Established 1888. Thomas Jamison, President.

The First National Bank of Homestead. Established 1887.

The Union Trust Company. Established 1889. Andrew W. Mellon, President.

The Pennsylvania National Bank. Established 1890. A. S. M. Morgan, President.

The Liberty National Bank (later merged with East End Savings & Trust Co.). Established 1890. John H. McKelvey, President.

The Dollar Savings Fund & Trust Company (later the Dollar Savings & Trust Co.). Established 1890. John W. Chalfant, President.

The First National Bank of Sewickley. Established 1890. R. J. Murray, President.

The Mercantile Trust Co. Established 1890. Theophilus Sproull, President.

The National Bank of Tarentum. Established 1890. John W. Hemphill, President.

The First National Bank of Duquesne. Established 1892. John W. Crawford, President.

The National Bank of Western Pennsylvania (later the Western National Bank and afterwards merged with the Monongahela National Bank). Established 1893. James Hemphill, President.

The Pittsburgh Trust Co. Established 1893. J. J. Vandergrift, President.

The Columbia National Bank (afterwards absorbed by the Bank of Pittsburgh). Established 1893. E. H. Jennings, President.

The Bank of Secured Savings of Allegheny. Established 1893. R. H. Gilliford, President.

The First National Bank of Verona. Established 1893. R. D. Elwood, President.

The Pittsburgh Stock Exchange. Established 1894. Henry M. Long, President.

The Dime Savings Bank (later the Western Savings & Deposit Bank). Established 1895. John Dimling, President.

The Pennsylvania Title & Trust Co. (afterwards merged with the American Trust Co. and still later merged with the Colonial Trust Co.). Established 1895. E. H. Jennings, President.

The United States National Bank. Established 1895. William Pickersgill, Jr., President.

The Citizens Bank of Turtle Creek. Established 1896. U. G. Williams, President.

The State Bank of Pittsburgh. Established 1896. J. S. Epsy, President.

The Wilkinsburg Bank of Wilkinsburg. Established 1896. J. A. Strickler, President.

The State Bank of Braddock. Established 1897. R. M. Holland, President.

The Coraopolis National Bank. Established 1897. J. A. Ferguson, President.

The Equitable Trust Co. Established 1898. Theophilus Sproull, President.

The Ohio Valley Bank. Established 1899. Capt. E. S. Wright, President.

The Guarantee Title & Trust Co. Established 1899. S. H. McKee, President.

PITTSBURGH BANKS—1927

Allegheny Trust Co. Chas. W. Dahlinger, President.

Allegheny Valley Bank of Pittsburgh. E. J. O'Brien, President.

All Nations Deposit Bank. J. S. E. Ruffennach, President.

American State Bank & Trust Co. Ivan Bielek, President.

The Arsenal Bank of Pittsburgh. H. S. Davison, President.

Bank of Aspinwall. G. D. Edwards, President.

The Bank of Pittsburgh, N.A. Harrison Nesbit, President.

Bank of Secured Savings. J. B. Keaggy, President.

Bloomfield Trust Co. H. J. Booth, President.

Brookline Savings & Trust Co. P. S. Space, President.

Carrick Bank. William R. McShane, President.

Citizens' Savings Bank of Pittsburgh. A. E. Niemann, President.

Citizens' State Bank of Dormont. H. L. Dixon, President.

The City Deposit Bank. J. R. Mellon, President.

The Colonial Trust Co., James C. Chaplin, President.

Commonwealth Trust Co. of Pittsburgh. George D. Edwards, President.

The Corporation Trust Co. K. K. McLaren, President.

The Diamond National Bank. James D. Callery, President.

The Dollar Savings Bank. Samuel Bailey, Jr., President.

Dollar Savings & Trust Co. George E. Meyer, Chairman of Board.

Duquesne National Bank. W. S. Linderman, President.

East End Savings & Trust Co. J. O. Miller, President.

Farmers Deposit Savings Bank of Pittsburgh. E. B. Coll, President.

Exchange National Bank of Pittsburgh. Joseph W. Marsh, President.

Farmers Deposit Trust Co. A. E. Braun, President.

Farmers Deposit National Bank. A. E. Braun, President.

Federal Reserve Bank of Cleveland (Pittsburgh Branch). J. C. Nevin, Managing Director.

Fidelity Title & Trust Co. Malcolm McGiffin, President.

Forbes National Bank. Richard K. Mellon, President.

Fifth Avenue Bank of Pittsburgh. C. F. Niemann, President.

Fourteenth Street Bank. J. E. Roth, President.

First National Bank of Birmingham. T. H. Sankey, President.

First National Bank at Pittsburgh. Lawrence E. Sands, President.

Franklin Savings & Trust Co. of Pittsburgh. J. M. Stoner, Jr., President.

Freehold Bank. James C. Chaplin, President.

Garfield Bank. H. J. Booth, President.

Hamilton State Bank. R. L. Sleeth, President.

Hazelwood Savings & Trust Co. D. C. W. Birmingham, President.

Highland National Bank. Harrison Nesbit, President.

Hill Top Savings & Trust Co. Henry Meuschke, President.

Homewood People's Bank. John C. Hill, President.

Iron & Glass Dollar Savings Bank of Birmingham. F. William Rudel, President.

Keystone National Bank of Pittsburgh. A. C. Beymer, President.

McGillick Savings & Trust Co. F. E. McGillick, President.

Manchester Savings Bank & Trust Co. G. C. Gerwig, President.

The Marine National Bank of Pittsburgh. Hill Burgwin, President.

Mellon National Bank of Pittsburgh. R. B. Mellon, President.

Merchants Savings & Trust Co. E. L. Parker, President.

Metropolitan Savings Bank & Trust Co. J. O. Miller, President.

Modern State Bank. Jacob L. Phillips, President.

Monongahela National Bank. James E. Fulton, President.

Mount Lebanon Bank. Howard B. Salkeld, President.

Napoleon State Bank. Louis Napoleon, President.

National Bank of America. F. N. Hoffstot, President.

Oakland Savings & Trust Co. C. B. Aylesworth, President.

Ohio Valley Bank. Henry M. Reed, President.

Ortale & Co. W. P. Ortale, Owner.

Pennsylvania National Bank. Joseph A. Kelly, President.

Pennsylvania Savings Bank. Joseph A. Kelly, President.

Pennsylvania Trust Co. of Pittsburgh. Benjamin Page, President.

Peoples Savings & Trust Co. of Pittsburgh. A. C. Robinson, President.

Peoples Trust Co. of Pittsburgh. H. F. Wigman, President.

Perry State Bank. Hugh L. Porter, President.

Pittsburgh Clearing House Association. R. B. Mellon, President.

Pittsburgh State Bank. Emanuel Dym, President.

Pittsburgh Trust Company. Louis H. Gethoefer, President.

Polithania State Bank. F. M. Schrack, President.

Potter Title & Trust Co. John E. Potter, President.

Provident Trust Co. C. F. Kirschler, President.

Real Estate Savings & Trust Co. of Allegheny. Thomas E. Long, President.

St. Clair Savings & Trust Co. Henry Henning, President.

The Second National Bank of Allegheny. W. L. Guckert, President.

Sheraden Bank. Dr. H. E. Clark, President.

South Hills Trust Co. Edwin W. Smith, President.

Terminal Trust Co. Louis H. Gethoefer, President.

Third National Bank of Pittsburgh. W. McK. Reed, President.

The Union Savings Bank of Pittsburgh. H. C. McEldowney, President.

The Union National Bank of Pittsburgh. Lloyd W. Smith, President.

Union Trust Co. of Pittsburgh. H. C. McEldowney, President.

Washington Trust Co. of Pittsburgh. W. C. McEldowney, President.

Western Savings & Deposit Bank. Charles E. Schuetz, President.

West End Savings & Trust Co. H. S. Hershberger, President.

William Penn Trust Co. J. S. Crutchfield, President.

Workingman's Savings Bank & Trust Co. Emil Winter, President.

LABOR'S PART IN THE DEVELOPMENT OF PITTSBURGH

JAMES J. DAVIS

James J. Davis, Secretary of Labor in the Cabinets of Presidents Harding and Coolidge, was born in Tredegar, South Wales, October 27, 1873, son of David James and Esther Ford (Nicholls) Davis. He attended the public schools until eleven years of age and later took a four months course in a business college. The family, including the parents and six children, came to the United States in 1881. Mr. Davis became a puddler's assistant shortly after his eleventh year and at the age of sixteen he was a puddler.

He moved to Elwood, Indiana, in 1893, and was employed in the various steel and tin plate mills. In the meantime, he became interested in politics. He was city clerk of Elwood from 1898 to 1902 during which time he studied law for three years. In 1903 he became recorder of Madison county, Indiana. In 1906 he was made supreme organizer of the Loyal Order of Moose, later made director general; known now as the founder of the organization in its present form. He founded Mooseheart in Illinois, a school caring for, educating, and training with a trade more than 1,400 dependent orphan children of the fraternity, and their mothers. Founded Moosehaven, Florida, which cares for more than 200 aged people. He was chairman of the Moose War Relief Commission in 1916, visiting during this time French, Belgian and Italian battlefields. He is (1928) chairman of the Federal Board for Vocational Education.

Married Jean Rodenbaugh, of Pittsburgh, Pennsylvania, in Los Angeles, California, November 26, 1914. Has five children: James J., Jr., Jane Elizabeth, Jean Alys, Joan and Jewel.

Member of the Amalgamated Association of Iron, Steel, and Tin Workers and has held various offices in this association. President of the Liberty Bond and Mortgage Company. Member of many clubs and fraternal organizations. Honorary LL.D. from Bucknell, Pennsylvania Military College, Chester, Pennsylvania, and University of Pittsburgh.

Addresses of the Secretary: (1) Labor Department, Washington, D. C. (2) 3012 Massachusetts Avenue, Washington, D. C. (3) 2117 Farmers Bank Building, Pittsburgh, Pa. (4) 812 Bellaire Avenue, Pittsburgh, Pa.

JAMES J. DAVIS

Labor's Part in the Development of Pittsburgh

BY JAMES J. DAVIS

MY Pittsburgh friends could not have given me a task I would rather perform than to help advance the progress of this great city that has been my home for so many years. For the past twenty years my activities have taken me all over the United States. I could have made my home in any one of the many places, but I stick to Pittsburgh by choice. I have lived here because I like it.

As I look back now to the time over forty-five years ago when I came here as a boy of eight, I must have felt even then the bold, building spirit that is in the very air of this city. It is probably why I felt so much at home here from the very beginning.

My father was one of the later pioneers drawn to this teeming, thriving region when he set out from Wales to try his fortune in an unknown land. He too caught the Pittsburgh spirit and way, as soon as he got here.

At six o'clock one morning, in the Welsh town where he worked as an iron puddler, he wound up his work on a night shift. At noon he caught a train to Liverpool and got there that evening. Next morning his boat left Liverpool and he was two weeks at sea. From the dock in New York where the boat landed one morning he went straight to the Pennsylvania station ticket office and sat up most of the day and all night on a train for Pittsburgh. In those days it was a longer trip than it is now.

The train got him here in the morning, and at one o'clock that day my father was at work on the job his brother had ready for him. That was the Pittsburgh spirit, the Pittsburgh way of doing things. Except for the enforced idleness for two weeks on the high seas, it might be said that he walked straight from his job in Tredegar to a better paid job right here.

A country like this, a region that did business in the Pittsburgh way, struck my father as the place for his family, and he set out to save up his earnings to bring the rest of us over. When my mother was ready to bring my sister and brothers and myself, a house here was ready for us, and we too stepped out of life in Wales right into a new home.

I cite these matters to give you a picture of the Pittsburgh region as it looked to the working man. It made no difference how far he had come or what was his place or origin; if he had the necessary skill, Pittsburgh had a prompt place for him at wages always a little higher than he could earn elsewhere. I know that one man's family was grateful, and that was ours, to Pittsburgh for enabling him to bring us into the rich opportunities here. That was forty-five years ago, not a long time as compared with the length of Pittsburgh's history, but perhaps as one of these more recent arrivals I can testify all the better to the strong, vigorous, progressive go-ahead air of this region, where those longer steeped in its life may have become used to it.

Even as a boy, that spirit of doing things, doing them at once and doing them big, must have hit me like a bracing tonic.

I don't mean that everything went along without a hitch. In those days American industry was still in an experimental stage. It was only then beginning to find itself, to reach out into its true field. One of the great American industrial leaders has said of the steel business of that time that it was either feast or famine. It had its ups and downs, it needed stabilization. We workers felt that along with the rest. But the great driving spirit was here, and the man of skill who was ready to turn out work was paid a good wage for his output. In time the violent bursts and drops in steel disappeared because in time the geniuses in organization who appeared in this place soon put it on an orderly and stable basis. But scientific organization based on efficient management alone does not account for the fact that Pittsburgh has always been at the head of American industry. Great credit must also be given to her splendid population of skilled and intelligent workers.

The ambitious men drawn here as my father was have also played a great part in the upbuilding of this region. We were all living in Sharon and I remember that when I qualified as a master puddler, my eyes were turned toward Pittsburgh. Here, a skilled worker was sure of a good wage, but he was even more sure of a chance to rise, where in the district where I learned my trade, a young fellow had to wait for his father's job.

In Pittsburgh, the worker with the go-ahead spirit was not simply permitted to get ahead, he was sent ahead. The influence of this district as exerted on the rest of the country has never been fully calculated. And by that I mean a direct, personal influence. I could tell you the names of any number of skilled Pittsburgh workers drafted to other cities to become managers of various industries. Outsiders who needed specially skilled men came here to find them. They bore the stamp of Pittsburgh approval. The rest of the country wanted the benefit of men trained in the Pittsburgh school of skill and drive. They have been drafted to all parts of the country, and with them have gone the ideals of skill and high speed production they learned here.

In my travels about the country I have met many of these men in positions of power, and all of them leaders wherever they were. Here at home, some of the men who toiled at the heaviest of trades—iron and steel work, glass-blowing—now occupy leading positions in Pittsburgh's field of education, and professional life. I knew them all, fathers and sons, and saw this process work out. In the light of such facts one can say with truth that the biggest asset any city can have is its intelligent working population. Industry cannot flourish without wise management, but neither can it live without trained and willing hands to execute the plans of management and turn out the finished product. Capital is soon exhausted unless it has in its employ men able to turn out a useful and salable product.

But the working population of Pittsburgh has been an asset for another and better reason. The workers of this city have been able to do more than turn out products to make it famous the world over. Its workers have managerial and organizing brains, inventive genius, as well as skilled hands. It will astonish any one to go over Pittsburgh's great industries, one after the other, and discover how many of them are now directed by men who once toiled at the forge, the furnace or the lathe. My friend Humphrey, head of the great Westinghouse company, who began life as a machinist, is only one shining example of many who stepped from a worker's overalls to don the authority and responsibility of management.

Out of Pittsburgh's mechanical genius, much of it among its workers, has been developed the marvelous new methods and machinery that have refined and multiplied output and taken some of man's heaviest tasks from the back of the worker. I look back in amazement over the advances made in the iron and steel industry alone. Until recent years no machine had been devised to do the work I learned to do. It seemed that no mechanical way could be found to take the place of the human touch and eye in the puddling of iron. Millions have been spent in experiment with such a machine, and the time is now probably at hand when this most laborious work in the industry will at last be lifted from the backs of men. In nearly every other process of the manufacture of iron and steel, machinery marvelous for its ponderous power and great ingenuity swings masses of white-hot metal that once were slowly handled by weary and sweating human beings.

Yet as the metal they handled glowed and sparkled, so did the hearts of those workers glow and sparkle at the tasks they performed. Every man of them was a real artist taking pride in his skill.

Some of them refused to let promotion take them from their daily work they loved so well. Nobody here needs to be reminded of "Captain" Bill Jones, who chose to remain a man about the plant rather than accept stock and high office in the company, and was rewarded with a salary equal to that then paid to the President of the United States. Bill Jones exemplifies as no one else the spirit of the Pittsburgh worker, and the willingness of his employer to pay him what he has always been worth.

No record of the upbuilding of this or any other great center of industry would be accurate or complete unless due credit is given to the workers of the mills and factories. These strong, vigorous skillful men who have made Pittsburgh's iron, steel, glass, and other products famous in the four corners of the world, are the very backbone of its stability. It is to this intelligent labor force, as well as to the great business genius this region has developed that Pittsburgh owes its place at the forefront of the world's industry. Among all its rich natural resources, this city stands most fortunate of all in this combination it has always possessed, of great organizing genius together with an eager, ambitious, intelligent population of workers. It is that union of effort which has made this big, strong, prosperous business community you see about you today. Through all the years of its great and rapid growth, Pittsburgh has been the same community of pioneers that began here with a handful of bold and hardy men set out to dare the risks and the dangers of the unbroken wilderness. It has always been the same community of daring pioneers. It has always been the magnet drawing new pioneers to itself, and drawing the daring genius out of them. Many of the great inventions that have revolutionized life originated or were developed here. Pittsburgh has placed at the head of American business, men who brought wealth to the people, good wages to hundreds of thousands of workers, and who profoundly affected the destiny of the nation.

Our enormous industrial development, now the wonder of the world, began its first rapid expansion about a half century ago, when Pittsburgh's pioneering brains first showed the way. Organization is the secret of our industrial progress, as first put into practice by the great trail blazers of that time. I was going to say Pittsburgh has made industrial history. It is better to say that American industry itself was made here in Pittsburgh.

Throughout the history of American industry you will find Pittsburgh's leaders of industry and of labor setting the pace. Look back from the metropolitan city of today to the little band of settlers nearly 200 years ago, and at every step you will find this region linked with our country's history and growth. The first man to see the importance of this spot as a gateway to the then undeveloped west was George Washington himself. It is a fact that the careers of Pittsburgh and George Washington began together, at the moment when the young Virginia surveyor first came here to look over a key route to the western wilderness in which his fellow Virginians were interested. Washington's unerring eye saw the strategic value of this point of land at the junction of the Allegheny and Monongahela rivers, and with the expedition he led to lay claim to the place, the history of Pittsburgh began. So did the history of George Washington.

Precisely as Washington foresaw, this region became the passageway to the west. As the new nation settled down to peace and industry, the westward migration set on its way. From the tide of adventure that passed its way, Pittsburgh drew the spirit that has dwelt with it ever since. Its industries were born in the service it rendered the voyagers who passed its doors. And soon it was found that nature had still further blessed the young city in its location. Near at hand were found iron, coal, oil, and gas. Business genius, hard work, and well-paid and intelligent workers, all spurred by the Pittsburgh spirit, have done the rest.

I said the pioneers who first applied the principle of organization to industry, profoundly affected the destiny of the nation. It is beyond contradiction that these organizers who introduced a new principle in industry made possible our present vast industrial development.

At this later day we see, for what they are, the great industrial institutions that have come about—inventions as revolutionizing as the steam engine itself. We see now how foolish was the fear that greeted them at first. Then we saw only their size and power, and were blind to their usefulness. Stringent laws, born of fear, were passed to keep them in leash. Now, we understand that these greater industrial units were inevitable. A country as big as ours could do things only in a big way. If we were to bring forth the wealth of this land, it could be done only on the great scale by orderly methods of organization. Now we are proud of these disciplined, scientifically functioning production units. We no longer ask how big is this organization, but how useful it is. We know that the bigger the organization the harder it is to hide. Public opinion has become the real and sole regulator of our great industrial combinations. It asks of them only that they supply it at the lowest cost, with a liberal wage and generous treatment for their workers and a good profit to themselves.

The benefits of these great industrial institutions are taken for granted today. We can hardly think of American industry without them. Our people even demand that a disorganized industry shall put itself in line with the economies made possible to the well organized industries. Comparisons are the only standard of measurement, and if you would understand how indispensable these modern combinations are, and what they have done for the country, you have only to turn to one great industry I could point you to as an example of American industry before the principle of organization was applied.

That single industry remains unorganized and is fifty years behind the times. It is subject to frequent strikes, and to cut-throat competition.

It is also subject to fluctuations of price and to stoppage of production, that keep the country in constant suspense and that slow up all the other industries we have. The contrast between that industry so completely at war with itself, and the other great modern industrial institutions we have, is the greatest possible tribute to the genius of those Pittsburgh pioneers who developed the principle of organization and first put it into practice on a colossal scale with its system, method, and saving.

I hope that as each of the other major industries has developed its genius, so also the basic industry of coal will find among its leaders the man to bring system and order into its operation. He will have the greatest task of all, but he will earn the greatest honor, not alone for the difficulties he will have overcome, but for the added stability he will have brought to every other industry we have.

There is a further organization I would suggest for Pittsburgh. I wish every employer here would unite for the purpose of admitting no one to their association who did not pay good wages and provide good working conditions. The head of one of the nation's greatest industries is on record with the remark that you get nowhere in industry without contented workers—workers well paid, well housed with no worries and no resentments in their minds. And let me cite right here one of the bitterest resentments a worker can feel.

Men are urged to speed up their production thereby increasing their earnings, and then are told by the management that this larger pay is "out of line" with standard pay in the same trade. It is only a way of giving him no more money, while getting more work out of him. Keep your worker's production up, but pay him what he earns.

American industry today is permeated with a good-will between worker and employer such as we have never known before. That good-will we must strive to maintain if for no other reason than because it is good business. The nearly forty-two million workers we have are the largest buying element in the country. They constitute a great and important part of our home market. A great metropolitan paper conceded the other day that the practical, hardheaded men at the head of business now understand that our present prosperity is due in large part to good wages well distributed among our best and biggest customer—the workers.

We want that prosperity to continue unbroken and one way to maintain it is the payment of good wages. Let Pittsburgh lead the way in this as she has at all other times of our industrial history.

This great city of ours I am sure will go on being filled with the pioneering spirit in which it began. Just as George Washington did, it will have its eyes on the west. The great stretches from here to the Pacific coast that gave this region its early growth, are still here, the same challenge to Pittsburgh's pioneering spirit, the same market for its famous products. If competitors have come into that rich field, the challenge to Pittsburgh is all the greater, and I know she will meet the challenge.

We are optimists here. "Pittsburgh Forward" is our watchword. If we have had some faults in the past, they are as the sands of the sea that have been washed, let us hope, until the faults have been erased. The occasional discords of another day are all forgotten now. In the old go-ahead spirit let us reach forth together, worker and employer, to the greater Pittsburgh of tomorrow.

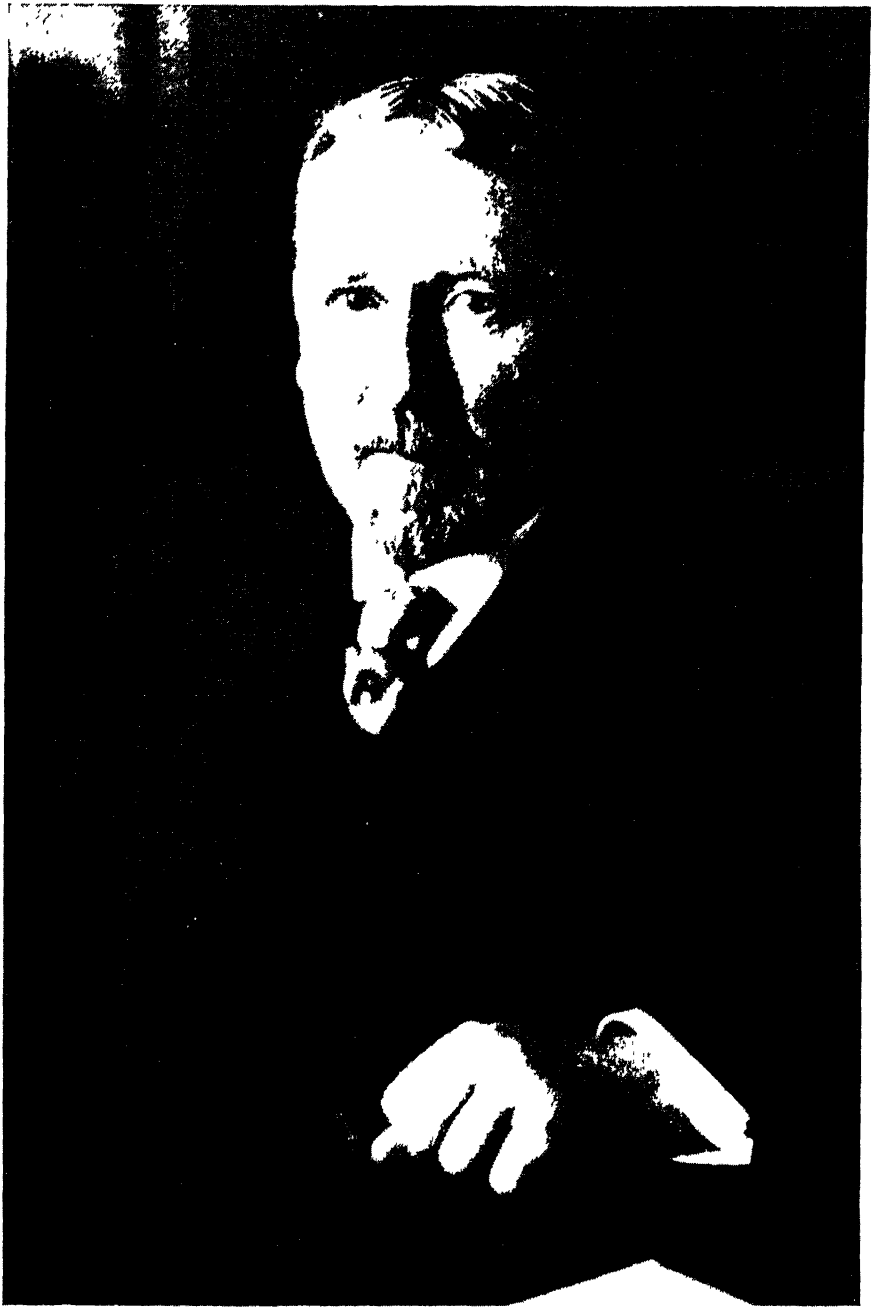
RELIGIOUS LIFE IN PITTSBURGH

SAMUEL B. McCORMICK

Dr. Samuel B. McCormick, chancellor emeritus of the University of Pittsburgh and author of the address on "Religious Life in Pittsburgh" in the series on "Pittsburgh and The Pittsburgh Spirit" was born near Irwin, Pa. twenty-one miles from Pittsburgh in 1858. He was prepared by his father, a physician and classical scholar, for the sophomore year in college and graduated from Washington and Jefferson College in 1880.

He taught for a time in the Canonsburg Academy and later at Washington & Jefferson. He was admitted to the Allegheny County Bar in 1882 and practiced law in Pittsburgh and Denver for the next five years. He was a student of theology at the Western Theological Seminary 1887-1890 and was called to the pastorate of the Central Presbyterian Church, North Side, Pittsburgh in 1890. He was pastor of the First Presbyterian Church of Omaha, Nebraska, from 1894 to 1897 and president of Coe College from 1897 to 1904.

He was chancellor of the University of Pittsburgh from 1904 to 1921 and chancellor emeritus from 1921 until his death. He was a trustee of the Carnegie Foundation 1905 to 1923 and subsequently an honorary member of its supreme council. He was for twelve years a director of the Pittsburgh Chamber of Commerce, deeming it the best agency through which he might serve the community in addition to the university. Dr. McCormick died on April 18, 1928.



SAMUEL B. McCORMICK

Religious Life in Pittsburgh

BY SAMUEL B. McCORMICK

ONE cannot understand Pittsburgh unless he interprets its religious faith and one cannot interpret its religious faith unless he takes a typical Ulsterman apart and finds out how his wheels go around. This does not mean exactly that the Ulsterman was the sole creator of Pittsburgh. He was not the sole creator of Pittsburgh of course; but if one stands off and looks at Pittsburgh with its 665,000 people gathered from every quarter of the globe and if he walks around it to get a view of all four sides of it, the composite picture which looks back at him is the picture of an Ulsterman and nothing else. It does no good to dispute it and argue that the German was here as soon as the Scotch-Irishman and that he has been coming to Pittsburgh ever since. He was and he has; but that does not change the fact that Pittsburgh is so completely Scotch-Irish that if it should be transported to the north of Ireland, and have its face washed, every Orangeman in the region would welcome it as a blood brother. It might not be so handsome as Belfast but it would have exactly the same animating spirit.

The oldest church in Pittsburgh celebrated its one hundred and forty-fifth anniversary about three months ago and it was not a Presbyterian church but a German church. What of it? Nothing, except that for one hundred and forty-five years this persistent church has flourished in an alien atmosphere. It does no good to resent it and complain about and denounce the narrowness and intolerance of the blue Presbyterian and declare he will have none of it; the newcomer always ends up by accepting the fact and conforming to it.

Look at the great churches in Pittsburgh—the Episcopal, which got its first grant in 1787, and the Methodist and Baptist and Lutheran and the rest; and observe how quickly the new clergyman in their churches no matter whether he has come from Boston or San Francisco becomes conservative and orthodox, just like his Presbyterian brother. He may protest and kick against the goads and declare he will do nothing of the sort; but at last he succumbs to the spirit of his environment and conforms to type. Robert Garland may pose as an Episcopalean and the brother of a bishop, but he deceives nobody. He is simply an Ulsterman, that is a Presbyterian, with the garb of the church thinly disguising the granite faith and rugged character of the man of Ulster who over there even if he is of the established church, takes on, as they all do here, the hue and lineament of the abused and often disliked followers of Calvin and Knox. What I really mean to say, in giving expression to these reflections, is that the Chamber of Commerce does well to include in this list of addresses upon Pittsburgh one which has to do with religion and the church.

One can scarcely conceive a more uncongenial soil out of which to grow religion and meeting houses than that of Pittsburgh in 1787. Few visitors of that period had anything good to say of the several hundred people who had gathered here or of the houses in which they lived or of the habits and behavior of the inhabitants. They were eloquent over the natural beauty of the situation—the noble rivers, the great forests, the hills covered with verdure, the fertile soil, the birds singing in the branches and the abundant game roaming everywhere; and from Washington down they were enthusiastic over the location, a gateway to the great west, prophetic of a future great city; but when they had anything to say of the people, it was to describe them as traders, sharp to take advantage, dirty, lazy, often drunken, and to be damned without benefit of clergy. There were two or three lawyers, two or three doctors, a few doubtful school teachers, but no preachers at all and apparently no particular desire that there should be any. And yet perhaps things were not quite as bad as they seemed. Else why in this village pictured as God-forsaken, should a group of German speaking people five years earlier, in 1782, have formed themselves into a congregation for worship and why in February of that same year, 1787, should one of those lawyers, Henry M. Brackenridge, later a novelist of some repute and still later a judge of the supreme court of high repute, have procured from the legislature a charter for the Pittsburgh Academy?

It must be remembered that already there were ministers of the gospel in what are now Westmoreland, Fayette and Washington counties—Finley, Power, McMillan, Smith, Henderson, and in Pittsburgh, Barr, mentioning only those who were incorporators of the academy—and that there must have been a goodly number of religious people since in the fall of that year charters were secured for three churches—Presbyterian, Episcopal, and German Evangelical. It is too much to expect in the conditions which prevailed in 1787 and in view of the kind of people who would seek these conditions, that there should be any general interest in either education or religion; but that this desire did not exist at all is contradicted by the facts of history as they stand recorded to this day.

I now proceed to the particular subject of this paper, the religious life of Pittsburgh, with an account of the early churches and meeting houses, grants of William Penn, the growth and present prominence of our religious institutions.

Historically, the Roman church was the first to send missionaries to the headwaters of the Ohio; but because the period antedated actual settlement and because not a trace of this activity remains, we need not dwell upon it at any length, interesting as the journals of such men as Father Bonne-camps, a Jesuit, of Father Denys Baron, a Franciscan, and of others, actually are. More interesting to us, perhaps, is the fact that on November 26, 1758—Duquesne is henceforth Pittsburgh—the Rev. Charles Beatty, a Presbyterian minister, chaplain of the regiment, preached the first Thanksgiving sermon west of the Alleghenies, a "Clarion of Calvinism" prophetic of the future spread of Presbyterianism over the region. This incident was not isolated but is connected with much that has happened since; for Charles Beatty was the father of Erkuries Beatty, and Erkuries Beatty was the father of Charles C. Beatty, who with Hetty his wife founded and long conducted Steubenville Female Seminary, invested wisely in the newly introduced transportation system known as the railroad, and became the benefactor of both the Western Theological Seminary and Washington and Jefferson College, making gifts in buildings and in endowments, which insured the permanence of both. From this time 1758, until 1787, and indeed until even later, there was no complete absence of worship of some description but on the other hand an almost complete absence of settled ministers of the gospel. Three churches received grants of land from the Penns, all on the same date, September 24, 1787, and I give special attention to these three.

The first grant by the Penns was to the First German Evangelical Protestant Church. The form of the gift was the same in all three: "John Penn, Junior and John Penn of the city of Philadelphia, Esquires, late proprietors of Pennsylvania, for a nominal consideration of five shillings current, lawful current money of Pennsylvania deeded two and one-half lots" bounded by Smithfield street, Sixth avenue, Miltenberger and Strawberry alleys. The congregation, however, dates from 1782 when Rev. Johann Wilhelm Weber visited the settlement of sixty wooden houses and huts and one stone house. In these sixty-one houses there lived about 100 families. Mr. Weber gathered the German people together and they worshipped in a log building corner Wood and Diamond and it is quite probable that he built a log church at this corner. It was not, however, until sometime between 1791 and 1794 that a log church was built on the Penn grant which in 1833 gave place to a large brick building in whose cupola the first church bell in Pittsburgh was hung. In 1868 the fine building which stood until two years ago was erected at a cost of $150,000. This congregation, whose pastor is Dr. Carl A. Voss, now worships in the exquisitely beautiful and churchly edifice which forms a part of the new building which stands on the original site. The congregation numbers 1,000 and there are a total of 6,000 communicants of this denomination and nine churches in Pittsburgh today.

The second Penn grant was to the Presbyterian congregation (now the First Presbyterian Church) of two and one-half lots (Colonel Woods Plan lots 439-438 and one-half 437, the other half going to the Episcopal Church) on Sixth avenue, Wood street and Virgin alley (now Oliver avenue), then under the care of Rev. Samuel Barr. Later Mr. Barr bought for the church lot 440 which is a part of the present property. It was, however, in 1784, two years after Mr. Weber came to Pittsburgh, that the presbytery of Redstone appointed supplies to Pittsburgh and in 1785 Mr. Barr arrived and began to gather the Presbyterians together into a congregation. He remained pastor until 1789 and from then till 1800 there were only occasional supplies.

Meanwhile a log church, with squared timbers, was erected on this grant. There is a plan of the pews of this church with the names of pewholders and among them such well-known men of that early period as Judge Addison, John Scull, (founder of the "Pittsburgh Gazette," July 29, 1786), James O'Hara, Ebenezer Denny, first Mayor of Pittsburgh in 1816, John Wilkins, John Irwin, Isaac Craig, James Ross, and others.

The second pastor was Rev. Robert Steele who became pastor in 1800, and in 1803 became persona non grata to a part of the congregation and true to Presbyterian form there was a split and in 1804 the second Presbyterian church was formed. It is a tradition that Mr. Steele's fault was that he gave out to be sung two lines of a stanza instead of the usual one; but whether this is true or not, we do know that Dr. Bruce, the pastor of what is now the First United Presbyterian Church and for twenty years the principal of the Western University of Pennsylvania, did nearly disrupt his church some fifteen years later by doing that very thing.

Meanwhile a new church was necessary and it was proposed to erect a brick edifice to replace the squared timbers. The movement began in 1801 and in two months subscriptions amounted to $2,400; but it was not completed until 1805. Even then it was evidently not paid for because in 1808 there appeared in the "Gazette" an advertisement announcing "a scheme of lottery for raising part of the sum of $3,000 for defraying the expenses of finishing the Presbyterian church in the borough of Pittsburgh." The three managers of this lottery and the thirty-eight persons from whom tickets could be procured reads like a roster of the influential and prominent men in the business and social life of the community; and yet it was a partial or complete failure as a money-raising scheme.

In 1811 Francis Herron became pastor of the First Presbyterian Church and so remained until his death in 1860 and if one were to trace the ups and downs of this church through forty years until the Civil war, he would have an excellent view of the progress of the entire community. Dr. Herron's salary at the beginning was six hundred a year but it was apparently too much; for the church was sold by the sheriff for debt and Dr. Herron bid it in, restored it to solvency and then turned it back to the congregation. It was not long after beginning his pastorate that Dr. Herron practically split his congregation wide open by introducing the weekly prayer meeting; not that the Presbyterians of that day did not believe in prayer but that they did not believe in any changes in the established order of worship; and if Dr. Herron had not himself been an Ulsterman, the people would have won out in the ensuing conflict. As a fact he beat them to it and the mid-week prayer service remains an honored institution until this day.

In this church, facing on Wood, there occurred May 10, 1822, the brilliant and spectacular induction into office of the first faculty of the Western University of Pennsylvania—Bruce, Black, McElroy, Swift, and Maguire—preachers all of them,—one Roman Catholic and the other four Presbyterian, representing four of the numerous brands of Presbyterianism flourishing in that day. In 1853 was erected the beautiful church building which remained until 1903, when it was replaced by the present stately edifice.

If one sometimes wonders at the great influence this church has wielded in the last hundred years, and is wielding today relatively as it did a century ago, the explanation lies, in part at least, in its wisdom in selecting pastors—the wise and venerable Herron; the eloquent Paxton, great preacher and long-time professor in Princeton Seminary; the learned Scovel, later the distinguished president of Wooster; the scholarly Kellogg, international preacher, teacher, missionary; the golden-mouthed Purves, whose sermons here and later in the Fifth Avenue Church, New York, were listened to by an enraptured and breathless crowd of worshippers; Dr. Moffat, president of Washington and Jefferson College, whose clear expositions of gospel truth and masterly ability in debate made him the most influential leader in the Presbyterian church and who for three years held the church in his strong hand until the coming of Dr. Breed, who at four score years, still abides with us, and who in sheer sermonic skill, stands up, like Saul, towering over all his brethern; Maitland Alexander, preacher executive, leader, transforming the church into an institution, the most forceful personality in Pittsburgh today; and Dr. Macartney now in the very beginning of his ministry here.

If any other church, in Pittsburgh or elsewhere, can exhibit a list of pastors even approaching this line of distinguished men I do not know where that church is. The First Presbyterian Church of Pittsburgh holds a unique position among the Protestant churches of America with its 2,500 members and its remarkable organization of activities, and is full of the vigor of youth.

In so brief an address as this, it is impossible to refer to the other ninety-two Presbyterian and to the eighty-five United Presbyterian, and to the four Reformed Presbyterian churces in Pittsburgh with their 86,242 members, a total which is confirmation of the fact referred to in the beginning that Pittsburgh is a great Calvinistic community. The Second Presbyterian Church whose outstanding pastor was Dr. Howard; the Third, whose first pastor was the eminent David H. Riddle, principal of the University 1849-1855 and father of Matthew Brown Riddle, the great professor of Greek Exegesis and a reviser of the New Testament, and the other eminent men who followed him including our own Dr. McEwan who has been pastor for over thirty-three years; the East Liberty, the Shadyside, the First of Allegheny, with the two Swifts, 1835-1888, the elder, Elisha P. Swift, a member of the first university faculty; the First United Presbyterian Church whose first pastor was Robert Bruce, the first principal of the university 1822-1843, and whose last two pastors—father and son, W. J. Reid (1862-1902), and W. J. Reid, Jr. 1902 to the present, have up till now served a period of sixty-six years; and a host of others, served by men eminent in their day, are the fruits of Penn's grant to the Presbyterian congregation and the first log meeting-house at the corner of Wood and Sixth 140 years ago.

The third Penn grant was to the congregation of the Protestant Episcopal Church and included the two and one-half lots adjacent to those given to the Presbyterian congregation. The trustees named in the grant were John Gibson, former commandant of Fort Pitt; John Ormsby whose descendants are still here; Devereux Smith, a prominent business man; and Dr. Nathaniel Bedford, whose headstone stands in Trinity church yard today, the first physician in Pittsburgh. Until 1825, the church had a checkered career, encountering all manner of obstacles. In 1797 John Taylor, not then ordained, began to gather together the adherents of the church and continued his work for twenty years. In 1805 the congregation purchased the three cornered lot at Wood, Liberty, and Sixth, now occupied by the Monongahela National Bank, and in July the corner stone of the popularly called "Old Round Church," was laid and in 1808 this church like the Presbyterian instituted a lottery to liquidate the indebtedness. It had forty-two high-back pews and a gallery. The church struggled along under immense difficulties until 1824 when John Henry Hopkins, a young lawyer on the sure road to a considerable practice, became deeply interested in the church and was licensed by Bishop White. Mr. Hopkins at once took up the matter of erecting a new building on the tract donated by the Penns in 1787 and in June 1825 the church was consecrated. Five years later Mr. Hopkins became assistant rector at Trinity Church, Boston, from which a short time ago Bishop Mann came to the diocese of Pittsburgh; and later still became Bishop of Vermont. In 1871 the present church building of Trinity was erected and at the present time a movement has been instituted to make it the Cathedral church. *Under the present rector, Dr. Kammerer, the church is doing noble work and is making great progress. Its membership is 756.

Mention should be made of St. Andrew's Church whose long time rector was Dr. White who for many years was president of the board of trustees of the university; of St. Peter's Church which until its removal to Craft avenue stood at the corner of Grant and Diamond;

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*Trinity was actually inaugurated as Trinity Cathedral on June 3, 1928, with Dr. Kammerer as Dean.

of the Church of the Ascension; and particularly of Calvary Church, with its influential membership and its distinguished succession of rectors—Bishop Boyd Vincent, Dean Hodges, Dr. McIlvaine, Bishop Ferris, and the present incumbent—Dr. Van Etten. Neither can I omit to mention Bishop Whitehead through whose forty years of distinguished service the churches of the diocese made such rapid advancement until there are in greater Pittsburgh, thirty-nine churches and 18,926 baptized members. Dr. Whitehead was at the time of his death and had been for years, vice president of the board of trustees of the university. It is an interesting fact that Pittsburgh is the residence of three bishops—Bishop Boyle, Bishop Mann and Bishop McConnell.

The limits set for me forbid my going beyond the three churches to which the Penn grants were made but I must refer to the fact that as early as 1808 "there were seven societies of Christians in Pittsburgh as follows: Presbyterian, Episcopal, Covenanter, German Lutheran, Roman Catholic, Methodist Episcopal, and Anabaptist." The real beginning of the Catholic church, which now has eighty-three churches, and an exceedingly large membership, was in 1808. Father Maguire, member of the first university faculty, founded St. Paul's.

The Methodist church, with services in the homes of the adherents as early as 1785, dates from 1809 and the second congregation was organized in 1817, at Smithfield and Seventh, familiarly known as "Brimstone Corner", which the congregation has held ever since. This second strongest denomination in Pittsburgh has seventy-five congregations and 40,674 members.*

The Lutherans date from 1836, (until that year they were associated with the Evangelical church), and with the large German population in Pittsburgh, number in the three synods, 114 churches and 35,160 members.

The Baptists date from 1812 and the denomination has not only one of the most costly and beautiful churches in the city but numbers twenty-six churches and 8,319 members.

The followers of Campbell, known as the Christian Church, have twenty-six congregations and 10,000 members, the East End church under the pastoral care of John Ray Ewers, being one of the most active and useful churches in Pittsburgh, worshipping in a new and

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*All figures are approximate only, though every effort has been made to secure accuracy. In general they include Greater Pittsburgh.

costly building. The Reformed church, formerly the German Reformed, has several churches and many members.

There are a surprisingly large number of negro churches, of all denominations, one of these having some 4,000 members.

The Free Methodists, Primitive Methodists, Methodist Protestants, Congregationalists, Seventh Day Adventists, and miscellaneous, add some forty-five other churches to make up a total of 556 churches in Greater Pittsburgh.

To all the foregoing we must also add the twenty-six Jewish congregations, numbering 43,000 people which include a large number of the most influential men in Pittsburgh who stand for the highest and best things in religion and in citizenship.

It is obvious from the foregoing, that the distinctive characteristic of Pittsburgh is religion and that the distinctive type of theology is Calvinistic conservatism. Pittsburgh and Toronto stand in a class by themselves among American cities in the matter of church attendance and sabbath observance. Pittsburgh is the only city the writer has known whose men of affairs are universally connected with the church either as communicants or as supporters. There are practically no exceptions to this rule either at the present time or in the past.

It has not been a matter of chance that there are three theological seminaries in Pittsburgh and that they are all Presbyterian. Pittsburgh is the one community, at least one of few, which does not economize first on religious giving at the pinch of hard times. In the Presbyterian church the boards of home and of foreign missions originated in Pittsburgh.

The University of Pittsburgh has no religious affiliation but every member of the board of trustees is connected with a religious body and though church relationship is never even thought of in the election of trustees two-thirds of them are Presbyterian. The first semester (1927-1928) enrollment of students, one half of the total belonging to Pittsburgh proper, shows that only four are agnostic, 155 express no preference, and the remainder are distributed among the church bodies in relative proportion of 1,844 Presbyterian, 1,224 Roman Catholic, 1,085 Methodist, 1,029 Hebrew, 460 Lutheran, 311 Episcopalian, 280 Baptist, 127 Christian and the rest distributed among fifteen other denominations.

The people of Pittsburgh are individualists. They hold themselves responsible to God and their own conscience and nothing else counts. They attend to their own affairs and let other people attend to theirs and while this sometimes leads to unfortunate results in political affairs it is rather a good principle of behavior.

Nevertheless, while the community is individualistic, it responds warmly to every appeal for the relief of suffering and distress. It is a city of exceptionally fine churches—St. Paul's Cathedral and Church of the Sacred Heart, Calvary, First Baptist, First Presbyterian, East End Christian, and a host of others, beautiful and costly. At the same time, expressing the essentially humanitarian spirit of the community, great hospitals with modern equipment abound on every hand. When the criticism is made, as it sometimes is, that immorality and wickedness prevail to such degree as to make Pittsburgh a city apart in this respect, the simple answer is that it is not so. Pittsburgh is great in industry and commerce and finance and it is greatest of all in character; Pittsburgh is great in schools and colleges and universities but it is greatest of all in its religious faith. It is a city that hath foundations and upon these is being reared a superstructure, strong, enduring, and beautiful, because the fear of God is in the hearts of the people and the worship of God is their delight.

PITTSBURGH AND THE STEAM RAILWAYS

E. T. WHITER

Edward Tait Whiter, vice president of the Pennsylvania railroad, was born in Steubenville, Ohio, March 26, 1864, the son of W. L. and Amanda (Fetrow) Whiter. He was educated in the Steubenville public schools, and married Josephine Catherine Hegener of Philadelphia, Pa. October 14, 1883.

Mr. Whiter began his railroad career with the Pennsylvania railroad as telegraph operator, March 1, 1881, and has continued with that road successively as train dispatcher, 1885-96; assistant trainmaster, 1897-99; train master eastern division 1900-03; superintendent same division 1903-12; general superintendent Northwest system Pennsylvania lines, 1913-14; assistant general manager Pennsylvania system, 1915-19; assistant to vice president (personnel) Pennsylvania system, 1920-22; vice president northwest region, at Chicago, 1923-24; and vice president central region at Pittsburgh, since November 15, 1924.

He is a director of the Peoples Savings & Trust Company, the First National Bank of Pittsburgh, the Pittsburgh Chamber of Commerce, and is a member of the Engineers' Society of Western Pennsylvania.

Pittsburgh and the Steam Railways

BY E. T. WHITER

SIX generations ago the world's military strategists looked upon the territory at the headwaters of the Ohio as a pivotal point in the strife being waged for the conquest of a raw continent. Before Pittsburgh was founded, its future site had been marked by the natural course of events as a gateway; first for the soldiers, latterly for commerce by the artisans who followed the flag westward. Water routes leading from the foothills of the Alleghenies to the Mississippi basin attracted the military strategists; these same water routes together with canals and wagon roads were employed during Pittsburgh's second and third generations to expand their trade circle. With the coming of the fourth generation, a trifle more than three-quarters of a century ago, young Pittsburgh's importance from a military standpoint was surpassed by its value as an economic key site. At the same time, other points immediately west of the Alleghenies entered the battle for supremacy as economic key positions. The scales were turned in Pittsburgh's favor when the fathers of you older men and the grandfathers of our younger men acted quickly in bringing the steam railroad from the seaboard to Pittsburgh and then clinched dominance by pushing or helping to push other railroad lines out from Pittsburgh like spokes radiating from a hub.

There is a touch of the absurd in the thought that Pittsburgh existed quite thrivingly prior to the days of its first real railroad. As we view Pittsburgh and its present-day tonnage, it seems impossible that this community could have carried on without railroads. Yet, this is not more fantastic, in the light of later developments, than it is to recall that just twenty-one years ago I could have stood on the site of this Chamber of Commerce building and seen a freight train moving past on Liberty avenue, preceded by a man on foot who announced the train with a red flag and a hand bell.

This year of 1927 marks the diamond jubilee anniversary of Pittsburgh's all-rail connection with the eastern seaboard. In these seventy-five years the railroad has been employed as a vital economic agency to win and hold manufacturing, mining, commercial advantage and prestige for Pittsburgh. In all these years there has been nothing easy in maintaining a successful struggle for supremacy. Pittsburgh is today in partnership with its railroads and must so remain. The intensive improvement of railroad facilities is not a whit less important than that of our industrial establishments and must be commensurate therewith.

It has given me a great deal of pleasure to accept the invitation to talk on the subject of "Our Steam Railways" to this Chamber. In the preparation of data on the subject I have had the advantage of much personal experience, since my own railroad life in this area dates back almost half a century. I count it good fortune that I have been one of the participants at a major point in the moving drama of a young country finding itself and building the foundations for history's most imposing economic structure.

Today it is taken as a matter of course that one may board a train here late in the evening for an overnight journey to some city four or five hundred miles distant and, after a night's sleep in a comfortable bed and a good breakfast on board the train, arrive at destination early the next day, ready for business or pleasure. Compare this with the tedious journey of seventeen hours to Philadelphia, and twenty hours to Chicago, involved even with the fastest trains of the early days. Crude sleeping quarters were provided, and food had to be either carried by the individual or obtained at meal stations enroute where twenty-minute stops were usually allowed for that purpose. In the days when canal boats and stage coaches were the only forms of transportation available, it required from three and one-half days to a week for the trip between Pittsburgh and Philadelphia.

Early traffic in both directions between Pittsburgh and Philadelphia grew despite poor highways until it was eventually necessary to substitute wagons for pack-trains. Starting about 1786, stage coach trips were made between the two cities every two weeks. In 1804 this was increased to a daily service. Numerous freight wagons were also on the road. The coaches and wagons were not used in winter or during the rainy season due to the poor condition of the roads. It required about three weeks moving during daylight hours only to cover the distance with a wagon load of freight. The State Legislature passed an act in 1806 incorporating the Harrisburg and Pittsburgh Turnpike Road. Work on the project was not started, however, until 1814. This was the first incorporated transportation route to Pittsburgh.

Meantime many toll highways, radiating from Pittsburgh to various communities, were built by private capital. River transportation of freight, beginning about 1777, with the construction here of the first keel-bottom boat, grew until ship-ways were scattered along the Monongahela from Pittsburgh to the Cheat river. Since this is to be a talk on steam railways, further reference to water transportation by natural waterways will not be made, except to state that at one time Pittsburgh was the port of clearance for boats destined to England, Italy and other foreign countries.

Just about the time the Pennsylvania state turnpike was being completed, an event occurred which threatened the future of Pittsburgh. This was the opening of the National turnpike, a pet scheme of the citizens of Baltimore to attract trade to their port. The turnpike extended from Baltimore through Cumberland to the Ohio river at Wheeling. An immense traffic was diverted from the route through Pittsburgh to the new toll-free line of communication. The furor over this crisis had hardly subsided before the city was thrown into a fresh spasm of apprehension at the construction of the Erie canal in the state of New York. These developments so menaced the commerce of Pittsburgh and the entire state that the Legislature was aroused and steps taken to build a canal as a counter move. By an act of 1825 commissioners were appointed to consider a canal route to connect the Susquehanna and Allegheny rivers. Actual operations in the construction of the canal were started under an act of 1826, and work was completed under the General Canal Act of 1827. On August 10, 1829, the first canal boat was operated into Pittsburgh. It arrived with 130 barrels of salt from Saltsburg, Pa. On October 31, 1829, the first boat loaded with Philadelphia merchandise arrived in this city.

The canal came down the north side of the Allegheny river into Allegheny City. At a location a few hundred feet west of Cedar avenue it branched; one portion extended westward to a turn just west of Federal street, thence parallel to that street through several locks to the Allegheny river. The old arch which carried Federal street over the canal is in existence under that street. The main branch crossed the Allegheny river into Pittsburgh on a long wooden aqueduct about 100 feet up stream from the present Pennsylvania railroad bridge. The pier footings for this old aqueduct are in the bed of the river and were plainly visible during low stages of water until a few years ago when the Emsworth dam permanently raised the pool level. From the aqueduct the canal paralleled Eleventh street on the west side of the main terminal basin located on the plot of ground on the east side of Grant street recently purchased by the Government for a post-office site. This basin was connected by a canal and a series of locks with the Monongahela river. It was carried in a tunnel under Grant Hill. A portion of that old tunnel is yet used to carry the tracks of the Panhandle division of the Pennsylvania railroad. Recently when a gasoline filling station was constructed at the corner of Liberty avenue and Eleventh street, one of the old stone canal locks was uncovered with its wooden gate still in place. No doubt when the excavation is made for the new post-office building other evidences of canal construction will be disclosed.

In passing from the subject of canals it seems appropriate to quote the published route from Philadelphia to Pittsburgh as shown in "Appleton's Railroad and Steamboat Companion" of 1849, as follows: "At Philadelphia the traveller will take the cars of the Columbia railroad at 274 Market street, and proceed to Harrisburg, the capital of the state. There, two routes will be at his disposal. The first and most eligible is by railroad to Chambersburg via Carlisle. At Chambersburg good lines of stages leave twice daily for Pittsburgh. Total time between the two cities about three days. Distance 312 miles. Fare usually $11.00. The second route from Harrisburg is by the eastern division of the Pennsylvania canal to Hollidaysburg, thence by the Allegheny Portage railroad to Johnstown and by the western division of the canal to Pittsburgh. Total distance by the second route is 399 miles. Usual time, if by packet boat on the canal, four and one-half days, and if by line boat, about a week. Fair usually $13.00 and by line boat $2.75 less." The competition thus indicated between the stage coach and canal route had then been in effect for twenty years and continued until the advent of the railroad. The coaches predominated as passenger carriers and the canal boats as freighters.

While Pittsburgh's prestige as the main gateway for traffic between the east and west temporarily was preserved through the construction of the Pennsylvania canal, yet that great work had hardly been completed when it became apparent to leading shippers that they must eventually have a railroad. The middle and southwestern territories were then developing with astonishing rapidity and the outpour of traffic in both directions was taxing the capacity of both the canal and turnpike routes. The congestion was aggravated in winter, when the canal was closed from one to three months by ice, and in the summer when droughts closed navigation on the rivers for even longer periods.

The desire for better transportation facilities culminated in railway conventions held in 1836 and 1837. As a result numerous railroads designed to serve Pittsburgh were chartered in 1837. Some of them never got beyond the paper stage. No actual construction work was done on any of these Pittsburgh projects until late in the 40's and early 50's. The extension of the Pennsylvania railroad westward from Harrisburg, was started July 22, 1847. The Ohio and Pennsylvania railroad was incorporated in 1848 and work was started quickly thereafter. About 1848, events in connection with railroad transportation, particularly in its relation to Pittsburgh, began to happen with amazing swiftness.

Steam railway transportation, insofar as it pertains to our city, had its inception and has been developed to its present unsurpassed traffic handling capacity, within the memory of some of our living citizens. It is indeed a far cry from the existing facilities to those provided in the initial service. This city did not pioneer in the earlier development of railroads and was therefore fortunate in that when finally obtained they came with motive power, cars and other features constructed with the experience of about twenty-five years of experimental work. Its citizens were spared the trials and difficulties experiencd by other communities in which railroad transportation had its infancy.

In 1850, just twenty years after the initial operation of a steam locomotive in this country, ground was broken in Allegheny for the Ohio and Pennsylvania railroad. In the same year work was started in Pittsburgh by the Pennsylvania railroad, although by that time its main line had been completed between Harrisburg and Altoona. On October 6, 1851, regular passenger service was inaugurated on the Ohio and Pennsylvania to New Brighton, and on December 10, 1851, the Pennsylvania was formally opened, but its rails only extended as far as Turtle Creek, from which point it was necessary to cover a twenty-eight mile gap in the line to Beatty by stage coach. However, the all-rail route to Philadelphia was placed in service December 10, 1852. The Ohio and Pennsylvania or the Pittsburgh, Fort Wayne and Chicago railway (to which its name had been changed after merging with two extensions west from Crestline, Ohio) was opened through to Chicago in 1856.

By this time a wonderful development had been made in motive power, cars and other operating facilities. Railroads were acclaimed the real solution to the transportation problem. They were being built in all directions. The canal passed out of the picture in 1857, after a life of twenty-eight years, during which, however, it had been Pittsburgh's greatest boon.

Succeeding years saw new lines, or extensions thereof, placed in service. The Pittsburgh and Connellsville railroad, now a part of the Baltimore and Ohio system in Pittsburgh, was completed between West Newton and Connellsville in September, 1855, but the extension into Pittsburgh was not made until 1861, and the connection from Connellsville to the main line of the Baltimore and Ohio at Cumberland was not completed until 1871.

The Allegheny Valley railroad was formally opened to Kittanning, January 29, 1856, and later extended to Oil City. The Pittsburgh and Steubenville railroad followed by opening its line from Birmingham (now Pittsburgh, southside) to the east bank of the Ohio river, opposite Steubenville, in 1864. The bridge over the river at that point and the one over the Monongahela river into Pittsburgh were not constructed until 1865. The Pittsburgh and Steubenville made connections with the Steubenville and Indiana railroad, both now included in the Panhandle division of the Pennsylvania railroad.

The Cleveland and Pittsburgh railroad was built from Cleveland and connected with the Fort Wayne at Rochester, Pa., in 1856, from which point it had trackage rights over that line into Pittsburgh. The Erie and Pittsburgh railroad came down from the north and connected with the Fort Wayne west of Beaver Falls in 1864. The West Penn railroad came into Federal street (northside, Pittsburgh) in 1866. The Pittsburgh, Virginia and Charleston railroad was completed to Homestead in 1873. With the exception of the Pittsburgh and Connellsville railroad, all of the lines so far named are now included in the Pennsylvania railroad.

In chronological order came the Pittsburgh and Northern R. R., a narrow gauge line starting alongside the Butler plank road in Millvale, or Bennett as it was then known, and projected northward along Girty's run. It was built and operated as far as Evergreen borough, but no farther on account of the inability to finance the cost of a tunnel through the hill to Pine Creek. The company was reorganized as the Pittsburgh, New Castle and Lake Erie railroad and work was begun in 1877 on a new alignment starting from Etna. It was completed to Zelienople in 1879, into Allegheny in 1880, and extended along the Ohio river to lower Allegheny City in 1881. This railroad, which had been renamed the Pittsburgh and Western, was subsequently absorbed in the Baltimore and Ohio system. It was connected to the main line of the latter company in 1884, by the Pittsburgh Junction railroad, now also a part of the Baltimore and Ohio. It is the line which extends from Laughlin Junction on the Monongahela river via the hollow in Schenley park and Thirty-third street to Millvale on the Allegheny river. The Baltimore and Ohio line to Wheeling, incorporated as the Hempfield railroad, was completed in 1852 from that city through Washington, Pa. to Finleyville, its terminus for years. It was extended by way of Streets Run and over the Monongahela river to connect with the main line and Pittsburgh in 1884.

The next trunk line railroad to come into Pittsburgh was the Pittsburgh and Lake Erie railroad, now included in the New York Central system. Traffic was inaugurated thereon between Pittsburgh and Youngstown, Ohio, in 1879. The Lake Erie was originally a single track line with many high and long iron viaducts across the lateral valleys between here and Monaca. Its extension from Smithfield street up the river to Twenty-second street was accomplished through the purchase of the Pittsburgh and Becks Run railroad, which had track laid from Smithfield street to Jones and Laughlin's mill, but had never operated. The Pittsburgh, McKeesport and Youghiogheny railroad, now also a part of the New York Central, was built to Connellsville in 1883. The first passenger train on that line departed here November 18, 1883.

Our other railroads are of comparatively recent origin. The Union railroad was built in 1896 to connect the plant of the Carnegie Steel Company, now a part of the United States Steel Corporation, at Bessemer, with those at Homestead and Duquesne and more recently was extended to Clairton. The Bessemer and Lake Erie, originally incorporated as the Pittsburgh, Bessemer and Lake Erie railroad, was opened for traffic in 1897. It is now a line of the Steel Corporation and was built to haul lake iron ore from a terminal constructed for that purpose on Lake Erie at Conneaut. The next railroad to reach Pittsburgh was the Buffalo, Rochester and Pittsburgh. The rails of this line terminate at Butler and it is operated thence into Pittsburgh over the Baltimore and Ohio, with which it has trackage rights. Service over this route was inaugurated in 1899. The most recent acquisition is the Pittsburgh and West Virginia railroad, originally built as the Wabash Pittsburgh Terminal railway which was placed in service in 1904. The West Side Belt railroad, now operated by the Pittsburgh and West Virginia, was opened for traffic from Pittsburgh to Bruceton in 1902 and through to Clairton in 1903.

The Pittsburgh district is also served by other important railroads, not included in the list of trunk lines. The most important are the Monongahela Connecting railroad, a subsidiary of the Jones and Laughlin Steel Corporation; the Pittsburgh, Chartiers and Youghiogheny railroad owned jointly by the Pittsburgh and Lake Erie and the Pennsylvania; and the Montour railroad, owned by the Pittsburgh Coal Company.

We also have several short pioneer lines, which, while still in existence are not now operated under their old names. The first is the Little Saw Mill Run railroad, built in 1852 by the Economites. It originally extended from the mouth of Saw Mill run three miles to Banksville, and was used to convey coal from mines at the latter point to the Ohio river for shipment by water. Passengers were also carried. It is now a part of the West Side Belt railroad. The following year, work was started on the Chartiers Valley railroad to connect Pittsburgh with Washington, Pa., and the Hempfield railroad. Work was not completed until it was absorbed by the Pennsylvania railroad. It is now known as the Chartiers branch of the Panhandle division of the Pennsylvania between Carnegie and Washington, Pa. The Pittsburgh and Castle Shannon railroad was a narrow gauge steam railroad built in 1871 from the top of the hill on the south side, back into the country a distance of six miles, to Castle Shannon. The Pittsburgh Railways Company took it over in 1905.

Let us review the respective situations that existed when each of the trunk line railroads inaugurated service. The first railroad station in this community was located in Allegheny on the west side of Federal street, alongside the old canal. It was a two-story brick structure with a frame freight station adjoining and was replaced in 1877 with a model layout for those days, which preceded the one now in use. The Ohio and Pennsylvania railroad terminated at that point until September 22, 1857, when the first wooden railroad bridge was thrown into service over the Allegheny river. While this gave entrance into Pittsburgh, consent could not be obtained from city authorities to cross Penn avenue and Liberty street and trains were temporarily terminated at the corner of Penn avenue and Tenth street.

Later the differences with the city were reconciled and March 10, 1858, trains were run into our first Union station. By that time the Ohio and Pennsylvania (or the Fort Wayne as it was then known) had been completed to Chicago, and the Pennsylvania to Philadelphia. It then became possible for a traveler to make an all-rail journey between those two cities with only one change of cars, in a station common to both railroads.

The Pennsylvania railroad originally came into the city down the center of Ferguson street, which was located between Liberty avenue and the hillside, thence diagonally across the center of Liberty avenue at Seventeenth street. It extended down the center of Liberty avenue from that location to the wharf along the Monongahela river at the Point, where Pittsburgh's first freight station was located. The original Pennsylvania railroad passenger station was located in a white lead warehouse on the northwest corner of Liberty avenue and O'Hara street, now Twelfth street. This was a temporary arrangement which endured until the construction of the first Union station about 1854. The latter was a one-story frame structure built on a plot of ground, now vacant, lying between Liberty avenue and Seventh avenue, and Grant street as now relocated and its site prior to the recent change. The Pennsylvania track was located on the west side of the station connected by a switch with the track extending down the center of Liberty avenue. The Fort Wayne crossed Liberty avenue and the Pennsylvania track on that street and extended along the other side of the station in a location parallel to Grant street. Trains were not interchanged between the two railroads at that time. Incidentally Grant street, as relocated, occupies its original site. The earlier change was made when the Grant street freight station was built in 1902.

In 1863, work was started on a stone retaining wall along Liberty avenue between Eleventh and Seventeenth streets in order to remove the railroad tracks from the street between those limits. At the same time the buildings located between the street and the hillside were razed to make way for a new Union station. St. Patrick's church, now located at the corner of Liberty avenue and Seventeenth street, was one of the structures removed. A Methodist burial ground occupied a space between it and the old canal. The wall and new station were completed and Pennsylvania station in substantially its present location was thrown into service in 1865. The station was a long four-story brick structure with the upper floors used as a hotel. It was destroyed by fire July 21, 1877, during the riots. The present structure was thrown into service on October 1, 1901. It replaced a two-story brick building constructed after the riots.

The old Allegheny Valley station was located at the corner of Eleventh and Pike streets, into which all of this line's passenger trains were operated until the track was built in 1872 at Twenty-eighth street to connect with the Pennsylvania. Thereafter, Allegheny Valley trains were handled at the Union station. During the early days of the valley, the use of locomotives was not permitted west of Seventeenth street and it was necessary to use horses to move trains between that point and the Eleventh street station. The train was cut into one and two-car sections to make such a movement possible.

The West Penn passenger station was located on Federal street, Allegheny, diagonally across the street from the Fort Wayne station. All West Penn trains were routed into that station until the Brilliant branch was built in 1905. They are now routed from Aspinwall, via that branch and East Liberty, into Pennsylvania station.

When the Pittsburgh and Connellsville railroad came into Pittsburgh, its first station was a two-story frame structure at the end of Grant street, in which the upper floor was on the street level and used for offices, with the lower floor and waiting rooms on the track level. The existing station was built in 1885 to replace it, and was remodeled in its present form in 1915. The general floor arrangement is radically different from the layout in its original form. The change made therein is a model of architectural skill in that connection.

The Pittsburgh and Western station was located in Allegheny between the Seventh and Ninth street bridges into which its passenger trains were operated until 1912 when they were diverted over the Pittsburgh Junction railroad track to the Baltimore and Ohio station on Smithfield street. The Buffalo, Rochester and Pittsburgh formerly used the old station in Allegheny.

On the south side of the Monongahela river, the Pittsburgh and Steubenville railroad terminated until completion of the bridge in 1865, which permitted its entrance into the Pennsylvania station. The first station was a small frame structure west of the present station. The one now in use was built in 1884. This line formerly crossed the wide valley of the Saw Mill run on a long high series of iron-truss bridge spans, which have long since been replaced by the high embankment with stone arch bridges over the run, the West Side Belt railroad and the streets.

The Pittsburgh and Lake Erie station was a frame structure which formerly stood about midway between the existing splendid station and office building and the freight offices. The present structure was thrown into service on January 1, 1900. The train shed built at the same time has since been extended to twice its original length. The frontage on the opposite side of Smithfield street from the station was occupied for years with rambling, unsightly brick and frame structures. These were removed a number of years ago to provide space for a team track delivery yard.

The last station acquisition was the Wabash Pittsburgh Terminal, now the Pittsburgh and West Virginia station, at the corner of Liberty avenue and Ferry street. To make room for its construction many old structures of historical interest were removed, notably among which was Pittsburgh's first hotel at the corner of Ferry and Water streets.

At this point and before passing on to other features, I cannot refrain from adding a personal touch to this recital, which can well be given without umbrage on the part of the other trunk line family since none of them has similar distinction. We have living here one of Pittsburgh's native sons, to whose keen foresight, resourcefulness, and indomitable energy the Pittsburgh and Lake Erie railroad owes its existence. He was instrumental in the organization and financing of that company and has since been the power behind the development to its present splendid proportions. He is now chairman of its Board of Directors in which capacity he has served continuously since its organization fifty years ago. I refer to Col. J. M. Schoonmaker.

Each transition in the method of transportation was made only after overcoming many obstacles, both physical and political. When turnpikes were substituted for bridle paths and wagons for pack trains many opposed the use of state funds for that purpose. Innkeepers, stage coach and wagon train companies in turn endeavored to thwart the construction of the canal. And finally the canal boat companies tried to frustrate the construction of railroads. Each step was a struggle, but by the time Pittsburgh obtained its first steam railroad all doubt as to their desirability had disappeared.

The track of our first railroads was laid with "T" rails, spiked to wooden ties in about the same fashion as they are today. The rails were wrought iron weighing about 56 pounds to the yard. They were coupled with flat bars on each side of the web of the rail. Ballast was the native sand, gravel or rock found near the track. Compare such a track structure with the present 130-pound rail having splices stronger than the rail itself, laid on creosoted ties closely spaced, and fully tie-plated, all on crushed stone ballast. Turnouts were arranged with hand-thrown, noisy, stub-end switches with crude frogs. The switches did not have a light target at night to indicate whether they were open or closed. Modern point switches and solid frogs are comparatively noiseless. All hand-thrown switches are equipped with night indication.

In the beginning private sidings were not used except to serve coal mines, mills and large industries. Team tracks for car load delivery of freight were scarce, as most of it was merchandise handled to or from the freight house by drays. Each railroad had but a single terminal freight station. The construction of tracks was confined to the main line, terminal yards, engine house yards and those at freight stations. The total length of all tracks within a radius of twenty-five miles from the Court House probably did not exceed 175 miles during the first ten years of development. At present the trunk line railroads serving Pittsburgh have a total of about 1866 miles of main tracks, yards and sidings within the same limits. Several of the terminal yards each has over 125 miles of track. There are now twenty-one freight stations and forty-seven carload delivery yards within the city limits.

Such a thing as an interlocking plant was unheard of in the old days. A modern railroad would certainly lose in safety, speed and efficiency and be made practically inoperative at large terminals without those central towers from which the operation of a large number of switches are controlled by a few men. Each movement is locked, interlocked, and signalled to prevent a fouling operation. Added to these safeguards are the automatic roadside and the newer cab signals.

The old bridges were, of course, designed to carry the loads then prevailing. Stone arch construction was used for the shorter spans and wooden truss bridges for the long structures. Some of the old stone arches are in safe use today. The wooden bridges were replaced by iron structures which in turn have been replaced by modern steel or concrete structures, to meet the constantly increasing weight of motive power and rolling equipment.

Very little difference exists today in the fundamentals of either locomotives or cars as compared with like equipment provided by our first railroads. However, they have been so enlarged and improved upon, and so many accessories added for comfort, safety and efficiency, that the actual difference is many more times pronounced than that which existed between first rail facilities and those of stage coach days. The first locomotives in general use here weighed about 20 tons, and could haul, on level track, a train having a gross weight of 550 tons. Pumps connected to the running gear were used to force water into the boilers. Both wood and coal were used for fuel. They were equipped with link and pin couplers and hand brakes, the latter only on the tender, as braking power from the locomotive was obtained through the use of steam in the cylinders with the valves in reverse position. The locomotives were named rather than numbered. The first one on the Ohio and Pennsylvania was named "Salem" and the first Pennsylvania locomotive in Pittsburgh bore the name "Indiana." Both these locomotives were brought to Pittsburgh by canal boat. The early passenger locomotives, some of which were in use during my youth, were certainly a pleasing sight, with their burnished brass steam and sand domes, stack and cylinders and polished black iron boiler jackets with brass encircling bands. Some of them had their wheels painted bright red. Their clear tone bells and musical whistles were a delight. Compare such locomotives with the giants of today, which weigh as much as 290 tons, carry a steam pressure of 250 pounds and haul on level track a train having a gross weight of about 10,000 tons. The boiler of one of the old equipment could be placed inside of the fire box of some of the modern locomotives with room to spare. Our early locomotives hauled from fifteen to twenty of the loaded light cars then in use. Now a train on level track is limited to 100 loaded cars of the present heavy construction only because of the difficulty of communication between the front and rear ends. A multitude of improvements have been added which are too numerous to recite in full, the most important, however, are the automatic coupler, automatic air brake, feed water pumps and heaters, automatic stokers, super-heaters and many more, all designed for increased safety and efficiency.

The old passenger coaches were of wooden construction, about forty feet in length, with two four-wheel trucks. They had link and pin couplers, hand brakes, rubber springs, sperm candles for lighting, and coal stoves for heating. Communication between the conductor and engineman was by means of a gong fastened to the ceiling of the locomotive cab. A rope was attached to this gong and threaded back through each of the cars, supported by hangers and within easy reach of the conductor. Many a yard of slack rope had to be pulled in at the rear of the train before the gong could be sounded. The use of link and pin couplers was quaintly emphasized by a notice posted in each car to the effect that "one blast of the locomotive whistle when train is standing is a signal for passengers to sit down." If the passengers did not voluntarily observe that rule they certainly did involuntarily when the slack in the couplings was taken up in starting the train.

In strong contrast to that old equipment are the seventy-foot steel coaches of today with automatic signals, air brake, air signals, steam heat, electric light, comfortable seats and closed vestibule ends.

The early type sleeping cars were little more than bunks permanently arranged. The passengers were privileged to either carry their own bedding with them or use that which could be found piled promiscuously in the end of the car. Porters were not in attendance. Dining cars were unknown. It is hardly necessary to mention the luxurious equipment provided now in connection with both of these features.

Freight cars were of the box car and gondola type with two four-wheel trucks. They had a maximum capacity of about 20,000 pounds. Small four-wheel cars, known as dumps, were used in the coal mine traffic. They held about 10,000 pounds of coal. All had link and pin couplers and hand brakes. Safety appliances were unknown. Rapid strides were made in the development of such equipment and in the late 80's a limited number of 60,000 pound capacity cars were in use. We now have steel cars of every description, all equipped with automatic couplers, air brakes and safety appliances. The standard capacity is 100,000 pounds, with many rated at 140,000 pounds and a limited number with a capacity of 200,000 pounds. The modern empty car weighs much more than the combined weight of car and lading of the early days. Cars for the transportation of live stock came into use in the sixties. They were of the open variety somewhat similar to the old wooden coke racks. They were replaced with the predecessor of the closed stock car of today. Refrigerator cars followed shortly thereafter. Ventilated cars and many special types designed for particular commodities are now in use.

The movement of trains on Pittsburgh's first railroads was governed by time tables. Dispatching by telegraph was adopted as the standard practice several years after the advent of the first road. It was first used by the Erie railroad in New York state. Railroads and the telegraph were contemporary developments and have always been very closely associated. The railroads were the first extensive users of telephones which have displaced the telegraph, on many of the trunk line railroads, for train dispatching purposes.

Statistical data is rather meager with relation to the commercial tonnage of the pioneer days in Pittsburgh. The first record may be found in "Niles Register" for May, 1814, which estimated that during the preceding year 4,000 wagon loads of dry goods, groceries and miscellaneous merchandise and 1,000 wagon loads of iron were received in Pittsburgh. The average load per wagon hardly exceeded 2,000 pounds upon which basis the inbound traffic amounted to about 5,000 tons. Assuming that the outbound was the same a total business of 10,000 tons is indicated. This, of course, does not include tonnage moved on the rivers. Transportation by regular wagon routes into Pittsburgh had not been in use much over twenty-five years, up to 1814. During 1826, three years prior to the advent of the canal, 9,300 tons of merchandise were received from the east by wagon and 5,300 tons forwarded there by the same type of conveyance, a total of 14,600 tons for the year.

The "Pittsburgh Commercial Journal" of November 6, 1851, gives a detailed list of merchandise received and forwarded by the Pennsylvania canal, during 1851, from its opening in March to November 1. Summarized, the statement shows that 62,217 tons came to us and 67,678 tons were dispatched. The latter figure includes 7,611 tons of coal. This represents a total business of 129,895 tons for the year, excluding any freight handled by wagons during the closed winter season on the canal. This was the final year of big business on the canal as railroad service for freight was inaugurated the following year.

A tabulation made by this Chamber of Commerce shows that in 1925 our railroads collectively moved a total of 168,120,824 tons of freight to and from the Pittsburgh district. The full significance of this enormous increase in tonnage will be appreciated when it is realized that throughout the year the railroads moved daily more than three and one-half times the total tonnage handled on the old canal to and from Pittsburgh during the entire year 1851. Between 1813 and 1826 there was an increase of about fifty per cent in tonnage handled. Between the latter year and 1851 it multiplied about ninefold. At the end of seventy-five years of railroad transportation the traffic is over 1300 times greater than at the beginning. All of the foregoing figures pertain to traffic over man-made routes and do not include tonnage moved on the rivers.

It is interesting to note another angle in our city's growth and importance, which resulted through the acquisition of railroads. In 1839 the supervisor in charge of the canal in Pittsburgh made a report in which he stated that 121 canal boats were then operating in and out of this city, manned by a total force estimated at 847 persons. The construction of canal boats gave employment to a comparatively small number of men, with very little subsequent employment for maintenance. No materials, other than feed for the horses and mules, were required for their operation. At the present time our trunk line railroads give direct employment within our metropolitan limits to more than 25,000 persons, whose aggregate monthly compensation is in excess of $3,750,775. Large terminal shops and enginehouses are located in this district for the maintenance and repair of cars and locomotives. These give employment to thousands of men. The railroads spend annually many millions of dollars in our city for materials and supplies and in addition give indirect employment to practically every existing craft and profession.

The first railroads had hardly been established when it became necessary to expand their facilities to take care of the constantly increasing traffic. Each succeeding trunk line had the same experience. All have been in a constant process of expansion ever since. Some came in with single-track lines, others with double-track. Most of them now have four or more main tracks. Modern freight stations, warehouses and team-track delivery yards have been constructed and still greater improvements of this character are in the formative stage. Large terminal yards with attendant locomotive facilities have been constructed at outlying locations. Diverting lines have been built to remove the heavy freight traffic from the heart of the city; this, however, has been peculiar to the Pennsylvania railroad on account of its location in the city. The first of these was the construction of the Port Perry branch and bridge over the Monongahela river in 1875 to divert freight from the Panhandle to the Pennsylvania main line east of Brinton. It was followed in 1890 by the Ohio Connecting railroad and bridge over the Ohio river at Brunot Island to connect the Fort Wayne and Panhandle divisions. The last one to be built was the Brilliant branch and bridge over the Allegheny river in 1904, to join the Conemaugh division at Aspinwall with the Pennsylvania main line at East Liberty.

The railroad tracks have been either elevated or depressed to eliminate crossing city streets at grade. The serious traffic congestions were thereby relieved at such important crossings as Second, Liberty, and Penn avenue, in downtown Pittsburgh, and at Anderson, Sandusky, and Federal streets, in the northside business section, as well as numerous ones also of importance in the western section of that portion of our city. The most recent work of this character was the elevation of the tracks over Cedar avenue, Chestnut, Heinz, and other streets on the north side.

A change of vast importance was made in 1906 when the railroad track, which since 1851 had extended down the center of Liberty avenue from Eleventh street to the point, was removed and placed on the elevated structure built on Duquesne way for that purpose. Many will no doubt recall the days when all traffic on the streets crossing Liberty avenue was at a standstill during the passage of a long freight train which was not permitted to exceed a speed of four miles an hour.

Prior to that change, all of our produce merchants were located in the buildings on the north side of Liberty avenue between Sixth and Seventh streets. Produce was unloaded direct from the railroad cars and displayed for sale on the street, sidewalks, and open front buildings within those limits.

Pittsburgh has done much in the development of equipment and other facilities used in railroad transportation. It was here that the air brake was invented and perfected by George Westinghouse. Without that great invention the railroads never could have attained the speed and effectiveness now so necessary. Steel cars, automatic couplers, interlocking switch devices, automatic signals, and many other features essential to the safe operation of railroads originated here. For many years our city has predominated in the fabrication of the iron and steel bridges required in railroad construction. It pioneered in the manufacture of steel rails and still leads in their production. The world's largest electric locomotive was built here. As that type of motive power is put more widely into rail use, Pittsburgh will undoubtedly continue to lead in its construction, as well as the manufacture of electric equipment to generate energy necessary for electric operation. All of these features have added to our importance as a manufacturing center.

History proves that Pittsburgh is the child of transportation. Its first settlement was a fortified trading post on a transportation route adapted by nature for that purpose. The necessities of life were exchanged with the trappers and other pioneers for furs, ginseng and like products of the wilderness. As the country to the west became populated and developed agriculturally the requirements of trade included farming implements and small tools, hardware, cloth and such simple necessities. These were obtained from the east, but the crude transportation facilities made them difficult and costly to secure. The opportunity for profit, thus presented, was soon recognized by some of Pittsburgh's early inhabitants and they proceeded in a small way to fabricate a limited variety of the commodities in demand. Their first efforts were confined to small articles of iron, leather and wood. This was about 1785, when the community, which is now Pittsburgh, had 130 families and an estimated population of 500 persons. Soon articles of glass, crockery and woven fabrics were included in the list of goods manufactured. The raw materials for all of these, together with an abundance of coal, was close at hand. In this manner our city had its birth as a manufacturing center.

Conceived as a settlement on a natural transportation route, born as a manufacturing community as a result of the requirements of travelers over that route, Pittsburgh had a precarious infancy through the threatened removal of transportation, but canals permitted it to enjoy a healthy youth. And with a subsequent vigorous growth it was able to aid transportation upon the advent of railroads. Pittsburgh is still in its youth and while brilliant achievements are to its credit in the years that have passed, still greater ones are expected of it in the future. In these the railroads will shine in the city's reflected glory.

HIGHER EDUCATION IN PITTSBURGH

THOMAS S. BAKER

Thomas Stockham Baker, president of the Carnegie Institute of Technology and author of the address on "Higher Education in Pittsburgh" in the series on "Pittsburgh and The Pittsburgh Spirit", was born in Aberdeen, Hartford County, Maryland, March 23, 1871; the son of John H. and Cornelia E (Stockham) Baker. He graduated from Johns Hopkins University in 1891, and received a Ph.D. from that institution in 1895 He did graduate work at the University of Leipzig in 1892. The University of Delaware made him an LL.D. in 1924. He was a Johns Hopkins associate in German, 1895-1900; lecturer on modern German literature 1900-08; professor of modern languages, 1900-08, and director, 1909-19, of the Jacob Tome Institute, Port Deposit, Maryland; served as secretary of the Carnegie Institute of Technology, Pittsburgh, March 1919-22; became its president in 1922. He was music critic for the "Baltimore Sun", 1895-1905, and is a member of Phi Beta Kappa and the Modern Language Association of America, as well as the Head Masters' Association.

He is author of "Lenau and Young Germany" and edited Hauptmann's "The Sunken Bell", 1898. He has contributed many literary and educational essays to magazines and newspapers.

In 1926 Dr. Baker organized the first International Conference on Bituminous Coal, which was held at the Carnegie Institute of Technology, Pittsburgh, and in 1928 he gave a series of lectures in Paris under the auspices of the Carnegie Endowment for International Peace.

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Higher Education in Pittsburgh

BY THOMAS S. BAKER

THE history of higher education in Pittsburgh began on February 28, 1787, when the General Assembly of the Commonwealth of Pennsylvania passed an act incorporating the Pittsburgh Academy "for the education of youth in useful arts, sciences and literature."

The chief promoter of the enterprise was the Honorable Hugh Henry Brackenridge, a graduate of the College of New Jersey (now Princeton University), who came to Pittsburgh soon after his graduation and became a leader in the community. Judge Brackenridge was indeed a seer, for he wrote of Pittsburgh in 1786: "This town in future will be a place of great manufactory. Indeed the greatest on the continent, or perhaps in the world."

Pittsburgh then had a population of about 1,000. Arthur Lee, a friend of Washington, had written of the place four years previously: "It is inhabited most entirely by Scots and Irish, who live in paltry log houses and are as dirty as in the north of Ireland or even Scotland. There are in the town four attorneys, two doctors, and not a priest of any persuasion, nor church nor chapel, so that they are likely to be damned 'without benefit of clergy.'"

But this state of affairs was not to last, for the Reverend Samuel Barr, a graduate of the University of Glasgow, came to Pittsburgh shortly after this and served as pastor in the First Presbyterian Church. Mr. Barr was associated with Judge Brackenridge in starting the academy.

At this time, to quote Dr. William J. Holland, to whom the writer is indebted for this early history, "Chicago was a marsh inhabited by ducks and herons; Denver was upland mesa over which buffaloes roamed; Kansas City a bluff upon which wild turkeys roosted; St. Louis a tiny settlement of French fur traders; Louisville a village of twenty log cabins. Pittsburgh was a squalid place, in which a few traders and former officers of the Continental army (mainly land speculators) were congregated. Great forests stretched in all directions.

"Chemistry was in its infancy. Most of the main chemical elements and their compounds were unknown. The science of physics was little farther advanced. The only pieces of electrical apparatus known to the world were the Leyden jar and lightning rods. Astronomy had not advanced beyond the opera glass stage. Botany and zoology were little farther advanced than they had been in the days of Aristotle."

The Reverend Joseph Stockton, who was principal of the academy from 1807-1819, was the author of the first school books published west of the Allegheny mountains, one of which was entitled "The Western Calculator."

After more than thirty years of growth by the academy and development by the community, an act of the Legislature of Pennsylvania on February 19, 1819, changed the Pittsburgh Academy into the Western University of Pennsylvania. The trustees under the revised charter were men whose names are historic in the annals of Pennsylvania—members of congress, a judge, a supreme court justice, etc. The first principal was the Reverend Robert Bruce, pastor of the First United Presbyterian Church in Pittsburgh, and the faculty was made up of clergymen representing five denominations. Among the subjects taught were ancient and modern languages, mathematics and philosophy.

In the act incorporating the university the legislature had made a grant of forty acres of public land in Allegheny, but the citizens of Allegheny protested so effectually against having the free pasture for their cows and hogs taken from them that the new building of the university was erected at Fourth avenue and Cherry way. The school, which was then merely a college of liberal arts, flourished and graduated a number of men who in subsequent years attained distinction.

In April, 1845, the great fire which almost destroyed Pittsburgh consumed the building of the university with all its records. The trustees immediately resolved to rebuild on Duquesne way and together with the adoption of plans for the new building it was resolved to extend and enlarge the work of the institution. A course in law was proposed. The movement was under the leadership of Walter H. Lowrie, Esq., who later became chief justice of the Supreme Court of Pennsylvania. He associated with himself Mr. William Bakewell, who in later years was one of the most eminent members of the bar of Pittsburgh. At this time it was also resolved to initiate instruction in engineering and courses leading to the degree of C. E. were planned. During the period immediately succeeding the fire, instruction was given in such quarters as could be found largely in lecture rooms of the First and Second United Presbyterian Churches, and in the offices of gentlemen belonging to the legal profession.

When the new building had been completed and only in part occupied it was destroyed by a fire in 1849. Discouraged by these calamities the university suspended activities and the law school which had been initiated and the courses of instruction in engineering which had been undertaken, together with all other instruction, came to an end. In 1855 the work of teaching was resumed in a new building erected at the corner of Ross and Diamond streets. In 1864 Dr. George F. Baker became the "professor of natural science." Subsequently he achieved fame at the University of Pennsylvania. He said in his later years: "The first steady electric light generated in Pittsburgh, if not in the country, was produced by me in the laboratory of the Western University of Pennsylvania."

The appearance of Donati's comet in 1858, inspired an association of Pittsburgh men of means interested in astronomy to establish the Allegheny Observatory, which in 1866, by act of legislature, was transferred to the university. Samuel Pierpont Langley became director of the Observatory in 1867, to remain in this position for twenty years. It was here that he made many of his epoch-making discoveries in astrophysics, and carried out his fundamental experiments in heavier-than-air flight.

After the close of the Civil war Mr. William Thaw made a proposal to contribute $100,000 toward the endowment and enlargement of the facilities of the university provided the citizens would raise a similar amount. This was done. Among the contributors was Mr. Andrew Carnegie, who gave a collection of natural history specimens valued at $5,000. Mr. Carnegie said later: "This was my first considerable gift to an institution of learning."

When fire destroyed the Allegheny County Court House in 1882 the university building was sold to the county and temporary quarters were found for the university in buildings of the United Presbyterian and Reformed Presbyterian seminaries on North avenue, Allegheny, which were used until 1890, when new buildings on Observatory hill were ready for occupation. Dr. Holland became chancellor in 1891. The curriculum was again revised, the requirements advanced, and the Department of Engineering originally initiated in 1869 under Major W. G. L. Nicodemus, U. S. A., was enlarged under the care of

Dr. Daniel Carhart. In 1897 the School of Mines was established. The following professional schools were added to the university during this period:

The Western Pennsylvania Medical College, organized in 1883, became the medical department in 1892, retaining its own charter and board of trustees until 1908, when it became an integral part of the university.

After the abortive attempts to establish a law school in 1845, and again in 1869-72 under Judge Henry W. Williams and William Bakewell, Esq., the Pittsburgh Law School was formally organized in 1895, under Judge John D. Shafer, and has been from its beginning the School of Law of the university.

The Pittsburgh College of Pharmacy, established in 1878, became the School of Pharmacy of the university in 1896. It retains its own charter and property, and is under the direction of a separate board of trustees.

The Pittsburgh Dental College was founded in affiliation with the university in 1896, and in 1905 was transferred wholly to university control as the School of Dentistry.

During the early years of the present century the new building of the Allegheny Observatory in Riverview park was erected with funds raised by Dr. John A. Brashear from gifts of private citizens.

By 1904 it was seen that the university had again outgrown its plant. In 1907 approximately forty-eight acres of land were purchased in the Schenley Farms district, the present site of the university. The name was changed from the Western University of Pennsylvania to the University of Pittsburgh, as being more appropriate to the community it serves. The first buildings to be erected on the new campus, State and Thaw Halls, were completed in 1909. In 1910 the Mellon Institute of Industrial Research was established by Messrs. A. W. and R. B. Mellon, and a permanent building was shortly erected. The School of Economics (the name was changed to the School of Business Administration in 1923) and the School of Education were established in 1910. The Graduate School was organized in 1912, although graduate instruction had been given in some departments since the early nineties. In 1920 Alumni Hall, used mainly for classrooms in the undergraduate schools, was erected as a gift of the alumni. In 1921 the university purchased the H. K. Porter and the Bailey properties adjoining the campus and the Frick property at Fifth avenue and Bigelow boulevard, bringing the total area of the university campus to eighty-one acres, with twenty-seven buildings, including the Trees Gymnasium and the Stadium.

The rapid increase of the student body from 1,138 in 1909 to 9,304 in 1925 created a serious emergency. As the way out the "Cathedral of Learning" was conceived by Chancellor Bowman. Construction has been started on this building, which will be erected near the center of the Frick estate. The new structure will house all the schools of the university except the medical and dental departments which will be developed on the present hillside campus and on the Porter estate, with a group of associated hospitals.

Off-the-campus activities of the university include the downtown division and the extension courses. The downtown division is the outgrowth of the Evening School of Accounts and Finance. It is located in the Chamber of Commerce building, where courses are offered in the late afternoon and evening by the School of Business Administration, the College, the School of Education and the Schools of Engineering and Mines. The Division of University Extension gives courses for adults in towns in western Pennsylvania and West Virginia.

"I shall straight conduct ye to a hillside where I will point ye out the right path of a virtuous and noble education, laborious indeed at the first ascent, but also so smooth, so green, so full of goodly prospect and melodious sounds on every side."—John Milton, Tractate on Education.

Back in 1869 was first published the prospectus of a new school for the higher education of women to be established in a now almost unbelievable Pittsburgh—a city without gas, electricity or telephone, with an "execrable water supply," with no real parks and but few paved streets.

The need for such an institution in western Pennsylvania was undoubtedly felt by many, but it fell to the lot of a few far-sighted men at the suggestion of the Reverend W. T. Beatty, then pastor of the Shadyside Presbyterian Church, to take decisive action in regard to it. The charter was granted December 11, 1869, and in September, 1870, the Pennsylvania Female College (the name later changed to the Pennsylvania College for Women) was formally opened, offering to women an opportunity for sound education and an academic degree.

The early days of the young college were auspicious in spite of the usual financial struggles of a new institution. Fortunate in its founders—broadminded, reverent men and women, liberal in religious views—it has been equally fortunate in its leaders through the years—trustees, teachers, deans and presidents. Out of their long and self-sacrificing effort has grown the fine spirit of service, democracy and comradeship which pervades the life at the Pennsylvania College for Women.

In 1908 was organized a course of study called social service, in order that, as its organizer said, "students may learn in a wise way that their education is not an ornament to set them above the less favored of humanity, but a means to be used for service." This was the first department of its kind in the undergraduate division of degree-granting institutions, although certain universities had previously offered training in welfare work in their graduate departments. There were no text-books, as none had been written.

Briefly characterized, Pennsylvania College for Women stands as a small separate college for women—indeed the only one of its kind in western Pennsylvania. It maintains excellent standards of scholarship; a faculty of recognized standing; small classes with individual instruction; a genuine religious atmosphere; special courses leading to certificates in music, spoken English and social service, which enable its students to combine professional training with the broader general courses, and lastly, a secluded campus in one of the most beautiful residential districts of Pittsburgh and yet within easy access to the center of Pittsburgh. Its well-trained alumnae are to be found in a wide variety of occupations: in the graduate schools of great universities; teachers in high school and college; in various forms of social service; in library and secretarial work; and as efficient managers of homes. They have become doctors, lawyers, nurses, business women, missionaries, etc. The college is particularly noted for its system of vocational guidance.

The School of Music was organized in 1871 and is the oldest school of its kind in Pittsburgh. Through the art courses the student gains a broad appreciation of art, its interpretation and place in modern life. The college emphasizes social life as an essential part of education.

The college buildings stand upon a finely wooded hill, and the campus includes a natural amphitheater which is employed effectively for out-door plays and pageants. The buildings consist of Berry Hall; the Administration Building; Dilworth Hall, containing assembly hall, lecture rooms and laboratories; the gymnasium, to which music studios and practice rooms have been added; Woodland Hall, a thoroughly modern dormitory, and the president's house on Woodland road.

Duquesne University is situated on an eminence overlooking the Monongahela river and the "Golden Triangle" of Pittsburgh. Being geographically central, the university is accessible from both the residential and the business sections. The campus, consisting of about seven acres, was acquired piecemeal by the Holy Ghost Fathers, who have conducted the school since 1878. Eight buildings constitute the present plant; St. John's Hall and St. Martin's Hall, both residential, acquired from former owners; the Main Building, erected in 1884; the Chapel, begun in 1894 and enlarged in 1904; the Science Hall, built in 1915; and the power plant, the gymnasium and Canevin Hall, all three erected in 1922. In addition, three floors in the Vandergrift building, on Fourth avenue, downtown, have been rented since 1913 for the use of the School of Accounts.

In 1878 Right Reverend Bishop Dominic urgently requested Father Joseph Strub, C.S.Sp., exiled from his native Germany by the Bismarck regime, to undertake the direction of the institution. He complied, and after much effort found quarters for his confreres and their forty pupils in a business block at Wylie avenue and Federal street. The Reverend W. P. Power, C.S.Sp., was the first president. His seven years' administration were years of struggle for existence, but of constant progress, ending shortly after the dedication of the first permanent building on what is now the campus. Reverend John T. Murphy, C.S.Sp. (recently deceased as Bishop of Port Louis, Mauritius), guided the destinies of the college for thirteen years. It was he who purchased most of the present recreation ground, built handball courts, a temporary gymnasium and the chapel, raised the standard and widened the curriculum of both the classical and commercial courses, furnished the library, established debating societies and the students' magazine.

The Very Reverend M. A. Hehir, C.S.Sp., LL.D., who became president in 1899, has set the stamp of his character on the work of the various departments. In his first years he added to the courses in modern languages and sciences, and made provision for the education of needy students. In March, 1911, Holy Ghost College became Duquesne University, with the legal right to offer all the professional courses implied in that title. The Law School began its work in the George building the following September with Judge Joseph M.

Swearingen in the position of dean. In 1913 were opened the School of Speech Arts, under Dr. Clinton E. Lloyd, and the School of Accounts, Finance, and Commerce, under Dr. William H. Walker. The School of Social Service was opened in 1916, but discontinued when the Students' Army Training Corps was established in 1918. The past year saw the university's first entrance in the medical field, in the establishment of the School of Pharmacy, with Dr. Hugh C. Muldoon as dean, and the opening of the Graduate School, under the leadership of the Reverend J. F. Carroll, C.S.Sp., S.T.D. The School of Music, headed by Professor Joseph A. Rauterkus, is now in its first year.

The College of Arts offers courses leading to the degrees of Bachelor of Arts, Bachelor of Letters, Bachelor of Education, and Bachelor of Philosophy. Among its graduates are numbered about half the priests of the Pittsburgh diocese and many professional and business men. By means of night courses, Saturday classes and summer sessions, it has in the last decade opened the way for hundreds to secure special training.

The College of Science offers a combined science and arts course leading to the degree of Bachelor of Science. It gives pre-medical and pre-dental preparation to those who wish to matriculate in medical and dental schools.

The School of Pharmacy offers three and four-year courses. The former, leading to the degree of Graduate in Pharmacy, trains men for positions as prescriptionists, for hospital dispensing; the latter leading to the degree of Pharmaceutical Chemist and Bachelor of Science in Pharmacy, gives additional training in pharmaceutical and chemical manufacturing and control work, analytical chemistry, bacteriology, and in food, drug, and water analysis.

The School of Accounts, Finance, and Commerce is a school of business administration, the work in which leads to the degree of Bachelor of Commerce and Bachelor of Science in Economics, and prepares students to pass successfully the state examinations for the position of Certified Public Accountant.

The Bachelor of Laws degree is conferred on the completion of a three-year course in the School of Law.

The degree of Bachelor of Arts in Drama is conferred on those who complete the four-year course in the School of Speech Arts.

Music, both vocal and instrumental, has been taught in Duquesne

University since its foundation. A number of celebrated musicians received their first training here. It was only in the present year, however, that steps were taken to establish a School of Music with fully graded courses leading to degrees. Instruction is offered both to those who wish to adopt music as a profession and to such students in the College of Arts and Letters as wish to carry certain courses for elective credit. Broad literary and artistic culture are insisted upon rather than narrow concentration upon one branch of technical work.

The Holy Ghost Fathers, while entrusting the distinctive work of the departments to specialists, maintain the general management and control of the university. Today its students represent every section of the country, and number well over 3,000.

The Western Theological Seminary was founded by the General Assembly of the Presbyterian Church, U. S. A., in 1825, and the institution was opened in 1827 with an enrollment of four students and a faculty of two professors.

The first building was erected in 1831 on what is now known as Monument Hill. This building was completely destroyed by fire on January 23, 1854. The second building, erected on Ridge avenue in 1855 and known as "Seminary Hall," was partially destroyed by fire in 1887 and immediately repaired. In 1914 this building was demolished to be replaced by a large modern group, two wings of which were dedicated May 4, 1916. The new buildings are English collegiate gothic, with steel frame and fire-proof.

The first dormitory, erected in 1859 and made possible by the generosity of Mrs. Hetty E. Beatty, was known as "Beatty Hall." This structure becoming inadequate by 1877, the Rev. C. C. Beatty furnished funds for a new dormitory to be known as "Memorial Hall," as Dr. Beatty wished to make the edifice commemorate the reunion of the old and new school branches of the Presbyterian church. The present dormitory, which was dedicated in 1912, was erected on the site of Memorial Hall and retains the historic name of the old hall. It is a reinforced concrete, fire-proof building, with suites to accommodate seventy-five students. It also contains a beautifully furnished social hall and a thoroughly equipped gymnasium, as well as a dining room.

About 2600 students have been trained for the ministry of evangelical churches, and of the graduates 144 have served as foreign missionaries in every part of the world. Many of the graduates have distinguished themselves in the various spheres of ministerial activity, as preachers, educators, administrators, and some have won a position of distinction among the leaders of other communions.

In the course of a hundred years the seminary has been able to secure for its faculty some of the leading theologians, Biblical scholars and preachers of the Presbyterian church. We mention among them Archibald Alexander Hodge, Samuel H. Kellogg, Benjamin B. Warfield, Melanchthon W. Jacobus, Matthew B. Riddle, William M. Paxton, Samuel Jennings Wilson, Henry T. McClelland, Robert Christie and David Gregg.

Today a complete modern theological curriculum is offered, with elective courses leading to the degrees of S. T. B. and S. T. M. The faculty consists of seven professors and five instructors. The average enrollment is seventy-five.

The Pittsburgh Theological Seminary of the United Presbyterian Church of North America was also founded in 1825. It is under the control of the First Synod of the West and the Synods of New York, Ohio and Pittsburgh.

Seminary Hall, the present building, is located on the corner of North avenue and Buena Vista street and overlooks the north side park. It is equipped with a library, reading room, gymnasium, dining room, dormitories, etc.

The curriculum is prescribed by the general assembly. The term of study consists of three annual sessions. The standard requirement for entrance is graduation from an accredited college. The degree of Bachelor of Theology is conferred upon all students who graduate, provided they have received their preliminary college degree or have received the equivalent of college training. Other graduates are granted a diploma without a degree. The degree of Master of Theology is conferred for a fourth year of study and certain other requirements.

The Pittsburgh Seminary cooperates with a group of universities, colleges and theological seminaries in support and control of the American School of Oriental Research in Jerusalem. Special arrangements are made to reduce the expenses of students of the school to the lowest point. The courtesy of some of the lecture courses at the Western Theological Seminary is extended to the students of the Pittsburgh Seminary, and by a special arrangement with the University of Pittsburgh its undergraduate and graduate courses are open to the seminary students, giving them every opportunity of supplement-ing their college training by taking advanced and specialized courses, or those who have imperfect college preparation may make up deficiencies. The Allegheny Observatory is also open to students of the seminary.

The total number of students who have taken complete or partial courses at the seminary is 1654. In 1925 (per minutes of the general assembly) 576 of the living ministers of the United Presbyterian church had been students in the Pittsburgh seminary. The total enrollment for 1926-27 is eighty-seven. The faculty consists of six professors and two instructors.

Pittsburgh as one of the great commercial centers of the world affords unexcelled opportunities for the study of social, economical, political, racial, and other problems with which a minister, who is to work among men, must be familiar, and the city and its suburbs afford an excellent example of the Church at work.

"My heart is in the work," the motto on the seal of the Carnegie Institute of Technology, expresses Mr. Carnegie's attitude toward its founding. As he had himself experienced the struggles of a poor but ambitious young man to advance himself he was inspired to make it easier for other young people to get an education along technical lines. In a letter to the mayor, dated November 15, 1900, Mr. Carnegie tendered to the city of Pittsburgh the money to establish a technical institution upon the condition that the city would provide a suitable location of ample size for future extensions.

On November 26th the mayor transmitted the communication from Mr. Carnegie to the members of the select and common councils of the city. On December 15th Mr. Carnegie placed the Technical Schools under the direction of the Board of Trustees of the Carnegie Institute, and on January 28, 1901, the city of Pittsburgh accepted Mr. Carnegie's gift.

The work of organizing the Institute of Technology was committed to the care of Dr. Arthur A. Hamerschlag, who was appointed director. In 1918 his title was changed to president and he continued in this office until 1922, when he resigned. The rapid progress and expansion of the institute was due largely to his energy and foresight.

In the course of the year 1902 a site was selected, and in February, 1903, the trustees, meeting with a committee of councils, approved a tract of thirty-two acres of land adjoining Schenley park, near the Carnegie Institute building, as the home of the new institution. This was acquired by the city in September of the same year and tendered to the Carnegie Technical Schools. Mr. Carnegie then agreed to place at the disposal of the trustees of Carnegie Institute a sufficient fund with which to erect the necessary buildings.

In April, 1905, ground was broken and in October of that year the building now occupied by the College of Industries opened its doors to students. As new structures were made ready for occupancy, additional departments were inaugurated. In 1906 Machinery Hall of the College of Engineering was erected; in 1907 the building of the women's college, the Margaret Morrison Carnegie College; in 1908 the Science Building; in 1912 the College of Fine Arts; and in 1914 the Central (administration) Building. The Langley Laboratory of Aeronautics was erected for war-time instruction, and in 1924 the new gymnasium. Since the original grant the campus has been extended to include fifty-two acres and various buildings have been added, including dormitories for men and for women, a library, inn, etc.

In June, 1908, the institute awarded its first diplomas, graduating students in chemical, civil, electrical, mechanical and metallurgical engineering from the College of Engineering, and students in architecture from the College of Fine Arts. On April 20, 1912, the name "Carnegie Technical Schools" was changed officially to the "Carnegie Institute of Technology" and the institution received from the state of Pennsylvania a charter of incorporation with the power to confer degrees. The first degrees were given at the fifth commencement, in June, 1912.

The College of Engineering gives courses leading to the Bachelor of Science degree in chemical, civil, commercial, electrical, mechanical and mining engineering, and in chemistry, physics and mathematics. A limited number of fellowships for a year's graduate work in mining and metallurgy are granted each year, for which the Master of Science degree is conferred. These fellows work in cooperation with the U. S. Bureau of Mines on research problems, and the results of their investigations, which are published, are recognized by the mining profession throughout the world as of great value.

A Bureau of Metallurgical Research was established a few years ago, and it has already justified its creation. Many of the problems of the steel industry are brought to it for solution.

An International Conference on Bituminous Coal was held at the Carnegie Institute of Technology in November, 1926, which was attended by over 1,700 delegates from all sections of the United

States, Canada, Mexico, England, France, Germany, Belgium, Norway, Sweden, Czechoslovakia and Japan, representing states, cities, universities, learned societies, business and industry.

The College of Industries, which is a pioneer in its field, gives the Bachelor of Science degree for four-year courses in building construction, works management, printing and industrial education. The aim of these courses is to furnish to industry salesmen, executives and administrative officers, and the student specializes in the underlying science and technique of production, sales and management. Unusually complete shop equipment combined with frequent visits to the industrial plants of the Pittsburgh district are great aids in realizing the aims of the instruction.

The College of Fine Arts, which is coeducational, offers courses leading to the Bachelor of Arts degree in architecture, painting and decoration, music, drama and sculpture. The college is equipped with a library of the fine arts, a theater, rehearsal, practice, exhibition, lecture and drafting rooms, studios, collections of objects of art, etc. Frequent recitals and concerts by the orchestra are given by the students of the Department of Music. The Department of Drama gives about 100 performances of plays a season which are attended by about 30,000 people. Scenery, costumes, lighting, as well as the acting, and in some cases the plays, are the work of the department. The students and graduates of the Department of Architecture have brought distinction to the institute by winning important fellowships and prizes in national competitions, and faculty and students in the Department of Painting and Decoration contribute largely to the annual exhibition of the Associated Artists of Pittsburgh.

An important conference on the drama was held at the Carnegie Institute of Technology in November, 1925, which was attended by delegates from colleges, universities, the professional theater, little or community theaters. From the interchange of views much information of value was secured.

The Margaret Morrison Carnegie College provides for the education of women for occupations in the home, teaching and the business world. It offers courses leading to the Bachelor of Science degree in household and costume economics, secretarial studies, general science, library and social work. The following motto of the college, written by the beloved Lucien Scaife, a former trustee of the institute, adorns the entrance to the building: "To make and inspire the home; to lessen suffering and increase happiness; to aid mankind in its upward struggles; to ennoble and adorn life's work however humble; these are woman's high prerogatives." Instruction in this college is, in many subjects, modified from the traditional methods in order to emphasize laboratory, studio and field work, and to combine the training of mind and hand. Extensive laboratory equipment is provided for this purpose, and frequent use is made of the opportunities offered by the city environment for bringing the students in contact with large scale operations, industrial or professional.

The Division of General Studies gives instruction in the academic branches in all the colleges.

In none of the phases of activity of this group of colleges is there ever absent a constant stimulating reaction from the Pittsburgh district as a dynamic background. Each year a large number of leading scientists, engineers, specialists and executives from Pittsburgh companies give lectures in the classrooms of the various colleges. As a part of its contribution to the community the Carnegie Institute of Technology shares with the people of Pittsburgh the lecture courses by eminent physicists, chemists and other scholars which are arranged yearly for its faculty and students, and members of the faculty act as consultants and work out problems for the industrial plants in the institute laboratories.

The Night School, a phase of education in which Mr. Carnegie was deeply interested—has an enrollment of over 3,600. Most of these students work during the day in the industrial plants of Pittsburgh, over 1,100 firms being represented this year.

The day school has become international in its appeal, students being registered this year from China, Japan, Egypt, India, Palestine, Canada, South America, and many of the countries of Europe. The enrollment exceeds 2,400, which with the night school and part-time students gives a total of 6,598.

Each year in April the Carnegie Institute of Technology has an evening "at home," when the people of Pittsburgh are invited to visit the colleges where students are at work in all departments and special programs and exhibitions are arranged.

The endowment of the Carnegie Institute of Technology at the present time amounts to about $15,000,000. An arrangement has been made between the trustees of the Carnegie Institute of Technology and the Carnegie Corporation of New York by which the sum of $8,000,000 will be added to the endowment provided $4,000,000 is contributed by the friends of the Carnegie Institute of Technology. In other words, for every dollar that is subscribed the Institute of Technology will receive two dollars from the Carnegie Corporation. One-third of this amount may be in buildings; the other two-thirds must be applied to the endowment. This fund must be secured by 1946.

The authorities of the institute are not looking forward to a policy of expansion. It is not expected that the enrollment will be permitted to grow much beyond the present number except in the evening classes in which students will be accepted up to the capacity of the shops, laboratories and classrooms. This number has already been reached in many departments.

In the field of research, the Carnegie Institute of Technology is devoting itself especially to metallurgy and coal. It is in these branches that it feels it can do most for the Pittsburgh district. At present it is approaching the study of these subjects partly from a theoretical point of view, but what is an abstraction today may be of great importance in a practical sense tomorrow.

The Carnegie Institute of Technology enjoys noteworthy advantages through having as a background the city and district of Pittsburgh, the industrial production of which annually exceeds in its tonnage that of any other city in the world. The diversity and perfection of technological practice involved in this production and the range of industries contributing to it are distinctive assets.

The city of Pittsburgh has reached its great importance as an industrial center largely through the application of scientific principles. It is therefore essential that its educational institutions do all that is possible to advance the cause of science. The advantages that come to an industrial community through the presence of a great school of engineering are obvious. The necessity of encouraging work in the field of abstract research may not be so clear, but progress in technology in the long run can only be achieved through advancement in the fundamental sciences.

PITTSBURGH AS AN ART CENTER

HOMER SAINT-GAUDENS

Homer Schiff Saint-Gaudens, director of fine arts of the Carnegie Institute, Pittsburgh, was born in Roxbury, Massachusetts, September 28, 1880, the son of Augustus and Augusta F. (Homer) Saint-Gaudens.

He graduated from Harvard, 1903, and married Carlota Dolley of Philadelphia, on June 3, 1905. He was assistant editor of "The Critic", New York, 1904; managing editor "Metropolitan Magazine", 1905; stage director for Maude Adams in "Legend of Leonora", "Kiss for Cinderella", etc. 1908-16; directed production of "Beyond the Horizon", "The Red Robe", etc. 1919-21.

Mr. Saint-Gaudens became assistant director of fine arts, Carnegie Institute of Pittsburgh, July 1, 1921 and director of fine arts July 1922.

He was captain Company A, 40th Engineers (1st Camouflage Unit) A. E. F., in charge of camouflage work on the front of 2d Division, 1st Corps, 2nd Army in the World war, receiving honorable discharge February 5, 1919; Major Engineers, R. C. He is the author of "Reminiscences of Augustus Saint-Gaudens", 1909; also of short stories and many special articles in magazines.

Pittsburgh as an Art Center

BY HOMER SAINT-GAUDENS

I AM to talk today on Pittsburgh in art and, in particular, on the International Exhibition of Paintings in Oil, held each year in the Department of Fine Arts of Carnegie Institute.

The previous speakers in this series have been telling you of how, for the last seventy-five years, Pittsburgh has profited from material affairs to a degree that would have made Aladdin's smoking Djin green with envy.

Each season, as I wander through Europe in my search for paintings, I hear much of this prosperity from those wise in the ways of an older and more harried world than ours.

"Your prosperity," they tell me, "is more widespread than man has ever dreamed of before. Luck to you! But please, Mr. American, what are you going to do with that prosperity, and even more please, what is that prosperity going to do with you?"

Now, since Pittsburgh's quantitative prosperity is the apotheosis of American prosperity, full of power, plumbing, health, and wealth, is it not especially important that we regard this bounty, which we have taken from pipes and holes in the ground, with thought and questioning? Is man's reason for existence and extent of happiness to be bounded, forever, by the anaesthesia of auction bridge, the synthesized lure of the latest movie queen, eighteen holes of well-alibied golf, and rolling down a concrete lane slightly tainted with carbon monoxide?

Let me suggest that if Pittsburgh is to go down in history as of any consequence, it must grow in its spiritual aspect, as all great commercial centers have grown—Antwerp, or Venice, or London, or Rome.

The wise old French critic, Sainte-Beuve, once said that "in life the height of joy and the depths of despair are separated by scarcely more than the trembling of a leaf."

Well, to me, this leaf, this delicate fluttering little thing, is what we call our soul; and these days, we are prone to lose track of that soul in the worship of efficiency as an end and not as a means to an end.

I am not decrying efficiency. But now that we have got it, what are we to do with it?

To me efficiency is not the god so many folks make it out to be. Efficiency is a nice box, built with the latest Grand Rapids veneer that will not crack when the steam heat goes up to eighty, and that you can stand on without crushing.

The gods, to my mind, are inside. They are called Flavor, and Fragrance, and Leisurely Delight.

So how are we to open that box and to make efficiency worth while? By learning to enjoy, to feel, to embroider on things of the spirit, to rediscover the essence of life?

We lack any one patent nostrum that will cure all.

But this art I am to talk about will help.

It is of no practical use, this little blossom of art. We do not eat it, or wear it, or wash in it, or make money with it. From the point of view of efficiency, it is zero.

But as something to cause our hearts to beat a little faster, to allow us to live, not longer, but more richly—that is, richly in spirit, if a bit leanly in pocket—then the index of this art flower is one hundred.

For, believe me, you men of commerce, wealth has not finished your task, but just begun it. For wealth, as so many of you have good cause to know, is transitory, but art, in its widest sense, is the most permanent thing that man has created. Art will be on this earth of ours long after your engines of iron and steel that line these rivers have rusted away.

You do not believe me?

"The glory that was Greece and the grandeur that was Rome."

On what do we base this glory and this grandeur; on the size of Athenian marble quarries, or the ingenuity of Roman water works?

No, on their art, the Parthenon, the Arch of Trajan.

Why has this art of Greece and Rome endured?

Because it was in touch with everyday life, not a holiday pleasure only, but of as continuing interest as our love for everything we admit is reprehensible on the front pages of our newspapers.

There is nothing impossible about this sort of art for Pittsburgh, if we only have the will.

Pittsburgh is a city richly picturesque, both in the romantic history of steel and in the masculine strength of its location; flung by the brown tumult of labor along the broken gullies and bluffs that line the junction of the Monongahela, the Allegheny and the Ohio. It is a city filled with the varied imaginations of many lands. It needs but the development of this imagination for its inhabitants to profit by its picturesqueness, to enhance their pleasure in life.

What do I mean by this art that will prove an open sesame to these imaginations?

I mean the sensuous enjoyment of visual objects.

I do not mean just pictures and statues when I say "Art." I mean women's hats.

Every time I stand up before an audience of women, I praise the Lord for hats. They have got all kinds of hats and most of them are cheerful hats; and they do a lot more than cover bobbed hair. In fact, I have a notion that most women's hats are chiefly constructed to palpitate the heart of the proximate male.

So the art I am pleading for is just hats; that we pay more attention to what we see about us, and less to the insides of some new fangled faucet. For, believe me, we cannot get the finer things of life out of a pipe, or out of a can, or out of a frigid air box.

This is no new idea.

In fact, quite the contrary. The world has always stirred with this imaginative desire for decoration which we call art, whenever man has at last arranged his creature comforts and has time to look around him.

This was true of our early colonies along the Atlantic coast.

It was true as our settlers moved westward.

Of course, art did not flourish immediately in the original garrison at Fort Pitt, nor among the traders who lived in the log huts near it. When the first pioneers topped Laurel Ridge about 1760, nature was far too stern to permit of emotional gymnastics.

Why paint portraits, or paint at all, when the General Assembly of Pennsylvania offered you "fifty dollars for the scalp of every female Indian killed?"

As I have said, there must be material comforts first.

But affairs soon began to progress hereabouts. The initial city plan, drawn by Colonel John Campbell in 1764, laid the town out along the Monongahela river between Ferry and Market streets. In 1786, the "Pittsburgh Gazette" made its appearance. In the next year Pittsburgh Academy, the ancestor of the University of Pittsburgh, was incorporated. By 1796, the court house, our first important public building, was erected on the site of the present market. Soon after, the trains of pack horses coming over the mountains gave way to the famous Conestoga wagons. Finally, in 1804, a stage line was established for the speedy six-day journey to or from Philadelphia.

Pittsburgh had built itself up as far as Grant street. It boasted a population of about three thousand. It possessed an iron foundry, a cotton factory, glass works, and other industries.

It had creature comforts. It could sit down and draw a mild breath of leisure.

So what happened?

It asked, as all humans have asked, for a bit of art.

And it got that bit of art in the form of two men.

One was a landscape painter, S. H. Dearborn, and the other a miniature maker. Both worked with unction and meticulous care. Both struggled over the hardwood ridges, not to give us devastating doses of "art for art's sake," but to make their bread and butter, by pleasing the eyes of their fellowmen. Art in Pittsburgh started off with the right foot.

Remember, please, that this was the time when, in the east, Wilson Peale, whose paintings now sell for thousands, was not only an artist, but a leather worker, a watch maker, a taxidermist, and a dentist; when Fulton, that most promising student of Benjamin West, caused the first steamboat to labor her smoky way up the Hudson river; when Samuel Morse not only was a painter of repute, but wrecked his genius from the point of view of the local critics by inventing the telegraph.

Such beginnings seem strange to us who feel that the province of the artist is to see beyond the horizon, to distill the beauty of what he sees, and to bring that distillation into our workaday homes that we may become more intimately in touch with our dreams.

But no like thought entered the minds of the men of property of those rough years. None, in their drab sobriety, could set any great claim to refinement. Painting meant a portrait, a record of their relatives, which they wished to retain, however much they disapproved of them, for sternly genealogical reasons. Certainly, the owners had no notion that the presentment of sharp-faced dames added one little ray of sunshine to their rigorous surroundings.

In fact, it was a matter of amusement to the population of 12,000 souls in 1818 that they should be invited by a visiting Frenchman to pay twenty-five cents apiece to view a gallery of European pictures of Mt. Etna and Vesuvius, vomiting pictorial fire and brimstone. Obviously, our Gallic friend was one of the first of that long line of exotic exploiters of our superfluous greenbacks.

In the early twenties, however, with a little wealth came a pronounced notion that there might be more stimulating objects to look upon than sleek inconsequential lambs embroidered on samplers. So the important leaders of the city assembled a pocketbook which provided funds for one, A. Bowman, to study in Europe under Sir Thomas Lawrence, president of the Royal Academy. Indeed, Bowman even journeyed to France, where a beneficent rumor reported that Lafayette took him into his house for nine months, while he painted the general in a fashion contemporary critics claimed to be equal to any canvas hung in the Louvre.

That contemporary critics are not contemporary prophets is a subject for tragic contemplation.

So matters artistic prospered until 1828, when Pittsburgh organized a museum which we can visualize with modern eyes. For just as now in Carnegie Institute we may look between the red walls of our longest shrine of art to where those stuffed giraffes in our halls of science gaze with startled horror across our aesthetic threshold, so under the leadership of one whom our modern critics would call a "significant" painter, James R. Lambdin, there was erected at Fourth and Market streets a series of rooms where portraits of Judge Henry Baldwin and canvases by West and Trumbull held even more than a nodding acquaintance with certain reptiles wriggling in spirits, Indian curiosities accumulating dust, and stuffed quadrupeds and birds breaking all laws of nature and anatomy.

Then followed Chester Harding, who, in 1833, made the likeness of the Honorable Harmar Denny, a distinguished lawyer, before the polite world of London under the Georges removed him from the austere valleys of Pittsburgh to the more sophisticated surroundings of Park Lane complacency.

By now, Pittsburgh was calling itself the "seat of manufacture in the United States." The population had reached 40,000. The city was assuming structural prominence. The old Drury Theater had been built, together with a more imposing court house.

Unfortunately the 1840's were upon us; years when our art and architecture drifted rapidly into that awful and complicated stew of horror which ultimately reached its climax in the period of the worst taste that the world has ever known.

The rage of the Greek classic style began it.

But, in an appallingly short time, the little flicker of beauty had fled before traveling draughtsmen who distributed inept sketches for bastard imitations of Italian villas.

Houses became monstrosities, with iron stags at bay nobly poised on the front lawn, ready to engage in mortal encounter with a neighbor's bronze bloodhound rampant, over the possession of some iron Venus who was poised between three lead swans, straining at the hands of certain bulbous babies as they squirted a small portion of the Allegheny, or the Monongahela, onto her coy umbrella.

The only germ of satisfaction is that nobody else's architecture was better. If Pittsburgh's Berry mansion, occupied by the first Pennsylvania Female College, plumbed the fathomless depths of bad taste, so did London's Albert Memorial.

Indeed, the height of art during these years, when the human form divine was only to be gazed upon as a thing of sin, was achieved by one Hiram Powers, who snatched enduring fame by presenting to the veiled eyes of American modesty his "Greek Slave." So chaste was her well-smoothed body that a committee of ministers from Power's home town, Cincinnati, to whom a nude should have been as a burning brand, after viewing her with meticulous care gave her a character.

But not so Pittsburgh; for it seems that our little slave received severe criticism by the local press when she appeared in all her gentle nudity in 1848.

Through all these years, years of gold fever, slave trading, and industrial expansion, art was becoming more and more incredibly sincere and dull, despite the opening of an academy for instruction in drawing and painting in 1855. Yet, when pulchritudinous maidens had not yet achieved the polychrome heights of those cigarette seducing advertisements where pretty girls smile at us above the words, "Fragrant, Delicious, and Refined," even the depths of graphic sentimentality satisfied the demands of the gullible tobacco chewing plutocrats who had the slightest yearnings for an imaginative holiday. For should such men turn of an afternoon from their factories, or mines, for a few minutes surreptitious education, they perforce went to loaf with W. C. Wall, or Peter McClory, who spread the Hudson river all over 12,000 square feet of canvas; a result that is understood to have quickened the pulse of even the inhabitants of Philadelphia.

Then came the Civil war, which, strangely enough, also encouraged the art idea in Pittsburgh.

The women of this city had extended their hospitality to the soldiers who passed to or from the battlefields. Money was needed to carry on this work; and in June, 1864, the Western Pennsylvania Sanitary Fair was opened, with, as a part of it, the first formally-organized art exhibition held in the council chamber of city hall of Allegheny.

Next year the Pittsburgh School of Design for the instruction of women in art was established.

Then the 1870's wrapped their mantle of antimacassars and bears' grease about us.

Gloom was the rage.

Artists chiefly seemed to worship paintings made from a gravy of burnt umber, with all the enthusiasm that modern young America enjoys the fadeout on Norma Talmadge's final embrace. They, the artists, even flocked abroad to study the technique of bitumen-soaked horrors.

With the reaction appeared the impressionists, the group of sunlight and fresh air; and thus it came to pass that Joseph R. Woodwell spent seven years in close association with them in Paris. When he returned he and Alfred S. Wall formed a nucleus that did much to promote the art idea in Pittsburgh in the seventies and eighties; while two other Pittsburgh painters, John W. Alexander and Charles Stanley Reinhart, also crossed the Atlantic.

Now, too, individuals began to acquire sufficient wealth to indulge in the purchase of work.

There was a sending of European artists. You can find them liberally sprinkled through the catalogs of the General Loan Exhibition in 1879, organized to aid the old Pittsburgh Library.

They seem to have been the forerunners of the host of foreign painters whose standarized gold bricks still possess such an unalloyed power to attract millions from what was, and is, regarded across the seas as a nation of raucous gamblers covered with gold.

It was stimulating, almost too stimulating.

Like the rest of our land, Pittsburgh was acquiring libidinous goddesses by Bouguereau and valiant galloping Arabs by Schrier in charming ignorance that they were then, and have remained ever since, the apotheosis of the commonplace.

Indeed, Pittsburgh's taste in the 80's may be gleaned from the Soldiers' monument on the Northside, or the equestrian statue of Washington in West Park, or the figure of Thomas Armstrong nearby.

One look is enough to remind you that those were the days when the sum of art lay in the buxom bosoms of voluptuous neo-classic ladies who slid down the banisters to pirouette on the hall newell posts, clutching with one hand some few iron posies, or the chaste bit of bronze cloth that used to be, or was going to be, their dress; while, with unabashed insouciance, with the other hand they held aloft the gas jet that lighted not only their own desperate condition, but also the primly retiring family from their Eastlake spring rockers to their somber walnut beds.

Yet, for all our neo-Victorian contraptions, the aspiration was there, even though it disguised itself in "Godey's Ladies' Book," that arbiter of taste and fashion, or in wax flowers, or bustles, or lambrequins, or the Hudson River School of Painting, or the Rodgers Groups.

And, after all, the aspiration is the thing. For it, we can even forgive art devoted chiefly to whiskered worthies in red plush frames in the years when the women folk sat on horse hair ottomans and talked of basques and alpaca and passementerie, whatever they meant, and the devastating cut of their men's Dundreary whiskers.

But we must not be surprised that the results were feeble, even though by the time of the panic of '73 and P. T. Barnum, a small number of cultivated persons organized the Pittsburgh Art Society.

Indeed it was not until the endowment of Andrew Carnegie that art became a factor in the education of Pittsburgh.

For this Scotch master of iron and steel possessed ideals that led him into the realm of imagination and endowed him with a power of organization that could make practical those ideals.

Looking forward through the smoke and dust of his industries, he saw, not far away, the time when mankind would have surrounded itself with the needs and comfort of life created by that industry, and would have provided itself with periods of leisure hitherto unknown.

What, he reasoned, was Pittsburgh to do with that leisure?

His orginal plan was modest. First, he wished to give Pittsburgh a Free Library. Next, feeling its need for an Art Collection, in 1895 he presented it with a building, containing a Library, a Department of Fine Arts, and a Museum. Finally, in 1907, he enlarged the whole structure into the present edifice, where the activities of the Department of Fine Arts matured into importance under the guidance of Mr. John W. Beatty.

Then, too, was organized the outstanding effort for which this department is recognized, our International Exhibition of Paintings. This when next presented, for the twenty-sixth time, will be through the kind auspices of the Secretary of the Treasury and his brother, Mr. R. B. Mellon.

It is inspiring to think that the burden of this exhibition, which in the past was maintained through the foresight of a man of power, has now been generously assumed by contemporary leaders of strength and vision.

The International differentiates the artistic development of Pittburgh from any other city of the United States.

It is the only American exhibition recognized in Europe. London knows all about it, as I discovered five years ago, when I first went abroad to obtain paintings. Paris knows all about it. Venice knows all about it. Sweden knows all about it.

On our side of the Atlantic, New York, Chicago, every one of our chief cities knows all about it.

They send their critics here to study the general condition of painting as it exists today.

New York papers give it pages of space.

When we are through with it, more important communities ask for it than we can satisfy. We seek no market. Chicago and New York come to us.

Since our inception we have had as members of the Jury of Award virtually every highly recognized painter in the United States and Europe. I think of La Farge, or Zorn, or Chase, or Cottet.

See the names on the list of prize winners, such as Orpen, Thayer, Bellows, Le Sidaner, and Bonnard.

There are many others, also, who, while they may not have won awards, are outstanding among their fellow craftsmen. I think of Degas, Puvis de Chavannes, and Whistler; with later, Sargent, Anglada and Mancini.

Also, we have been instrumental in bringing to our land the best of European artists, like Augustus John and Besnard.

Away back in the fifteenth century somebody found out that colors mixed in oil and applied to canvas or wood, were capable of setting forth, in the finest technique, the noblest sentiments that man can put down in visual form. Never once since then has any single nation possessed the craft of painting to the exclusion of others. But all nations have expressed themselves in different manners, and right-fully so; just as Mrs. Brown may develop her personality in lamp shades and Mrs. Jones in souvenirs of Niagara.

So we are trying to say in Pittsburgh that "here are paintings by the skillful modern men representing the various groups of the various countries."

There are about fourteen countries included, and, on the assumption that each land splits itself into five cliques, there are probably about seventy aspects of art shown in our International by 300 painters, four or five painters to an aspect.

It is a fascinating thing to watch this temperamental barometer of taste go up and down.

You will not like it all. That is not the point.

Mr. Royal Cortissoz, art critic on the New York "Tribune," does not like it all. Neither does Mr. Forbes Watson, art critic on the New York "World."

But, strange as it may seem, the part of the all that Mr. Cortissoz does not like, is not, by any possible stretch of calculation, the same part of the all that Mr. Watson does not like. Moreover, I venture to suggest that if they set themselves up as rival candidates for a judgeship of what is good and what is bad, most of you would be electing a dark horse soberly to draw your imaginative buggy between perverse hypocrisies on the one hand and the innocuous dilutions of soporific slush on the other.

We none of us wish to be acknowledged as ostriches with our feathers in the air, but our brains in the sand. Therefore a large share of us read the "Literary Digest" as a short cut to erudition. Of course, we find that we cannot exactly subscribe to every opinion in every article that we read. But, nevertheless, we do like to know what all the newspapers of this land have to remark about the reduction of naval armaments; to get all the points of view of many lands.

So it is with Art, and our International. Only when you come to it, remember and thank goodness that while the question of taste can always be argued, it can never be settled.

Man has been creating art for 20,000 years or more. But hitherto he has neglected to boil it down and skim it off to one single formula.

So, perhaps what is interesting in art is just what after all is interesting in life; progress, the unfolding of the human soul.

What in the past met the approval of those we now call bromidic old hats, is just as good and not one whit better than what in the present wins the patronage of these specks of hateful egoism known as latter day art critics.

Nobody's pencil, or eraser, has ever settled art, or is ever going to settle it.

Art is always ahead of us, and, like tomorrow, when we get there, we will not be there.

The only sure thing we know is that while art can get along without us, we never have been able to get along without it.

Therefore, since Pittsburgh prides itself upon the idea of electicism, of a desire to profit by the new opinions that pass about us hour by hour, such a show as the International is especially fitting here.

When the International was established, the impression prevailed that the works of European artists were, by virtue of the superior educational advantages enjoyed by their creators, more important artistically than those produced by American painters.

That was natural.

If we look back through history we find that each young nation borrowed from the more mature lands, gleaned, and absorbed. And then, as each adolescent nation took its place with those which had won their reputations, it developed, on the basis of the borrowed, an art peculiarly its own.

This general process has been especially true in the United States.

So it has come about within the last few years that our painters have felt confident that they might play hookey from the stultifying art Sunday school, that, under Ruskin's self-styled leadership, bubbled its complacent hanky-panky in London, or Paris, or Munich, and sneak down to the old swimming hole along with the rest of us. They are living and tasting our lives, which are their lives, in our own way, which is their way.

But even more than this, what is as important as the development of artists, is the development of the artists' audience.

Art is no Phoenix to rise birdlike from even a spiritual flame. It needs more than that, a few crumbs to peck at in the form of wealth and leisure capped by an emotional desire.

It is getting them. For we have all the needed elements.

We have wealth. If any of us scratch to make our budget balance, we take vicarious satisfaction Sunday mornings by reading what the French say about Uncle Shylock Sam.

We have leisure. Mr. Ford invented it for us with his forty-hour week.

We have the emotional desire.

Up to now we have been in our hours of ease like Stephen Leacock's cowboy who rushed from his cabin, leapt on his horse, and rode rapidly off in all directions.

But some times, I will admit much against our own will, we are going to realize that gas out of a pipe, or white hot steel tossed upon clanging rollers, is not the end of life, but the beginning; that material things to be of consequence have to be transmuted by that vague mist some German poet called "the joy of living."

So you see, in closing, I am pleading for more than just our Art Museum, or the International.

I am pleading for the art idea as one of the essentials for the happiness of our citizens in the future, just as material strength has been essential for their happiness in the past.

Our Department of Fine Arts, then, and our International, I would have you regard not as an end, but as a means to an end; as eyeglasses, through which we may look at beauty, as lenses that will focus our otherwise scattered vision.

If Pittsburgh, therefore, would become the art center it should be, it must see to it that art enters freely into the haphazard details of its daily routine. The province of art is not just to bore us into the mellifluous anodyne of the radio when we corral it in our drawing rooms and neglect it in our streets. Art's only reason for existence is to increase our humdrum six by eight enjoyment of our surroundings in our cafeterias and on the very lamp-posts that light our steps as we progress along through our drab uncertainties.

For art, let me repeat, not only has been filling our imaginative voids for thousands of years, but is the only thing in civilization that lasts.

What have you had left in any other land; the Lions of Mycaene, the Pyramids of Egypt, the Piazza San Marco of Venice, or the Sistine Chapel of Rome?

Will no one believe me?

PITTSBURGH FIFTY YEARS HENCE

A. L. HUMPHREY

Arthur Luther Humphrey, manufacturer, was born in Buffalo, New York, June 12, 1860. The son of Arthur K. and Hulda (Orcutt) Humphrey. He received a high school education and married Jennie Field of San Bernardino, California, January 16, 1890. He was successively a farmer, a machinist apprentice, and a railroad employee, advancing in the last named service to the position of superintendent of motive power.

He served with the Union Pacific, Southern Pacific, Atcheson, Topeka & Santa Fe, Colorado Midland, Colorado Southern, and Chicago and Alton Railroads; in 1903 was appointed western manager of the Westinghouse Air Brake Co at Chicago. He became general manager of that company in Pittsburgh in 1905, and was promoted to the vice presidency in 1910. He has been president of the Westinghouse Air Brake Company since 1919 and is president of the Union Switch & Signal Company; Keystone Clay Products Company; American Brake Company; is chairman of the board of the Locomotive Stoker Company; the Massey Concrete Products Corporation; Westinghouse Union Battery Company; National Brake & Electric Company; First National Bank of Swissvale; and Swissvale Trust Company.

He is a director of the American Brake Shoe & Foundry Company (New York), Canadian Westinghouse Company, First National Bank at Pittsburgh, Union Trust Company of Pittsburgh, Pittsburgh Chamber of Commerce (ex-president), Pittsburgh Branch of the Federal Reserve Bank. For nine years he was a director of the United States Chamber of Commerce, resigning in May, 1928. He is a trustee of the University of Pittsburgh. While living in the west, Mr. Humphrey served in the Colorado legislature two terms and was speaker of the House in 1895. He served as industrial expert on the staff of the Chief of Ordnance of the U. S. Army during the World war, and was a member of the President's Conference on Unemployment in 1921.

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Pittsburgh Fifty Years Hence

BY A. L. HUMPHREY

IN an endeavor to portray what Pittsburgh will be fifty years from now, one hesitates between the tendency to indulge the imagination freely and the tendency to hold it severely in check. If we learn anything from the progress of the last fifty or one hundred years, however, it is that the prophet falls short rather than shoots over the mark. When Jules Verne wrote his imaginative romances some fifty years ago it was generally supposed that they were wild extravagances and that nothing so fantastic could ever come to pass. We all know now that, on the whole, Verne's dreams were grounded in scientific law and fact and that while men may never take trips to the moon, we are indeed living in an age of miracles which warns us to be cautious about undertaking to circumscribe inventive achievement or social and industrial progress.

Even so astonishing a genius as Napoleon Bonaparte failed grotesquely to sense what the future of mankind had in store. If Napoleon had possessed as much imagination in some directions as in others, he would probably have given a very much different reception to a certain young Pennsylvanian who in 1807 or thereabouts visited him in the hope of interesting him in an invention which its author confidently insisted would revolutionize navigation and introduce a new epoch in international affairs. That young Pennsylvanian was Robert Fulton, who offered Napoleon a steamboat, only to be turned away as a half-mad dreamer. Ten or twelve years later in his confinement at St. Helena, Napoleon confessed that if he had given Fulton a chance to demonstrate his invention, he might have used it to rob England of her supremacy on the seas and turned his downfall of 1815 into a world-conquering victory.

We do not need to go back as far as Napoleon for examples of surprising lack of appreciation of the power of science to create new worlds. We have already heard in these Chamber of Commerce addresses on "Pittsburgh and the Pittsburgh Spirit" how many doors were closed against the giant of Pittsburgh invention and industry, George Westinghouse, when he was endeavoring to introduce his epochal discovery, the air brake. And lately in my reading I came across the following delicious utterance of John T. Sprague, a man well-known in London, England, in his day, (which was only a generation ago:) "Neither Mr. Edison nor anyone else can over-ride the well-known laws of nature, and when Mr. Edison says that the same wire which brings you light will also bring you power and heat, there is no difficulty in seeing that more is promised than can be performed. The talk about cooking food by heat derived from electricity is absurd."

Again, for the purpose of overcoming undue timidity in prophecy, we may remind ourselves that no longer ago than in 1913, T. Commerford Martin, reporting for the Committee on Progress at the National Electric Light Association's convention, declared: "The truth will emerge clearly in this period on which we are now entering, that the water powers, as such are of no use to anybody, that their development is as risky a business as mine prospecting and often as unprofitable. It could almost be said that as far as we have gone, all the capital invested in hydro-electrical development would have earned much larger profit in any other industry."

Those familiar with the different phases of the development of electricity in this country will doubtless remember the heated discussions and agitation that took place regarding the practicability of the alternating current which was being developed by Pittsburgh engineers and capital less than thirty years ago, at which time many engineers of prominence (some of international reputation) pronounced the idea as visionary, impracticable, and dangerous, and that the only successful use to which it could ever be applied would be in connection with the operation of the electric chair for the extermination of criminals.

These and many other illustrations which we might resort to admonish us that we would perhaps do well to be guided in our attempted forecast of the Pittsburgh of fifty years hence by the legend above the doors of the fabled oriental temple. On the first door was written, "Be bold;" on the second door was written likewise, "Be bold;" again on the third door was the same injunction; above the fourth door was written "Be not too bold." It will be my aim to obey all four exhortations.

The Pittsburgh of somewhat more than one hundred years ago was thus seen by Dr. Jedediah Morse, writing in 1819:

"The center of a great and rapidly increasing commerce, and the avenue through which passes the immense concourse of immigrants from east to west. It is fitted for all kinds of manufacturing establishments which require the use of fuel; and they can be supported and carried to any extent that may be necessary, and a population maintained equal to their management. There are very few places in our country which bid fairer for a rapid and extensive growth than this city. In size of places north of the Allegheny, it is next to New Orleans. In a few years this place will rival Manchester in cotton goods, Birmingham in iron ware, Russia in hempen productions, and Germany in her glass wares."

What the Pittsburgh of fifty years hence, or in other words, 1977, will be we must discover in the light of the past, and I ask you to look back with me over the fifty years which have just ended. The city at that time had a population of about 150,000. To be exact, the federal census of 1880 fixed the population at 156,389. The municipal area in 1877 was 27.31 square miles as against the 49.17 square miles of today. It will be seen that our growth in population has exceeded our growth in area very materially, for within the little more than forty-nine square miles of the city proper today we have a population of 642,000; that is to say, the area has increased a little more than eighty per cent, while the population has increased considerably more than 300 per cent.

There was in 1877 little urban development beyond East Liberty, and in fact, East Liberty itself was for the greater part sparsely settled. There was no Pittsburgh north of the Allegheny, and the boroughs of Birmingham and Temperanceville occupied the south banks of the Monongahela and Ohio. The business section then, as now, was confined to that part of the city which we have since had reason to nickname as the "Golden Triangle." The business houses of 1877, however, were of insignificant dimensions compared with the great establishments which rise from all our downtown streets today. The five-story buildings of 1877 were regarded as skyscrapers and our first eight-story building, which many of us still remember, almost inspired awe. The Monongahela House was the only hotel of note, supplemented by the Central, the St. Charles, and the Red Lion. Cobblestones were the prevalent street paving, although not universal, for one of the longest and most important of our thoroughfares, Penn avenue, then known as "The Pike" (which was short for Greensburg Turnpike, was paved in wooden block and was not entirely free from toll houses.

Neither Pittsburgh nor of course any other city had at that time any horseless street railways. The steam railroads were not yet an old institution and horses or mules were the only motive power for the street cars. Electric lighting had not yet been invented; gas lamps which shed their so-called radiance hardly ten feet were the only means of street illumination, while candles and oil lamps still lighted thousands of homes in which gas lighting was beyond reach because of the expense. The incandescent lamp was being talked about but had not been sufficiently perfected for commercial use. As for the telephone, we are informed that attempts to introduce it were even yet met with great skepticism on the part of even our most prominent business men. One of our local historians is authority for the statement that a prominent bank board consented to subscribe fifty dollars a year for a telephone only upon condition that half a dozen other banks should agree to hazard the same innovation. The editor of one of the daily newspapers being offered a telephone by the telephone company accepted it with a vague sense of impending calamity and instead of using it, relegated it to the sacred confines of a coat closet. As in Pittsburgh, so it was in other cities. There was no more resistance or incredulity in the presence of the rapidly moving commercial and industrial revolution here than elsewhere.

About an acre of grass-covered land between Grant and Ross streets, known as Second Avenue Park, was the only public recreation ground in Pittsburgh.

We had then excellent public schools, but the progress of the last fifty years is nowhere more profoundly impressive than right in this direction. In contrast with the magnificent school system of today, including a numerous group of splendid high schools, each one of which greatly surpasses in scope and equipment the average college of fifty years ago, we had then at the summit of our grade schools only one high school, while the higher education was offered only at the Western University of Pennsylvania (now the University of Pittsburgh), the Pennsylvania College for Women, and a very limited number of private schools.

The Pennsylvania railroad, the Panhandle, the Baltimore and Ohio, the Allegheny Valley, and the Pittsburgh, Fort Wayne and Chicago railroads were our main means of transporation, although river traffic was in a most flourishing condition. We did not then have nearly as large a river tonnage as now. Our shipments of coal down the Monongahela and Ohio contribute today to a river tonnage reaching the enormous total for the year 1926, of nearly 31,000,000 tons.

On the other hand, miscellaneous merchandise as well as passenger business was carried then to a larger extent on the lower rivers than now, as far as Pittsburgh is concerned, with the result that our wharves presented a scene of greater animation than at the present day.

For the reason that, as already stated, the progress of the last half century is the only measure by which the progress of the half century to come can be divined, you will bear with me, I am sure, while I present just a few statistics by means of which our remarkable growth may best be visualized. Our population growth of more than 300 per cent within the city proper has been alluded to. The population gains within what is conveniently called the Metropolitan Area including the suburbs, have of course been even more notable, for it is after all in the outskirts of our great cities that the larger growth is inevitable. And if, as now seems entirely possible, the pending state constitutional amendment already favorably acted upon by two legislatures is ratified by the people of the state and subsequently the people of Allegheny county avail themselves of the metropolitan form of government which it will provide, we shall have (perhaps by the census of 1930) a city here of approximately 1,500,000 as against the 150,000 of just fifty years ago.

The wealth of Pittsburgh is piled up in more visible form in the "Golden Triangle" than even in our finest residence sections or most fashionable suburbs. A comparison of the property valuations in the First, Second, and Third wards, which constitute the Golden Triangle, is little short of astounding. The entire assessed valuation of those three wards in 1880, was only $1,828,250. In 1890, it had risen to $38,599,876; but it was in the last three decades that the most amazing growth of property values in this key section of the city occurred. The assessed valuation of $58,414,760 in 1900 had actually increased in 1910 to $277,573,286. In the following ten years the expansion was not so rapid, the total for 1920 being $297,745,910. In the seven years that have passed since 1920, there has been another marked property development, the valuation at the beginning of the present year in the three wards of the "Golden Triangle" having stood at $344,625,560. In comparison with the "Golden Triangle" valuations of just twenty-six years ago this is a gain of 510 per cent.

Let us turn to industrial production. The value of the industrial production of the city of Pittsburgh, taking account of only the city proper and none of its great industrial suburbs, in 1926, was $711,164,-300. That compares with a production valued at $243,453,693 in 1910; $126,859,657 in 1890; and only $75,915,033 in 1880. In short, the value of our industrial production was almost tripled between 1910 and 1926, and multiplied almost ten times since 1880.

The commonest and most generally accepted index to the total business activity of any community is the volume of its bank exchanges. That index in the case of Pittsburgh reflects not only a constant but an almost phenomenal increase. The Pittsburgh Clearing House, through which bank exchanges are made, was organized in 1865 and the first clearings were recorded in 1866, the total in that year being $83,781,242. The total clearings or exchanges in 1877, just fifty years ago, were $223,569,252. Between that and 1890 there was an increase of approximately 250 per cent, bringing the 1890 total up to $786,694,231. Between 1900 and 1905 the increase was nearly a billion dollars, the 1905 total being $2,506,069,215. Our greatest period of business growth and development, however, as indicated by our bank exchanges, was the five years between 1915 and 1920 when the exchanges actually increased from $2,666,312,569 to $8,982,887,397, an increase of approximately 240 per cent in five years. Our 1926 clearings $9,197,686,607 were forty-one times as large as the clearings of fifty years ago.

Our bank exchanges, which we have just compared give a very fair idea of the volume of trade and industry as a whole. If we turn to another group of statistics, namely the reports of inbound domestic money orders at the Pittsburgh Postoffice, we shall get a clue to the enterprise and growing magnitude of our merchants. The total number of such money orders cashed in 1900 at the Pittsburgh Postoffice was 183,300 and their value $1,726,896. In 1920 their number had increased to 1,516,725 and their value to $16,952,485. In 1926, 2,349,299 were cashed of a total value of $21,884,625. If to these figures are added the money orders transmitted through the express companies, it will be seen that our merchandising concerns have been steadily and largely increasing their trade in outside territory, so that we may fairly claim an uninterrupted extension of the boundaries of our trading area and our dependent territory.

On the whole, the Pittsburgh of fifty years ago might well be likened to a young Titan in that it was endowed with tremendous potentialities and giving promise of a power unequaled by that of any other community of equal population in the world. Looking back now over the fifty years we see that the promise has been abundantly fulfilled. Even then the city was recognized as an unrivaled iron, steel, coal, and glass center that distinction having come upon it through the natural advantages of its great stores of nearby raw materials and its exceptionally favorable location for the distribution of its products throughout the country.

In passing, it must be said that our economic position and general industrial situation were at that time disturbed by a labor conflict of deplorable character. We may refer with the least embarrassment to this condition for the reason that it has since been very happily almost wholly cured. However, it is a fact that strikes were a common occurrence in mills, mines, and factories, and in 1877 we had the great railroad strike with a shocking destruction both of life and property, necessitating the temporary establishment of martial law. The events of that year form one of the darkest chapters in the city's history. The effects of the riots were long felt in many directions. Banks failed, public credit suffered, and many commercial and industrial enterprises dragged along for years under a depression which it was almost impossible to shake off. It was, after all, very fortunately the proverbial darkness before the dawn, for one cannot read our history without discerning that it was really just about at this time—fifty years ago—that Pittsburgh entered upon that era of uninterrupted prosperity which has made it, in proportion to its size, the busiest, most astonishingly productive, and wealthiest city on the globe.

There were at work at that period in Pittsburgh two men of gigantic personality, Andrew Carnegie and George Westinghouse, whose genius might almost be said to have created a new industrial epoch, and who undoubtedly, more than any of the other industrial giants developed here, were the makers of Pittsburgh's unique place in the marvelous industrial evolution of the last half century.

Mr. Carnegie's phenomenal business sagacity left an impress which is still felt and for generations will continue to be felt in the iron and steel industry, with the consequence that Pittsburgh became the world's most important iron and steel-producing center. The marks left by Mr. Westinghouse, a great industrial creator and inventor, upon the age, were at least as wide-spread. He laid in Pittsburgh the foundation for a number of vast industrial enterprises which have not only made a tremendous contribution to the city's wealth and prosperity, but have served, perhaps more than any other one thing, to carry the name and fame of Pittsburgh to every part of the civilized world.

It is to the everlasting glory of Mr. Carnegie that, apart from his achievements in the industrial field, he gave a powerful impetus to our civic and educational development by the establishment and endowment of the Carnegie Institute including not only the great library, museum, and art galleries, but the Carnegie Institute of Technology as well.

In the Carnegie Institute of Technology, where young men and young women are taught both the manual trades and the higher arts, and in the University of Pittsburgh, with its various colleges and its magnificient cathedral-style home now rising, Pittsburgh has educational facilities for its youth which are bound to stimulate ambition, develop genius, and provide us with a leadership for the future which need not fear comparison with our leadership in the past, magnificently inspiring as that has been. If we should know what is in store for our community and what likelihood there is of its producing generations of men and women surpassing any of its products of a purely material character, we must reckon with these splendid university schools just spoken of and with others that we have not the time and space to mention.

There is one adjunct of the University of Pittsburgh which deserves, I think, particular notice in any discussion of what Pittsburgh has done or what Pittsburgh is likely yet to do in the way of significant contribution to the up-building of our modern industry and civilization. I mean the Mellon Institute of Industrial Research, generously founded by Mr. A. W. and Mr. R. B. Mellon and carrying on original scientific researches and investigations which have already proved invaluable to industry and are bound to be increasingly serviceable in the discovery and development of new industrial processes and methods as time goes on.

If a capacity for discovery, a faculty for pioneering, is necessary for the progressive development of any community into one of the great significant of the country or the world, we may take comfort in the fact that Pittsburgh has repeatedly shown itself not to be without resources of this kind. One of the biggest accomplishments of the twentieth century has been the quickening of communication. It may be said without any appearance of boasting that Pittsburgh has played an enviable part in bringing the nations closer together, for it was here that the engineers of the Westinghouse Electric & Manufacturing Company not only developed the science of radio broadcasting, but also, by the erection of KDKA, established Pittsburgh as the pioneer broadcasting station of the world.

The first practical demonstration of radio broadcasting in any country occurred on November 2, 1920, when the results of the Presidential election were broadcast in Pittsburgh from the pioneer station. The second red-letter event in the development of radio science came on January 2, 1921, when, for the first time in history, religious services were broadcast from a church, the church in this instance being Calvary Episcopal Church in this city.

Transmission of an entertainment program to England was accomplished on December 31, 1923, the hearing of Pittsburgh's voice in Europe provoking worldwide comment. But a greater miracle was yet to come, for on December 12, 1924, KDKA's short waves carried to the "Johannesburg (South Africa) Star" a report of the Owen D. Young dinner in New York.

On January 26, 1925, KDKA's broadcast was heard in Australia. Two nights later an Australian station received KDKA with such strength that it was able to rebroadcast the program. Pittsburgh's voice was thus heard half way round the world.

The latest and most spectacular example of this marvelous method of bringing the nations within speaking distance of one another was afforded by the triumphant home-coming of Charles A. Lindbergh from his historic flight across the Atlantic, when a radio hook-up made it possible for 300,000,000 people to "listen in" on President Coolidge's greeting and the heroic young aviator's response.

Inasmuch as the vision and the faith of the men of Pittsburgh are the things on which we must depend to make a reality of the great future of which we dream, it will surely not be deemed out of place to refer briefly to another Pittsburgher of the past who found here the secret that made possible one of the greatest advances in the upward and onward march of mankind. Professor Samuel Langley, acknowledged builder of the first heavier-than-air machine that actually was capable of sustained flight, is the man. Professor Langley died without bringing his machine to the point where it could be commercially exploited. His title to the incomparable distinction of having thus solved one of the most baffling problems of the ages, blazing the way to aviation, is beyond question. Surely we shall be pardoned for pride in the fact that it was while he was director of the Allegheny Observatory in Pittsburgh that he not only did this supreme thing, but at the same time did his best work in the astronomical field.

We cannot prolong our survey of the progress which, beginning when we had the distinction of being the outpost of western civilization, has through a period of 175 years brought us to our present foremost position among cities. It has been a hurried survey, recalling only a few of the particulars which have been given you by the gentlemen who have preceded me in this series of addresses on "Pittsburgh and the Pittsburgh Spirit". Our brief retrospect was necessary, however, because we may be certain that this rich, prosperous, highly industrious and industrialized Pittsburgh whose rise we have been tracing fore-shadows the Pittsburgh which is to be. For my own part, I have both pride in the past and confidence in the future as I turn to the question, "What will Pittsburgh be fifty years from now?"

To begin with, in our attempt to anticipate the character of our future development, it is my judgment that the first great event affecting the course of our program during the half century ahead will be the establishment of a greater city, whose area will be the same as that of the county. This event, as has been said, is now clearly within sight through the medium of the proposed constitutional amendment for the creation of a metropolitan government in Allegheny county.

In view of the fact that the consolidation of contiguous urban areas is under way, and in view of the admitted waste and lack of efficient coordination inevitably resulting from the existence of 124 independent municipal governments in Allegheny county, the coming of a metropolitan government here sooner or later seems as certain as anything human can be.

What it will mean to every citizen of Allegheny county to be counted as a citizen of a city of 1,500,000 people every business man knows. The commercial, financial, and industrial prestige attaching to a city of that size is at least twice as great as the prestige attaching to a city of the much smaller population now credited to Pittsburgh. With the prestige bringing about an entirely new attitude on the part of the whole country to Pittsburgh there will unquestionably come new population, new trade, new industries, which can be secured in no other way. It is no species of day dreaming, but an exceedingly practical judgment acquired through a long business experience and acquaintance with the habits of men, which leads me to the belief that the new rank which will be conferred upon our city by the metropolitan legislation will benefit us far more in a material way than anything else that has happened for more than two generations.

It is not only as a tremendous stimulus to our growth that the metropolitan city will affect us. It will also operate as a beginning of great community improvements, of county-wide proportions, which could not hitherto be undertaken because there was no way of securing the necessary concerted action. I trust I shall not seem too bold if I predict that the success of the metropolitan plan, making us the fourth or fifth city of the United States with a population of 1,500,000 in 1930, will so speed up our development as to give us a population of over 2,000,000 in 1940.

The next great event playing a more than ordinary part in the molding of our future will be, I am bound to believe, a marked development of our water transportation facilities. It is a rather singular fact that while George Washington saw the strategic importance of our position at the point where the Monongahela and Allegheny unite to form the Ohio, we have never enjoyed full advantage of that position commercially. We are virtually at the head of the greatest waterway system on earth, for nowhere is there a greater industrial and commercial region than the Ohio and Mississippi valleys. We cannot but think that the slackwatering of the Ohio should have proceeded faster. However, we now have reason to expect that the completion of the Ohio river improvements, bringing dependable all-the-year-round river navigation from Pittsburgh to the Gulf, will be witnessed during the next two or three years.

The recent tour of nearly four score of Pittsburgh's financiers and industrialists to the leading cities of the lower rivers was a proper recognition of the enormous expansion of trade which will without doubt follow in all the river ports from Pittsburgh to New Orleans shortly after all-the-year-round navigation begins. The vast river-railroad terminals that some of these cities have already built clearly indicate what is coming.

Pittsburgh now has a railroad tonnage of 175,000,000 annually with a river traffic of more than 30,000,000 tons annually. Our railroads are energetically enlarging their facilities to meet the demands of our constantly increasing industrial output, but there is no question that it is in the direction of our waterways that we must look chiefly for greater power to compete in the markets with rival cities. The Carnegie Steel Company, the Jones & Laughlin Steel Corporation, and others of our steel producers are already shipping considerable quantities of steel by river to the great southwestern markets. This traffic is only in its infancy. It is easily conceivable that within the next decade we shall have found outlets by river for two or three times the tonnage now shipped in that way. The strengthening which will accrue to our steel industry from this more economic form of transportation cannot easily be overestimated.

Furthermore, we have within our reach the Great Lakes as well as the Gulf. Just as the river improvements will make Pittsburgh a Gulf port, so the proposed Ohio river and Lake Erie canal will make it a lake port, enabling us to bring iron ore from the Lake Superior mines at such a material reduction of cost as, added to the natural advantage of our incomparable coal, will make it possible for Pittsburgh to achieve a more decided supremacy in the basic iron and steel industry not many years hence than it has ever had before.

Just when the Ohio river and Lake Erie canal will be built it is not our purpose to undertake to say. Its feasibility from both the commercial and engineering points of view is unquestioned. Its bearing upon our economic future is vital. While, therefore, we cannot say when it will be built, its building seems inevitable. And from the moment when Pittsburgh is enabled not only to ship its finished products but also fetch its raw materials by water it will enter upon a growth and prosperity to which we would hesitate to set any limit.

This waterway development of which we speak will in no sense, in my judgment, be a displacement of railroad business. We men of business are all aware of the tremendous additions that the railroads of the United States have been making to all their facilities and equipment, and the magnificent service which they render. How many billions of new capital they have invested in late years the business world knows. They have never been spending larger sums or giving better service than now.

Within the next decade or two there will undoubtedly be railroad electrification on a large scale which will stimulate one of our most important Pittsburgh industries. The great electric locomotives produced by the Westinghouse Electric & Manufacturing Company will be standard equipment on many thousands of miles of American railways in no distant future. We have every reason to suppose that railroad development in the United States will continue at an accelerated rather than a diminished rate. The great days of American trade and industry are not behind but ahead.

So enormous will be the distribution of products throughout our great national domain that the maximum development of which our railroads are capable will still not avail to meet traffic demands unless supplemented by some such system of national waterways as Secretary Hoover is earnestly advocating. Mr. Hoover's program, let us note, assumes that a major role in his great drama of water transportation will be played by the river system of which the Allegheny, Monongahela, and Ohio are a part.

When Pittsburgh has become not only the head and center of the vast river commerce for which men of foresight are already equipping their industries, and when we have also diverted a large part of the commerce of the Great Lakes this way, we shall be ready for still another far-reaching stage of our evolution. This next phase, I confidently believe, will be an unparalleled diversification of our industries. I have already indicated reasons for my faith that our supremacy in iron and steel will remain unchallenged for a long time to come, as an editorial writer for the "Wall Street Journal" not long ago concluded. It is, in fact, within our power to increase our share of the country's iron and steel production by means of the waterway improvements to which we have just been giving our attention. But apart from iron, steel, coal, and glass, the industries which in a past generation were our staples and with which we were seemingly satisfied, an expansion of our productivity seems to be an inherent necessity of our geographical position and that expansion can hardly help taking the direction of very extensive diversification.

We shall diversify, not because of any mere resolution to diversify, but because we happen to have virtually unlimited manufacturing facilities and transportation potentialities along with a situation within twelve hours' railroad ride of a larger population than any other city of comparable size in America. To be specific, within a 500-mile radius of Pittsburgh there is a population not far short of 75,000,000 or more than sixty-six per cent of the population of the United States. It is the most highly industrialized and most prosperous region on the face of the globe. The population of this part of the United States within the 500-mile radius of Pittsburgh is nearly twice as large as that of all the rest of the United States. It includes more than 1,700, or nearly sixty per cent, of all the cities in the United States and Canada of a population in excess of 2,500.

We have the richest coal beds on the continent and an unlimited supply of electric power at lower rates than any other American community with few exceptions, so we must set all economic laws at defiance in order to doubt the development of an enormous diversification of industry within the next generation at this favored spot. Already the departure from the few great staple lines of production which contented us in the past has reached notable proportions.

Considering that the cost of distribution is a fundamental factor in the success or failure of enterprise and that Pittsburgh is closer than any other large center to the bulk of population, we should be astonished if this foreordained diversification of Pittsburgh industry has not already manifested itself.

Our railroad equipment, electrical machine, food, aluminum, refractory, by-product coke, chemical, oil-refining, and oil-field equipment, machine tool, cement, radium and vanadium industries are among the largest in the world. We have the largest steel plant, the largest air brake, railway signal and safety appliances manufacturing plants, the second largest electrical works, the largest aluminum plant, the largest cork works, and the largest food-packing plant, in the world. There are already in the Pittsburgh district no less than 300 lines of manufacture, most of them of a ferro-metallurgical character, but with scores entirely unrelated to the ferro-metallurgical industries.

Iron and steel are manufactured in 51 communities of the Pittsburgh district; glass products in 28; clay products in 16; chemicals in 14; machinery and tools in 12; enameled ware in 11; non-ferrous metals in 9; railroad equipment in 8; tin and terne plate in 7; electrical equipment in 5; and paint and varnish in 4 communities.

Perhaps some one will say that our anticipations of Pittsburgh's future take on too much of the color of our own desires. That is to say, the wish may be regarded as the father of the thought. It is well to note, under the circumstances, that predictions of gigantic growth here have been made by people who cannot for a moment be suspected of prophesying from self interest.

The world is moving so fast that the manufacture and sale of airplanes at lower prices than automobiles may come in five or ten years hence. At the same time, our inventive genius may produce a control which will enable the planes to land more advantageously than at present. It will then be possible for people of even the most moderate means to live without inconvenience thirty, forty, sixty, even one hundred miles from the place of their employment. The barriers which now limit the geographical extent of cities will then have disappeared. There is accordingly nothing unreasonable in the expectation that cities covering an area equal to that of a half dozen of our present counties will be evolved. They will, of course, be free from the acute congestion which now afflicts our large cities in their central business areas.

The cities of the airplane era, when practically all able-bodied men will be fliers, will extend over vast areas and will have many shopping and marketing centers instead of merely one or two such centers as now. They may even be so large that city governments will more and more take on what may be described as the federal form, with the subsidiary or local centers (call them boroughs or what you will) retaining and exercising a large measure of self government in purely local affairs. Even with this qualification we can hardly be accused of rashness if we forecast cities with populations of 25,000,000 and we are warranted in supposing that Pittsburgh will be among the largest of these huge aggregations of human beings, for reasons to which we have already referred.

Whatever the future may hold for this America of ours it seems inevitable that Pittsburgh will gain rather than lose eminence.

The fact that the territory for 200 or 300 miles on every side is the most highly industrialized territory in this or any other country gives us another ground. This wonderful industrialization is not the product of whim but of inherent and inalienable natural advantages, which are the assurance that it will continue.

A third ground for our faith is found in the traditional character of our population. It is a blessing, not a curse, that Pittsburgh has become a synonym for industry. It is a fashion here for even the richest to work. That fashion and that example have had their effect upon our people as a whole. Nowhere in the United States is there more industry or thrift.

The spirit of 1877 has fortunately passed. Our labor is given, to a greater degree than in almost any other of our great industrial centers, to cheerful production rather than discontented agitation. The result is what one might have foreseen—namely, we have the best paid and most prosperous labor in America and per capita wealth of the people of the Pittsburgh district is higher than that of the people of any other section of the country. Metropolitan Pittsburgh, as may be proved by reference to the reports of the federal census, is the fourth metropolitan area of the United States in point of poulation while it leads all in individual buying power.

If Pittsburgh fifty years hence were ten times as large as it is today, and I believe it will be; if it were several times as rich and powerful as it is today, and I believe it will be; if its commerce found a dozen new outlets, and great fleets of vessels from both the Gulf and the Great Lakes were entering our harbor, as I believe they will be; if the vast factory power which has enabled us to hold our present ratio enables us to do likewise in the America of 200,000,000 people which in another generation is to be—if all this came to pass, but nothing more, we might yet be disappointed in the Pittsburgh of 1977.

We desire all this magnifying of our population, our trade, and our financial power, but we desire just as much that this shall be a better as well as a greater Pittsburgh. There are happy omens that this higher heritage also shall be ours. We are thinking seriously of our human obligations. We are cultivating good-will and mutual understanding between employer and employee. We are building great temples and cathedrals of learning to which our young men and women are pressing in a multitude that brings within sight the day when Pittsburgh will be looked to by hundreds of thousands of youth in all parts of the land for the gifts of mind and spirit as eagerly as Israel in the desert looked to the Promised Land. Our industry and our wealth must be transformed in constantly increasing measure into spiritual enlargment and social light and beauty, after the manner of the parable of industry which that great Pittsburgh artist, John W. Alexander, has left so beautifully painted in the Carnegie Institute upon the spacious walls of Alexander Hall. Our wealth and our industry are in vain unless they gain a richer life and a deeper joy in even the lowliest work for us all. In those masterly murals Mr. Alexander not only fondly indulged a lofty dream for his city of Pittsburgh, but dared to make a glowing prophecy, and I take his prophecy for my prophecy, for I believe the Pittsburgh of fifty years hence will have made it come true.

MY CITY OF WONDERS

JAMES FRANCIS BURKE

James Francis Burke was born in Pennsylvania, October 21, 1867, and was educated in the public schools and the University of Michigan. He is a member of the bar of Michigan, the bar of Pennsylvania, and the bar of the Supreme Court of the United States. In April 1892 he founded and became president of the American Republican College League with branches in the leading colleges and universities of the United States. In August 1892 he was elected secretary of the Republican National Committee. He has participated in all Republican national conventions from 1892 to 1924, inclusive; was a representative of the United States in the Parliamentary Peace Conference at Brussels in 1905; was a member of Congress from 1905 to 1915, when he voluntarily retired to resume his law practice He was United States War Savings Director during the World war.

He is general counsel for the Chamber of Commerce of Pittsburgh and Pittsburgh Clearing House Association, and represents many trade and business organizations throughout the United States, including the Bolt, Nut and Rivet Manufacturers Association, the Aluminum Wares Association, the American Paving Brick Manufacturers Association, and the American Cold Rolled Strip Steel Association.

In June 1927 he was tendered the office of Assistant Secretary of Commerce by Secretary Hoover. In December 1927 he was elected general counsel of the Republican National Committee, and on January 7, 1928 was designated as parliamentarian of the Republican national convention of 1928.

My City of Wonders*

BY JAMES FRANCIS BURKE

AT the close of the first fifty years of its history, the Pittsburgh Chamber of Commerce found the American business world engaged in taking an inventory of its capacity to keep pace with the enlarged responsibilities to which we fell heir at the close of the World war.

It soon became apparent that this organization must do likewise.

In keeping with America's custom of furnishing a man for every emergency, a genius appeared in the Chamber's councils. His brain and body proved to be a veritable storehouse of inexhaustible energy. He urged and undertook a reawakening of the spirit of Pittsburgh. Out of the dead past and the living present he called for not only a resurrection but a virile expression of the mighty forces that have made this industrial empire one of the real wonders of the world.

He marshaled an army of leaders to do his bidding and glorify a community.

From archives that had become dust begrimmed and from memories that had become indifferent, his magic wand beckoned a story of golden triumph.

The lips and pens of leaders in every line of activitiy have unfolded a story of moral and material achievement that is at once a source of pride and inspiration to every man and woman in Western Pennsylvania.

As a consequence of it all, our city stands rejuvenated and this distinguished gathering is one of its happy consequences.

The genius of whom I speak and to whom we are all indebted tonight is the most potent of all dynamic forces in that galaxy of unselfish civic leaders who constitute the board of the Pittsburgh Chamber of Commerce—our former president, Arthur L. Humphrey.

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*This address by Mr. Burke, passing in review the addresses in the "Pittsburgh and the Pittsburgh Spirit Series," was delivered at a dinner tendered to the Hon. Andrew W. Mellon and the Hon. James J. Davis on May 28, 1927.

For nearly a third of a century I have participated in the Chamber's public functions and have had the honor of presiding over many, but at no single table in all that stretch of time can I recall an array of leaders of substantial achievement as fine as that which flanks my left and right at this moment.

Let me call the roll of honor in this powerful portrayal of our city's achievements.

Would you hear the story of Pittsburgh's contribution to civilization? There sits its author, John G. Bowman, chancellor of the university that bears our city's name.

Is it the story of the origin and history of our city that commands your interest? There sits the painstaking William H. Stevenson, president of the Historical Society of Western Pennsylvania.

Is it the marvelous development of the glass industry that has commanded your admiration? There sits its rugged and brainy leader in the person of William L. Monro, of the American Window Glass Company.

Is it the romantic story of the birth and the spread of the petroleum industry around the world? There sits that engineering genius, George S. Davison, of the Gulf Refining Company, whose name is synonymous with success on both sides of the equator.

Is it the story of the forge and blazing furnace, the ingot and the fabricated steel that has bound the world together? There sits William G. Clyde, that young genius who presides over the company that was the parent of it all.

Is it the fascinating story of aluminum that began with the crude ingot and reached the climax of its conquering career when that aluminum blade carved among the clouds the path of that young eagle, whose plane never touched land or sea from the moment the "Spirit of St. Louis" left the American shore until it landed in the heart of the French Republic and thrilled the world? There sits the incomparable Arthur Vining Davis, president of the Aluminum Company of America.

Is it the transformation of our public utilities from the earliest stage of their development to their modern power and perfection of today? There sits James Dawson Callery, whose boyhood and manhood gave to them the best service his fine abilities could command.

Is it electricity captured from the clouds and devoted to a million uses at man's merest whim? There sits E. H. Herr, president of the pioneer and greatest electrical manufacturing company in the world.

Is it the world famed air brake and those other safety devices that have saved millions of lives from the hour of their invention? There sits Herman H. Westinghouse, chairman of the board of the greatest safety appliance institution on earth.

Is it the story of cork, that has not only saved countless lives imperiled at sea, but applied itself to manifold uses of mankind from the laboratory of the chemist to the floor covering of factory and home? There sits the founder and president of the greatest cork company in the old world or the new—Charles D. Armstrong.

Is it our steam railways that are bearing man's burdens from place to place and bringing communities into more intimate touch as the hours go by? There sits Edward T. Whiter, whose physical and intellectual capacity has won him his honored and cherished place in the world of transportation.

Is it the purification, preservation and distribution of food throughout the world? There sits Howard Heinz, whose name is synonymous with the highest standard of integrity wherever the magic sign of "57" challenges the eye throughout the world.

Is it the story of water transportation from the Indian canoe to the steel barge of mighty tonnage of today? There sits William B. Rodgers, whose family name has been sung by our streams on their way to the sea for half a century.

Among those whose absence we regret tonight—but whose contributions to the story of Pittsburgh's progress, we acknowledge with gratitude, are B. F. Jones, Jr., J. Frederic Byers and J. H. Hillman.

Is it her public school system, her higher education, her art, or her religious spirit, or any of the higher and finer humanities? There sit Dr. William M. Davidson, Dr. Thomas S. Baker, Homer Saint-Gaudens, Dr. Samuel B. McCormick and Bishop Alexander Mann, every one of them equipped to the last degree to impart the spirit of the activities to which they are devoting their lives.

With such a fund of material to draw upon and such an array of intellectual wealth and vigor to weave the fabric into finished form, what could stay the progress of our community?

But in our elation over our possessions let us frankly face some of our failings.

One of our city's weaknesses has been pointing out God's original blessings in addition to the many substantial accomplishments of our ancestors, and then folding our arms in self-contentment.

Too many people in the world assume that our duty is merely to sustain the structures of our forefathers, ignoring the fact that the world is moving onward every hour, that the spirit of competition among communities is keener than ever in history, and that we must toil if we would triumph as we go.

Flattery may satisfy the superficial, but it does not build cities. The plain truth is often needed to induce people to realize their shortcomings, correct their errors and meet their responsibilities.

During the last century the words "thrift" and "enterprise" had few finer exemplars than the builders of this community.

The rolled-up sleeve, the hardened muscle, the untiring energy, the inventive brain, and the poetic vision that not only builded as they went but peered into the realms of prophecy, stamped her people as possessors of a combined ruggedness and refinement that entitled them to a high place among God's most favored children.

And what is her glorious heritage?

Time will not permit a portrayal of her many priceless possessions. She is fortunate in her three great waterways; her twenty-five different railroad systems; the largest aluminum finishing plant in the world; the largest structural steel plant; the greatest wire manufacturing plant; the greatest window glass factory; the largest cork factory; the largest electrical generating plant; the largest fabricating steel structure plant; the largest preserving plant; the largest blast furnaces; the largest electrical conduit factory; the largest tube and pipe mill; the largest bolt, nut and rivet factory; the largest sanitary equipment factory; the largest table glassware factory; the largest vanadium finishing plant; and to prove that she is keeping pace with modern progress, she established what was the pioneer, and is now the most powerful broadcasting station in the world.

Incident to this we will make history tonight by having two members of the cabinet address us from this rostrum while a third, Secretary Hoover, will prove the wonders of the wireless by addressing us from a station a thousand miles away.

All this brings to mind the historical fact that no man in all the world had greater faith in and gave more material assistance to the development of the radio art than Thomas Hartley Given whose pioneer leadership justifies this tribute to his memory tonight. Like the voice of the radio itself his spirit speaks to us in the scientific triumph he encouraged when others faltered.

Now a word as to our city's natural beauty.

Her rugged hills and busy valleys are not without their charms.

Have you ever had a real birdseye view of Pittsburgh?

No human being ever stood on the crest of Mt. Washington by night and looked down upon the million lights that blaze from the windows of her towering structures, illumine her highways, and reflect themselves in the streams that swing two valleys into one, and then looked up to the countless gems of night that shed their holy light upon the world, without realizing that here was one of the rarest combinations of the charms of heaven and earth that ever revealed itself to human eye.

Below, we gaze upon the busy scene of man's never-ending struggle; above, we contemplate the incomparable serenity of God's abode among the stars.

And what of her famous men and women?

In the world of industry, we point to Andrew Carnegie, Henry Clay Frick, Benjamin Franklin Jones, Henry W. Oliver and Henry J. Heinz, all of whose monuments and memories are our cherished possessions of today.

In the world of inventions, we point to George Westinghouse, whose fame will long survive the activities that stamped his name upon history as one of the giants of his day.

In the world of statesmanship I point to Edwin M. Stanton, who stood at Lincoln's side, sustaining the pillars of an imperiled republic; and to Philander C. Knox, who was the counsellor of three Presidents and an intellectual leader of the senate at the very zenith of its influence.

In the world of literature, I point to Richard Realf, whose facile pen portrayed our city leading the world in "the bannered march of crowned humanity"; to Samuel Harden Church, whose scholarly mind and facile pen revealed in a new light the genius of his "Cromwell"; to Doctor William J. Holland, whose charming volumes tell their own fascinating story of the most delicate and beautiful creatures to whom God has given wings of flight; and to our own Mary Roberts Rinehart, the charm of whose fiction holds millions under its magic spell.

In the realm of music, while Charles Wakefield Cadman is charming the world's ear today, I still listen enraptured to my boyhood friend, Ethelbert Nevin, as "Narcissus" and "My Rosary" reveal the harmony that God had planted in his soul; and then comes the memory of Stephen Collins Foster, bearing me into every corner of the universe where the "Swanee River" and "My Old Kentucky Home" have breathed the spirit of simple melody into the living hearts of all mankind.

If it be in the world of science I take you to the world's watch towers of astronomy, where the movements of the planets and the mysteries of the stars are being fathomed through the lenses that stamped the beloved John A. Brashear as one of the most gifted geniuses of this day.

If it be in the world of labor, I point to the mill boy of yesterday and the statesman who sits as a virile Presidential aid and counsellor today—the Honorable James J. Davis.

If it be the world of finance, I point to that patient, far-sighted, gentle character who, in the field of private enterprise, builded like a colossus, and in the domain of national and international finance displayed the vision of an eagle and the polish of a diplomat, in leading the world out of chaos—our own Andrew W. Mellon.

If it be in finished products, whether it is her armor that shields our boys in battle, her cork that bears them up when the wreck has cast its precious freight upon the waves; her turbines that propel the great "city on the sea", or the generator that lights the homes and highways of the world; whether it be her steel rails over which we speed from state to state in the new world, and country to country in the old; whether it be her locomotives and steel cars that plunge here and there with their mighty burdens to meet the needs of nations; her air brake that halts them in the face of danger; her glass through which we study the fashions in the windows of London, or her mirrors that reflect back our own images in the drawing-rooms and boudoirs of continental Europe—there she stands towering above all others in all her incomparable majesty like Mont Blanc among the Alps, as she blends in one glorious harmony her blazing furnaces, her busy counting houses, her roaring mills, her countless homes of learning, her temples of art, and shrines of religion, under skies upon which God paints those golden sunsets that are the wonder of the dying day.

Whether it be her 12,000 miles of navigable highways that plead at her very doorway for an opportunity to carry her freight, or her twenty-five railroad systems that bring her within a night's journey of 64,000,000 of the people of North America, she has written over the face of all the earth the irresistible story of her natural resources her inventive genius and her accomplishment.

What community ever builded on a surer foundation? What community ever furnished a sturdier background for enterprise or for investment?

Where in all the world have intelligence and industry combined to insure with greater certainty the stability of the future than here where I have spent my boyhood and my manhood, and under the green turf of whose hills I shall dream away the future years, as my spirit lingers over the cherished scenes and loving faces of this great Wonder City of the World.

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