Scherzer Rolling Lift Bridges

Scherzer Rolling Lift Bridges

Scherzer Rolling Lift Bridge
Across the Connecticut River at Saybrook, Connecticut

624

Scherzer Rolling Lift Bridges

Their Inception, Development and Use

THE SCHERZER ROLLING LIFT BRIDGE COMPANY

Engineers

NEW YORK CHICAGO

Cable Address: Scherzer, Chicago

Scherzer Rolling Lift Bridge
Across the Chicago River at Chicago, Illinois, for the Metropolitan Elevated Railroad
The first Scherzer bridge

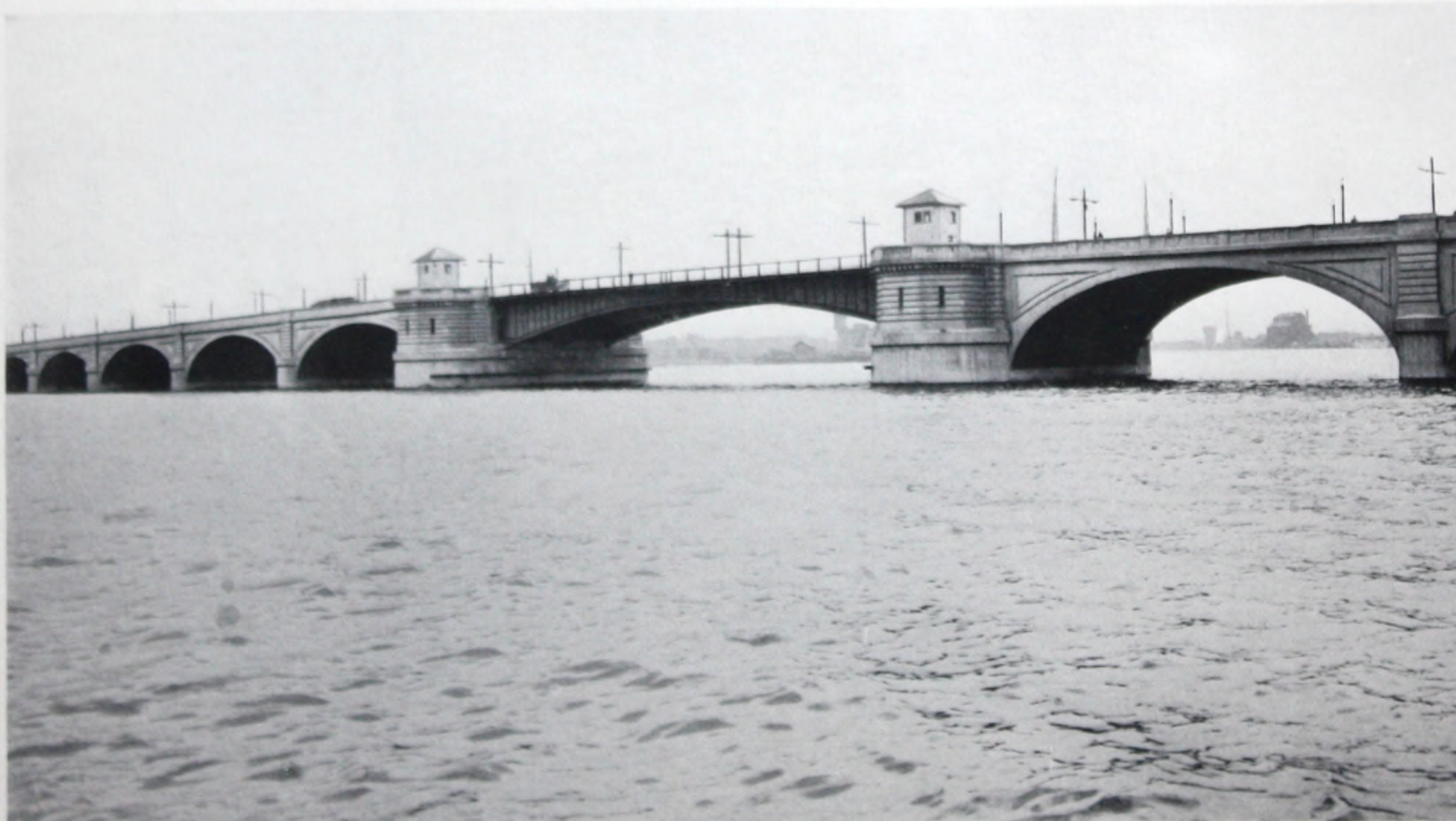
Foreword

WE take pleasure in presenting to our patrons and the public this little pamphlet showing the Scherzer Rolling Lift Bridges in service and under construction and illustrating and describing the few principal details embodied in our designs. Starting at a time when engineering in this particular branch of the science was entirely undeveloped and there was little upon which to base our designs, except theory and unbounded faith, we have now the satisfaction of having proven both our theories and our faith, the Scherzer Rolling Lift Bridge being today universally known as the standard of excellence in bascule bridge design, after a period in modern structural engineering in which the development of the bascule bridge has been one of the noteworthy features.

It is a basic principle of all great inventions that necessity is the stimulus, and a brief outline of how history repeated itself and necessity brought out the Scherzer Rolling Lift Bridge is interesting. The Metropolitan West Side Elevated Railroad of Chicago had practically completed all of its other construction without solving the serious problem of carrying its tracks over the Chicago River where the limited right of way between the swing bridges at Jackson Boulevard and Van Buren Street precluded the use of a horizontally moving bridge of the required span length. Time and money were expended freely in consultation with the most eminent engineers in the country and various solutions were suggested, each, however, developing limitations that made them impractical. Vertically moving bridges in all of the varieties as then known even to a reproduction of the new Tower bridge across the Thames in London were proposed but none was satisfactory in meeting all of the requirements. The management called in William Scherzer of Chicago, a consulting engineer specializing in structural design, and it was his ingenious but practical suggestion that both solved the problem for the railroad and gave to the science of movable bridge engineering its most important development. It is the irony of fate, too, that death from over-work in concentrating on this very matter should have robbed William Scherzer of the satisfaction of seeing the completion of the structure to which he had given so much of his time and thought, but credit will be given to his name wherever the history of movable bridge engineering shall be written.

The consummate genius of William Scherzer in conceiving the principle of operation and in working out the details of design without precedent as a basis is best evidenced by the fact that this Metropolitan West Side Elevated Railroad bridge has been in continuous service since the spring of 1895, a period of twenty years, carrying an average of fifteen hundred trains daily, and that during this time it has never delayed either railroad traffic or navigation. The operating charge has been virtually nil, as the bridge is operated in conjunction with an adjacent interlocking plant, and only such maintenance charges have been necessary as are usual with any exposed steel construction. We believe this record of design, construction, operation and maintenance in a pioneer type of movable bridge will cause this bridge to be justly considered among the foremost examples of structural engineering in a period when epoch making developments in the science were common.

Scherzer Rolling Lift Bridges
Across the River Rouge at Detroit, Michigan,
for the Solvay Process Company
The latest Scherzer bridges



Scherzer Rolling Lift Bridge
Across the Maumee River at Cherry Street, Toledo, Ohio

The Scherzer Rolling Lift Bridge Company

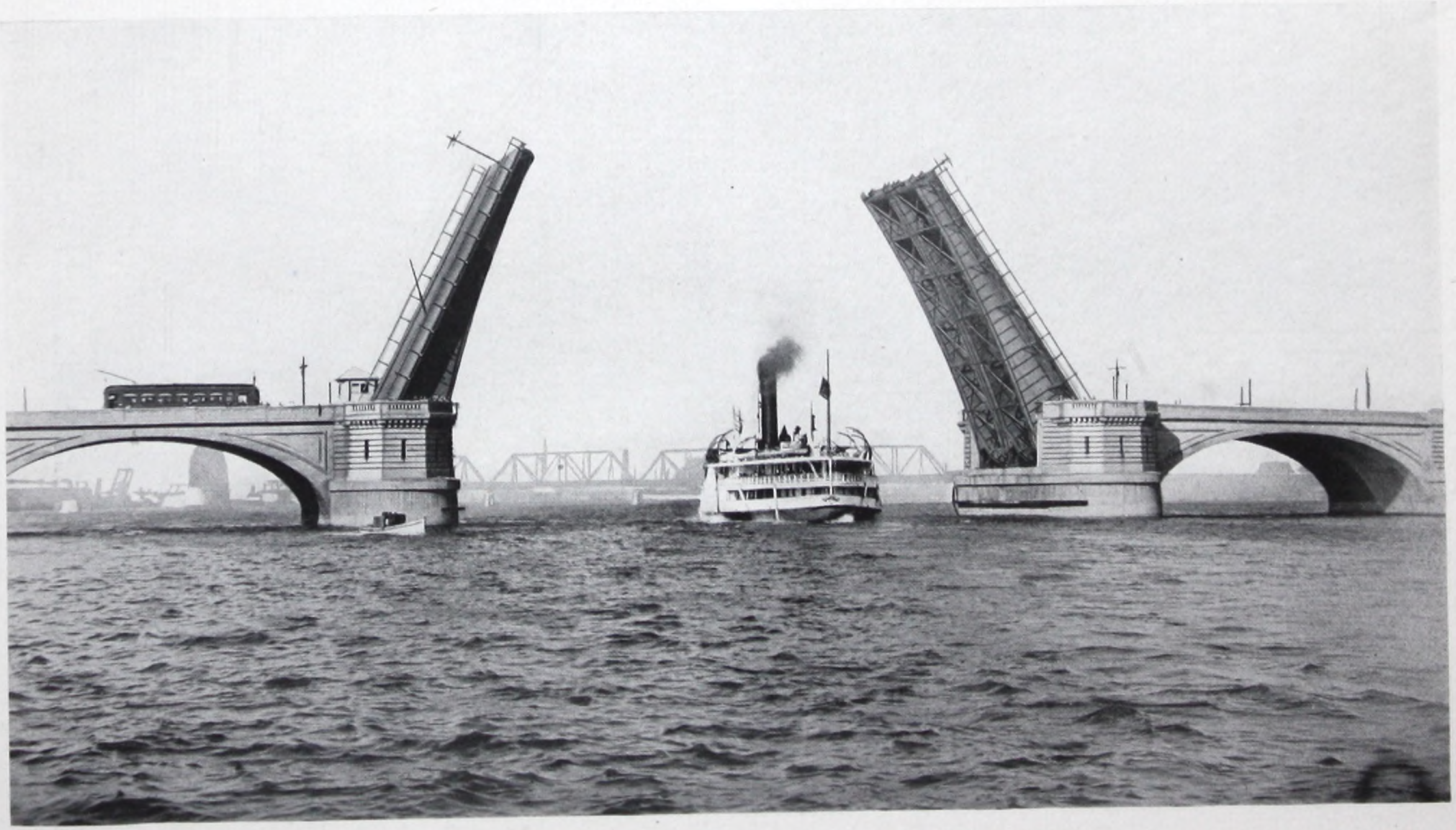
The possibilities of the rolling lift type of bascule bridge being indicated by the success of the first bridge steps were taken shortly after the death of William Scherzer to develop the principles of design conceived by him and place them before the public on a business basis. The Scherzer Rolling Lift Bridge Company was accordingly formed as an Illinois corporation with general offices in Chicago and an organization was effected to promote the use of bascule bridges in place of the then universally used swing bridges. From its beginning, the growth of the Company has been steady and it is noteworthy that through periods of both prosperity and depression each year has almost without exception shown an increase in the number of bridges built to its designs. The personnel of the executive staff of the organization has remained unchanged from its inception and the mature judgment of nearly twenty years in one line of work exclusively is brought to each new problem. It is this experience and the study based upon it that has resulted in the constant improvement in details and the simplifying of construction that have been such marked features in the development of the Scherzer Rolling Lift Bridge as compared with other complicated structures that have been brought forward in competition with it. James Watt's terse expression—*"In all things, but proverbially so in mechanics, the supreme excellence is simplicity"*—is a classic that is kept constantly before each member of the organization and *"Simplicity"* is the keynote in the design of every detail. The result of simplicity must necessarily be economy and efficiency and the result of the three is the superiority of the Company's products.

The Scherzer Rolling Lift Bridge Company is prepared to handle all work related to the design and construction of movable bridges. Well organized departments, each under the supervision of officers of our executive staff, are maintained for surveys, estimates, designs, supervision and construction. Our subordinate employees are brought to our organization while young and are thoroughly grounded and trained in all of the details of the business. The success of this method in the development of our employees has been most apparent in the skill with which work executed under our supervision has been carried out in such difficult conditions as have attended the construction of large Scherzer Rolling Lift Bridges in India, Burma and Egypt.

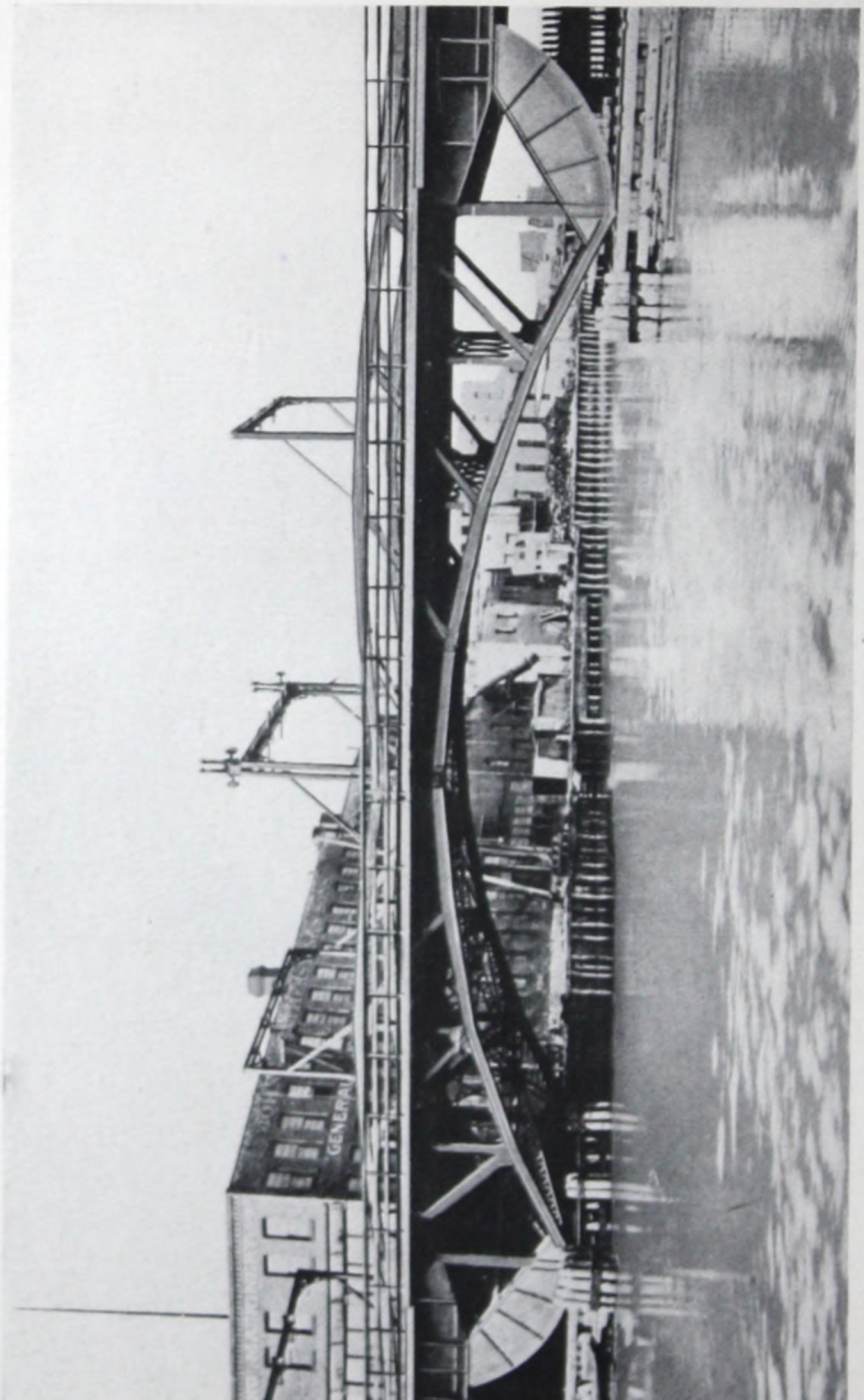
The fees charged for our work are as moderate as can be made consistent with the high class of service we render and the great responsibility involved in the design and construction of movable bridges. In considering the amount of fees for such service it should be remembered that in practically every instance the fee is more than saved in the economies we are able to effect in the cost of work, both through the inherent economy of the principles of design in the Scherzer Rolling Lift Bridge and in the practical application of economical details evolved through our long experience in this class of work. We may say also with what is, we trust, pardonable pride that wherever our services have been employed in any of the large varieties of work in which we are engaged the results have always been achieved with credit and satisfaction both to ourselves and to our patrons, as evidenced by the large number of additional orders we have received from those who have engaged us on previous work.

As will be noted in the accompanying list, Scherzer Rolling Lift Bridges have been built or are under construction in every part of the world to the orders of the most eminent consulting engineers and for the largest municipalities and railroad systems. This extended use of Scherzer Rolling Lift Bridges in the United States, Canada, England, Ireland, Wales, Holland, Russia, France, Egypt, India, Burma, Argentina, Hawaii, Mexico and other countries, demonstrates both the adaptability of this type of construction and the satisfaction experienced in its use.

We will be pleased to receive inquiries regarding proposed new movable bridges and to furnish, without charge, sketches and estimates of cost of Scherzer Rolling Lift Bridges adapted to the conditions. In order to enable us to prepare economical layouts and to estimate intelligently the cost we should have as full and complete information as possible of the local conditions and requirements, including a plat and profile of the bridge site if such data is available.



Scherzer Rolling Lift Bridge
Across the Maumee River at Cherry Street, Toledo, Ohio



Scherzer Rolling Lift Bridge
Across the Chicago River at North Halsted Street, Chicago, Illinois
One of the early Scherzer bridges

Advantages of the Scherzer Rolling Lift Bridge

From the beginning of human activities to the present time the roller and wheel have been mankind's means of moving weights, and today, either singly or in combination, the land transportation of the world is dependent upon them, whether it be the moving of a building with its hundreds of tons of dead load or the speeding railroad train and automobile. If the weight is great the roller is utilized, but for light loads and high speeds the wheel is of course more effective. With the wheel, however, the difficulties of friction and lubrication in the hub or journal become serious, and, because of this, roller bearings are now a standard part of wheel construction where the greatest efficiency and freedom from frictional troubles is desired.

It is readily seen, therefore, that mechanical science does not favor a plain axle and journal for the movement of heavy weights where a combination of rollers is within practical limits. In the Tower bridge across the Thames in London roller bearings were utilized for the main trunnions to obviate the difficulties of friction from the great weight concentrated at the points of support, and it was a study of this particular feature of the Tower bridge that led to the use of a large radius fixed roller in the invention of the Scherzer Rolling Lift Bridge, simplifying the construction of the essential details of operation.

To draw a homely simile, the Scherzer Rolling Lift Bridge may be likened to a two-wheeled sulky or cart, with the wheels locked on the axles and sufficient weight rigidly fixed under the seat to counterbalance the weight of the shafts. The shafts may be likened to the front arm of the bridge and the seat to the rear or tail end. With the cart thus balanced, and on a smooth and level surface, very little power need be exerted to raise the shafts to a vertical position, and if the center of gravity of the counterbalancing weight is so placed that a straight line from that center of gravity to the center of gravity of the shafts passes through the center of the wheel the cart will remain in any position in which it may be placed. The wheels being locked on the axles, the motion must be one of rolling on the tires rather than the frictional movement of revolving about the axles, and as it is well established that in wheels subjected to heavy usage the tires will outlast the hub bearings two to one it must follow that the action obtained in utilizing the large radius of the wheel as a roller will give not only greater ease of motion but longer life with less maintenance.

This, then, is the Scherzer Rolling Lift Bridge; steel trusses or girders spanning the navigable channel and supported on and rigidly connected to large steel rollers or rockers, a weight at the rear end counterbalancing the front arm. The rollers or rockers are segments only, as the entire movement of the structure to gain a full clearance of channel opening describes an arc of less than ninety degrees.

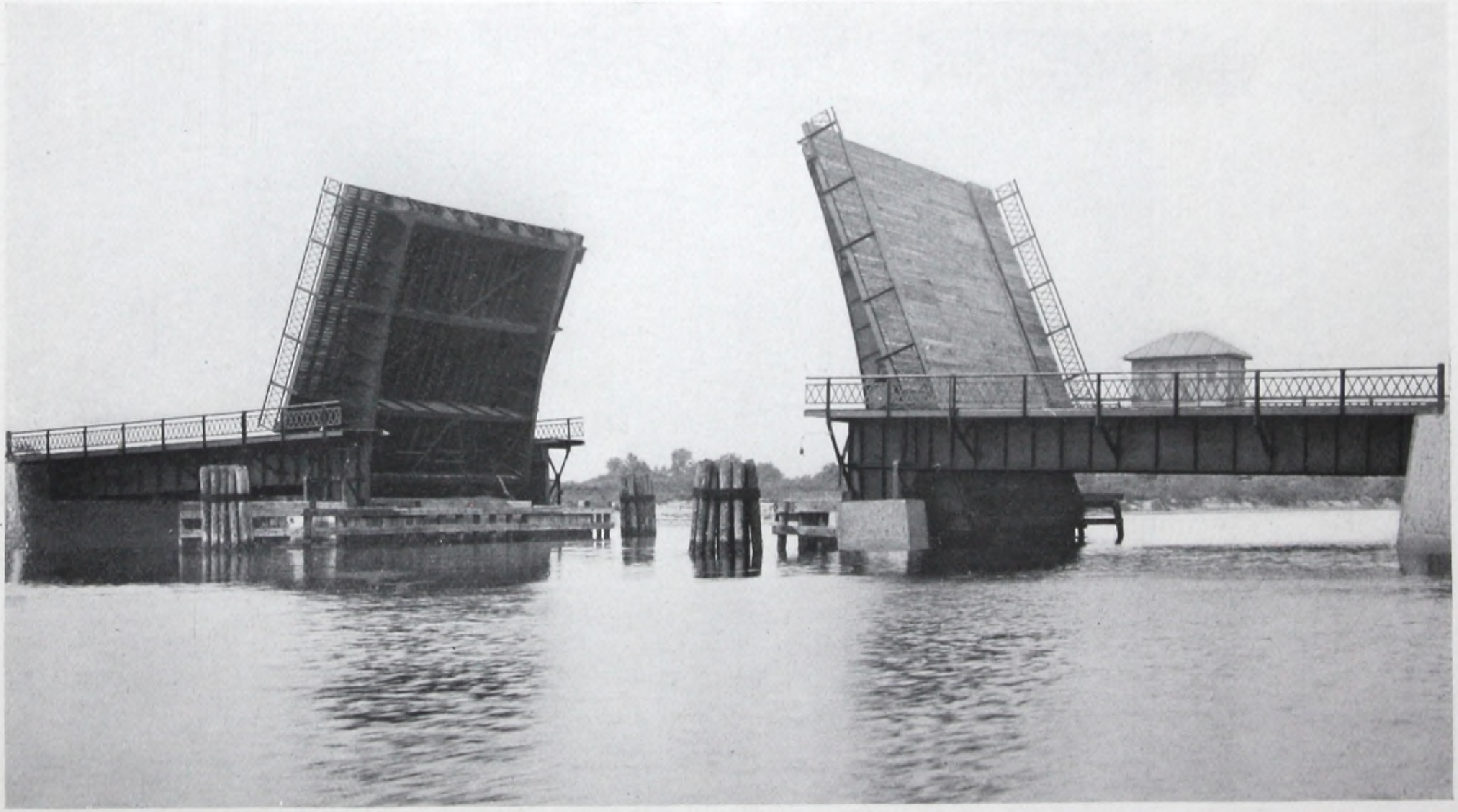
In the operation of the bridge the segments roll on steel track girders supported on the piers or foundations, these track girders having perfectly smooth and level bearing surfaces. As the bridge is in balance in all positions, practically the only power necessary for operation is that required to overcome inertia in starting, the structure running after starting almost without power. This ease of operation due to the rolling principle of the design necessitates a minimum of machinery parts and a cost for power that is usually too small to need consideration. As machinery is the most expensive of all of the elements making up a movable bridge structure, the economy of the Scherzer Rolling Lift Bridge in this particular essential becomes at once apparent.

Carrying out the law of mechanics so forcefully elucidated by James Watt, simplicity is obtained in the Scherzer Rolling Lift Bridge by the one-piece construction of bridge, segments and counterweight. Multiplicity of these parts must cause unnecessary expense in first cost of construction and in cost of operation and maintenance. The counterweight is of concrete, extending across between the girders or trusses at the rear ends. Embedded in the concrete is the steel cross framing and bracing of the rear end of the bridge, so that the concrete in addition to its principal function of counterweighting acts as a reinforced concrete beam between the trusses, tying them together and stiffening the entire structure into a rigid mass absolutely devoid of vibration under the heaviest loads. The advantage of this rigid counterweight is also particularly apparent in the open position of the bridge in withstanding the effect of wind pressure. As vibration in a structure when either closed or open is serious, this feature in the Scherzer design becomes one of its principal advantages.

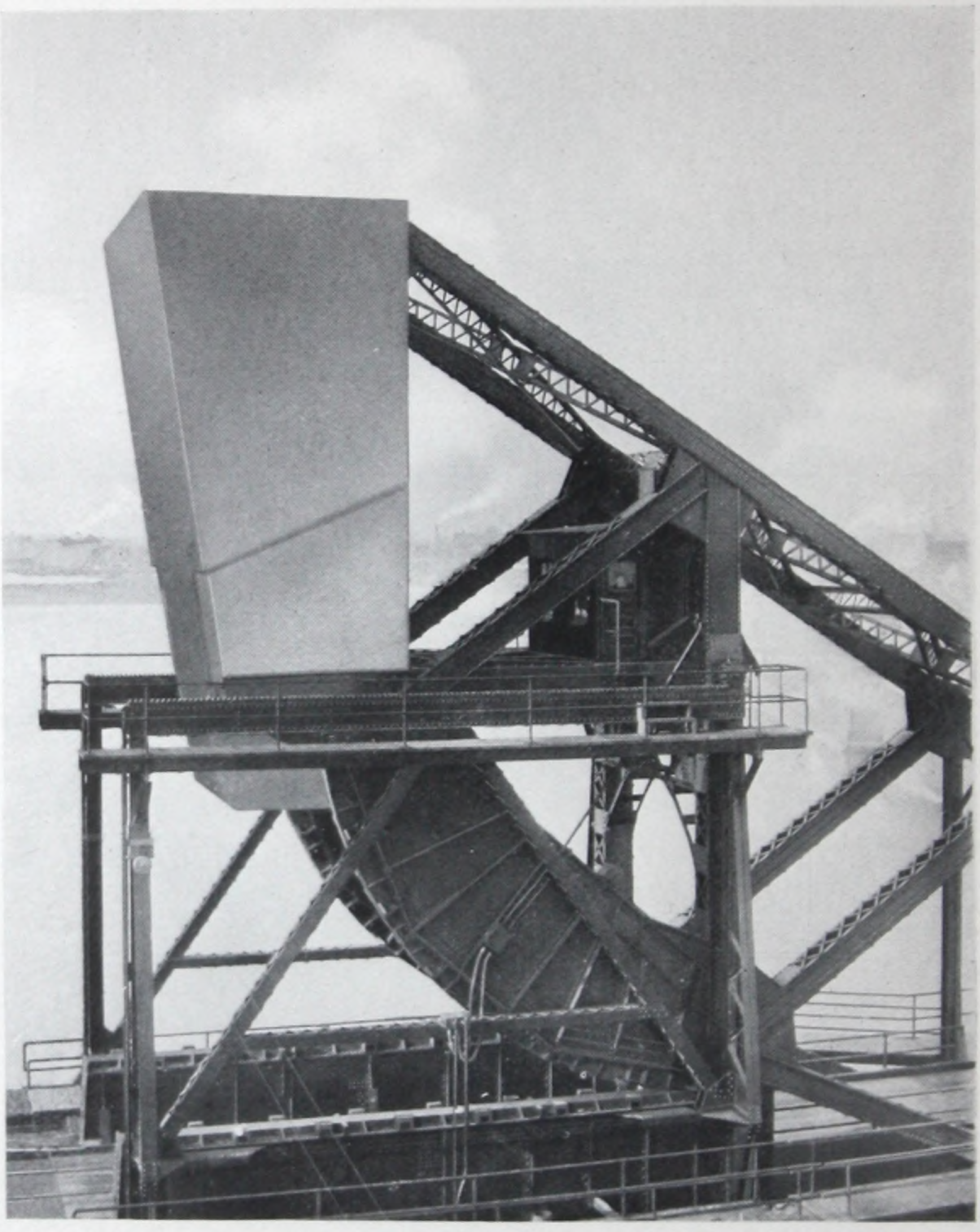
Owing to the rolling motion of the bridge in operation it moves backward and upward at the same time. This movement peculiar to the design permits of the shortest possible span length in the closed position, the roller supports being placed at the front ends of the track girders on the piers. Upon opening, the bridge leaf rolls back on its tracks, so that clearance for the passage of small vessels is obtained at all points immediately upon the beginning of the operation, and in the fully opened position the lower parts of the structure are well behind the pier faces. This prevents any possibility of accidents common to other types of movable bridges by the ramming of heavy ships into the piers. The combined motion of rolling and lifting in opening also reduces the length of travel of the moving leaf, and the time of operation and delay to traffic is reduced accordingly.

The span length being less in the Scherzer Rolling Lift Bridge than in any other type for any required clear channel opening for navigation, it must necessarily follow that the weight of structural steel in the front arm of the span from bearing point to bearing point is less. This saving in structural steel and the corresponding saving in counterweight, and the lesser weight of machinery required due to the small power necessary for operation, results in lighter reactions on the foundations from the dead load of the bascule superstructure. Lighter superstructure loads mean more economical foundations and freedom from difficulties of construction in this most important part of bridge work. The advantage of this feature of the Scherzer Rolling Lift Bridge will be appreciated when it is considered that in more than two hundred and twenty bridge foundations, constructed under widely varying conditions of subsoil formation, there is no evidence of either failure or distress in any of them from the operations of the superstructure.

Of all of the advantages of the Scherzer Rolling Lift Bridge, probably the most important from the standpoint of practical application to commercial uses is its adaptability. Conditions to be fulfilled in the design of movable bridges vary with each structure. Even across the same waterway, streets and railroad tracks will be at different elevations or at a different angle, necessitating different designs and details of construction. One bridge will be built across a river where fifty openings daily are necessary for shipping and where a channel three hundred feet in width may be required; another will cross a small stream where but one opening a month may occur. One bridge may carry several railroad tracks, or the heavy street traffic of a great city; another the light loads of an undeveloped and sparsely settled rural district. One may have the outline and detail that goes with utility only; another the combination of utility and art. For each and all of these conditions a Scherzer Rolling Lift Bridge has been built. Spans varying from twenty-nine feet to three hundred and ten feet in length, and from nine feet to one hundred and thirty feet in width are in service, comprising simple spans of single-leaf through trusses and deck girders, and cantilever and arch double-leaf through trusses and deck girders. In some, the bascule itself spans the entire channel; in others, the bascule is but a part of a great structure thousands of feet in length. But in each and every instance the Scherzer Rolling Lift Bridge has adapted itself to the conditions economically and efficiently, and no requirements of length and width of span, loadings, foundations and approaches have yet been presented that have not been satisfactorily provided for by a Scherzer design.



Scherzer Rolling Lift Bridge
Across the United States Government Canal at Dickey Place, East Chicago, Indiana



One of the latest Scherzer bridges
Note the concrete counterweight, segmental and track plate castings, and fixed rack method of operation. The simplicity and compact arrangement of the operating details of a large bridge are most clearly shown in this view

Some Details of the Scherzer Rolling Lift Bridge

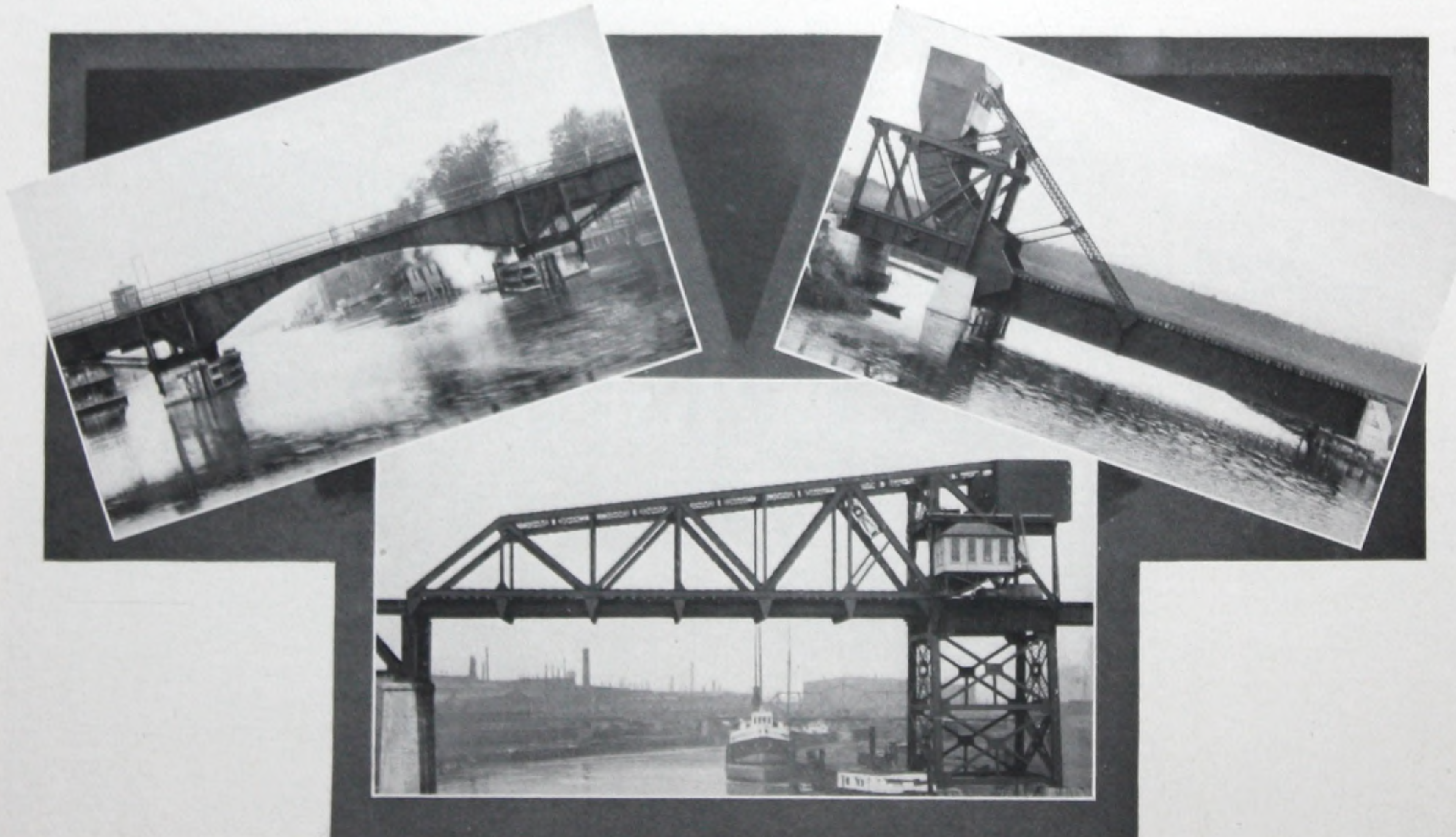
It is only to be expected that, in what may be termed pioneer construction, the details of design in the earlier Scherzer Rolling Lift Bridges were not perfected to the standards of today, although the element of simplicity was in the mind of the inventor and was apparent in the first bridge built in a comparative degree. In three respects particularly has the most marked progress taken place, due to the concentration of the organization of the Scherzer Rolling Lift Bridge Company on the important details of counterweight, machinery, and segmental and track girder bearings.

Counterweight, as originally used, was of cast iron or sashweight metal bolted in place on the rear ends of the main trusses or girders. Owing to the concentration of this great weight, heavy bracing and strengthening about these members was necessary, adding to the weight and cost of the bridge. After considerable study and observation in the field of bridges in service, it was determined that concrete between the trusses or girders and embedding the rear end bracing would not only serve the purpose and save a large proportion of the expense of counterweighting, but would also simplify the rear end details and stiffen the moving leaf into a perfectly rigid one-piece mass. The unit weight of this concrete counterweight can be easily and readily varied from one hundred and thirty-five to three hundred pounds per cubic foot, the heavier weight being obtained by the addition of the required proportions of steel punchings, scrap or pig iron to the concrete and at small cost. This variation in weight makes possible the use of concrete or composition counterweight under any conditions of structural design. Although developed and first used in the Scherzer Rolling Lift Bridge it has since been universally used in all types of bascule bridge construction and has done much to bring the cost of bascule bridges to its present low basis.

As in every instance where motive power is applied at a point away from its source, the early machinery designs of Scherzer Rolling Lift Bridges embodied details that while quite satisfactory for the purpose at that period, later developed limitations that made improvements and simplifications desirable. Principal among these was the movable operating strut, one end of the strut being pivotally connected to the bascule span at its center of roll and the other end engaging with the operating power gearing. The power equipment was placed on the fixed part of the structure in the rear of the moving leaf so that a direct pull was had through the operating strut. Although supported practically throughout its entire length, this strut caused vibration in both the movable and fixed parts of the bridge, and to avoid this vibration as well as to concentrate and simplify the machinery, special study was given to this feature both in the office and in the field. It was determined that, by following the method usual in all modern power propelled bodies of placing the entire operating equipment on the moving structure itself, both concentration and simplification would be obtained. This was readily accomplished due to the action of the bridge in operating. It will be seen that the center of roll or center of the circle of which the segment is a part, travels in a horizontal line exactly parallel to the surface of the track plates upon which the bridge rolls. By placing shafts on the moving span and running them through this center of roll, with pinions on the outer ends, the pinions will move backward and forward as the bridge is opened and closed. Driving these shafts and pinions by an electric motor, placed on the bridge between the main trusses or girders, through suitable gear reductions to regulate the speed of pinion movement, the pinions, by engaging with racks fixed outside and independent of the moving leaf, will move the bridge easily and rapidly. This fixed rack operation, as it came to be termed, revolutionized bascule bridge machinery design and construction, reducing the weight and cost of machinery for Scherzer Rolling Lift Bridges to less than half that of other types. Not only in economy, but in efficiency, too, is the development most marked. Direct application of the power to the movement of the bridge is effected through simple gearing, without recourse to movable links and struts, resulting in rapid operation without any tendency to vibration in the machinery parts. The rigidity of the bridge structure itself provides for perfectly rigid machinery supports, the motors and main operating parts being carried on a machinery platform across the bridge just in the rear of the center of roll and in front of the counterweight. Convenient access can be had to all parts of the machinery from this platform and it can be observed and readily inspected at all times, whether the bridge is in motion or at rest. Any vibration from the movement of the bridge is eliminated by the nature of the counterweight construction, the bridge structure, counterweight and machinery being unified into a homogeneous self-acting whole. The wonderful simplicity and efficiency of this arrangement will perhaps be better appreciated when it is said that from its inception more than ten years ago, and in the light of practical experience resulting from observation of its use on nearly two hundred bridges in active service, no material changes have been made or even considered desirable.

Naturally, in a rolling lift bridge the details of segmental and track girder bearings, as the essential operating parts, must be given the most careful consideration, both in the theory of design and in the economical application of these theories in practice. In a few of the earlier Scherzer Rolling Lift Bridges certain difficulties developed in these details, particularly in the tendency of rivets or bolts connecting the bearing plates to the girder flanges to break. Careful observation of such conditions brought out especially the fact that this failure of rivets or bolts was apparent only in the very heavy bridges where a double-web construction of segmental and track girders was used. In such construction there is a separate bearing of segment and track under each web, or two bearings for each truss. Where a single central bearing was used no difficulties have developed and this led to the design of bearing plates for both segmental and track girders that would provide a wide central bearing surface for both single-web and double-web systems, concentric with the segmental and track girders and equalizing the distribution of the bearing loads. For purposes of adaptability and to secure a uniform grade of metal of the required hardness, steel castings are utilized, the details varying from a single casting of an entire segment to the multiple section castings of the track plates only. In all of the variations, however, the central bearing requirement is maintained, and since the adoption of this detail and its use on many of the largest and heaviest railway and highway bridges in the world there have been no indications whatever of any recurrence of the minor difficulties apparent in some of the earlier bridges where the old detail of double bearing was used. As in every instance of development in the Scherzer Rolling Lift Bridge, this improvement also effected the desired elements of simplicity, economy and efficiency. The deep and sturdy castings, replacing the lighter form of rolled plate shoes, reduced the structural steel and simplified the workmanship in the girder flanges so that both weight and shop labor are saved in fabricating these parts. The efficiency of this construction is apparent from observation of it in service. The surfaces are machined to perfectly true and smooth bearings on which the bridge rolls easily and rapidly, and without shock or jar. The castings are of metal specified for such toughness as will avoid any possibility of brooming or flowing under the heaviest loads, and it can be stated with absolute certainty that these most important main operating details, as now constructed, will outlast the life of the structural steel in the bridge itself. Indeed, in those bridges where it has been used, operating thousands of times annually and subjected to all of the requirements of exceptionally severe traffic conditions, the shop marks on the machined surfaces are still as plainly visible as when the bridges were first put in service. More than this need not be said.

Scherzer Rolling Lift Bridge
Across the Calumet River at Hohman Avenue, Hammond, Indiana



Scherzer Rolling Lift Bridges
Views of typical double-leaf deck highway, single-leaf deck railroad and single-leaf through railroad bridges

A partial list of Scherzer Rolling Lift Bridges in operation or under construction in various parts of the world

UNITED STATES

Railroad

New York, New Haven & Hartford Railroad:

Three Double Track Bridges across Fort Point Channel, Boston. Span 98 ft. 9 in. Completed 1899.

Two Double Track Bridges across Pequonnock River, Bridgeport, Connecticut. Span 88 ft. 1 in. Completed 1903.

Two Double Track Bridges across Myannus River, Cos Cob, Connecticut. Span 81 ft. 0 in. Completed 1906.

Two Double Track Bridges across Saugatuck River, Westport, Connecticut. Span 76 ft. 0 in. Completed 1905.

Two Double Track Bridges across Housatonic River, Naugatuck Junction, Connecticut. Span 108 ft. 3 in. Completed 1907.

One Double Track Bridge across Connecticut River, Lyme, Connecticut. Span 158 ft. 8 in. Completed 1908.

Two Double Track Bridges across Neponset River, Massachusetts. Span 62 ft. 8 in. Completed 1907.

Three Double Track Bridges across Bronx River, New York City. Span 103 ft. 3 in. Completed 1908.

Three Double Track Bridges across Eastchester Bay, New York City. Span 81 ft. 7 in. Completed 1908.

One Double Track Bridge across Seekonk River, Providence, Rhode Island. Span 134 ft. 0 in. Completed 1909.

One Double Track Bridge across Niantic River, Connecticut. Span 68 ft. 0 in. Completed 1908.

Metropolitan West Side Elevated Railroad, Chicago:

Two Double Track Bridges across Chicago River, Chicago. Span 114 ft. 0 in. Completed 1895.

Cleveland, Cincinnati, Chicago & St. Louis Railway:

One Single Track Bridge across the Cuyahoga River, Cleveland. Span 125 ft. 0 in. Completed 1900.

One Double Track Bridge across Cuyahoga River, Cleveland. Span 120 ft. 0 in. Completed 1902.

Chicago Terminal Transfer Railroad:

One Double Track Bridge across the Chicago River, Chicago. Span 275 ft. 0 in. Completed 1901.

One Double Track Bridge across Main Channel, Sanitary and Ship Canal, Chicago. Span 154 ft. Completed 1910.

Boston, Revere Beach & Lynn Railroad:

One Double Track Bridge across Crystal Cove, Massachusetts. Span 35 ft. 6 in. Completed 1903.

Newburgh & South Shore Railroad:

One Double Track Bridge across Cuyahoga River, Cleveland. Span 160 ft. 0 in. Completed 1904.

Central Railroad of New Jersey:

Two Double Track Bridges across Newark Bay, New Jersey. Span 120 ft. 0 in. Completed 1905.

One Double Track Bridge across Elizabeth River, Elizabeth, New Jersey. Span 73 ft. 0 in. Completed 1912.

Baltimore & Ohio Railroad:

One Double Track Bridge across Cuyahoga River, Cleveland. Span 160 ft. 0 in. Completed 1906.

One Single Track Bridge across Cuyahoga River, Cleveland. Span 230 ft. 0 in. Completed 1907.

One Double Track Bridge across Cuyahoga River, Cleveland. Span 200 ft. 0 in. Completed 1911.

Brooklyn Rapid Transit Co.:

One Double Track Bridge across Coney Island Creek, New York. Span 50 ft. 0 in. Completed 1907.

New York, Chicago & St. Louis Railway:

One Double Track Bridge across Cuyahoga River, Cleveland. Span 160 ft. 0 in. Completed 1908.

One Double Track Bridge across Buffalo River, Buffalo. Span 165 ft. 0 in. Completed 1913.

New York Central & Hudson River Railroad:

One Double Track Bridge across Wappinger Creek, New Hamburg, New York. Span 50 ft. 0 in. Completed 1908.

One Double Track Bridge No. 127, Peekskill, New York. Span 67 ft. 0 in. Completed 1913.

Duluth, Rainy Lake and Winnipeg and Canadian Northern Rys.:

One Single Track Bridge across Rainy River at Pither's Point, Minnesota. Span 134 ft. 0 in. Completed 1908.

Norfolk & Western Railway:

One Double Track Bridge across Elizabeth River, Norfolk, Virginia. Span 159 ft. 0 in. Completed 1908.

One Double Track Bridge across Elizabeth River, Norfolk, Virginia. Span 144 ft. 0 in. Completed 1909.

Chicago, Lake Shore & Eastern Railway:

One Double Track Bridge across East Chicago Canal, Indiana Harbor, Indiana. Span 86 ft. 6 in. Completed 1908.

Seaboard Air Line Railway:

One Single Track Bridge across Hillsboro Bay, Tampa, Florida. Span 187 ft. 5 in. Completed 1909.

One Single Track Bridge across Savannah River, Savannah, Georgia. Span 151 ft. 5 in. Completed 1910.

Lake Shore & Michigan Southern Railway:

One Double Track Bridge across East Chicago Canal, Indiana Harbor, Indiana. Span 86 ft. 0 in. Completed 1909.

San Pedro, Los Angeles & Salt Lake Railway:

One Single Track Bridge across San Gabriel River, Long Beach, California. Span 187 ft. 5 in. Completed 1909.

Norfolk & Southern Railway:

One Single Track Bridge across Albermarle Sound, North Carolina. Span 152 ft. 0 in. Completed 1910.

Georgia & Florida Railway:

One Single Track Bridge across Altamaha River, Hazlehurst, Georgia. Span 102 ft. 0 in. Completed 1910.

Long Island Railroad Company:

One Double Track Bridge across Dutch Kills Creek, Long Island, New York. Span 60 ft. 0 in. Completed 1910.

Pittsburgh, Cincinnati, Chicago & St. Louis Railway:

Two Double Track Bridges across Main Channel, Sanitary and Ship Canal, Chicago. Span 154 ft. 0 in. Completed 1910.

Chicago Junction Railway:

One Double Track Bridge across Main Channel, Sanitary and Ship Canal, Chicago. Span 154 ft. 0 in. Completed 1910.

Buffalo, Rochester & Pittsburgh Railway:

One Double Track Bridge across Genessee Valley Canal, Rochester, New York. Span 29 ft. 6 in. Completed 1910.

Minneapolis, St. Paul & Sault Ste. Marie Railway:

One Single Track Bridge across Government Canal, Portage, Wisconsin. Span 72 ft. 0 in. Completed 1910.

South Jersey Realty Company:

One Single Track Bridge across Stone Harbor, New Jersey. Span 60 ft. 0 in. Completed 1911.

Buffalo Creek Railway:

One Double Track Bridge across Buffalo River, Buffalo, New York. Span 151 ft. 0 in. Completed 1911.

Gould Lines, Harriman Lines & Santa Fe:

One Double Track Bridge across Galveston Bay, Texas. Span 124 ft. 0 in. Completed 1911.

New York & Long Branch Railroad:

One Double Track Bridge across Manasquan River, Point Pleasant, New Jersey. Span 59 ft. 0 in. Completed 1912.

One Double Track Bridge across Cheesequake Creek, Morgan Station, New Jersey. Span 59 ft. 0 in. Completed 1913.

Southern Railway:

One Single Track Bridge across Savannah River, Augusta, Georgia. Span 101 ft. 0 in. Completed 1912.

Atlantic Coast Line Railroad:

One Single Track Bridge across Cape Fear River, Navassa, North Carolina. Span 117 ft. 6 in. Completed 1912.

One Single Track Bridge across Hillsboro River, Tampa, Florida. Span 119 ft. 0 in. Under construction.

Wildwood & Delaware Bay Short Line:

One Single Track Bridge across Wildwood Bay, Wildwood, New Jersey. Span 57 ft. 0 in. Completed 1912.

Aransas Harbor Terminal Railway:

One Single Track Bridge across Aransas Pass, Texas. Span 29 ft. 6 in. Completed 1912.

Elgin, Joliet & Eastern Railway:

One Single Track Bridge across East Chicago Canal, East Chicago, Indiana. Span 87 ft. 6 in. Completed 1913.

Dismal Swamp Railroad:

One Single Track Bridge across Dismal Swamp Canal, Virginia. Span 57 ft. 0 in. Completed 1913.

One Single Track Bridge across Dismal Swamp Canal, Virginia. Span 57 ft. 0 in. Completed 1913.

Gresham Toll Bridge Company:

One Single Track Bridge across Mattaponi River, West Point, Virginia. Span 93 ft. 0 in. Completed 1914.

River Terminal Railway:

One Single Track Bridge across Cuyahoga River, Cleveland. Span 148 ft. 0 in. Under construction.

Solvay Process Company:

One Single Track Bridge across Rouge River, Detroit, Michigan. Span 141 ft. 0 in. Completed 1914.

One Single Track Bridge across Rouge River, Detroit, Michigan. Span 210 ft. 0 in. Completed 1914.

Maine Central Railroad:

One Single Track Bridge across Sheepscot Bay, Wiscasset, Maine. Span 83 ft. 0 in. Under construction.

Tampa & Gulf Coast Railroad:

One Single Track Bridge across Clearwater Bay near Indian Rocks, Florida. Accommodates highway traffic. Span 55 ft. 0 in. Width 13 ft. 9 in. Under construction.

Highway

City of Chicago:

One Electric Railway and Highway Bridge across Chicago River at Van Buren Street. Span 115 ft. 0 in. Width 58 ft. 0 in. (Two Tracks.) Completed 1894.

One Electric Railway and Highway Bridge across Chicago River at North Halsted Street. Span 127 ft. 0 in. Width 49 ft. 0 in. (Two Tracks.) Completed 1897.

One Electric Railway and Highway Bridge across Chicago River at Taylor Street. Span 148 ft. 7 in. Width 31 ft. 8 in. (Two Tracks.) Completed 1901.

One Highway Bridge across Chicago River at Canal Street. Span 188 ft. 0 in. Width 41 ft. 0 in. Completed 1902.

One Electric Railway and Highway Bridge across Chicago River at Throop Street. Span 161 ft. 8 in. Width 59 ft. 0 in. (Two Tracks.) Completed 1902.

One Electric Railway and Highway Bridge across Chicago River at State Street. Span 161 ft. 8 in. Width 64 ft. 0 in. (Two Tracks.) Completed 1903.

One Electric Railway and Highway Bridge across Chicago River at Randolph Street. Span 169 ft. 2 in. Width 73 ft. 0 in. (Two Tracks.) Completed 1903.

One Highway Bridge across Chicago River at Loomis Street. Span 177 ft. 6 in. Width 59 ft. 0 in. Completed 1904.

One Electric Railway and Highway Bridge across Chicago River at Harrison Street. Span 182 ft. 0 in. Width 53 ft. 0 in. (Two Tracks.) Completed 1906.

One Electric Railway and Highway Bridge across Chicago River at Eighteenth Street. Span 161 ft. 8 in. Width 64 ft. 0 in. (Two Tracks.) Completed 1906.

One Electric Railway and Highway Bridge across Chicago River at Twenty-second Street. Span 216 ft. 0 in. Width 61 ft. 8 in. (Two Tracks.) Completed 1907.

One Electric Railway and Highway Bridge across Chicago River at Dearborn Street. Span 164 ft. 6 in. Width 57 ft. 0 in. (Two Tracks.) Completed 1907.

City of Cleveland:

One Electric Railway and Highway Bridge across Cuyahoga River at Middle West Third Street. Span 138 ft. 0 in. Width 42 ft. 0 in. (Two Tracks.) Completed 1903.

City of Marseilles:

One Highway Bridge across Canal at Main Street. Span 53 ft. 3 in. Width 34 ft. 0 in. Completed 1904.

City of Buffalo:

One Highway Bridge across City Ship Canal at South Michigan Street. Span 110 ft. 0 in. Width 40 ft. 0 in. Completed 1904.

New York City:

One Electric Railway and Highway Bridge across Gowannus Canal at Hamilton Avenue. Span 60 ft. 0 in. Width 48 ft. 0 in. (Two Tracks.) Completed 1905.

One Electric Railway and Highway Bridge across Gowannus Canal at Union Avenue. Span 56 ft. 0 in. Width 48 ft. 0 in. (Two Tracks.) Completed 1905.

One Electric Railway and Highway Bridge across Newtown Creek at Vernon Avenue. Span 172 ft. 0 in. Width 65 ft. 0 in. (Two Tracks.) Completed 1905.

One Electric Railway and Highway Bridge across Gowannus Canal at Third Street. Span 56 ft. 0 in. Width 48 ft. 0 in. (Two Tracks.) Completed 1905.

One Electric Railway and Highway Bridge across Gowannus Canal at Ninth Street. Span 56 ft. 0 in. Width 48 ft. 0 in. (Two Tracks.) Completed 1905.

One Electric Railway and Highway Bridge across Flushing Creek at Jackson Avenue. Span 71 ft. 6 in. Width 53 ft. 0 in. (Two Tracks.) Completed 1906.

One Highway Bridge across Eastchester Creek at Pelham Bay Park. Span 80 ft. 0 in. Width 49 ft. 0 in. Completed 1908.

One Electric Railway and Highway Bridge at Hunter's Point Avenue across Dutch Kills Creek. Span 71 ft. 6 in. Width 52 ft. 0 in. (Two Tracks.) Completed 1910.

One Highway Bridge across Eastchester Creek. Span 82 ft. 0 in. Width 80 ft. Plans ordered.

City of Boston:

One Highway Bridge across Malden River. Span 56 ft. 0 in. Width 37 ft. 0 in. Completed 1906.

One Highway Bridge across Saugus River. Span 56 ft. 0 in. Width 33 ft. 0 in. Completed 1906.

One Electric Railway and Highway Bridge across Charles River. Span 52 ft. 0 in. Width 86 ft. 0 in. (Two tracks.) Completed 1908.

City of New Haven, Connecticut:

One Electric Railway and Highway Bridge across Connecticut River at Kimberly Avenue. Span 51 ft. 0 in. Width 66 ft. 0 in. (Two Tracks.) Completed 1907.

City of Manistee, Michigan:

One Electric Railway and Highway Bridge across Manistee River at Maple Street. Span 81 ft. 0 in. Width 33 ft. 0 in. (Two Tracks.) Completed 1907.

City of Gloucester, Massachusetts:

One Electric Railway and Highway Bridge across Gloucester Canal at Western Avenue. Span 46 ft. 0 in. Width 46 ft. 0 in. (One Track.) Completed 1907.

City of Cambridge, Massachusetts:

One Highway Bridge across Lechmere Canal at Commercial Avenue. Span 49 ft. 0 in. Width 31 ft. 0 in. Completed 1908.

City of Fall River, Massachusetts:

One Highway Bridge across Taunton Great River. Span 113 ft. 6 in. Width 61 ft. 0 in. Completed 1908.

City of Peoria, Illinois:

One Highway Bridge across the Illinois River at Bridge Street. Span 142 ft. 0 in. Width 36 ft. 0 in. Completed 1909.

Buffalo Creek Railroad:

One Highway Bridge across City Ship Canal at Buffalo, New York. Span 90 ft. 0 in. Width 45 ft. 0 in. (Two Tracks.) Completed 1907.

Lake Shore & Michigan Southern Railway:

One Highway Bridge across Swan Creek at Monroe Street, Toledo, Ohio. Span 83 ft. 0 in. Width 45 ft. 0 in. Completed 1908.

City of Miamisburg, Ohio:

One Highway Bridge across Miami and Erie Canal at Linden Avenue. Span 43 ft. 0 in. Width 34 ft. 6 in. Completed 1909.

One Highway Bridge across Miami and Erie Canal at Smith Street. Span 39 ft. 3 in. Width 32 ft. 0 in. Completed 1912.

City of West Carrollton, Ohio:

One Highway Bridge across the Miami and Erie Canal. Span 43 ft. 3 in. Width 33 ft. 6 in. Completed 1910.

City of Bridgeport, Connecticut:

One Electric Railway and Highway Bridge across the Pequonnock River at Congress Street. Span 82 ft. 0 in. Width 75 ft. 0 in. (Two Tracks.) Completed 1910.

City of Dayton, Ohio:

One Highway Bridge across Miami and Erie Canal at Webster Street. Span 68 ft. 0 in. Width 36 ft. 8 in. Completed 1910.

City of Delphos, Ohio:

One Highway Bridge across Miami and Erie Canal at First Street. Span 43 ft. 3 in. Width 29 ft. 0 in. Completed 1910.

City of Piqua, Ohio:

One Highway Bridge across Miami and Erie Canal at Bridge Street. Span 43 ft. 3 in. Width 44 ft. 0 in. Completed 1910.

One Highway Bridge across Miami and Erie Canal at Water Street. Span 42 ft. 6 in. Width 32 ft. 4 in. Completed 1910.

City of Hammond, Indiana:

One Electric Railway and Highway Bridge across the Calumet River at Holman Avenue. Span 95 ft. 0 in. Width 55 ft. 0 in. (Two Tracks.) Completed 1911.

One Electric Railway and Highway Bridge across Calumet River at Calumet Avenue. Span 240 ft. 0 in. Width 55 ft. 0 in. (Two Tracks.) Under construction.

City of Bourne, Massachusetts:

One Electric Railway and Highway Bridge across Cape Cod Canal. Span 160 ft. 0 in. Width 35 ft. 0 in. (One Track.) Completed 1911.

City of Chaumont, New York:

One Highway Bridge across the Chaumont River. Span 60 ft. 0 in. Width 22 ft. 0 in. Completed 1911.

City of Elizabeth, North Carolina:

One Highway Bridge across the Pasquotank River. Span 84 ft. 0 in. Width 9 ft. 0 in. Completed 1911.

City of Stone Harbor, New Jersey:

One Railroad and Highway Bridge across Great Channel. Span 60 ft. 0 in. Width 31 ft. 0 in. (One Track.) Completed 1911.

City of Saybrook, Connecticut:

One Electric Railway and Highway Bridge across Connecticut River between Saybrook and Lyme. Span 212 ft. 0 in. Width 24 ft. 0 in. (One Track.) Completed 1911.

City of Galveston, Texas:

One Railroad, Highway and Electric Railway Bridge across Galveston Bay. Span 124 ft. 0 in. Width 5 ft 0 in. (Three Tracks.) Completed 1911.

City of Troy, Ohio:

One Electric Railway and Highway Bridge across Miami and Erie Canal at Main Street. Span 43 ft. 3 in. Width 53 ft. 0 in. (Two Tracks.) Completed 1911.

City of Huron, Ohio:

One Electric Railway and Highway Bridge across Huron River at Van Rensselaer Street. Span 104 ft. 0 in. Width 37 ft. 6 in. (One Track.) Completed 1911.

City of Minster, Ohio:

One Highway Bridge across the Miami and Erie Canal. Span 28 ft. 0 in. Width 29 ft. 0 in. Completed 1912.

One Highway Bridge across Miami and Erie Canal at Fourth Street. Span 33 ft. 0 in. Width 64 ft. 6 in. Completed 1914.

City of Sagamore, Massachusetts:

One Electric Railway and Highway Bridge across Cape Cod Canal. Span 160 ft. 0 in. Width 35 ft. 0 in. (One Track.) Completed 1912.

Village of Kimberly, Wisconsin:

One Highway Bridge across the Fox River. Span 77 ft. 0 in. Width 17 ft. 0 in. Completed 1912.

City of Hamilton, Ohio:

One Highway Bridge across the Miami and Erie Canal at Grand Boulevard. Span 33 ft. 0 in. Width 46 ft. 0 in. Completed 1912.

One Highway Bridge across the Miami and Erie Canal at High Street. Span 40 ft. 0 in. Width 51 ft. 0 in. Completed 1913.

One Highway Bridge across the Miami and Erie Canal at Heaton Street. Span 33 ft. 0 in. Width 51 ft. 0 in. Completed 1914.

City of Weymouth, Massachusetts:

One Highway Bridge across Back River. Span 59 ft. 0 in. Width 35 ft. 0 in. Completed 1913.

City of Lynn, Massachusetts:

One Electric Railway and Highway Bridge across Saugus River at Fox Hill. Span 49 ft. 9 in. Width 60 ft. 0 in. (Two Tracks.) Completed 1913.

City of East Chicago, Indiana:

One Electric Railway and Highway Bridge across East Chicago Canal at Chicago Avenue. Span 80 ft. 0 in. Width 65 ft. 6 in. (Three Tracks.) Completed 1913.

One Highway Bridge across East Chicago Canal at Canal Street. Span 73 ft. 0 in. Width 18 ft. 0 in. Completed 1913.

One Electric Railway and Highway Bridge across East Chicago Canal at Forsythe Avenue. Span 76 ft. 0 in. Width 55 ft. 0 in. (Two Tracks.) Completed 1914.

One Electric Railway and Highway Bridge across East Chicago Canal at Dickey Place. Span 77 ft. 3 in. Width 55 ft. 0 in. (Two Tracks.) Completed 1914.

City of Toledo, Ohio:

One Electric Railway and Highway Bridge across Maumee River at Cherry Street. Span 211 ft. 0 in. Width 70 ft. 0 in. (Two Tracks.) Completed 1914.

Middlesex County, New Jersey:

One Electric Railway and Highway Bridge across Cheesequake Creek. Span 58 ft. 0 in. Width 33 ft. 0 in. (One Track.) Completed 1913.

City of Tampa, Florida:

One Electric Railway and Highway Bridge across Hillsboro River at Lafayette Street. Span 83 ft. 0 in. Width 77 ft. 8 in. (Two Tracks.) Completed 1913.

City of Oshkosh, Wisconsin:

One Electric Railway and Highway Bridge across Fox River at West Algoma Street. Span 118 ft. 0 in. Width 40 ft. 0 in. (Two Tracks.) Completed 1914.

City of West Point, Virginia:

One Electric Railway and Highway Bridge across Mattaponi River. Span 83 ft. 0 in. Width 17 ft. 0 in. (One Track.) Completed 1914.

City of Saginaw, Michigan:

One Electric Railway and Highway Bridge across the Saginaw River at Genesee Avenue. Span 108 ft. 0 in. Width 56 ft. 0 in. (Two Tracks.) Completed 1906.

One Highway Bridge across the Saginaw River at Johnson Street. Span 100 ft. 0 in. Width 35 ft. 4 in. Completed 1913.

City of Easton, Maryland:

One Highway Bridge across Miles River. Span 49 ft. 0 in. Width 23 ft. Completed 1914.

Ocean City, New Jersey:

One Highway Bridge across Great Egg Harbor. Span 58 ft. 0 in. Width 22 ft. 0 in. Completed 1914.

Somers Point, New Jersey:

One Highway Bridge across Great Egg Harbor. Span 58 ft. 0 in. Width 22 ft. 0 in. Completed 1914.

City of South Norwalk, Connecticut:

One Electric Railway and Highway Bridge across Harbor at Washington Street. Span 79 ft. 0 in. Width 60 ft. 0 in. (Two Tracks.) Under construction.

City of Trenton, New Jersey:

One Electric Railway and Highway Bridge across Delaware and Raritan Canal at State Street. Span 30 ft. 6 in. Width 52 ft. 0 in. (Two Tracks.) Completed 1914.

One Electric Railway and Highway Bridge across Delaware and Raritan Canal at Greenwood Avenue. Span 37 ft. 10 in. Width 43 ft. 0 in. (Two Tracks.) Under construction.

One Electric Railway and Highway Bridge across Delaware and Raritan Canal at Hamilton Avenue. Span 37 ft. 10 in. Width 43 ft. 0 in. (Two Tracks.) Under construction.

City of Denton, Maryland:
One Highway Bridge across Choptank River. Span 58 ft. 0 in. Width 35 ft. 6 in. Completed 1914.

City of Lewes, Delaware:
One Highway Bridge across Lewes Canal. Span 51 ft. 6 in. Width 20 ft. 0 in. Under construction.

Bay City, Washington:
One Highway Bridge across South Bay Channel. Span 110 ft. 0 in. Width 16 ft. 0 in. Completed 1914.

City of New Orleans, Louisiana:
One Highway Bridge across Old Basin Canal at Broad Street. Span 57 ft. 0 in. Width 28 ft. 0 in. Under construction.

City of Chattanooga, Tennessee:
One Electric Railway and Highway Bridge across Tennessee River at Market Street. Span 310 ft. 0 in. Width 48 ft. 0 in. (Two Tracks.) Under construction.

City of Mount Vernon, New York:
One Electric Railway and Highway Bridge across Eastchester Creek. Span 86 ft. 0 in. Width 32 ft. 0 in. (One Track.) Under construction.

City of Pennsville, New Jersey:
One Highway Bridge across Salem River Canal. Span 45 ft. 3 in. Width 20 ft. 0 in. Under construction.

Burlington County, New Jersey:
One Highway Bridge across Bass River. Span 29 ft. 6 in. Width 18 ft. 8 in. Under construction.

City of Portland, Maine:
One Electric Railway and Highway Bridge. Span 137 ft. 2 in. Width 63 ft. 0 in. (Two Tracks.) Under construction.

City of Maumee, Ohio:
One Highway Bridge across Miami and Erie Canal. Span 30 ft. 0 in. Width 32 ft. 0 in. Under construction.

City of Waterville, Ohio:
One Highway Bridge across Miami and Erie Canal. Span 30 ft. 0 in. Width 32 ft 0 in. Under construction.

City of Ecorse, Michigan:
One Electric Railway and Highway Bridge across Ecorse Creek at Jefferson Avenue. Span 67 ft. 0 in. Width 40 ft. 6 in. (Two Tracks.) Under construction.

City of Bradentown, Florida:
One Highway Bridge across Wares Creek. Span 45 ft. 6 in. Width 33 ft. 0 in. Under construction.

Atlantic City, New Jersey:

One Highway Bridge across Risley's Channel. Span 64 ft. 0 in. Width 30 ft. 0 in. Under construction.

Hyde County, North Carolina:

One Highway Bridge across Out Fall Canal for the Mattamuskeet Drainage District. Span 44 ft. 6 in. Width 12 ft. 0 in. Under construction.

ENGLAND

Railroad

South Eastern and Chatham Railway:

One Railroad and Highway Bridge across Swale River, England. Span 65 ft. 0 in. Width 34 ft. 0 in. (One Track.) Completed 1904.

Furness Railway Company:

Vickers Sons & Maxim, Ltd.

One Railroad and Highway Bridge at Barrow-in-Furness, England. Span 110 ft. 0 in. Width 28 ft. 0 in. (One Track.) Completed 1909.

Great Central Railway:

One Railroad and Highway Bridge across Trent River at Keadby, England. Span 160 ft. 6 in. Width 53 ft. 6 in. (Two Tracks.) Under construction.

Highway

Borough of Barrow-in-Furness:

One Electric Railway and Highway Bridge across Walney Channel. Span 136 ft. 0 in. Width 51 ft. 0 in. (Two Tracks.) Completed 1908.

Shoeburyness:

One Highway Bridge across Havencore Creek for the British Government. Span 56 ft. 0 in. Width 15 ft. 0 in. Under construction.

IRELAND

Railroad

Fishguard & Rosslare Railways and Harbours Company:

One Bridge across Suir River at Waterford. Span 59 ft. 9 in. (One Track.) Completed 1906.

Highway

City of Dublin, Ireland:

One Highway Bridge across Royal Canal, North Wall Quay. Span 43 ft. 6 in. Width 26 ft. 0 in. Completed 1911.

One Highway Bridge across Royal Canal, North Wall Quay. Span 43 ft. 6 in. Width 26 ft. 0 in. Completed 1911.

WALES

Railroad and Highway

Messrs. Williams, Foster & Co. and Pascoe Grenfell & Sons, Ltd:

One Railway and Highway Bridge across the River Tawe at Swansea. Span 50 ft. 0 in. Width 14 ft. 0 in. (One Track.) Completed 1909.

Swansea Harbour Trust:

One Railroad and Highway Bridge across entrance to King's Dock, Swansea. Span 108 ft. 0 in. Width 17 ft. 3 in. (One Track.) Completed 1912.

HOLLAND

Railroad

Dutch Railroad Company:

Three Single Track Bridges across Sparne River at Haarlem. Span 39 ft. 8 in. Completed 1906.

Highway

Ministry of Waterways:

Two Electric Railway and Highway Bridges across North Sea Canal at Velzen. Spans 202 ft. 0 in. and 60 ft. 8 in. Widths 25 ft. 5 in. Plans ordered.

FRANCE

Railroad and Highway

Compagnie Generale Francaise de Tramways:

One Electric Railway and Highway Bridge across Passe du Bassin de Carenage at Marseilles. Span 59 ft. 9 in. Width 28 ft. 3 in. (Two Tracks.) Plans ordered.

One Electric Railway and Highway Bridge across Canal des Douanes at Marseilles. Span 30 ft. 2 in. Width 28 ft. 5 in. (Two Tracks.) Plans ordered.

RUSSIA

Highway

City of Petrograd:

One Electric Railway and Highway Bridge across Ekaterinhofka. Span 160 ft. 9 in. Width 70 ft. 0 in. (Two Tracks.) Under construction.

BELGIUM

Highway

City of Antwerp:

One Highway Bridge across Le Canal de Jonction. Span 93 ft. 8 in. Width 17 ft. 5 in. Under construction.

EGYPT

Railroad

Egyptian Government:

One Double Track Bridge across Harbor at Port Soudan. Span 160 ft. 0 in. Completed 1907.

Highway

Egyptian Government:

One Electric Railway and Highway Bridge across the Nile River at Cairo. Span 129 ft. 4 in. Width 63 ft. 0 in. (Two Tracks.) Completed 1912.

INDIA

Railroad

South Indian Railways:

One Single Track Bridge across Pamban Pass between the Island of Ceylon and mainland of India. Span 225 ft. 0 in. Completed 1914.

BURMA

Railroad

Burma Railways:

One Single Track Bridge across Ngawun River, Burma. Span 220 ft. 0 in. Completed 1908.

One Single Track Bridge across Pazundaung Creek near Rangoon. Span 119 ft. 0 in. Under construction.

ARGENTINE REPUBLIC

Railroad

Buenos Ayres Great Southern Railway:

Two Double Track Bridges across the Riachuelo, Buenos Ayres. Span 86 ft. 6 in. Completed 1909.

One Double Track Bridge across the Riachuelo at Casa Amarilla Access, Buenos Ayres. Span 87 ft. 0 in. Under construction.

One Single Track Bridge across the Riachuelo at Ensenada, Buenos Ayres. Span 105 ft. 8 in. Under construction.

MEXICO

Railroad

Tehuantepec Railroad:

Two Single Track Bridges across the Harbor at Salina Cruz. Span 109 ft. 0 in. Completed 1909.

HAWAII ISLANDS

Searchlight Tower

United States Government:

One 70 ft. 0 in. disappearing searchlight Tower at Fort Kamehameha, Honolulu.

CANADA

Railroad

Canadian Northern Ontario Railway:

One Single Track Bridge across Salmon River, Ontario. Span 67 ft. 9 in. Completed 1912.

One Single Track Bridge across Rideau Canal, Ontario. Span 67 ft. 9 in. Completed 1913.

Canadian Northern Railway:

One Double Track Bridge across Bear's Pass of Rainy River near Ft. Frances, Ontario. Span 57 ft. 0 in. Under construction.

Railroad and Highway

Canadian Pacific Railway and Department of Railways and Canals:

One Railroad and Highway Bridge across the Lachine Canal at Cote St. Paul. Span 50 ft. 0 in. Completed 1910.

Canadian Pacific Railway:

One Railroad and Highway Bridge across McKellar River at Ft. William, Ontario. Span 120 ft. 0 in. Width 58 ft. 0 in. (Four Tracks.) Completed 1913.

THE SCHERZER ROLLING LIFT BRIDGE COMPANY

Engineers

NEW YORK CHICAGO

Cable Address: Scherzer, Chicago