above 4.8.1927: LOOKING WEST. WESTINGHOUSE BRIDGE, TURTLE CREEK. opposite page 1896: PITTSBURGH'S POINT AND OLD RIVER BRIDGES.
In the Golden Age of Bridges

by Gerald M. Kuncio
4.8.1927: LOOKING EAST, LIBERTY BRIDGE, MONONGAHELA RIVER. opposite page & top corner of continuing pages • NINTH STREET BRIDGE.
HE NEWSPAPERS STRONGLY FAVORED IT.

Editorialists thundered that to defeat the measure would mean that the county is "standing still or going backward" in the race with other industrial centers. Votes in favor "will be votes for progress; votes against ... will be votes for retrogression." Approval would make the area a "more pleasant" place to live and would provide "an attraction for those considering new locations." More than 50 civic groups pushed for it. The Chamber of Commerce called the improvements "urgently necessary." Politically, the proposal split the Allegheny County Republican party, threatening its control over the County Commission. New stadiums for the Pirates and Steelers? Plan B? 1999? No, the debate occurred almost 75 years ago, as Allegheny County considered the merits of a massive road and bridge improvement program.

Announced in March 1924, the county's comprehensive "Ultimate Highway System" was designed to carry the road system
into the 21st century. Under the plan, radial roads would connect Pittsburgh with the outlying areas of the county while also connecting suburban towns without having to enter the city. New boulevards would whisk traffic along the rivers. And joining the riverside boulevards and spanning deep ravines would be new, long-span bridges.²

The Ultimate Highway System was never completed, although portions of it were being built as late as the 1950s. However, the system’s legacy lives on in the form of magnificent bridges—at Sixth, Seventh, and Ninth streets; plus the West End and McKees Rocks bridges; the Liberty, South 10th Street, and Westinghouse Memorial bridges—that are, among others, signatures of the county’s modern landscape. All were erected between 1924 and 1940, a Golden Age of bridge building that cemented Pittsburgh’s reputation as the “City of Bridges” and marked the county as a world leader in bridge design. The program produced a political backlash, however, that decimated the local Republican party and helped usher in a 60-year era of Democratic control of elective offices in county government.

**Improving the Area’s Infrastructure Had Been an Abiding Concern** of civic and political leaders since the early 20th century. In 1909, the city of Pittsburgh hired the renowned firm of landscape architect and urban planner Frederick Law Olmstead to develop a new vision for the city. The immediate impetus was a U.S. War Department declaration that six bridges over the Allegheny River were obstacles to navigation. The calls for action only increased as booming industrialization in the county’s river valleys and a 10-fold jump in automobile registrations between 1910 and 1921, including a disproportionate increase in commercial vehicles, outstripped the highway system.³

The most vocal advocate for improvement was the Citizens Committee on the City Plan of Pittsburgh (CCCP). Formally chartered in 1918, the CCCP was founded by some of Pittsburgh’s leading industrialists, including Richard Mellon, Charles D. Armstrong, Roy Hunt, Henry Buhl, and W. L. Mellon. The CCCP developed a framework for the area’s future development that included a major new highway plan that would divert cross-city automobile traffic away from the downtown triangle by increasing the number of river crossings.⁴ Despite its well-reasoned approach and the support of some of the city’s most influential members, the CCCP was unable to garner popular support for its plan. A 1920 bond issue was soundly rejected at the polls. Two years later a similar proposal facing certain defeat was pulled from the ballot prior to election day. Each measure fell victim to fear over the projected level of county indebtedness and a lack of interest from the county’s Republican administration.⁵ Clearly, if an improvement program was to win support, it would need a political champion.

Joseph G. Armstrong, a 1923 candidate for county commissioner, emerged as that champion. The affable Armstrong, a former mayor and director of Pittsburgh’s Department of Public Works, was a career politician with long ties to the county’s Republican party, the dominant political force.
According to contemporaries, Armstrong’s chief motivation was a genuine concern about Pittsburgh and Allegheny County. He agreed that inadequate infrastructure threatened the county’s national status, and he reasoned that only the county government had the “public credit” necessary to launch a comprehensive improvement program. Ever the politician, Armstrong also recognized that such a campaign would profit the county’s steel mills and construction companies. And there was a considerable subsidiary benefit. The county Republican party was divided into two competing factions. A large-scale improvement program would create a vast patronage network loyal to Armstrong and his political machine.

In 1923, Armstrong triumphed in a close primary, then ascended to the chairmanship of the Allegheny County Commission. He made the improvement campaign the first order of business. The support of Armstrong’s Republican coalition made all the difference to the voters. Despite a hasty publicity campaign and some public concern over a lack of specifics in the county’s program, a $29 million bond issue ($18.5 million for bridges) passed on April 22, 1924, by a better than two-to-one margin.

To prosecute the campaign, Armstrong revamped county government, creating in January 1924 the Department of Public Works (DPW). The revolutionary new department centralized and greatly expanded the functions formerly handled by two separate offices, the county engineer and the office of road commissioner. The DPW was organized to be a self-contained organization with the technical and administrative personnel necessary to design roads and bridges and supervise their construction without the need to engage expensive outside consultants. Its $15 million operating budget (59 percent of the county’s revenue) was larger than that of many state governments. This would prove to be controversial.

The DPW’s director was Norman F. Brown, another former head of the Pittsburgh DPW and a political ally of Armstrong. Vernon R. Covell, the former county engineer, oversaw the Bureau of Bridges. Apparently Brown and Covell did not get along, but Covell could not be removed from his position. Covell was supposedly given a desk in the hallway and no real responsibilities. Nevertheless, he is listed as bridge engineer on all county bridge plaques from the era.

And bridges were the highlight of the program. The Pittsburgh area, of course, was already famous for its bridges. Most long-span highway structures had been built by private toll companies or streetcar

**Between 1924 and 1932, the county would erect 99 bridges costing $47 million.**
lines to meet existing needs. Those bridges were designed by some of the best-known engineers in the country—men like Brooklyn Bridge designer John Roebling, who produced suspension bridges over both the Allegheny and Monongahela rivers, and Gustav Lindenthal, the engineer of the masterful Smithfield Street Bridge. Beginning in the late 19th century, City of Pittsburgh engineers contributed masterpieces like the Panther Hollow Bridge, a classic example of a three-hinge metal arch, and a series of handsome open-spandrel reinforced concrete arches at Larimer Avenue, Meadow Street, near the Pittsburgh Zoo on Butler Street, and at the entrance to Schenley Park on Beechwood Boulevard.

Two factors make the county’s bridge building program of the 1920s and 1930s unique in the history of the area. First, bridges were to be built in large numbers as part of a comprehensive transportation system, rather than on a piece-meal basis. Between 1924 and 1932, for example, the county would erect 99 bridges costing $47 million. Second, design and construction would be the responsibility of the county government. Previously county engineers had been minor players in the area’s bridge construction, primarily designing small, standardized arches and steel beam bridges. A number of monumental bridges had been built under its auspices, like the Washington Crossing and Jack’s Run (California Avenue) bridges, but these had been designed by consulting...
engineers. With the new program, county engineers would move to the forefront.

Few engineers faced the wealth of challenges that confronted the DPW in remaking Allegheny County's transportation system. County personnel had to contend with four navigable rivers, steep hills and deep ravines, a densely built and populated core, and the appropriation of the limited flat land along the rivers by railroad companies and industries. They also had to coordinate their work with the myriad groups that had a stake in bridge design and location. The DPW answered this daunting array of obstacles with a remarkable flowering of bridge designs that embraced new technologies or applied existing technologies in innovative ways. The bridges created by the DPW would mark the county as a world leader in bridge design.

The design and construction of the "Three Sisters"—Pittsburgh's Sixth, Seventh, and Ninth Street bridges (1926-1928)—illustrate the array of topographical and political challenges faced by the DPW's engineers, and the creative solutions they developed in response. The War Department ordered the existing bridges to be replaced, declaring them obstructions to navigation because of inadequate clearance between the water pool and the...
bridge decks. Local merchants insisted that all three crossings had to remain. City officials did not want the new bridges to interfere with planned riverfront improvements or to create extensive property damage, meaning that the grade and alignment of approach roads could be only minimally altered.

The DPW initially responded by designing three identical cantilevered, through-truss bridges that kept the number of piers in the water to a minimum and provided the necessary vertical clearance over the river without extensive changes to the approaches. However, the influential Pittsburgh City Art Commission, an advisory body created during the “City Beautiful” movement in the early part of the century, rejected the designs as “aesthetically inadequate.” They preferred that suspension bridges be built. But there were significant engineering problems associated with using suspension bridges. First, the anchorages used to support the cables of a traditional suspension bridge would interfere with existing railroad operations on the north bank of the Allegheny River and with proposed wharf and street improvements on the downtown side. Second, the depth of the bedrock and the condition of the subsoil made the anchorages subject to slipping.

Faced with a potential impasse, the DPW proposed building innovative “self-anchored” suspension bridges. Only four such bridges had been built—none in the United States. The ingenious structures, designed by engineer T. J. Wilkerson, did not use traditional anchorages. Rather, the suspension members were tied to the bridge’s stiffening girders, which acted as struts that resisted the pull on the suspension members. The design met the art commission’s objectives without interfering with existing railroad or wharf operations.

The bridges have a number of distinctive design features. They use eyebar chains rather than the more traditional wire rope for the cables, because DPW engineers believed that this created a better link with the stiffening girder. As an added benefit, it enabled the builder, American Bridge Co., to use cantilevered construction to erect the bridges, which kept the river channel open. The 15-foot camber in the girders and the corresponding steep roadway grade provided the necessary under-clearance without the need to raise the grade on the approach.
roads. The design, as typified by the Sixth Street Bridge, unanimously won the first American Institute of Steel Construction “Most Beautiful Steel Bridge” award in 1928. The judges praised its originality, simplicity, harmony of setting, and grace.\textsuperscript{11}

Other inventive bridge designs followed. The West End-North Side and McKees Rocks bridges linked populous sections of the city and county without the need to pass through the downtown triangle. Prior to their construction, there were no highway bridges over the Ohio River between the Point and Sewickley, a 13-mile distance. The long spans needed to keep the Ohio River's shipping channel clear made arch construction the most economical choice. At the West End Bridge (1932), navigation requirements and the skew of the bridge also dictated that the piers supporting the arch be relatively narrow — too narrow to support the 778-foot long main span. To compensate, DPW engineers used a tied arch, where the arch ends are tied to lower chords. Tied arch technology was known in the 19th century, but it had never been applied on such a massive scale. The McKees Rocks Bridge (1931) has been called “almost a sample of bridge-construction techniques.” The 750-foot-long, two-hinge, spandrel-braced main span is similar in design to the Pennsylvania Railroad's Hell Gate Bridge in New York Harbor. Approach spans include two- and three-hinge deck arches and two distinctive, 300-foot long crescent-shaped through-arches over the Pittsburgh & Lake Erie Railroad tracks. The structure is nearly a mile long.\textsuperscript{14}

The McKees Rocks Bridge connected with the newly constructed Ohio River Boulevard, a “boldly conceived” hillside highway that used six reinforced concrete arch bridges to span deep ravines. The DPW designed the bridges so that the steel centering used to make the arches could be transferred from bridge to bridge. The DPW also specified the use of high early-strength cement so that bridge construction could begin in the winter, the first time the material had been used on bridges of this size. The innovations enabled the DPW to complete the boulevard spans in just two years.\textsuperscript{15}

The DPW then took the knowledge gathered during construction of the Ohio River Boulevard arches to create what is perhaps the masterpiece of the DPW's bridge construction program: the spectacular,
1,598-foot long, Westinghouse Memorial Bridge (1932). The 460-foot-long main span was the longest reinforced concrete highway bridge in the Western Hemisphere. Erected to eliminate chronic bottlenecks on the Lincoln Highway (U.S. 30), the bridge carries traffic high above the narrow and congested streets of East Pittsburgh and Turtle Creek.

DPW engineers considered numerous bridge designs for the location, including a cantilevered steel deck truss that would have been less costly than the bridge that was built. They settled on a reinforced concrete open spandrel arch because of its “superior architectural merit.” The monumental bridge carries the highway 200 feet above the valley floor. Adding to the dramatic appearance is the extremely high “rise-to-span ratio” of the arches. The central span rises 153 feet over a 460-foot span. The great height is accentuated by the decorative end pylons that illustrate the achievements of industrialist George Westinghouse. (The Westinghouse air brake plant is located just to the south.) According to design engineer George S. Richardson, the bridge’s monumental character, slenderness, and simplicity were meant to bring order over the chaotic industrial valley, which was already crossed by three levels of transportation. A trade journal described the Westinghouse Bridge as “spectacular in the service it renders, in the boldness of its design and erection, in the grace and symmetry of its architecture, and in its location over a busy industrial valley.” It was compared with other engineering masterpieces of its era, such as the Hoover Dam, the George Washington Bridge, and the Holland Tunnel.

The county erected other long-span bridges of nearly every conceivable type and design. These included through-truss bridges like the McKeesport-Duquesne Bridge (1928) and the Boston Bridge (1932); the South 10th Street Bridge (1933), a traditional wire cable suspension span; cantilevered deck and through-truss bridges like the Liberty Bridge (1927), the Point bridges (1927), Glassport-Clairton Bridge (1928), and Charles Street Bridge.
World’s First Wire Suspension Bridge

John A. Roebling (1806-1869) was an inventor, architect, engineer, manufacturer, philosopher, musician, writer – and in 1841 in Saxonburg, (the town he founded), John Roebling built the world’s first factory for making wire rope. Out of this factory came cables of wire and a revolutionary concept in bridge building. Roebling’s first suspension bridge (actually an aqueduct) was built in 1844-45 across the Allegheny River. In 1845-46 he matched this feat with the Smithfield Street suspension bridge across the Monongahela.

What Roebling started first in Pittsburgh he took east to New York; he is remembered today as the creator of the Brooklyn Bridge. And it all began here – another example of the achievements and quality of life in Pittsburgh, then and now.

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Bridge (1929); and the steel arch 31st Street Bridge. Many used high-strength silicon steel, the first large-scale application of the material to bridge building. And, as Armstrong reminded voters, all steel used was produced in the Pittsburgh district. 19

Despite this output, opposition to the DPW and to the Armstrong administration was growing. Leading the attack was Charles G. McGovern, a political maverick not aligned with either of the two Republican factions. Appointed county controller in 1926 after the death of the incumbent, McGovern used his bully pulpit to denounce the DPW as inefficient, wasteful, and corrupt. His 1926 Controller’s Report was a scathing 300-page-long indictment of the DPW, its director, and Armstrong. McGovern called the DPW a “den of patronage,” a “huge parasite living off the public treasury,” and an “outlaw” organization engaged in “criminal engineering” and “monumental waste.” 19 Although shrilly presented,
many of the charges apparently were not without merit. George S. Richardson, a DPW engineer, remembered that “on the Westinghouse Bridge there were perhaps five or six Brown appointees on the job during construction. There may have been three or four times that many on the payroll that never appeared on site”—sinecures provided by Armstrong. Richardson intimated that this was standard operating procedure in the DPW.20

McGovern’s rhetoric struck a receptive chord with the voters. In 1927, he ran as an independent and won the minority county commissioner’s seat. Four years later, his reform wing of the Republican party captured the majority, and McGovern was appointed chairman. He moved quickly to dismantle the DPW and its patronage network. As one of his first official acts, McGovern fired all DPW workers, then hired back a workforce one-tenth the size.

Employment was slashed throughout the county government; all told, 4,800 workers lost their jobs.21 Large-scale bridge design and construction responsibilities were transferred to the semi-independent Allegheny County Authority, an agency created to tap into federal New Deal funding. The authority would fund large improvement projects by issuing revenue bonds, which would be retired by tolls. The DPW, re-christened the Department of Highways, Bridges, and Tunnels, was left primarily with bridge maintenance duties.

The Allegheny County Authority, however, proved to be unequal to the task. Its program of nine major improvements in Allegheny County withered in the face of difficulty in securing New Deal funds and “considerable opposition” to the idea of toll bridges and tunnels. The golden age of county bridges, it seemed, had come to an end.22

The long reign of the county GOP was also waning. McGovern’s attacks and victories had splintered the already fractious Republican party. His allegations of corruption and his actions as county chairman accelerated the dissolution of the political machine. In 1935, with the county and the country reeling from the Great Depression, Democrats riding the coattails of President Franklin Delano Roosevelt swept into power for the first time since the mid-19th century. They would not relinquish their hold for 60 years.23

The election of the Democratic majority unleashed a minor renaissance in county bridge design.
and construction. The reorganized Department of Works, now headed by John F. Laboon, assumed nearly the same structure and functions of the earlier DPW. Major bridges completed by the Works Department included the Homestead Hi-Level Bridge (1937), with its distinctive “Wichert Self-Adjusting Continuous Truss;” the crescent-arch Jerome Street bridge (1938) in McKeesport; and two cantilevered deck trusses, the Dookers Hollow bridge (1938) between East Pittsburgh and North Braddock and the Highland Park bridge (1939). Restrictions placed on steel usage suspended large-scale improvements after 1940. A number of long-span bridges would be built in the post-war years, with the Pennsylvania Department of Highways, PennDOT’s predecessor, as a partner. But the golden age of county bridge design had ended.

The 1924-1940 road and bridge program marked an epoch in the history of Allegheny County. Faced with threats to the county’s economic and industrial standing, strong county leadership stepped forward with a program to modernize infrastructure and keep the area competitive. The era reshaped the county’s landscape, created much of the road and bridge system still used today, and placed the Pittsburgh area in the nation’s eye as a leading center of bridge technology. Its most visible legacy, the monumental bridges that grace the county, define the area to this day. In the post-war era, a similar pattern of strong leadership under Pittsburgh mayor David L. Lawrence remade Pittsburgh’s landscape and helped redefine the area. The pattern may have relevance for today.

The Westinghouse Bridge was compared with other engineering masterpieces of its era, such as the Hoover Dam, the George Washington Bridge and the Holland Tunnel.

NOTES
1Editorial, Pittsburgh Press, June 25, 1928, and April 22, 1924; Editorial, Pittsburgh Gazette-Times, April 20, 1924.
4Citizens Committee on the City Plan for Pittsburgh, “A Major Street Plan” (Pittsburgh: CCCP, 1923).
5Farrington, 37-41.
and "Defeat at Primary Marked Doom of Powerful Armstrong Machine," Nov. 20, 1931; Farrington, 55.

"Pittsburgh Press, April 23, 1924. Four years later, in June 1928, voters approved by nearly the same margin a $45 million bond issue that included not only road and bridge projects but a new county airport and county office buildings. Pittsburgh Press, June 29, 1928.


"Allegheny County Annual Report for 1926, 60.


American Institute of Steel Construction (AISC), "The Artistic Bridge Award 1928" (AISC, 1928).


ENR (Aug. 1, 1929), 185; V. R. Covell, "The Construction of Concrete Arches in Allegheny County, Pennsylvania," Journal of the American Concrete Institute (June 1932), 653-661.


ENR (July 21, 1932), 67.

"Allegheny County Annual Reports, 1924-1932; Armstrong Campaign Pamphlet, 1931.

"See Allegheny County Annual Report for 1926, 58-91, for the portion that deals with the DPW in the greatest detail.

"Quoted in Farrington, 47.


"For an overview, see Michael P. Weber, Don’t Call Me Boss: David L. Lawrence, Pittsburgh’s Renaissance Mayor (Univ. of Pgh. Press, 1988), 38-64.

"Allegheny County Annual Reports, 1936-1940.