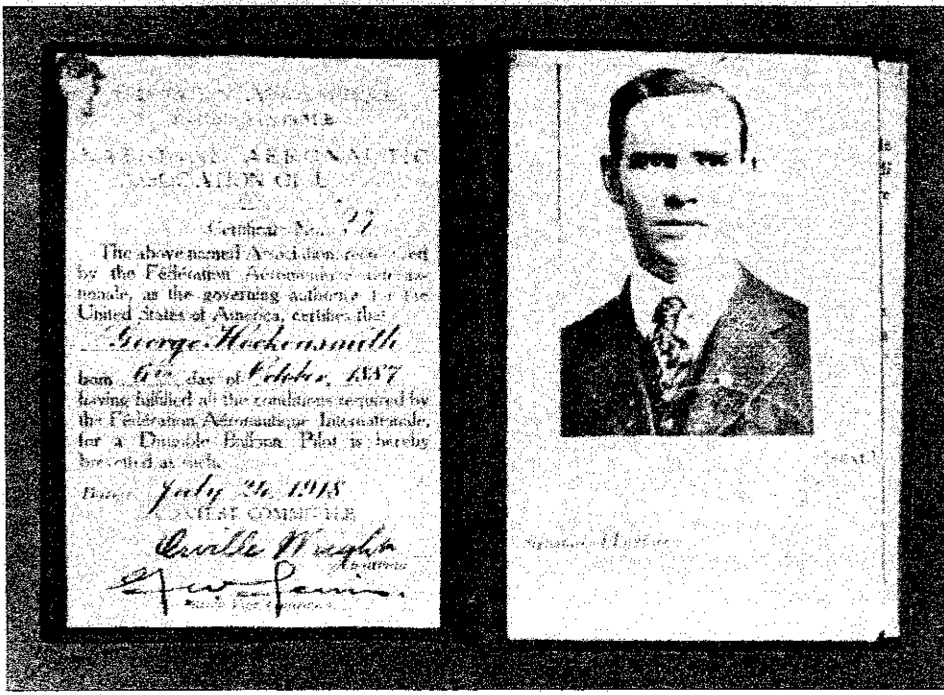
The Remarkable Mr. Hockensmith



Hockensmith's dirigible pilot's license was signed fifty years ago by Orville Wright.

Pioneer aeronaut George Hockensmith was the first man to fly the U. S. Navy's first Akron-built dirigible in 1917. At the time he was a construction superintendent for Hunkin-Conkey.

Hockensmith had been hired by Hunkin-Conkey in 1914 to supervise the construction of the Detroit-Superior High Level Bridge in Cleveland. By the time the bridge was completed in 1916, World War I was raging in Europe. Although not yet in the war, the United States was approaching a showdown with Germany over the sinking of American vessels by German submarines. The Navy asked the Goodyear Tire & Rubber Company to develop and build navigable balloons or dirigibles for anti-submarine warfare.

Hunkin-Conkey, which had built most of the Akron rubber plants, was awarded the contract to build Goodyear's blimp facilities at Wingfoot Lake on the outskirts of Akron. Hockensmith was assigned as construction superintendent.

The first dirigible was being readied before the construction of all the Wingfoot Lake facilities was completed. Hockensmith was fascinated by the blimp and frequently was found at the hangar where his construction knowledge proved helpful to the blimp builders.

High-ranking Navy officers were on the way from Washington to witness the first flight when the test pilot balked at flying the ungainly

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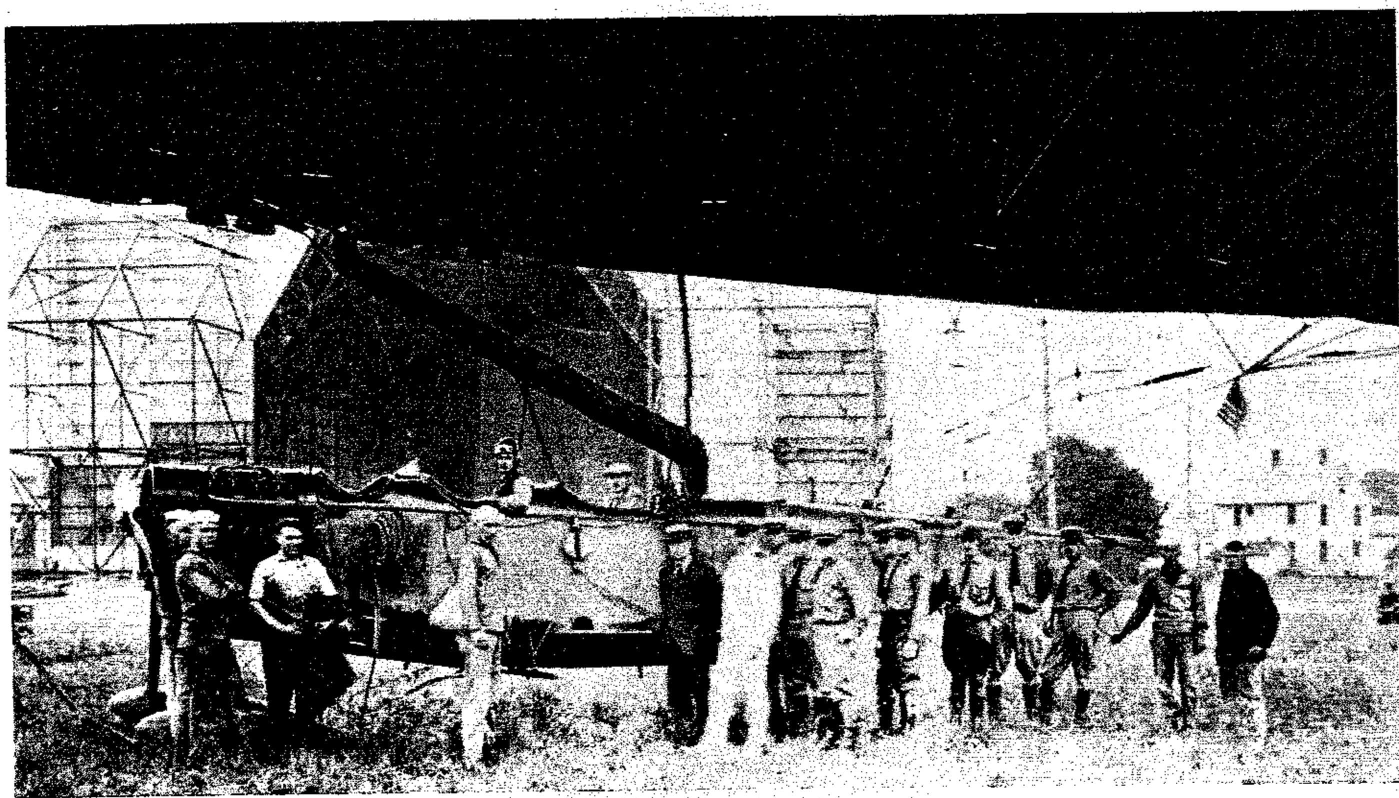


cross between a balloon and an airplane fuselage. Leaden feet paced Wingfoot Lake until Hockensmith, now thoroughly familiar with every device on the blimp, boldly volunteered to take it aloft. And so, without any previous training or experience in either balloons or airplanes, George Hockensmith cast off the mooring lines and rose to a place in the history of American aeronautics.

"Hockensmith was a daredevil—absolutely fearless—and always carried a six-shooter when I knew him" said S. E. Hunkin, now chairman of the board of Hunkin-Conkey. "He had been raised as an orphan by the Texas Rangers after marauding Mexicans raided and burned his family's Texas home, and a rod was more a part of his dress than a tie."

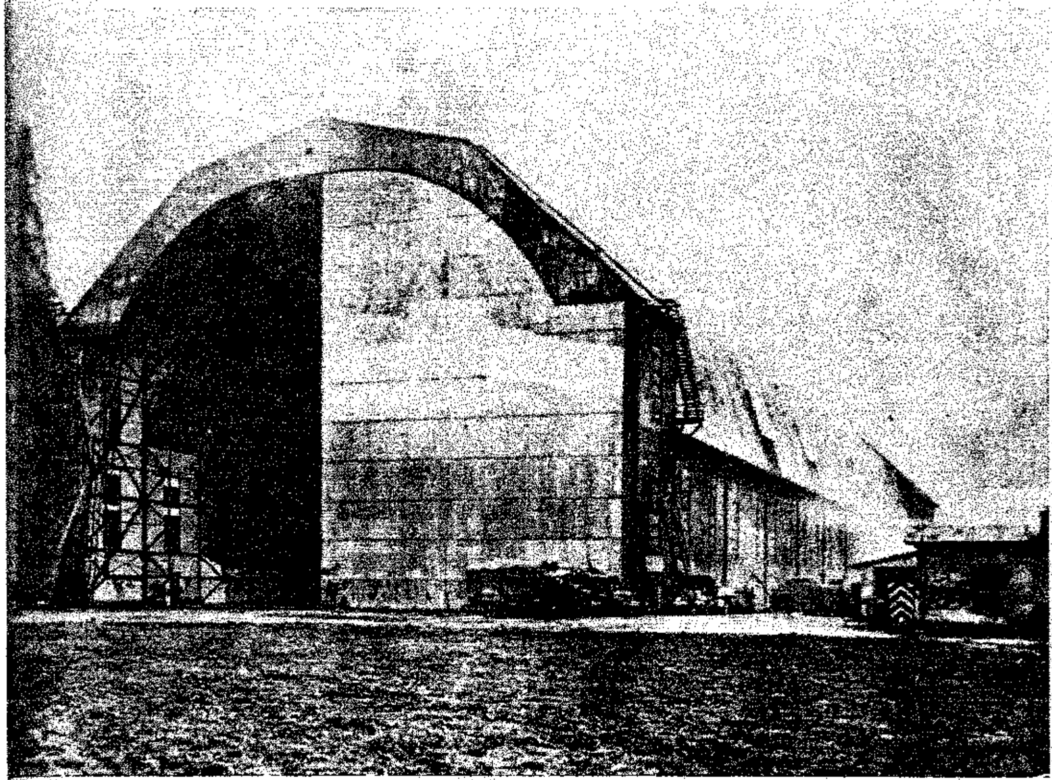
Hunkin, a young college graduate at the time, was timekeeper for the Wingfoot Lake project. He recalled that "Several days before Admiral Benson of the Navy was to arrive for final acceptance of the first blimp, the rip cord broke way up in the bag beyond reach.

"Hockensmith ordered me to dispatch a diver's suit from our yard in Cleveland so he could enter the hydrogen-filled bag to fix the cord. When he got into the diving suit, he found that the breast plate was too large to pass through the opening in the bag's appendix.

"Hockensmith swore a blue streak as he removed the suit, and before anyone could stop him, he filled his lungs with air and rushed up the ladder into the bag. After tieing the broken line he fell from the ladder, landing in the bottom of the bag. Luckily, he was close enough to the opening so those outside could reach his foot and thereby drag him from the bag. His lungs were filled with hydrogen, but he was revived through artificial respiration."

According to Hunkin-Conkey old-timers, Hockensmith once landed a blimp on the roof of Cleveland's Hotel Statler to the surprise of the onlookers below. As part of a July 4th celebration, he had piloted a blimp from Wingfoot Lake to Cedar Point, a Lake Erie summer resort some 75 miles northwest of Akron.

After circling the holiday crowds there, he flew eastward along the Lake Erie shoreline to Cleveland where he was to circle the downtown area before returning to Akron. The spectators gasped as the blimp settled down on the hotel's roof. Un-

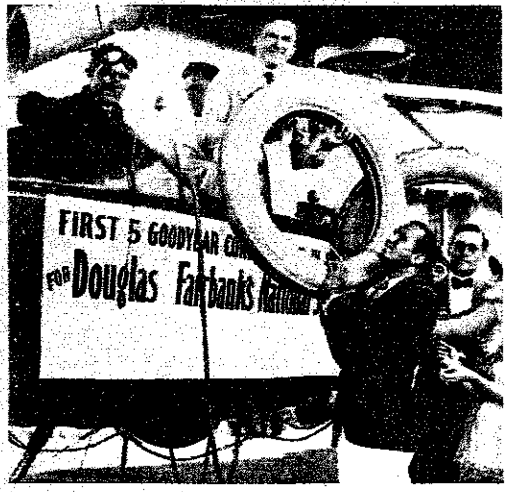


In adjacent photos, left to right:

Hockensmith at controls of first Navy dirigible built at Wingfood Lake.

Goodyear's Wingfoot Lake dirigible hanger built by Hunkin-Conkey in 1917.

In an early publicity stunt, Hockensmith landed blimp at Pickfair to present tires to Douglas Fairbanks and Mary Pickford (right).



known to anyone else, however, a landing party had secretly made its way to the roof and waited to grasp the mooring lines.

Hockensmith remained with Goodyear Aircraft Co. after Hunkin-Conkey completed the Wingfoot Lake facilities. He supervised the fabrication of dirigibles and balloons for the Army and Navy, served as test pilot, and trained other pilots. Goodyear decided to remain in the airship business following the end of World War I and established its own fleet of dirigibles and supporting facilities at strategic points around the country. Hockensmith was appointed manager of Goodyear's Los Angeles flying field where the company undertook the development of a small "Pony Blimp."

In an effort to develop practical commercial applications for the "Pony Blimp," Hockensmith once mounted a whalegun in the cockpit and cruised over coastal waters in search of whales. Fortunately, perhaps, he never had an opportunity to fire the harpoon. A sizeable whale could have taken the blimp on an exciting, if not dangerous, ride.

Another of his west coast experiences was described by Hugh Allen in "The Story of the Airship:"

"As early as 1920, Hockensmith, flying the 'Pony Blimp' from Los Angeles to Catalina Island, got lost when his compass failed in a fog so dense he could hardly see the nose of his ship. Flying low and slowly, barely off the water, he presently spied a dark shape ahead, came on a U. S. submarine, with decks awash, and an officer on lookout in the conning tower. He landed on his pontoons, taxied along side, borrowed a compass, went on to his destination."

After supervising the construction of Goodyear's Los Angeles tire plant and cotton mills, Hockensmith started his own construction business. In the late '20s, Hunkin-Conkey again sought out Hockensmith to supervise the construction of the Arlington Memorial Bridge in Washington, D. C.—now a national landmark. Following the completion of the bridge, he joined Booth and Flinn in Pittsburgh, where he supervised the construction of the George Westinghouse Bridge and the Ohio River Boulevard, which included 11 bridges.

Hockensmith continued to serve the field of heavy construction un-

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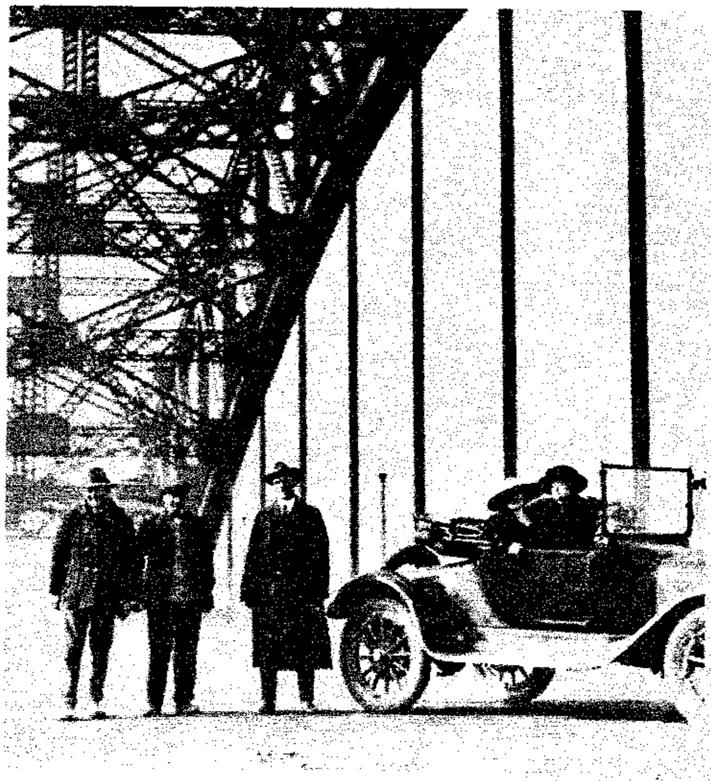
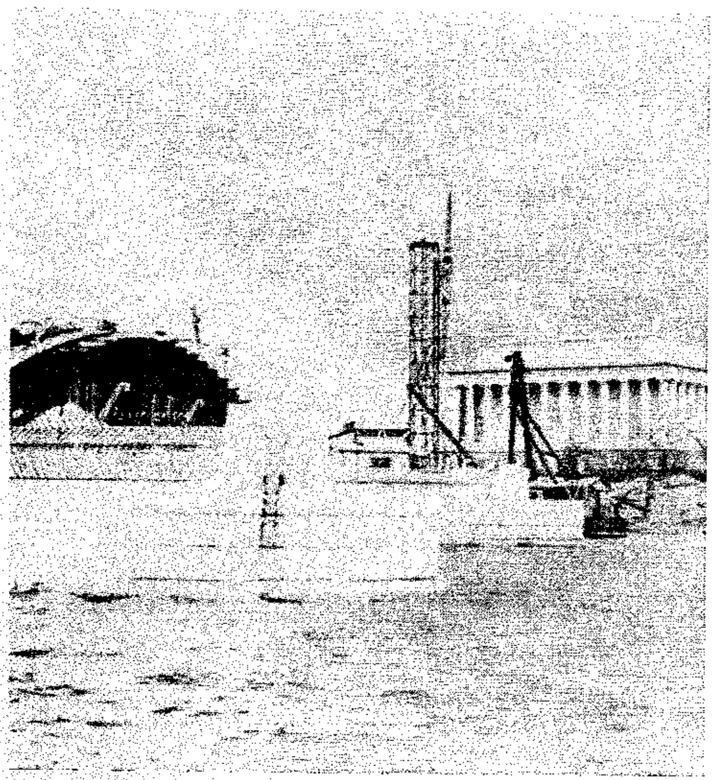


Hockensmith (center) stands on Cleveland's Detroit-Superior High Level Bridge prior to 1916 opening. His wife, Anna, is in car (left).



Arlington Memorial Bridge is shown under construction in Washington, D. C. Hockensmith was Hunkin-Conkey's project superintendent.

til his death, at the age of 64, in 1951. He was responsible for the construction of the Albany Rensselaer Bridge, Albany, N. Y.; the two Grand Island Bridges across the Niagara River near Buffalo; the Montgomery Lock and Terminal on the Ohio River near Beaver, Pa.; the Yolo By-Pass near Sacramento, Calif.; the Trinity River Bridge, Dallas, Texas; the British Guiana Air Base at Georgetown, British Guiana; airbases in Brazil; and several New Jersey Turnpike bridges.

Carrying on his father's tradition is Harold N. Hockensmith, senior vice president of Brown & Root, Inc. — a large, international construction firm based in Houston, Texas. Another son, George, is an engineer with Solvay Iron Works, Inc. in Syracuse, N. Y.

Hockensmith's widow, Anna, recalled when he fired a laborer on Hunkin-Conkey's Detroit-Superior High Level Bridge project. "After telling the laborer to pick up his pay, my husband asked him his name so he could write it on the pink slip. The laborer replied, 'George Hockensmith.' My husband wrote it down and handed the slip to the man. When I asked him why he didn't comment on the name, my husband said, 'What for? He was no damn good anyway. Why would I want to find out that he might be related to me?' "

George Hockensmith was remarkable—one of those dauntless men who pioneered this nation's development. As General Eduardo Gomes, then commanding general of Brazil's 2nd Air Zone, said in a 1944 letter to Mr. Hockensmith:

"As proof of my special appreciation of your services to my country, I appointed you to our government for decoration with the 'Ordem do Cruzeiro do Sul,' which by itself proves our gratitude for your devotion and self-sacrifice demonstrated in building airfields, often-times risking your health in order to complete the work of paving the roads of progress."

Erecting 3,800-Ton Bascules in the Arlington Bridge

Movable span in this monumental structure at Washington, D. C., one of heaviest in existence, made to harmonize with adjacent masonry arches by masking the trusses with ornamental sheet metal

By R. S. Foulds
Assistant to General Manager, The Phoenix Bridge Co., Phoenixville, Pa.

THE MOVABLE SPAN of the Arlington Memorial Bridge over the Potomac River in Washington, D. C., is one of the largest and heaviest bascules in the world. With an over-all width of 96 ft., including a 60-ft. roadway and two 14-ft. sidewalks of reinforced concrete, each of the two 108-ft. leaves and its concrete counterweight weigh 3,800 tons. Design, fabrication and erection consequently involved difficult problems.

The design of the Arlington Memorial Bridge was governed largely by architectural considerations. In appearance it is a nine-span arch bridge, but it actually consists of eight concrete barrel arches of 166- to 180-ft. spans and the 216-ft.-span bascule in the center, which is faced with ornamental metalwork to harmonize with the white granite facing of the arches. The substructure of the bridge consists of four abutments, one at each shore line and one at each end of the bascule span, and six piers. The total length of the bridge is 2,143 ft.

Bascule design

As shown in the accompanying illustrations, each leaf includes two bascule trusses mounted on a main trunnion resting in bearings either side of the truss. The bearings are carried on vertical trunnion posts that transfer the load directly to the abutments. The counterweight under the floor hangs as a pendant from counterweight trunnions at the rear end of each bascule truss, the arrangement being such that the counterweight moves parallel to itself as the leaf rotates upon the main trunnions. At the center of the span the two leaves are locked together by a detail designed to transmit shear and to maintain equal deflection for both leaves under all conditions of loading.

Each leaf is operated by two motors direct-connected to a herringbone-gear speed-reducer, which, through a self-contained equalizing device, delivers one-half the driving torque to each of the two main operating pinions, meshing with rack segments attached to the bascule trusses. Each operating motor is provided with a motor-mounted solenoid service brake. The intermediate shaft of the speed reducer is extended on each side to take two emergency solenoid brakes (four in all), which may be applied one at a time and are of sufficient capacity to hold the leaf fully open against a wind pressure of 15 lb. per sq.ft.

Power service at the bridge is in the form of alternating current, three phase, 60 cycle, 4,000 volts. A 4,000-volt, 300-hp. motor is direct-connected to two 100-kw., 600-volt d.c. generators, which supply current to the operating motors. The arrangement is such that the operating motors of either leaf can be supplied with power from either generator.

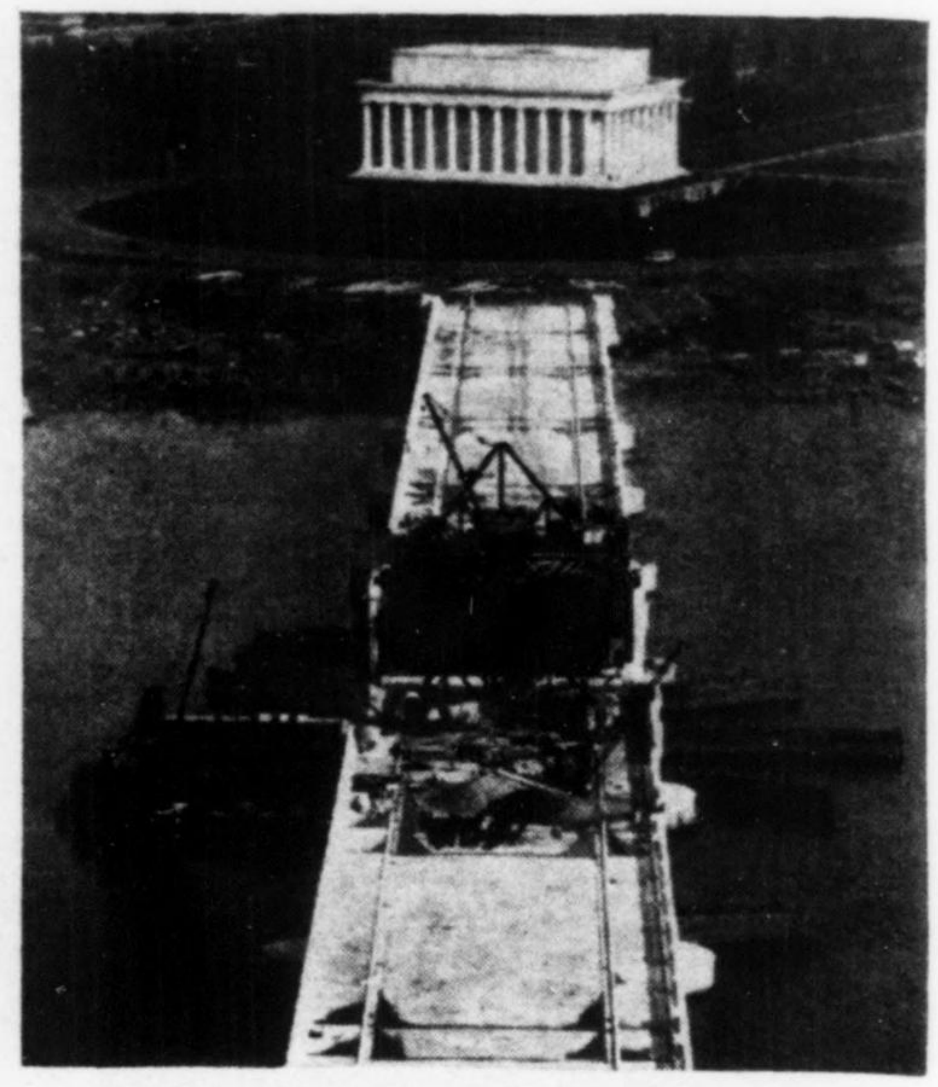


Fig. 2—Double-leaf bascule span at center of Arlington Memorial Bridge, Washington, D. C., erected by two stiff-leg derricks and a floating plant. Lincoln Memorial in background.

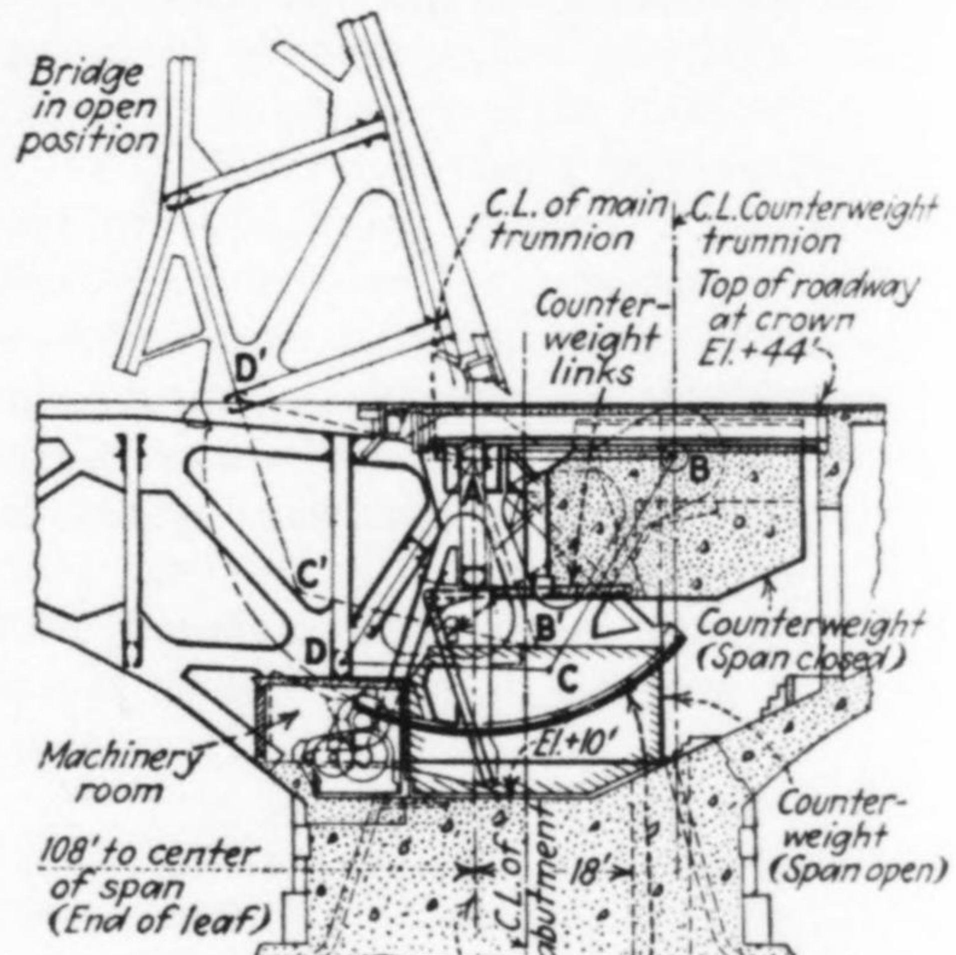


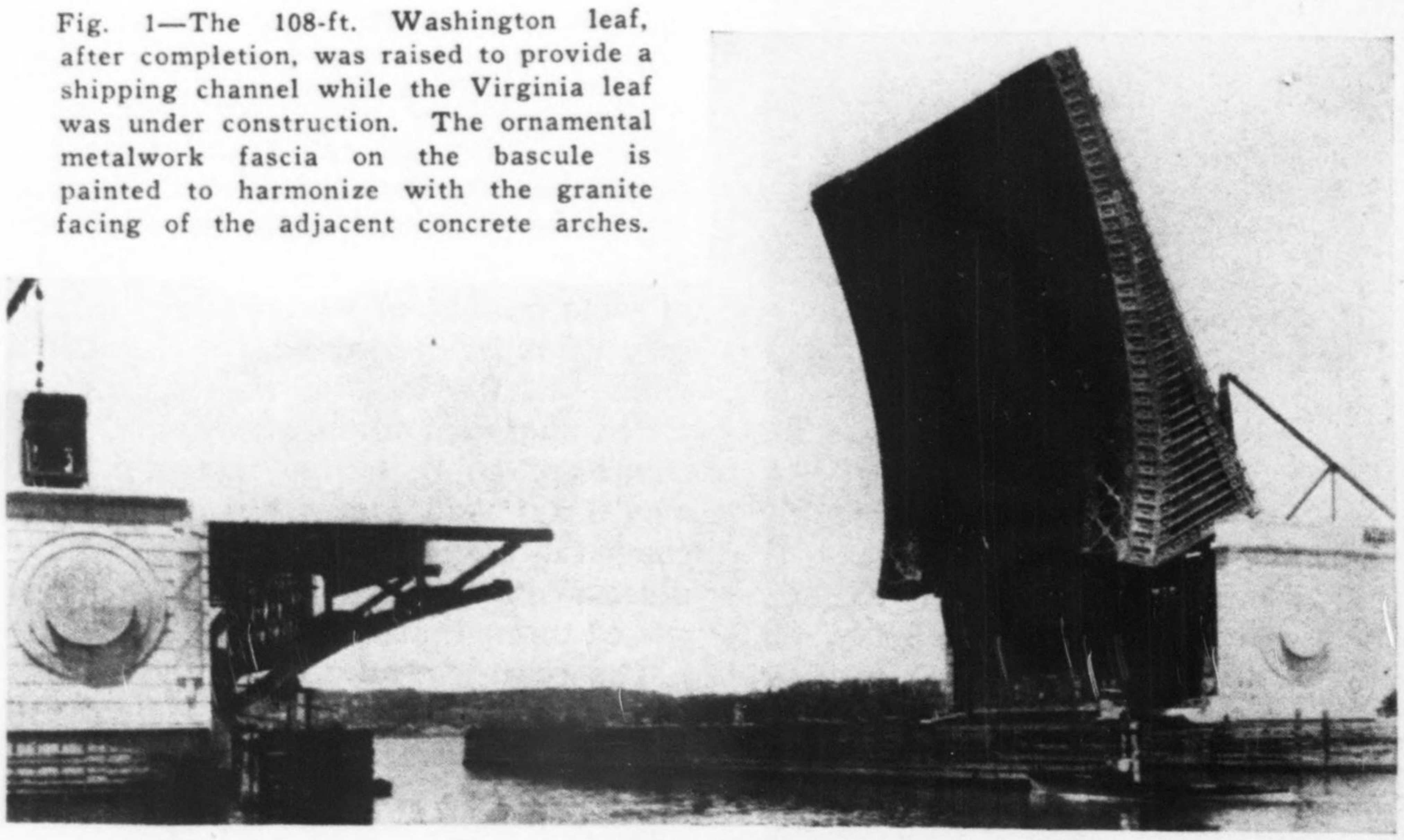
Fig. 3—Concrete counterweights, weighing about 2,400 tons each, move downward into a pit under the bridge floor when the 108-ft. leaves are raised.

The speed of leaf operation varies directly with the voltage, so that it is possible to combine a high motor torque with an extremely slow creeping speed for seating the bascule leaves. A gasoline-engine-driven generator set has been provided for use in case of failure of the regular power supply.

Bascule erection

The approaches to the bascule span were not complete when its erection was started, so that all materials had to be delivered by water. A contractor's yard was established and materials were received in the government reservation on the Arlington side of the river. A derrick car and cranes in this yard transferred materials to barges, on one of which an A-frame derrick was installed. From the yard to the site was one-third of a mile, and a tugboat moved the floating equipment between the two places. At the bascule site a 30-ton steel stiff-leg derrick was installed on each abutment, and materials were placed by these and by the derrick boat.

Fig. 1—The 108-ft. Washington leaf, after completion, was raised to provide a shipping channel while the Virginia leaf was under construction. The ornamental metalwork fascia on the bascule is painted to harmonize with the granite facing of the adjacent concrete arches.



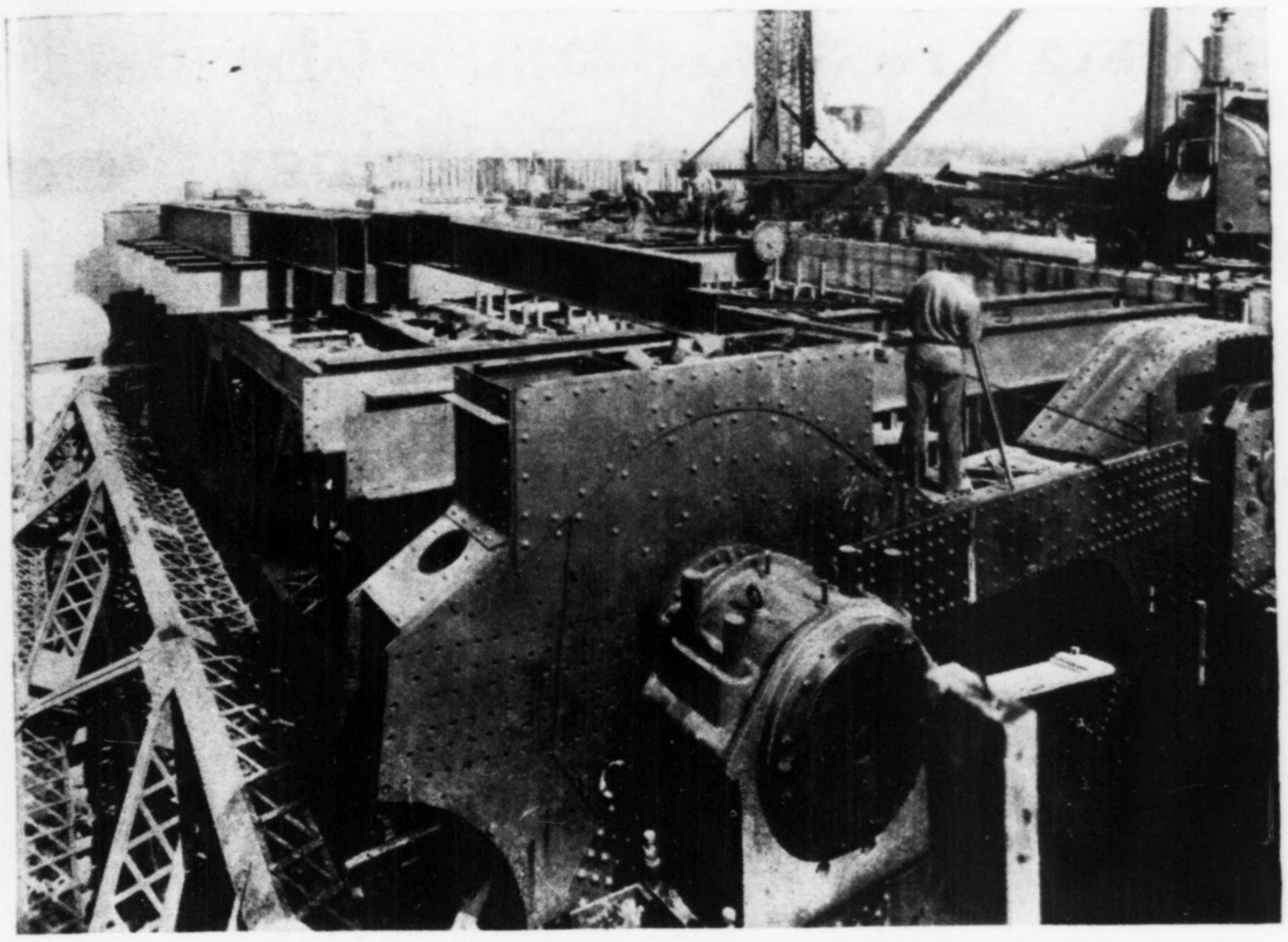


Fig. 4—Massive main trunnion and counterweight trunnion of Arlington bascule. Assembly of two main-truss members, gussets and trunnion pin comprised an erection lift of 31½ tons.

As the initial erection operation, the grillages under the trunnion posts and the trunnion bearings resting on the posts were set with extreme care. Before grouting the grillages they were leveled by set screws. Dowels of 1¼-in. size and 1½-in. set screws were used for locating and adjusting, and dummy trunnions with a taut wire through their axes were utilized in aligning the trunnion bearings before planing and inserting the necessary shims. The distance between trunnion axes on opposite abutments was carefully measured to insure proper matching of the leaves at the center of the channel. Machinery supports also were placed with great care. The trunnion posts were among the heaviest single lifts, each section weighing 22 tons. After these and the bearings were placed, the rear portions of the main trusses and the heavy counterweight truss suspended between them were built. The heaviest single lift in the bridge weighed 31½ tons and comprised an assembly of the two main-truss members and the gusset plates connecting them at the trunnion, the trunnion pin and the collars.

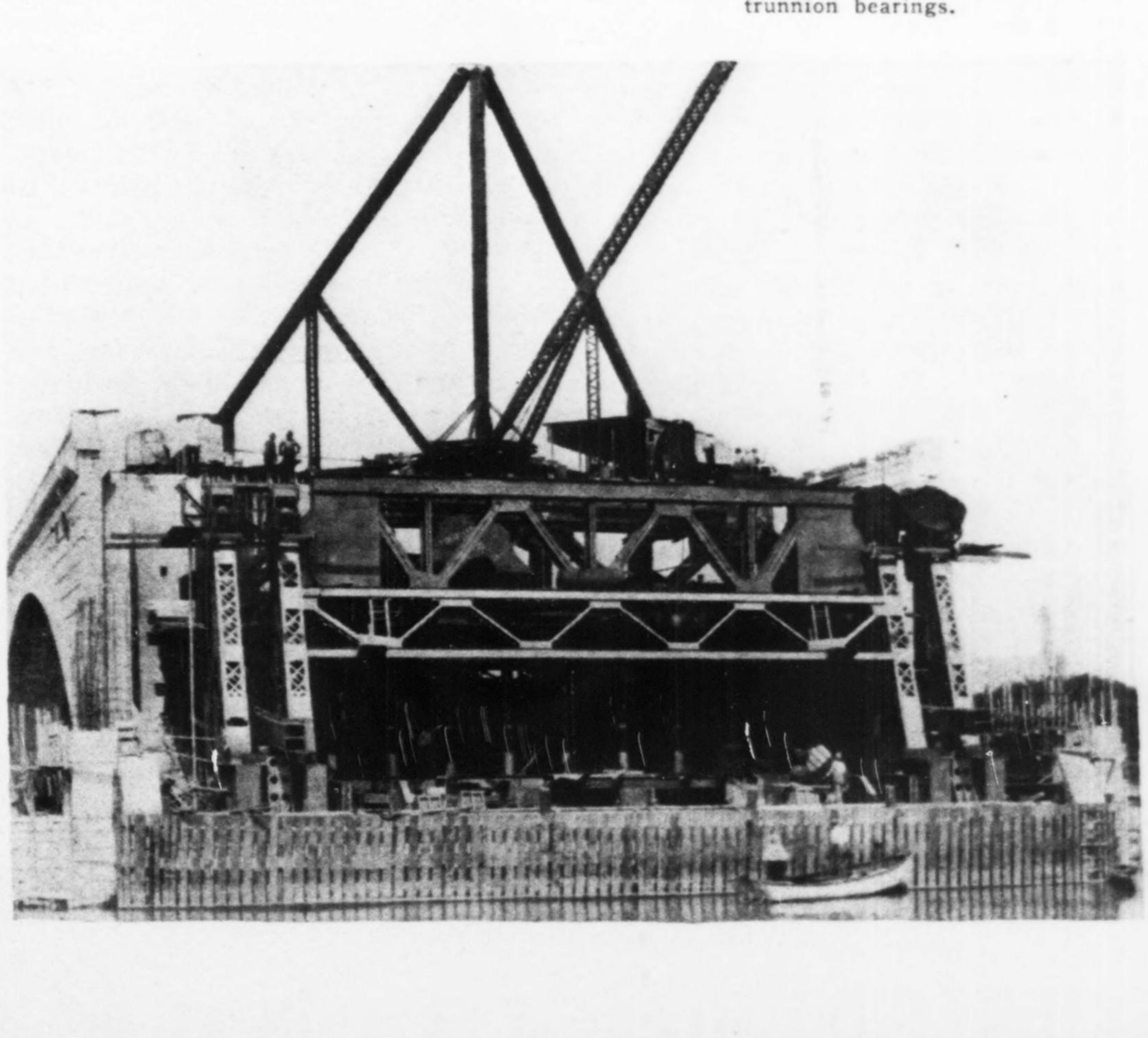
Counterweight—Steel falsework resting on the pit floor was erected to carry the mass of the counterweight, dimensions of which were approximately 16x25x66 ft. Three-inch planking on the falsework beams served as the bottom forms. The timber side forms were built in sections in the Arlington yard ready for assembly at the site.

The volume of each counterweight is 689 cu.yd. The weight per cubic foot required for the Washington leaf was 265 lb., and for the Virginia leaf 255 lb. (The center locking device on the Washington leaf accounts for the greater weight of its counterweight.) To secure the above unit weights, punchings were specified to be used in the concrete mixture. Although structural shop punchings are more satisfactory as a concrete ingredient than other forms of steel scrap, the counterweights on this bridge would have required about 3,000 gross tons of punchings—an amount too large to be accumulated from all the available sources in the time allowed. To solve this problem, an effort was made to secure a material of high specific gravity as a substitute. Consideration was given to "heating-furnace cinder" (lump of Fe_3O_4 obtained from heating furnaces), copper slag and various ores. Some ores, while having the high specific gravity, proved friable and unfit. Chilean ore was found to be a good substitute but unfortunately was not available. The solution was to use Swedish ore, which had satisfactory physical characteristics and a specific gravity of 4.94. The entire cargo of a ship from Sweden (2,400 gross tons) was secured and transferred by rail (59 carloads) to the Arlington yard, where it was run through a crusher to break up the lumps, and then transported to the concreting plant on the bascule abutments.

Compression tests of concrete specimens containing Swedish ore showed the strength to be entirely satisfactory, and the materials were accordingly proportioned to get the desired unit weights. Included in the counterweights as mixed are 2,200 bbl. of cement, 125 tons of sand, 910 gross tons of fine Swedish ore, 1,490 gross tons of coarse Swedish ore, and 1,136 gross tons of punchings. About 146 tons of water is retained in the mixture. Exclusive of reinforcing rods, the total mixture in the counterweights weighs 4,787 tons. All materials necessarily were proportioned by weight. In placing the concrete, a compacting machine was tried but proved impractical because of the large amount of reinforcing steel.

The program of construction called for erecting one leaf of the draw at a time, to permit placing the concrete floor slab with the leaf closed. To protect navigation, a fender 8 ft. wide and 143 ft. long was built in the center of the opening, and temporary fenders were built around the abutments. When these fenders and the Washington counterweight were completed, navigation was restricted to the south half of the channel. The main trusses, the masking

Fig. 5—Trunnion posts are braced by a heavy transverse truss over counterweight pits. On the left trunnion post is the dummy trunnion used in aligning the trunnion bearings.



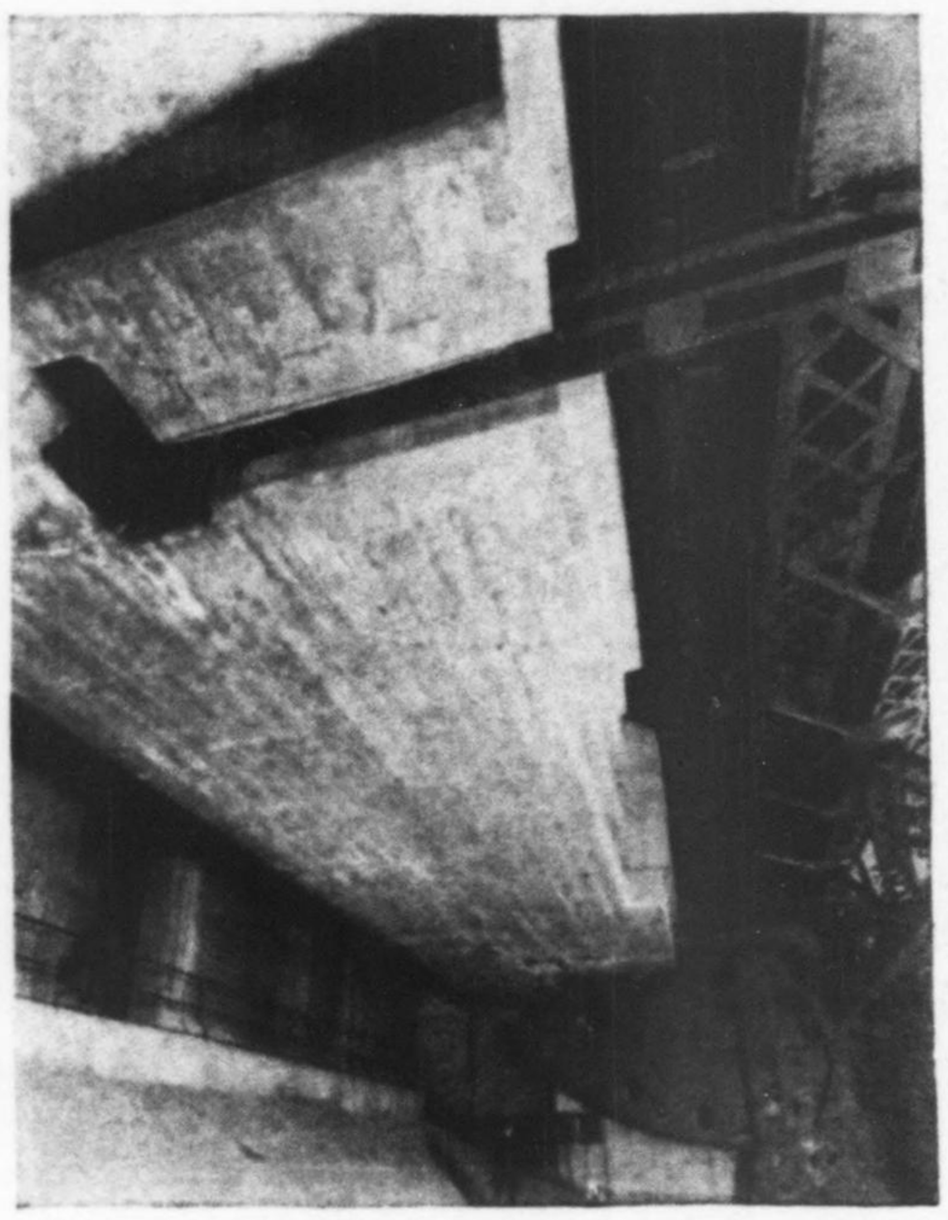


Fig. 6—Pit into which counterweight lowers when span is being raised. View gives indication of huge proportions of concrete counterweight.

trusses and all bracing for the Washington leaf were erected by the derrick boat. In this part of the work the heaviest single lift was the 26-ton end floor beam over the center of the channel. When all but the bottom-chord splices of the trusses had been riveted, forms for the roadway and sidewalk floor slabs were installed and the concrete was poured.

Before opening the leaf it was necessary to apply the copper-molybdenum metal to the masking trusses and to place and adjust the cast-aluminum balustrades on the deck. The installation of the machinery and power line proceeded along with the other work. When the leaf was raised it was found to balance excellently.

The construction of the Virginia leaf was carried out in a similar manner with navigation diverted to the north half of the channel.

The Arlington Memorial Bridge commission had charge of the entire project. For the commission Col. U. S. Grant, 3d, is the executive officer, and John L. Nagle is designing engineer. The Phoenix Bridge Co., of Phoenixville, Pa., had the general contract for all the work on the bascule span. The Faucus Machine Co., Cleveland, Ohio, had the subcontract for furnishing the machinery, and the Phoenix Bridge Co. erected it. W. V. Pangborne & Co., Inc., of Philadelphia, had the subcontract for the electrical equipment. The Hunkin-Conkey Construction Co., Cleveland, Ohio, had the subcontract for the stone-masonry finish and concrete backing for the abutments, as well as for the concrete for the houses and the floor slabs. The Strauss Engineering Corp. (C. E. Paine, managing engineer) was engineer for the bascule span. For the Phoenix Bridge Co., J. F. Kinter, superintendent of erection, was in general charge, and field operations were under H. A. Archinal, foreman, and Frank Peirce, resident engineer.

Surveys Record Data on Sewer-System Hydrology

By V. W. Willits
Assistant in the Bureau of Engineering, Los Angeles, Calif.

TO PROVIDE records showing the relation of sewer use to sewer capacity and information for programming extensions, Los Angeles has deevloped a system of surveys and recorded data during the past eight years. These surveys are based on field observations and provide statistics and material for a series of maps, giving immediate information on any phase of the sewer systems's use and its excess capacity.

Data Collected—The rate of flow in second-feet at various strategic points in the system is gaged at regular intervals to provide information including: (1) excess capacity and increase in flow since previous records were taken, correlated to population or industrial increase as a guide to future service; (2) position and cause of defects or clogging; (3) coefficients of quantities per capita or per acre in accordance with various conditions of topography and population; (4) time of arrival of peak loads from laterals to trunk lines; (5) comparison of actual performance with design; (6) influence of stormwater, and industrial waste, such as from packing houses and laundries; (7) silt and sand deposits; (8) measurements at outfall for information on entire system; (9) analysis of pumping plant data; (10) data for periodic billing of foothill municipalities for ocean outfall service.

Method—Gaging is done at existing manholes where the depth of sewage measurement permits the computation of flow at the station by reference to hydraulic properties of pipe diameter, grade and rating curve. The manholes selected for periodic gaging points total about 850 and have been carefully selected for the following characteristics: (*a*) critical position near outlet of a trunk or below or above junction of laterals; (*b*) uniform diameter and slope; and (*c*) accessibility, including freedom from heavy traffic on street, lack of offsets and depths preferably less than 15 ft.

Field parties, consisting of a chainman and two laborers with transportation, work under the direction of an assistant engineer. Measurements are made from rim to flow line and the time noted. In an average eight-hour day one of these parties can observe the depth and time of peak flow through eight or ten connected manholes. In special cases of heavy storms or industrial plant discharge, 24-hour runs are taken. A depth-gage with clock recorder is used if conditions are favorable.

Pumping Plants—An important feature of this survey and the resulting data is the information obtained from sewage-pumping plants. The usual statistics kept by a pumping plant including Venturi meter graphs, pressure gage records and meter readings are sufficient except in special cases. Observed lifts, pressure heads and power output indicate the power used in the plant. For smaller plants not equipped with recording instruments, portable water gage meters are attached for periods of ten days every three months for check purposes.

As measurements are based on the depth of flow and corresponding proportional discharge to full sewer capacity, all reference in books and diagrams refers to full pipe capacity at existing grade. In special cases of discharge various hydraulic problems arise in computing capacity. Statistics are assembled by drainage basins (except outfalls and interceptors) progressing from a junction with the trunks through laterals and tributaries. Notes and data are entered on a card reference system, cross-indexed for convenient reference.

To make this information available for rapid inspection and interpretation by city engineering and public officials, exhibit diagrams and maps are maintained showing summaries of collected material. Maps on 1,000- or 2,000-ft. scales in standard 30-in. sheets show: (1) sewage lines with full pipe capacities in black and colored figures to indicate maximum second-feet flow observed for each year since 1921 at gaged manholes; (2) location and length of pipes overloaded at the end of each year; (3) stormwater increment with wet-weather discharge together with dry-weather flow at special gaging points to indicate amount of stormwater and ground infiltration; and (4) special profiles and exhibits of overtaxed portions of trunk line giving monthly records of flow, storm observations, silt deposits, etc. In connection with these exhibits information service is maintained which is particularly useful in studies for improvements and extensions and the issuing of permits for laundries, swimming pools and the like.

This survey work is carried on by the part-time supervision of an assistant engineer, the full time of two junior engineers and one draftsman, part time of one surveyor and full time of two surveyors' helpers.

Detail development of this program has fallen largely to the writer under the supervision of Walter D. Smith, assistant engineer, and H. G. Smith, division engineer. J. J. Jessup is city engineer.