Little Kaukauna Lock and Dam
At the 13 mile marker
on the Lower Fox River
Rockland
Brown County
Wisconsin

HAER No. WI-89

HAER
WIS
5-ROCK,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
Rocky Mountain System Support Office
National Park Service
P.O. Box 25287
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

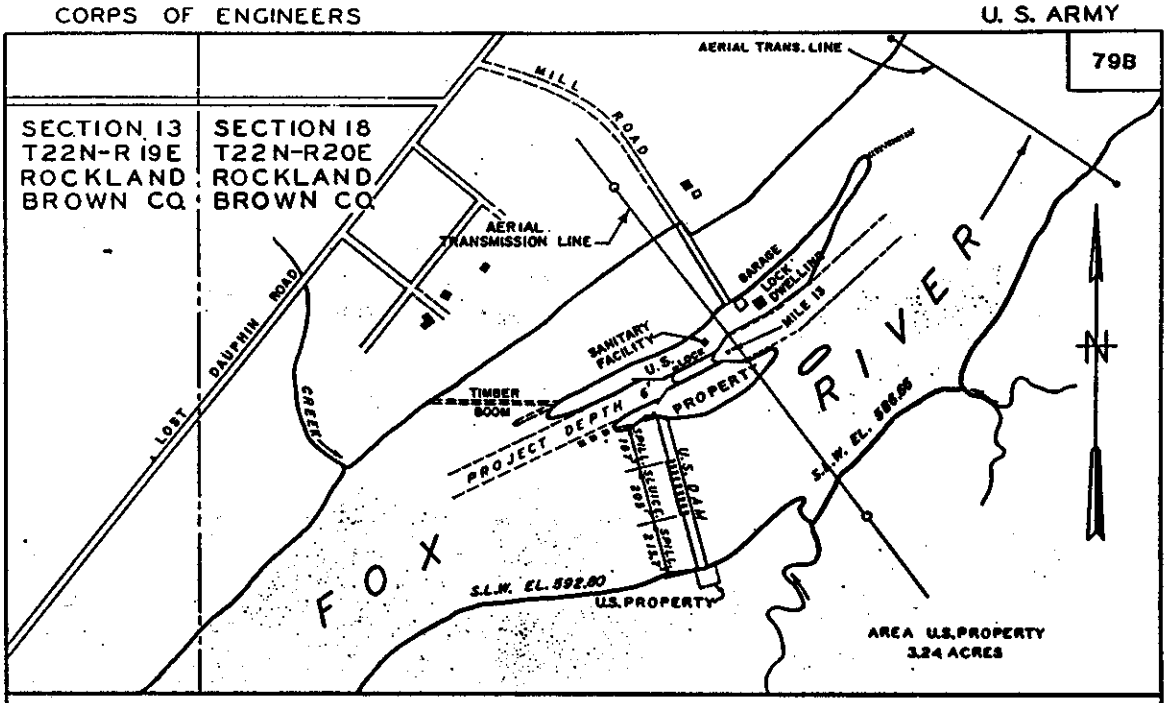
HAER
WIS
5- ROCK,
1-

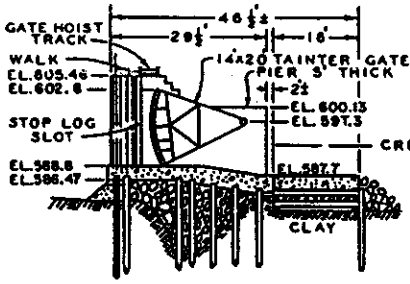
LITTLE KAUKAUNA LOCK AND DAM

HAER NO. WI-89

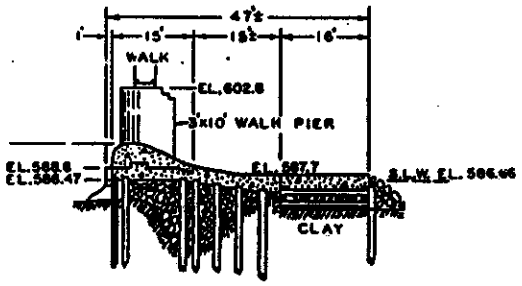
Location:	The Little Kaukauna Lock and Dam Complex is located on the south bank of the Fox River at river mile 13 in Williams Land Grant, T22N, R20E, Civil Town of Lawrence and the SW 1/4, NE 1/4, SW1/4 of Section 18, T22N, R20E, Civil Town of Rockland, Brown County, Wisconsin. UTM: North bank of dam: 16/410450/4914240 South bank of dam: 16/410490/4914030 Lock: 16/410460/4914200 USGS Quadrangle: De Pere, Wisconsin 7.5' series
Date of Construction:	1856 - 1943
Engineer:	United States Army Corps of Engineers with Contractors
Architect:	United States Army Corps of Engineers with Contractors
Present Owner:	United States Army Corps of Engineers
Present Use:	The Little Kaukauna Lock and Dam Complex is used by recreational boaters utilizing the Lower Fox River.
Significance:	The Little Kaukauna Lock and Dam Complex allows passage for watercraft around the rapids present in the Lower Fox River at Little Kaukauka.
Project Information:	This documentation was undertaken in 1995 in accordance with requirements detailed in a June 19, 1994 letter from Gregory D. Kendrick, Chief, History Branch, NPS to Dale Monteith, Acting Chief, Planning Division, USACOE, Detroit District. The Lower Fox system remains basically operational but was placed in caretaker status by the USACOE in 1982. The USACOE plans to divest itself of the Lower Fox system as soon as is feasible; therefore, NPS requested this documentation. All documentation conforms to HAER standards. Dr. John D. Richards, Principal Investigator; Georgia A. Lusk, Patricia B. Richards, and Robert J. Watson, Project Archivists with Great Lakes Archaeological Research Center, Inc.; Joseph Paskus, Project Photographer.

CORPS OF ENGINEERS U. S. ARMY

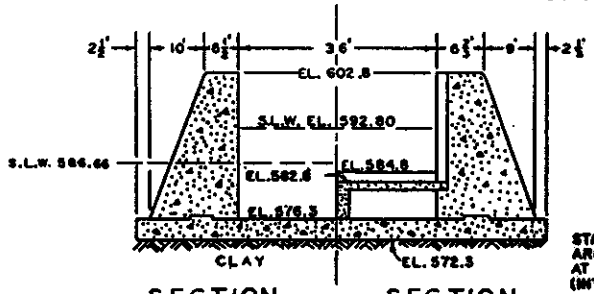




SECTION SLUICEWAY



SECTION SPILLWAY



SECTION LOCK CHAMBER

SECTION UPPER GATE RECESS

STANDARD LOW WATER AND ELEVATIONS ARE REFERRED TO MEAN WATER LEVEL AT FATHER POINT, QUEBEC, I.G.L.D. (1936) (INTERNATIONAL GREAT LAKES DATUM)

PROJECT DEPTH IS REFERRED TO STANDARD LOW WATER.

LOCK

STRUCTURE DATA

AVAILABLE LENGTH	146.0'
CLEAR WIDTH	38.0'
LIFT, MEAN STAGE	7.2'
UPPER MITER SILL	EL. 584.80
LOWER MITER SILL	EL. 577.22
BREAST WALL	EL. 584.80

DAM

STRUCTURE DATA

6 SLUICE GATES
LENGTH OF CLEAR SPILLWAY 361.7'
LENGTH OF CLEAR SLUICEWAY 160.0'
24" FLASHBOARD
AUTHORIZED MAY 29, 1909
(E.O. 71, 614/15)

LITTLE KAUKAUNA LOCK AND DAM
FOX RIVER
WISCONSIN

IN 1 SHEET SHEET NO. 1

SCALE OF FEET
100 0 500 1000 1500

U. S. ARMY ENGINEER DISTRICT, DETROIT
SEPTEMBER 30, 1966

☆ U.S. GOVERNMENT PRINTING OFFICE 1966-644-214

LITTLE KAUKAUNA LOCK AND DAM

General Description

The Little Kaukauna Lock and Dam Complex is located on the south bank of the Fox River at Mill Road, river mile 13. The complex consists of a dam, a lock, a canal, a lockkeeper's residence, a lockshelter, a garage, a storage building, and a sanitary structure.

History

In 1856, the Aquila became the first steamer to successfully navigate the Fox and Wisconsin Waterway between the Mississippi River and Green Bay. However, the Aquila's successful journey was only possible during months of high water levels. A report prepared in 1856 for the State Assembly, noted that difficulties negotiating the rapids at Little Kaukauna consistently plagued navigation between Green Bay and Lake Winnebago on the Lower Fox River.[1] Consequently, in 1846, the Fox and Wisconsin Improvement Company developed a plan to increase the depth of the waterway and to construct a lock and dam at Little Kaukauna Rapids.[2] The lock and dam was completed between 1857 and 1866.[3]

In 1866, Major Charles Sutter reported that the Little Kaukauna lock was in good condition. Sutter also reported that the Little Kaukauna complex included a 1,166 foot canal that by passed a 550 foot long, 6 foot high dam. However, by 1869, the Little Kaukauna dam was leaking badly and was partially washed out.[4]

Following the 1872 federal purchase of the Fox River Lock and Dam System an additional survey was conducted. Results indicated that the Little Kaukauna lock needed new plank lining; however, the partially washed out dam had been rebuilt and strengthened.[5] In 1873 Major Houston of the U.S. Army Corps of Engineers stressed the importance of the Fox-Wisconsin Waterway system to the development of an inexpensive national transportation system. Consequently, Houston devised a five point plan to improve the Fox-Wisconsin Waterway system. As part of Houston's plan the pile and timber dam at Little Kaukauna was to be replaced by a 587.7 feet long concrete structure. The new dam was finished in 1927 at a cost of $48,299.83.[6]

The crib timbers above the low water line at the Little Kaukauna lock were replaced and the entire lock chamber was relined with double thickness planks in 1875. In addition to these repairs, the upper gates were replaced and the lower gates were replanked.[7] On November 20, 1886 the lock was again closed to navigation in order to undertake a series of extensive repairs. At this time "All the planks, two courses, were removed from the sides and floor; the coping timbers and posts above the lower girts were taken out and replaced by new. The gates and hollow quoins were removed, new hollow quoins were framed and placed, and the gates repaired and rehinged. The mitre sills were removed, dressed over, replaced and fastened..., 6,092 superficial feet of double planking were spiked down in the floor, and 6,099 superficial feet in the chamber walls."[8] Additionally, more minor repairs were conducted on the timber-lined lock in 1908, 1909, 1910, and again in 1917. The Little Kaukauna lockwas completely rebuilt in 1939. Little Kaukauna was one of the first three locks to be rebuilt with reinforced concrete.[9] Construction on this lock continued for four years at a total cost of $362,426.81.[10] In 1940, the left wall of the original lock was lowered and three cribs were built above the lock on the right side of the canal.[11] The lock gates were cleaned and painted in 1947.[12]

Along with improvements to the Little Kaukauna navigational facilities, a new lockkeeper's house similar to the one at Little Chute was constructed in 1911.[13]

LITTLE KAUKAUNA DAM

The existing dam at Little Kaukauna has not changed structurally since it was built in 1927. The dam is oriented NNW/SSE and is 587.7 feet long. The dam is comprised of three sections: two spillways located at each end of the dam, and a central portion consisting of eight concrete sluiceways.[14] The dam maintains a maximum pool level of 592.8 feet above sea level.[15]

South Spillway

The south spillway is 215 feet 8 1/2 inches in length. The length of the south spillway is defined by the portion of the dam between the southern most dam abutment and the southernmost pier section of the sluiceway.[16]

The southern end of the southern spillway is connected to a concrete abutment which is 22 feet in height, and 45 feet in length. The abutment is comprised of three walls. The upstream end of the abutment extends perpendicular to the spillway and parallel with the channel of the Fox River. The head of the abutment is 25 feet in length, 2 feet 4 inches at the top and 9 feet wide at the base. The support wall is perpendicular to the head wall of the abutment and is beveled on both faces from a width of 6 feet 4 inches at the base to 2 feet at the top. This wall extends 9 feet from the abutment toward the bank and is located 22 feet 6 inches from the upstream end of the abutment head. The downstream end of the abutment is slightly angled toward the bank from the main axis.[17]

The south spillway is comprised of 24 poured concrete construction sections.[18] Each section is anchored to the bedrock of the river bottom by thirty 5/8 inch by 4 foot 6 inch steel bars at the upstream end of each section.[19] The length and width of each section varies according to its position in the overall layout of the dam.[20]

Aside from their differing widths, each construction section of the south spillway conforms to specifications of a generalized construction section plan. When measured parallel to the river channel, each construction section has a basal length of 24 feet 9 inches. The upstream face of the spillway curves toward the crest line at a 4 foot 8 inch radius. The downstream face of the south spillway, measuring 12 feet horizontally from the crest line to the downstream edge, is constructed by a curve with a 12 foot radius.[21]

The crest line is the highest point of the spillway, maintaining an elevation of 594.50 feet above mean sea level. By comparison the downstream "toe" of the spillway maintains an average elevation of 589.40 feet above mean sea level.[22]

The spillway construction sections are secured together with rebar. The upstream and downstream sides of the segments are connected by seventeen, 3/8 inch diameter 17 foot long rods on top and seventeen 5/8 inch diameter 16 foot long rods on bottom and fifteen 5/8 inch diameter rods that are 4 feet 6 inches in length. The north and south sides of the crest segments are tied together with nineteen 5/8 inch diameter rods.[23]

Three concrete walk piers on the upstream end of the south spillway serve as a base for a metal walkway running the length of the spillway. The longitudinal centerline of each walk pier is located 12 feet 6 inches from the edge of the crest segment.[24]

The walk piers of the southern spillway are bullet shaped, with the parabolic end pointing upstream. Each pier measures 10 feet from the tip of the parabolic end to the downstream edge. Measured from the downstream side, the pier sections maintain a maximum width of 3 feet for a length of 6 feet 5 1/8 inches, at which point the sides begin to curve gently toward the tip of the

parabola. Each side of the pier arches toward the upstream tip, maintaining a curve with a 5 foot radius.[25] The upstream nose of each of the walkway piers is armored with a 10 foot 6 inch section of 4 by 4 by 3/8 inch angle iron secured to the pier with 3/4 inch by 18 inch steel bolts.[26]

The walk piers are tied into the spillway construction sections by a rectangular concrete key at each end of the pier. The keys are centered along each pier's longitudinal axis. Keys are 1 foot 6 inches wide, 1 foot 6 inches high and extend 6 inches into the spillway. The upstream key is located 3 feet 6 7/8 inches from the parabolic tip of the pier and the downstream key is located approximately 1 foot 6 inches from the downstream end of the pier.[27] Each key is tied to the spillway construction by four 7/8 inch by 2 foot stub rods. In addition to the concrete keys, each walkway pier is tied to the spillway with 17 7/8 inch by 2 foot stub rods.

In profile, the walk piers are somewhat rectangular, with concave bottoms conforming to the curved surfaces of the spillway construction sections. The piers were designed to maintain an elevation of 604.50 feet above sea level at their tops, so although the sides of the piers average 10 feet 6 inches in height, the difference in elevation from the base of the pier varies. Measured from the point of contact with the spillway construction section, the difference in elevation of the upstream end of the walkway piers from 604.50 feet above sea level is 10 feet 6 inches, while the difference in elevation of the downstream end is 11 feet 8 inches. On the downstream end of the pier there are two 1 foot 4 inch risers which carry the elevation from 604.50 to 601.7 feet above sea level.[28] Thus, although the difference in elevation from 604.50 feet above sea level of the downstream base of the pier is 11 feet 8 inches, the actual height of this section is 10 feet 6 inches.

A walkway spans the entire length of the south spillway from the dam abutment to the first pier section of the sluiceway. The walkway over the south spillway consists of two 71 foot long sections of channel iron, four 49 foot 11 1/2 inch long sections of channel iron, and two 48 foot 11 1/2 inches long sections of channel iron bolted onto the walkway pier sections with 3/4 inch by 18 inch split anchor bolts fitted with specially beveled washers. Each side of the walkway is comprised of 4 channel beams bolted end to end, and spaced 3 feet 5 1/4 inches apart so that the channels of opposite beams face one another. The interior space between the channel beams is spanned by twenty five 3 foot 4 inch long I beams which have been bolted to the channel iron using L braces made of 2 inch sections of 6 by 4 by 3/8 inch angle iron and 1/2 inch by 1 1/2 inch machine bolts.[29] The horizontal I beam sections support ribs spaced 8 feet 4 inches apart along the entire length of the walkway.

On the exterior of the channel beams, sections of angle iron have been spaced at 16 foot 8 inch intervals the length of the spillway to form the uprights for a handrail. The majority of the south spillway handrail uprights are constructed of 4 foot sections of 2 1/2 by 2 1/2 by 3/16 inch angle iron. The two uprights located at the junction of the walkway and the south dam abutment are also 4 feet in height, and are constructed of 2 1/2 by 2 1/2 by 3/16 inch angle iron. A taller upright, 5 feet 6 3/8 inches in height, is located on the upstream side of the east spillway walkway at the walkway's junction with the sluiceway. This upright is connected to the first upright of the sluiceway walkway by two sections of 5 foot 10 5/16 inch long pieces of 2 1/2 by 2 1/2 by 3/16 inch angle iron that form a railing between the two walkways.[30]

The walkway uprights are spaced so that the bolts used to secure the horizontal I beam sections to the interior of the channel beam can also serve as the lower of two bolts used to secure the uprights to the exterior of the beam. The second bolt used to secure the upright to the channel beam is located 9 inches above this lower bolt. On each side of the south spillway walkway, two 220 foot lengths of 1/2 inch galvanized Extra Heavy Strand Siemons-Martin wire rope has been threaded through holes drilled in the walkway uprights. The upright holes are located 2 feet 3 inches and 3 feet 9 inches from the base of the walkway channel beam. The ends of the wire rope have been

looped and secured with three bolt guy clamps, and connected to 3/4 inch eye bolts fastened to 3/4 inch turnbuckles.[31]

The decking of the spillway walkway is made up of 18 foot sections of 3 inch by 12 inch planking laid three across to cover the span between the channel beams.[32] The planking has been nailed onto 3 foot 2 inch sections of 4 inch by 4 inch beams which are bolted to the tops of the horizontal I beam sections spanning the interior space between the channel beams.[33]

North Spillway

The north spillway is similar to the south spillway. The major difference between the two spillway sections is that the northern spillway is noticeably shorter than its southern counterpart, with an overall length of 167 feet. The northern spillway begins at the north end of the sluiceway, and extends 167 feet to the north, to connect with a concrete dam abutment.[34] The concrete abutment at the north end of the spillway is similar to the south abutment.[35] The major difference between the two abutments is that the northern abutment included an added support arm. The south end of this arm extends 35 feet from the downstream end of the northernmost crest section to the downstream wall of the northern abutment. The northern end of the support wall extends 23 feet from the downstream end of the northernmost crest to the downstream abutment wall. The wall is 4 feet wide and is connected to the northernmost crest sections with ten 1 inch by 30 inch bolts with double cinch anchors. The wall is connected to the concrete abutment with two 1 inch by 30 inch bolts with double cinch anchors.[36]

The north spillway is comprised of 18 poured concrete construction sections. Each crest section is anchored to the bedrock of the river bottom by thirty 5/8 inch by 4 foot 6 inch bars at the west end of the crest section.[37]

The length and width of each crest section varies according to its position in the overall layout of the dam. Aside from their differing widths, each construction section of the north spillway conforms to specifications of a generalized construction section plan. When measured parallel to the river channel, each section has a basal length of 24 feet 9 inches. The upstream face of the spillway curves toward the crest line at a 4 foot 8 inch radius. The downstream face of the north spillway, measuring 12 feet horizontally from the crest line to the downstream edge, is constructed with a curve defined by a 12 foot radius.[38]

The crest line is the highest point of the spillway, maintaining an elevation of 594.50 feet above mean sea level. By comparison the downstream "toe" of the spillway maintains an average elevation of 589.40 feet above mean sea level.[39]

The spillway construction sections are secured together with rebar. The upstream and downstream sides of the segments are connected by seventeen 3/8 inch diameter 17 foot long rods on top and seventeen 5/8 inch diameter 16 foot long rods on bottom and an additional fifteen 5/8 inch diameter rods that are 4 feet 6 inches in length. The north and south sides of the crest segments are tied together with nineteen 5/8 inch diameter rods that are 1 foot long. Alternate sections contain 30 foot longitudinally placed steel rods. Wire ties hold each rod in place.[40]

Concrete piers on the upstream end of the north spillway serve as a base for a metal walkway running the length of the spillway. The longitudinal centerline of each walk pier is located 12 feet 6 inches from the edge of each crest segment.[41]

The walk piers of the northern spillway are bullet shaped, with the parabolic end pointing upstream. Each pier measures 10 feet from the tip of the parabolic end to the downstream edge.

Measured from the downstream side, the pier sections maintain a maximum width of 3 feet for a length of 6 feet 5 1/8 inches, at which point the sides begin to curve gently toward the tip of the parabola. Each side of the pier arches toward the upstream tip, maintaining a curve with a 5 foot circular radius.[42] The upstream nose of each of the walk piers is armored with a 10 foot 6 inch section of 4 by 4 by 3/8 inch angle iron secured on the pier with 3/4 inch by 18 inch steel bolts.[43]

The walk piers are tied to the spillway construction sections by rectangular concrete keys at both ends of each pier. Keys are centered on the longitudinal axis of each pier. Keys are 1 foot 6 inches wide and 1 foot 6 inches high and extend 6 inches into the spillway. The upstream key is located 3 feet 6 7/8 inches from the parabolic tip of the pier and the downstream key is located approximately 1 foot 6 inch from the downstream end of the pier. Each key is tied to the spillway construction by four 7/8 inch by 2 foot stub rods. In addition to the concrete keys, each walk pier is tied to the spillway with seventeen 7/8 inch by 2 foot stub rods.[44]

In profile, the walk piers are somewhat rectangular, with concave bottoms conforming to the curved surfaces of the spillway construction sections. The piers were designed to maintain an elevation of 604.50 feet above mean sea level at their tops, so although the sides of the piers average 10 feet 6 inches in height, the difference in elevation at the base of the pier varies. Measured from the point of contact with the spillway construction section, the difference in elevation of the upstream end of the walkway piers is 10 feet 6 inches, while the difference in elevation of the downstream end is 11 feet 8 inches. On the downstream end of the pier two 1 foot 4 inch risers carry the elevation from 604.50 to 601.7 feet above sea level.[45] Thus although the difference in elevation from 604.50 feet above sea level of the downstream base of the pier is 11 feet 8 inches, the actual height of this section is 10 feet 6 inches.

A walkway spans the entire length of the north spillway from the dam abutment to the first pier section of the sluiceway. The walkway over the north spillway consists of two 71 foot long sections of channel iron, two 49 foot 11 1/2 inches long sections of channel iron, and two 48 foot 11 1/2 inches long sections of channel iron bolted onto the walkway pier sections with 3/4 inch by 18 inch split anchor bolts fitted with specially beveled washers. Each side of the walkway is comprised of 3 channel beams bolted end to end, and spaced 3 feet 5 1/4 inches apart so that the channels of opposite beams face one another. The interior space between the channel beams is spanned by twenty five 3 foot 4 inch long I beams which have been bolted to the channel iron using L braces made of 2 inch sections of 6 by 4 by 3/8 inch angle iron and 1/2 inch by 1 1/2 inch machine bolts.[46] The horizontal I beam sections support ribs spaced 8 feet 4 inches apart along the entire length of the walkway.

On the exterior of the channel beams, sections of angle iron have been spaced at 16 foot 8 inch intervals the length of the spillway to form the uprights for a handrail. The majority of the north spillway handrail uprights are constructed of 4 foot sections of 2 1/2 by 2 1/2 by 3/16 inch angle iron. The two uprights located at the junction of the walkway and the north dam abutment are also 4 feet in height, and are constructed of 2 1/2 by 2 1/2 by 3/16 inch angle iron. A taller upright 5 feet 6 3/8 inches in height, is located on the upstream side of the north spillway walkway at its attachment with the sluiceway. This upright is connected to the first upright sluiceway walkway by two sections of 5 foot 10 5/16 inch long pieces of 2 1/2 by 2 1/2 by 3/16 inch angle iron that form a railing between the two walkways.[47]

The walkway uprights are spaced so that the bolts used to secure the horizontal I beam sections to the interior of the channel beam can also serve as the lower of two bolts used to secure the uprights to the exterior of the beam. The second bolt used to secure the upright to the channel beam is located 9 inches above this lower bolt. On each side of the north spillway walkway, two 220 foot lengths of 1/2 inch galvanized Extra Heavy Strand Siemons-Martin wire rope has been threaded

through holes drilled in the walkway uprights. The upright holes are located 2 feet 3 inches and 3 feet 9 inches from the base of the walkway channel beam. The ends of the wire rope have been looped and secured with three bolt guy clamps, and connected to 3/4 inch eye bolts fastened to 3/4 inch turnbuckles.[48]

The decking of the spillway walkway is made up of 18 foot sections of 3 inch by 12 inch planking laid three across to cover the span between the channel beams.[49] The planking has been nailed onto 3 foot 2 inch sections of 4 inch by 4 inch beams which are bolted to the tops of the horizontal I beam sections spanning the interior space between the channel beams.[50]

Sluiceway

The sluiceway section of the Little Kaukauna dam is situated between the two spillways.[51] The overall length of the sluiceway is 205 feet.[52] The sluiceway is comprised of eight 20 foot poured concrete construction sections.[53] Each sluiceway construction section is tied into the pre-existing timber cribs of the earlier dam. The timber cribs were cut down leaving a 4 foot stub to be braced into the poured concrete of the sluiceway.[54]

The construction sections of the sluiceway conform to the specifications of a generalized construction section plan. With the exception of the sections at the extreme ends of the sluiceway, which are 15 feet in width, each of the construction sections is 48 feet wide. Measured parallel to the river's channel, each section has a basal length of 25 feet.[55]

Somewhat ramp shaped in profile, the sluiceway construction sections rise to a maximum height of 2 feet 6 inches above the average elevation of the river bottom, or 590.50 feet above mean sea level. The 2 foot 6 inch height is maintained for 17 feet 6 inches from the upstream end of the construction section at which point the section begins to slope gently downstream to a height of 1 foot above the average elevation of the river bottom. The extreme downstream end of each section is elevated 589.4 feet above mean sea level. The sluiceway construction sections are secured together by lengths of 5/8 inch diameter rebar spaced at 12 inch intervals.[56] Wire ties hold the rods in place.[57]

The sluiceway construction sections of the Little Kaukauna dam serve as foundations for a series of 9 upright piers which not only support a sluiceway walkway, but also contain the gate pins on which the sluiceway taintor gates are hung. Seven of the sluiceway piers are located along the centerlines of construction sections, while the two end piers are located at the extreme ends of the northern and southern sections.[58] Eight sluices are created by the placement of the pier sections.

The sluiceway piers are 28 feet 6 inches in length, and are 5 feet wide. The upstream ends of the piers are parabolic in shape, curved along a radius of 6 feet 3 inches. The upstream nose of each of the piers is armored with a 16 foot 8 inch long section of 4 by 4 by 3/8 inch angle iron secured onto the pier with 3/4 inch by 18 inch steel bolts.[59] Sluiceway pier heads measure 4 feet 11 inches from the parabolic tip of the upstream end to the downstream edge.[60] Immediately posterior of the pier heads is a "stop log" slot which runs the entire height of the pier section. The stop log slots, which are 6 inches deep and 13 inches wide, are located on pier faces interior of sluiceway openings. The downstream corners of the stop log slots have been armored with 16 foot 8 inch long sections of 4 by 4 by 3/8 inch angle iron secured onto the pier face with 3/4 inch by 18 inch steel bolts.[61]

The sluiceway piers are tied to the sluiceway construction sections by two rectangular concrete keys, sections of rebar, and anchor bolts.[62] Both concrete keys extend 6 inches from the top of the sluiceway sections into the bottom of the pier sections. Both keys are 8 feet in length and 2 feet

wide. They are secured to the sluiceway construction section with two rows of 5/8 inch diameter by 2 foot anchor bolts spaced at 18 inch intervals along the length of the key. The concrete keys are centered along the middle of the sluiceway pier. One key is located on top of the horizontal section of the sluiceway construction section and the other is on top of the slanted downstream section of the sluiceway construction section. In addition to the concrete keys, each sluiceway pier is tied to the construction sections with 19 sections of 5/8 inch diameter rebar. The rebar sections are spaced 18 inches center to center 4 inches inside the outer dimensions of the pier.[63]

In profile, the sluiceway piers are rectangular, with the upstream portion stepped up by four 16 inch risers above the rest of the pier section. These piers are designed with concave bottoms conforming to the curved surfaces of the spillway construction sections. The upstream ends of the sluiceway piers are 16 feet 8 inches from the tops of the sluiceway construction sections and the downstream ends are 12 feet 8 inches from the surface of the sections.[64]

Sixteen foot high steel taintor gates are located within each of the sluiceway openings. The taintor gates are hung on a 6 foot 8 inch long, 6 inch diameter cold rolled steel gate pin with a cast steel gate hinge. Each gate is connected to the gate hinges by end girders and bracing composed of 8 by 8 by 3/4 inch angle iron. The upper and lower arms of the end girders are 16 foot sections of angle iron fastened to the gate hinges with 7/8 inch rivets. The upper and lower arms of the taintor gate end girders form the sides of an isosceles triangle with a 40° angle adjacent to the gate hinge. The arms of the end girders are braced with three sections of triangulated 3 by 3 by 3/8 inch angle iron. Two of these angle iron sections are also connected to a 3/8 inch thick steel web plate which spans the space between the upper and lower arms directly behind the taintor gate face. The space between the gate end girders is spanned by sections of channel iron extending the width of the gate and connecting the upper and lower arms of opposite gate end girders. A 3/8 inch thick steel web plate is located directly behind the gate face at the centerline of the gate. This web plate is, in turn, tied to the horizontal gate bracing by two 4 foot 9 inch sections of 3 by 3 by 3/8 inch angle iron.[65]

The fronts of the sluiceway gates are faced with 3/8 inch thick steel plates secured to the gate bracing and web plates by 8 inch by 18 1/4 inch horizontal I beams. Seams between the plates are secured by 6 inch wide strips of 3/8 inch steel plate which run the entire height of the taintor gate. A 20 foot long 8 inch by 8 inch oak beam is bolted to the channel iron attached to the foot of the gate. The beam provides a sill for the gate.[66]

The sluiceway gates of the Little Kaukauna dam are operated by a "crab", a mechanism containing a pair of electric winches that moves from gate to gate along a track on top of the sluiceway.[67] The crab is constructed of two 21 foot lengths of channel iron connected parallel to each other by four sections of I beam iron.[68] The crab winches are powered by a five horsepower open type wound rotor motor mounted at the middle of the crab frame. A winch hand wheel is also located near the middle of the crab frame. The crab mechanism rides along a 3 foot 8 inch gauge track mounted along the downstream length of the sluiceway.[69]

In order to raise or lower a gate, the crab is positioned over the gate, and the winch chains are connected to the hoist chain connections on the gate.[70] Once positioned, the crab is connected to a power source, and the winches are engaged until the gate has been raised to the desired height. Once this height is reached, the crab is disconnected from the power source and moved to the next gate to be opened.[71] The electric winches are capable of lifting the gate at a rate of 2 feet per minute. In contrast, 61.5 revolutions of the hand wheel are required to raise the gate 1 foot.[72]

When not in use, the crab mechanism is housed in a wooden structure built over the span between the two southernmost sluiceway piers.[73] The gate hoist house is built on top of two 22 foot 4 inch long timbers spanning the space between the sluiceway piers. Along the upstream side of the gate

hoist house, a 4 inch by 4 inch sill plate has been bolted directly to the top of the sluiceway walkway planking. The sill plate on the downstream side of the crab house is a 4 inch by 8 inch beam which has been bolted 1 foot 3 inches above the top of the sluiceway pier section. At each end of the sill plates, 4 inch by 4 inch wall studs are fastened directly to the sill plate. Between these beams, 2 inch by 4 inch studs have been spaced 2 feet apart, center to center.[74] On top of the 4 inch by 4 inch wall studs, two 2 inch by 4 inch beams have been strung to form the top plate.

A 2 foot 8 inch personnel door is located on the spillway end of the crab house. A set of double doors on the sluiceway side of the crab house allow the crab to be moved along its track and positioned at the gates. The upstream and downstream sides of the crab house each contain a single window located in the center of the wall. The crab house is covered with a moderately pitched, front-gabled asphalt shingle roof.[75]

A walkway spans the entire length of the sluiceway. The walkway consists of a total of 32 sections of channel iron bolted onto the sluiceway pier sections with 3/4 inch by 18 inch split anchor bolts fitted with specially beveled washers. Each side of the walkway is comprised of 16 channel beams bolted end to end, and spaced 2 feet 7 inches apart so that the channels of opposite beams face one another. The interior space between the channel beams is spanned by twenty five 2 foot 7 inch long I beams which have been bolted to the channel iron using L braces comprised of 2 inch long sections of 6 by 4 by 3/8 inch angle iron and 1/2 inch by 1 1/2 inch machine bolts.[76] The horizontal I beam sections serve as support ribs spaced 8 feet 4 inches apart along the entire length of the walkway.

On the exterior of the channel beams, sections of angle iron have been spaced at 26 foot 5 inch intervals the length of the sluiceway to form the uprights for a handrail. The sluiceway handrail uprights are constructed of nine, 4 foot sections of 2 1/2 by 2 1/2 by 3/16 inch angle iron and two, 3 foot 6 inch sections of 2 1/2 by 2 1/2 by 3/16 inch angle iron.[77]

The walkway uprights are spaced so that the bolts used to secure the horizontal I beam sections to the interior of the channel beam can also serve as the lower of two bolts used to secure the uprights to the exterior of the beam. The second bolt used to secure the upright to the channel beam is located 9 inches above this lower bolt. On each side of the sluiceway walkway, two 202 foot lengths of 1/2 inch galvanized extra heavy strand Siemons-Martin wire rope has been threaded through holes drilled in the walkway uprights. The upright holes are located 2 feet 3 inches and 3 feet 9 inches from the base of the walkway channel beam. The ends of the wire rope have been looped and secured with three bolt guy clamps, and connected to 3/4 inch eye bolts fastened to 3/4 inch turnbuckles.[78]

LITTLE KAUKAUNA CANAL

The Little Kaukauna lock is contained within a canal that bypasses the Little Kaukauna dam to the north.[79] The Little Kaukauna canal was excavated sometime prior to 1866.[80]

Today, the Little Kaukauna canal is approximately 1,166 feet long, including the portion of the canal that lies within the lock. Roughly 500 feet of the canal is located below the lower wing walls of the lock, and 400 feet above the upper wing walls.[81] Generally oriented southwest to northeast, the canal's depth does not exceed 6 feet; width varies between 100 to 150 feet.[82] The canal has been periodically dredged and both banks are riprapped the entire length of the canal.[83]

LITTLE KAUKAUNA LOCK

The Little Kaukauna lock was one of the first three locks to be rebuilt with reinforced concrete.[84] Subsequent to the lock's construction minor repairs were undertaken in 1940, when the lock's left wall was cut down and three cribs were added above the lock on the right side of the canal. In 1947, the lock gates were cleaned and painted.[85] Other than these repairs, the lock remains the same as it was when constructed in 1939. The lock consists of a 211 foot 6 inch long concrete lock chamber with concrete wing walls at each end.[86]

The lower wing walls, or those located at the downstream end of the lock, are each lower than the main lock chamber. Each lower wing wall consists of poured concrete sandwiched between interlocking steel sheet piles. The wing walls are 25 feet in height at the northernmost edge and are beveled upward to a height of 28 feet, from the top of the north lock chamber wall to the top of the underlying concrete slab, at the southernmost end of the downstream wing wall. The steel sheet piles are attached to a concrete slab with 3/4 inch diameter bars spaced 2 feet center to center along the centerline of the slab. The slab sets on top of the steel sheet pile cutoff wall. Both downstream wing walls are aligned at a 60° angle with the edge of the north lock chamber wall. The steel sheet pile walls of the downstream wing are tied to the main lock chamber with 4 by 4 by 1/2 inch, 27 foot 7 inch long, angle iron.[87]

The upper wing walls are similar to the lower wing walls. Both upper wing walls are constructed of steel sheet piles and concrete and are 102 feet 2 inches in length. The walls are aligned at a 60° angle with the main lock chamber wall. The upper wing walls are supported by a clay back fill that begins at 564.5 feet above mean sea level and rises 605.5 feet above sea level.[88]

The lock chamber of the Little Kaukauna lock measures 171 feet from quoin to quoin. Additionally, there is a 28 foot 6 inch upper gate section at the upstream end of the lock and a 12 foot lower gate section at the downstream end of the lock which increases the overall length of the lock to 211 feet 6 inches.[89]

The upper gate section, located at the upstream end of the lock, is defined as that part of the lock structure upstream of the upstream gate mitre plate. The walls of the upper gate section extend beyond the upper mitre plate and into the actual lock chamber. Spaced 36 feet apart, the upper gate section walls are each 39 feet 6 inches in length.[90] The upper gate section walls are composed of an upper section and a lower section which serves as a base for the upper section.[91] The lower section of the upper gate section walls consists of a 39 foot 6 inch long concrete slab which is 20 feet wide and 4 feet thick.[92] The top of the concrete slab is elevated 578.0 feet above sea level. The slab is ell shaped with the shorter vertical leg extending 6 inches into the bedrock floor of the lock chamber.[93] The base of the forechamber walls is tied to the bedrock adjacent to the lock chamber with 1 1/2 inch diameter anchor bolts imbedded not less than 2 feet into the bedrock.[94]

The upper section of the upper gate section wall is secured to the base with a 4 foot wide concrete key which runs the entire length of the upper gate section and extends 6 inches into the bottom of the upper section. The base of the upper section measures 17 feet 5 1/2 inches in width, and is beveled to a 6 foot 6 inch width at the top of the section. The interior faces of the upper and lower walls of the upper gate sections are aligned flush with one another.[95] Directly behind the lock gates, the interior faces of the upper gate section walls are recessed 2 feet 2 inches in order to allow the gates to recess flush when opened.[96]

The mechanisms which allow the water level of the lock chamber to be raised are located within the floor of the upper gate section. Six butterfly valves are placed in groups of three on both sides of

the upper gate section immediately outside of the lock gates.[97] When the lock is to be flooded, the lock gates are closed by horizontal spars which connect the inside of the gates to geared vertical shafts enclosed within steel tripods mounted on both sides of the lock wall.[98] A removable bar is inserted into a socketed hub attached to a vertical shaft and serves as a handle with which to turn the shaft. In order to open or close the gate, the locktender must use the handle to rotate the vertical shaft by walking around the tripod. If the gates are to be opened, the locktender walks in a counterclockwise direction, and if the gates are to be closed, the locktender walks in a clockwise direction.[99]

When the gate is closed and sealed, the butterfly valves are opened and water is allowed to flow through a culvert below the mitre sill and into the lock.[100] The valves are operated by geared mechanisms connected to hand wheels mounted on top of the lock wall.[101] When opened, the six upstream valves can fill the lock chamber to provide the 6.1 feet of lift required to match the 594.5 elevation of the upper pool in under 3 minutes.[102]

The lower gate section of the Little Kaukauna lock consists of two 39 foot 6 inch long concrete sections spaced 36 feet apart from one another.[103] Like the upper gate walls, the lower gate section walls are made up of an upper section, and a lower section which serves as a base for the upper section.[104] The base of the lower gate section walls is a 39 foot 6 inch long concrete slab that is 20 feet wide and 4 feet thick.[105] The top of the base is elevated 577.0 feet above sea level. The base of the lower gate section is ell shaped in appearance, with the shorter vertical leg extending 6 inches into the bedrock floor of the lock chamber. The base is tied to the bedrock adjacent to the lock chamber with 1 1/2 inch diameter anchor bolts imbedded not less than 2 feet into the bedrock.[106]

The upper section of the lower gate section wall is secured to the base with a 4 foot wide concrete key which runs the entire length of the lower gate section and extends 6 inches into the bottom of the upper section.[107] The base of the upper section is 17 feet 8 inches wide, and is beveled to a 6 foot 6 inch width at the top. The interior faces of the upper and lower walls of the lower gate sections are aligned flush with one another.[108] Directly in front of the downstream lock gates, the faces of the lock walls are recessed 2 feet 2 inches in order to allow the gates to recess flush when opened. When opened, the spars connected to the gate tops pull the gates into the lock chamber.[109]

Six valves are located in the floor of the lower gate section, placed three on each side of the lock. When opened, these valves allow water to flow through a culvert under the lower gate sill to drain the lock.[110] The discharge valves are operated by geared mechanisms connected to hand wheels mounted on top of the lock wall near the lower gate. When opened, the lower valves can discharge the lock chamber to the lower pool elevation in a little over 2 minutes.[111]

The lower gates are closed by horizontal spars which connect the inside of the gates to geared vertical shafts mounted on steel tripods located on both sides of the lock wall.[112] A removable bar is inserted into a socketed hub attached to a vertical shaft and serves as a handle with which to turn the shaft. In order to open or close the gate, the locktender must use the handle to rotate the vertical shaft by walking around the tripod. If the gates are to be opened, the locktender walks in a counterclockwise direction, and if the gates are to be closed, the locktender walks in a clockwise direction.[113]

The lower gates are constructed of 19 foot 2 3/4 inch long 15 inch wide horizontal channel iron beams bolted to 27 foot 10 inch long vertical I beams to form the gate frame.[114] At the bottom of the gate, a channel iron is used for the gate sill, and a channel iron provides horizontal support at

the top of the gate. Between these channel iron beams, horizontal I beams of various gauges have been bolted between the vertical I beams. The first two horizontal supports above the sill plate channel iron are constructed from 75 pound iron, the three above these are made from 60.8 pound iron, the one above this is made of 55 pound iron, and the next two from 42.9 pound iron.[115] Including the channel irons at the top and bottom of the gate, there are a total of 10 horizontal support irons on each of the lower gates.

The spacing between the horizontal supports varies according to where they are located on the gate. Where greater rigidity is required, the space between the horizontal supports is decreased. Beginning at the sill plate and moving toward the top of the gate, the spacing between the horizontal I beams is as follows: 2 feet 1/8 inch between the sill and the first support; 1 foot 10 1/2 inches between the first and second supports; 2 feet 2 5/8 inches between second and third supports; 2 feet 3 3/4 inches between the third and fourth, and the fourth and fifth supports; 2 feet 4 3/4 inches between the fifth and sixth supports; 2 feet 4 7/8 inches between the sixth and seventh supports; 2 feet 5 1/8 inches between the seventh and eighth, and the eighth and ninth supports; and 2 feet 4 7/8 inches between the ninth support and the channel iron at the top of the gate.[116]

Between certain rows of the horizontal I beams, lengths of 4 by 3 by 3/8 inch angle iron stiffeners have been placed in five vertical columns to provide additional rigidity to the gate.[117] The lengths of the stiffeners corresponds to the appropriate length necessary to span the space between each of the rows. The stiffener columns are placed between the horizontal rows beginning at the first row above the gate sill plate up to the third row from the top of the gate. The first columns are spaced 3 feet 4 3/8 inches inside both ends of the gate, and the other columns are evenly spaced at 3 foot 1 1/2 inch intervals between these columns.[118]

The spaces between the horizontal I beams and the vertical stiffeners of each gate are filled by 5/16 inch thick steel plate fastened to the frame with 3/4 inch rivets.[119] A diagonal eye bar strung from the upper outside to lower inside corner of the gate and tightened with a turnbuckle provides additional support and rigidity.[120]

At the bottom of each of the lower gates, a 5 inch by 8 inch oak beam has been cut to the length of the gate and fitted to the outside of the lower channel iron. At the top of each gate, a 21 foot 2 inch long, 1/2 inch by 15 3/4 inch wide oak plank has been fitted to the upper channel iron forming a walkway. On the interior of the lower gate, from the second to the sixth horizontal row below the top, nineteen 3 inch by 10 inch oak plank fenders are hung vertically. These planks provide a measure of protection to vessels passing through the lock.[121]

The upper gates are similar to the lower gates in their construction, except that they are considerably shorter in height. The upper gates are constructed of 19 foot 2 3/4 inch long 15 inch wide horizontal channel iron beams bolted to 15 foot 5 3/8 inch long vertical I beams to form the gate frame. At the bottom of the gate, a channel iron is used to form the sill plate attachment and a horizontal channel iron is used as the top gate support.[122] Between the upper and lower horizontal channel irons, I beams of varying gauges have been bolted to the vertical I beams. The first horizontal support above the channel iron at the sill plate is constructed from 60.8 pound iron, while the remaining three are made of 42.9 pound iron.[123] Including the channel irons at the top and bottom of the gate, there are a total of 6 horizontal support irons on each of the upper gates.

The horizontal supports are spaced at different intervals from each other, depending on their location in the gate. Where greater rigidity is required, the spacing is decreased. Beginning at the sill plate and moving toward the top of the gate, the spacing between the horizontal I beams is as follows: 2 feet 7 1/8 inches between the sill and the first support; 2 feet 10 inches between the first and second supports; 2 feet 11 inches between the second and third supports and the third and

fourth supports; and 3 feet 4 1/2 inches between the fourth support and the channel iron at the top of the gate.[124]

Between certain rows of the horizontal I beams, lengths of 4 by 3 by 3/8 inch angle iron stiffeners have been placed in five vertical columns to provide additional rigidity to the gate. The lengths of the stiffeners corresponds to the appropriate length necessary to span the space between each of the rows. The stiffener columns are placed between the horizontal rows beginning at the first row above the gate sill plate up to the third row from the top of the gate. The first columns are spaced 3 feet 4 3/8 inches inside both ends of the gate, and the other columns are evenly spaced at 3 foot 1 1/2 inch intervals between these columns.[125]

At the bottom of each of the upper gates, a 5inch by 8 inch oak beam has been cut to the length of the gate and fitted to the outside of the lower channel iron. At the top of each gate, a 21 foot 2 inch long 1/2 inch by 15 3/4 inch wide oak plank has been fitted to the upper channel iron forming a walkway. On the interior of the upper gate, from the top to the first horizontal row above the sill plate, nineteen 3 inch by 10 inch oak plank fenders are hung vertically, providing protection to vessels passing through the lock.[126]

Each side of the lock chamber between the upper and lower gate sections consists of five 28 foot high concrete construction sections placed 36 feet apart, and tied end to end by 2 foot wide, 6 inch deep concrete keys running the entire height of the section. Expansion joints are placed in the seams between the sections, and 3/8 inch by 1 foot cut-off plates or 1/32 inch by 1 foot 3 inch soft copper plates extending the entire height of the section, have been placed in alternate keys.[127]

Each of the construction sections which make up the lock chamber wall is itself made up of two sections, an upper section, and a lower section which serves as a base for the upper section.[128] The base of a lock chamber wall section consists of a 39 foot 6 inch long concrete slab that is 20 feet wide and 4 feet thick. Each slab achieves an elevation of 578.0 feet above sea level at its top.[129] The base is ell shaped with the 6 foot long vertical leg extending 6 inches into the bedrock floor of the lock chamber. The base of the upper gate section walls is tied to the bedrock adjacent to the lock chamber with 1 1/2 inch diameter anchor bolts imbedded not less than 2 feet into the bedrock.[130]

The upper section of a lock chamber wall construction section is secured to the base with a 4 foot wide concrete key which runs the entire length of the lock chamber base section and extends 6 inches into the bottom of the upper section. At its base, the upper section measures 17 feet 5 1/2 inches in width, and is beveled to a 6 foot 6 inch width at the top of the section. The interior walls of the upper and lower sections of a lock chamber construction section are aligned flush with one another.[131]

In the sections immediately adjacent to the upper and lower gate sections, a 1 foot 8 inch wide ladder is recessed into the interior wall. The rungs of the ladder are constructed from twenty-two 1 foot 1/4 inch diameter bars spaced 1 foot 2 inches from one another. Also located on the inside face of alternating lock chamber sections are snubbing posts placed in 2 foot by 6 foot openings recessed approximately 2 feet into the lock wall.[132] The snubbing posts are used to secure lines to vessels during locking.

Once concrete construction of the locks was completed, the backslopes of all walls were backfilled with clay to the tops of the walls. The upper wing walls, upper gate chamber, and the lower gate section were filled to achieve an elevation of 605.5 feet above sea level.[133]

SIGNIFICANCE

The Kaukauna Lock and Dam Complex is a part of the Lower Fox River Waterway System constructed by private companies in the decade spanning 1850 to 1860, and rebuilt by the United States Army Corps of Engineers between 1872 and 1936. Conceived as a part of the larger Fox River Waterway, the Lower Fox River System facilitated water transport between Green Bay and Lake Winnebago. The dam at Little Kaukauna creates the pool that floods the canal at Little Kaukauna. The Little Kaukauna Complex allows passage around the rapids in this section of the Lower Fox River. The Little Kaukauna Lock and Dam Complex is an integral component of the greater Lower Fox River Waterway System.

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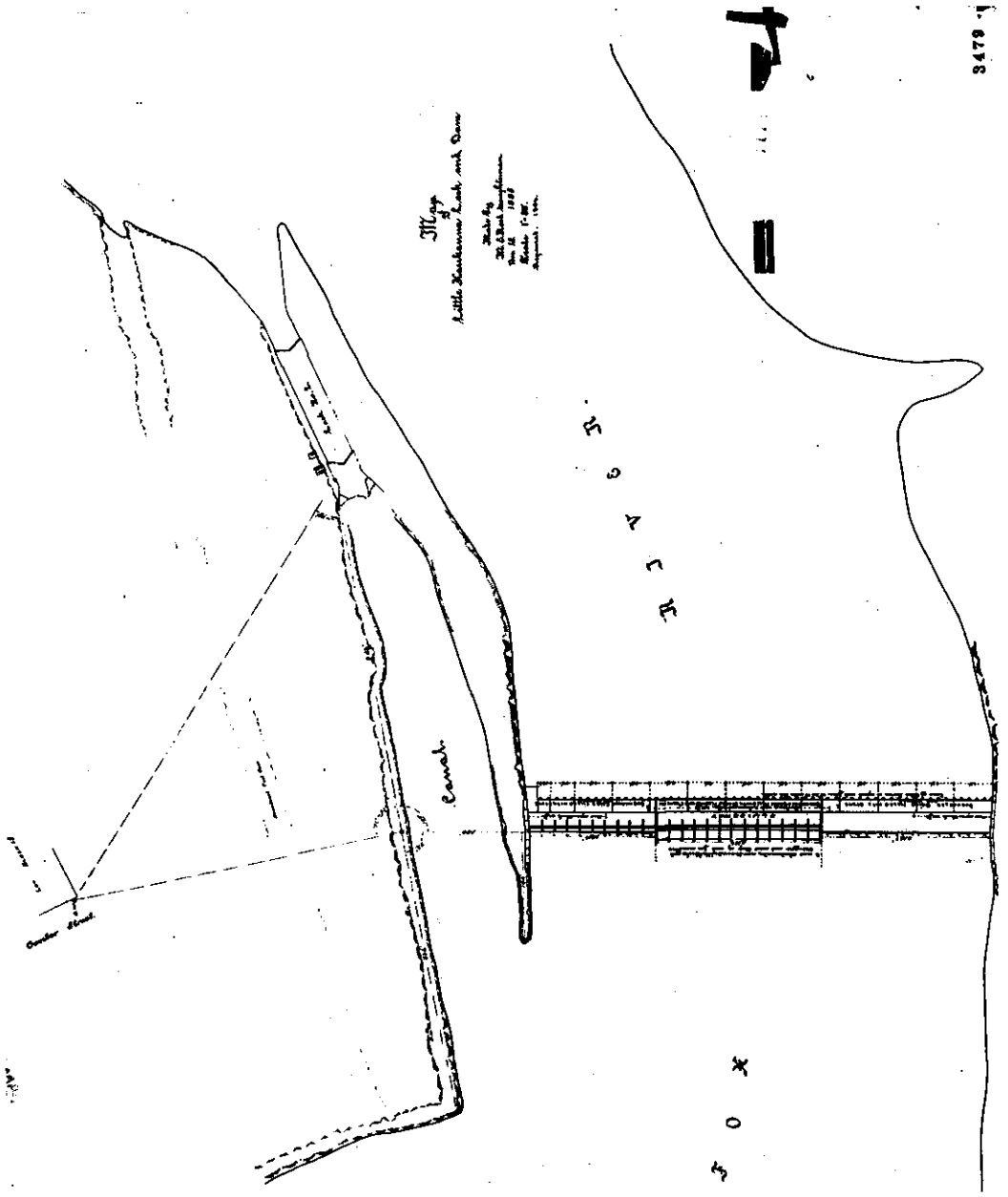
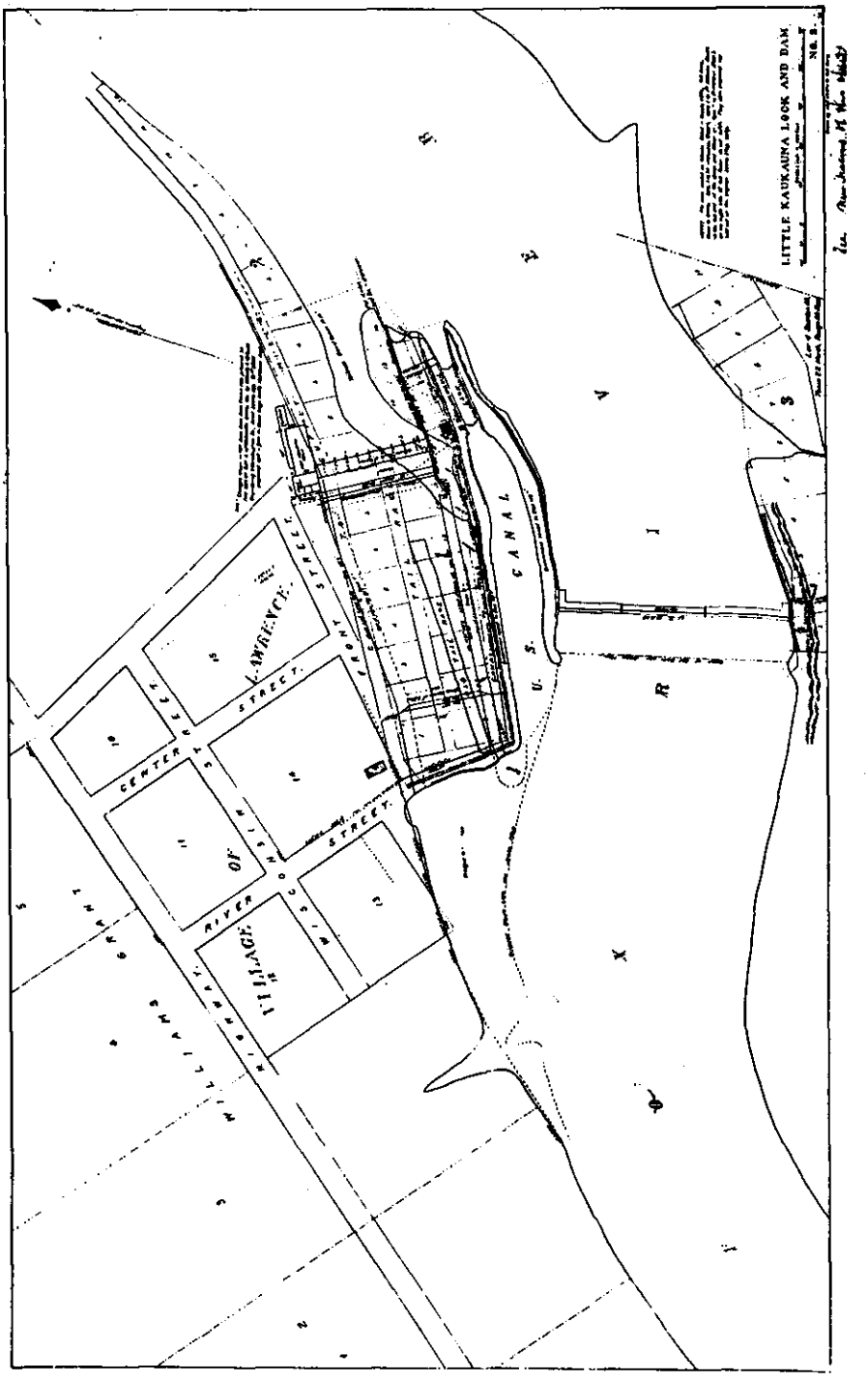
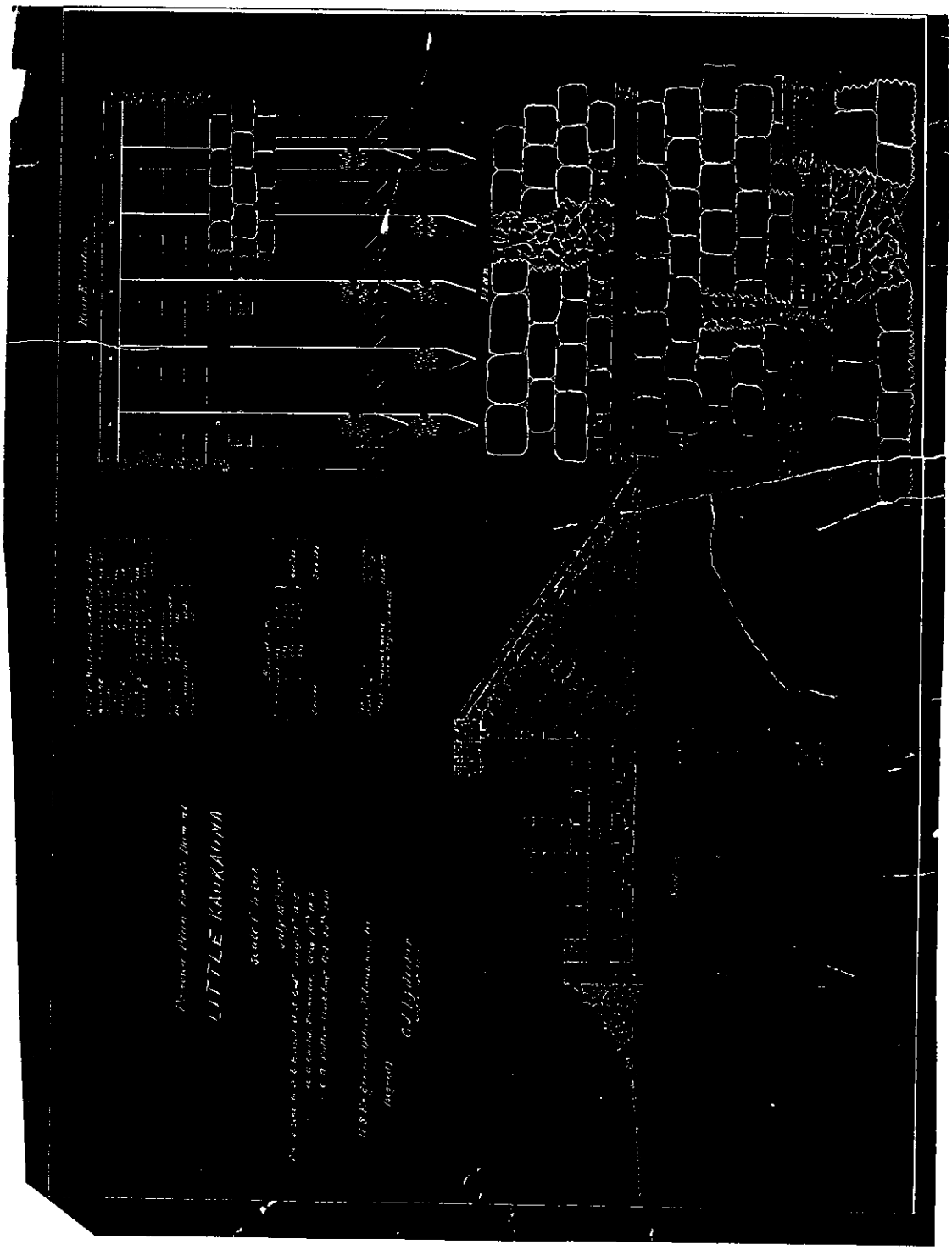


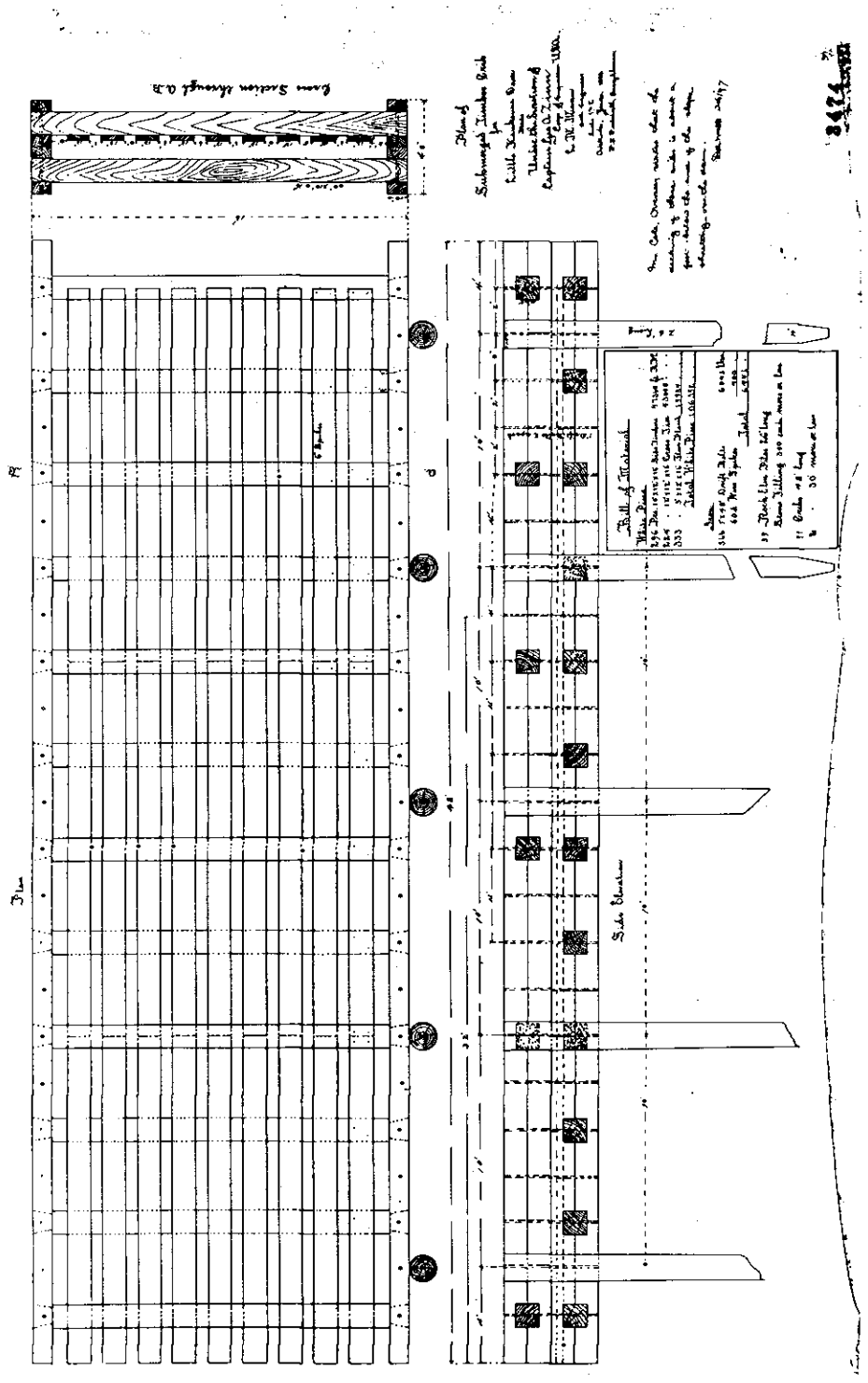
Photocopy of Map of Little Kaukauna Lock and Dam, as drawn by M.E. Reed, 1895, File #3479.



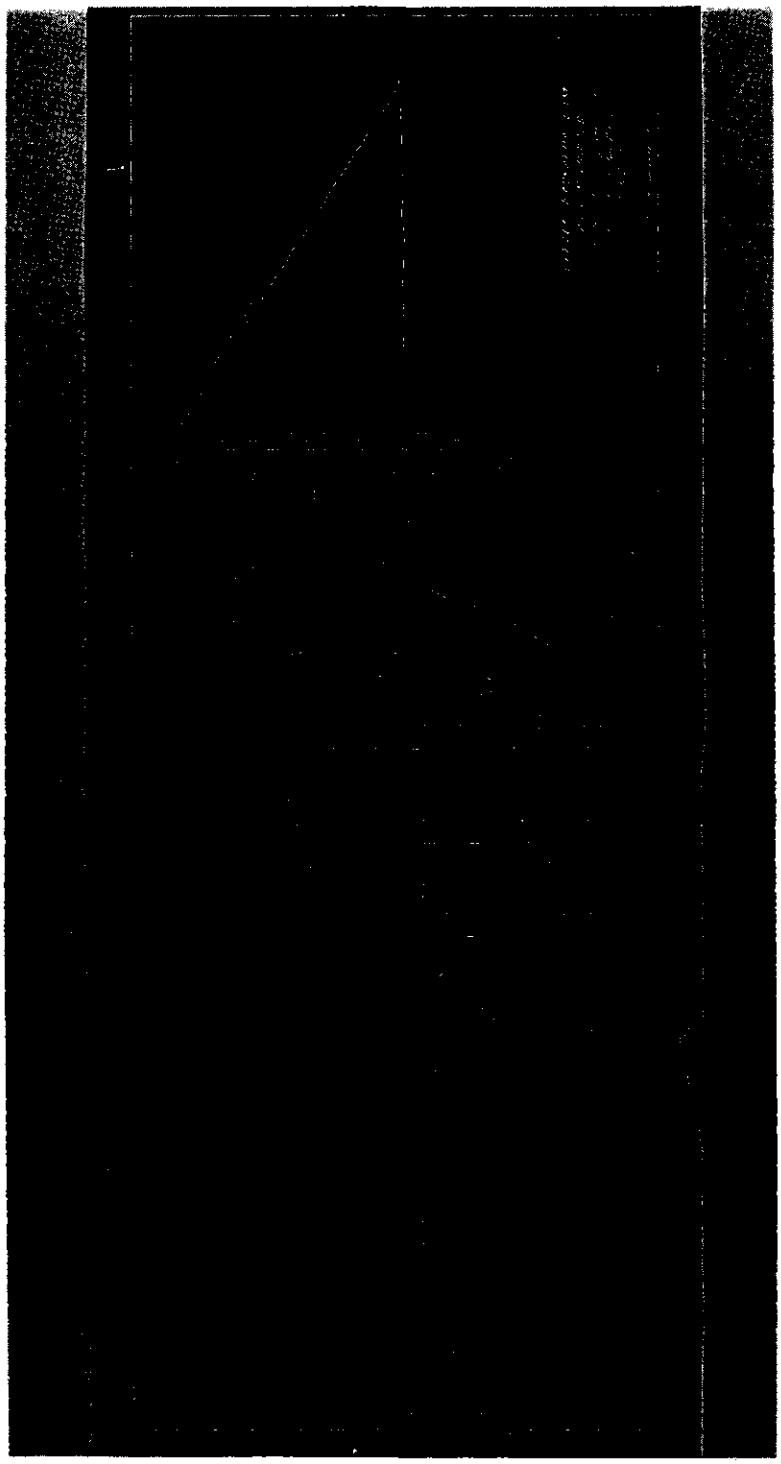
Photocopy of drawing of Little Kaukauna Lock and Dam, as drawn by W.K. Means and C.A. Young, File #401, sheet no. 2.



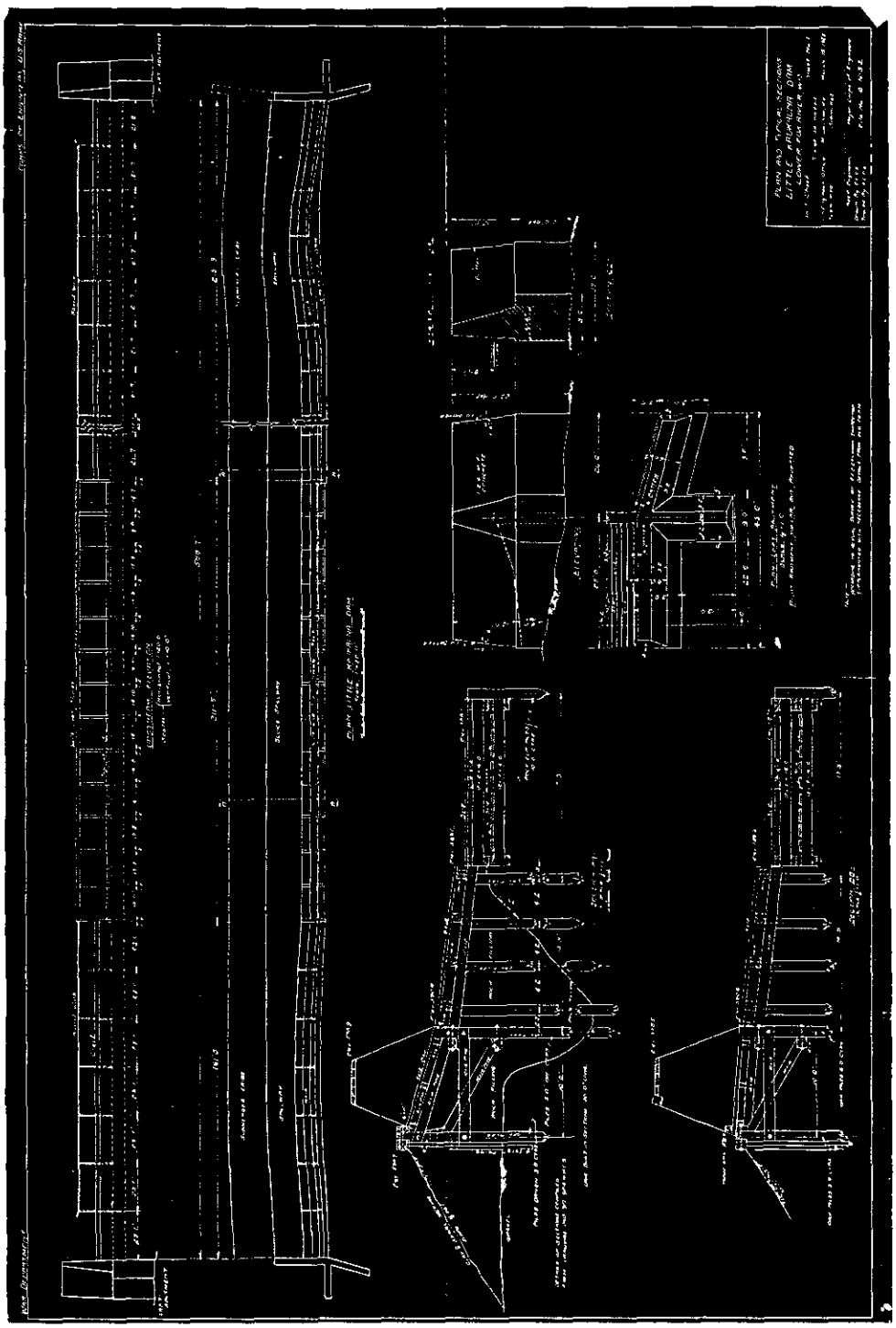
Photocopy of Proposed Plan for Pile Dam at Little Kaukauna, 1875.



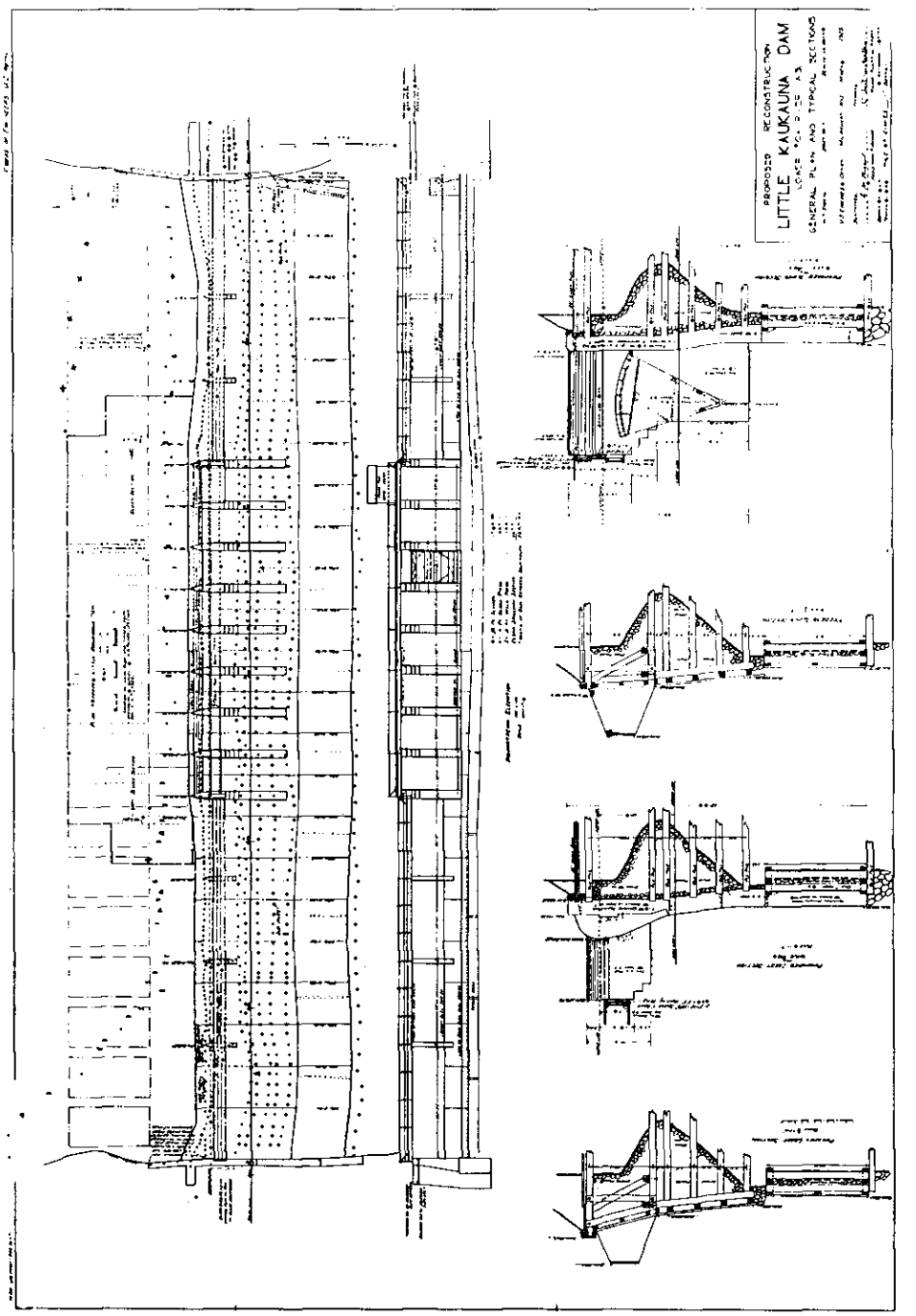
Photocopy of Plan of Submerged Timber Crib for Little Kaukauna Dam, File #3474.



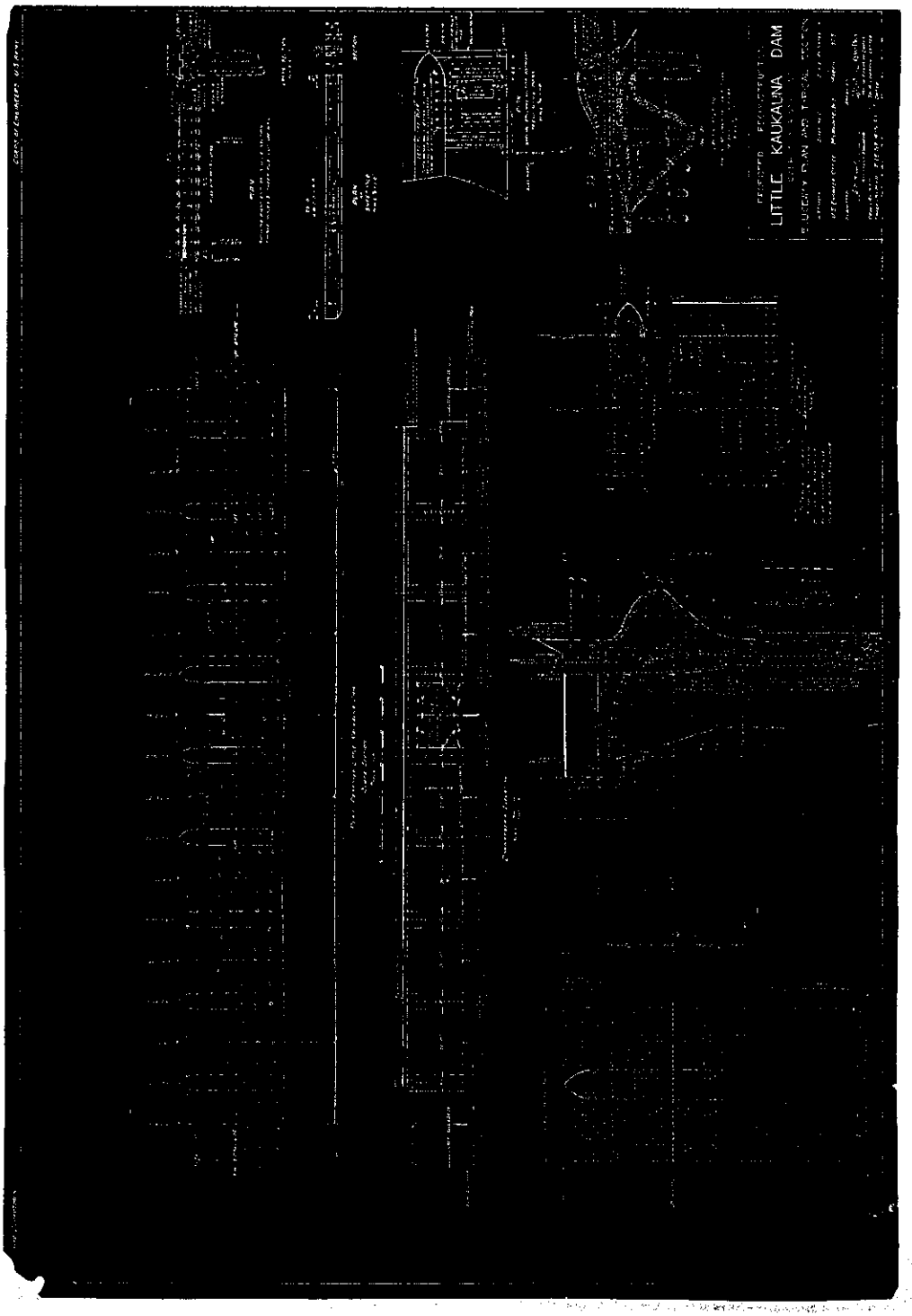
Photocopy of Plan of Little Kaukauna Dam as Constructed, File #3471.



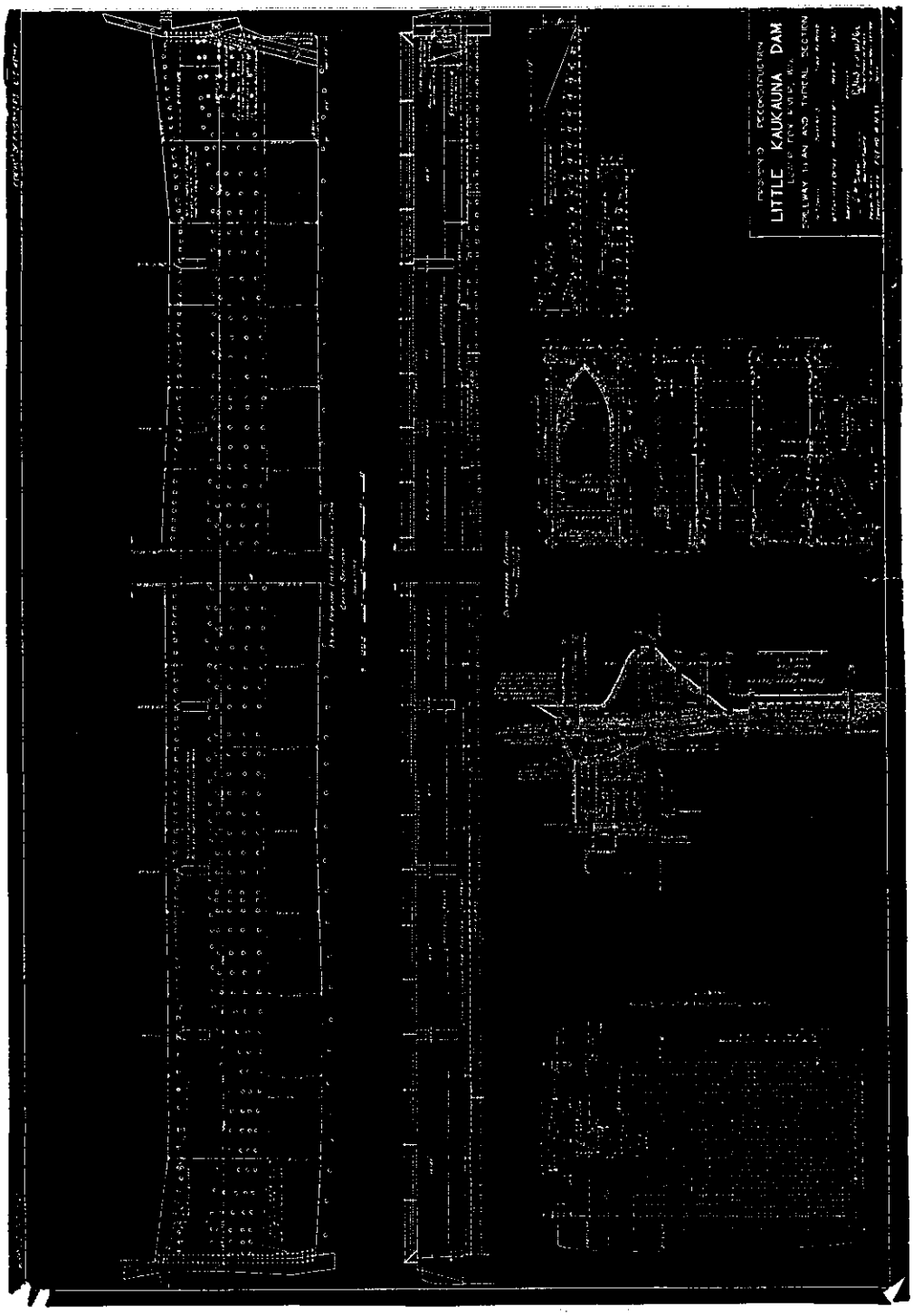
Photocopy of blueprint of Plan and Typical Sections Little Kaukauna Dam, File #4-N-5.2, sheet 1.



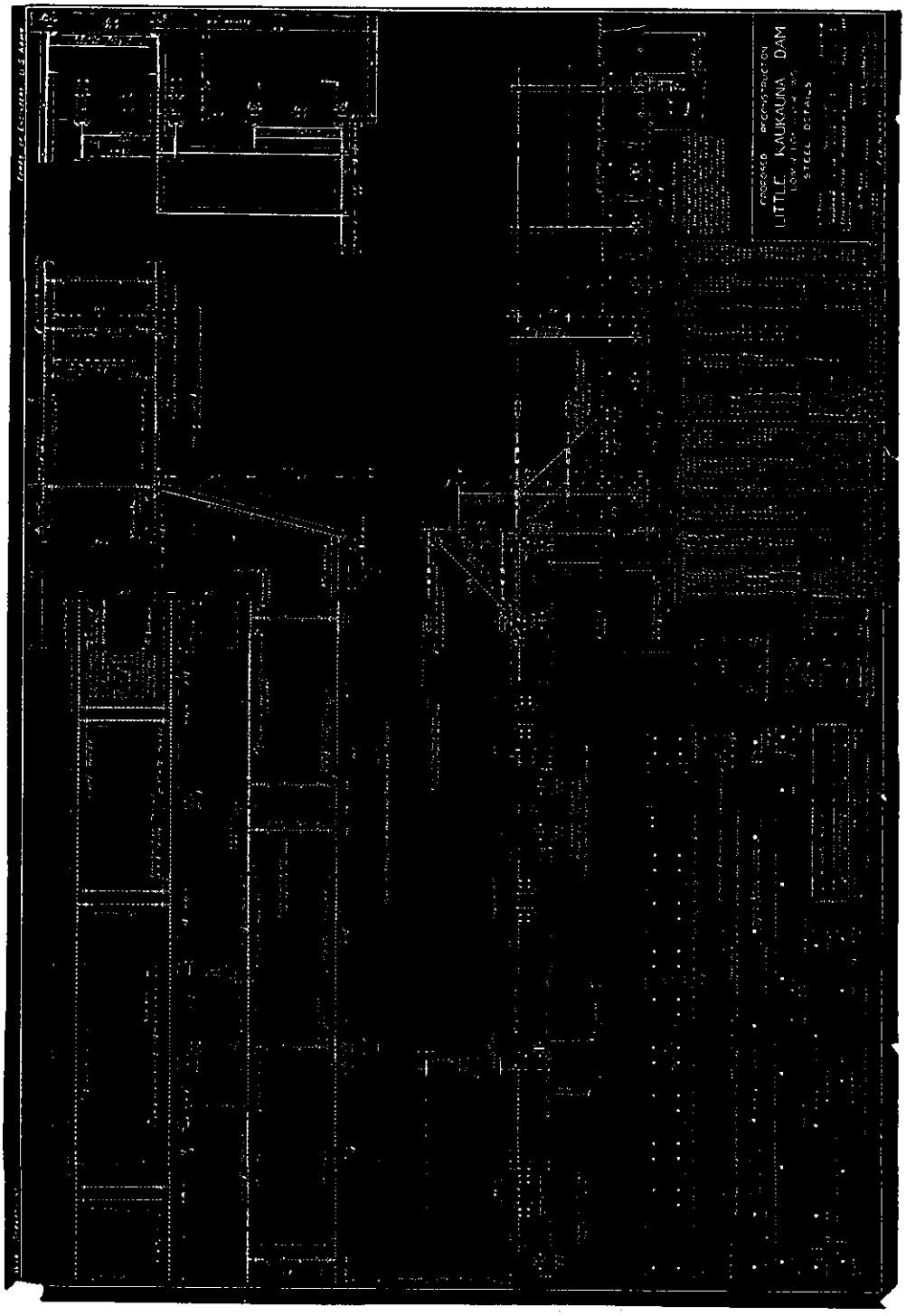
Photocopy, Proposed Reconstruction of Little Kaukauna Dam, General Plan and Typical Sections, File #4-N-5.3, sheet 1.



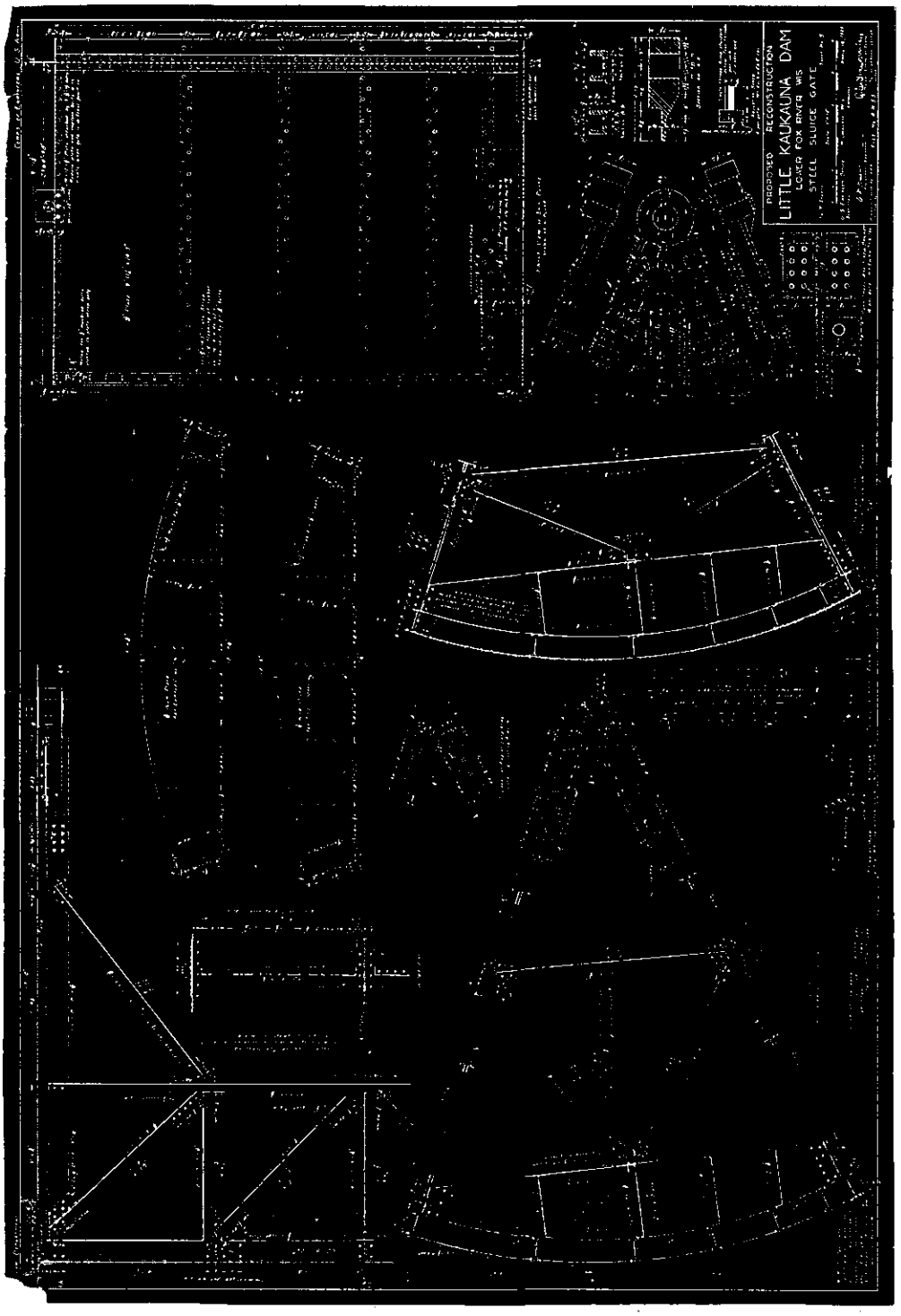
Photocopy of blueprint of Proposed Reconstruction of Little Kaukauna Dam, Sluiceway Plan and Typical Section, File #4-N-5.3, sheet 2.



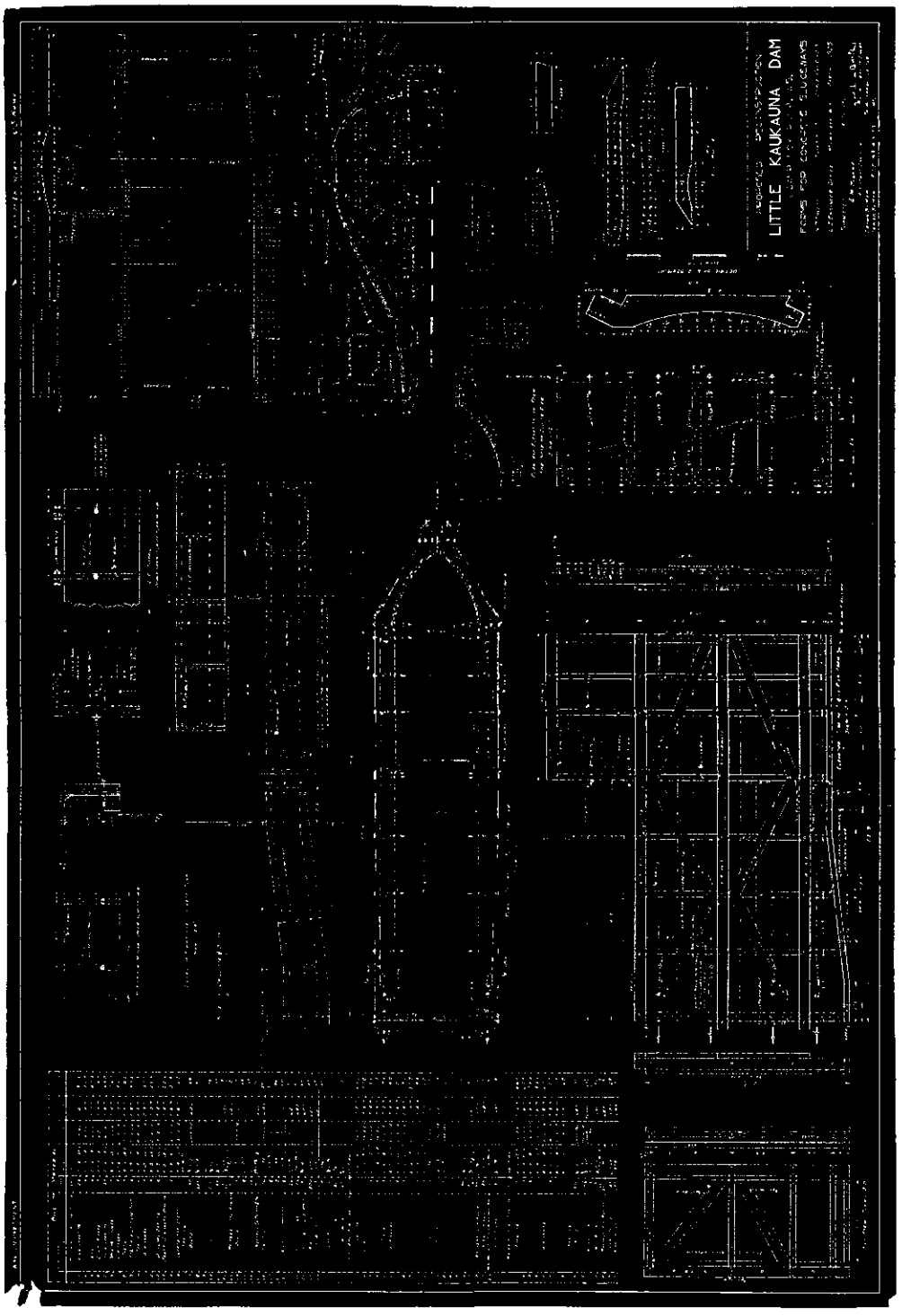
Photocopy of blueprint of Proposed Reconstruction of Little Kaukauna Dam, Spillway Plan and Typical Section, File #4-N-5.3, sheet 3.



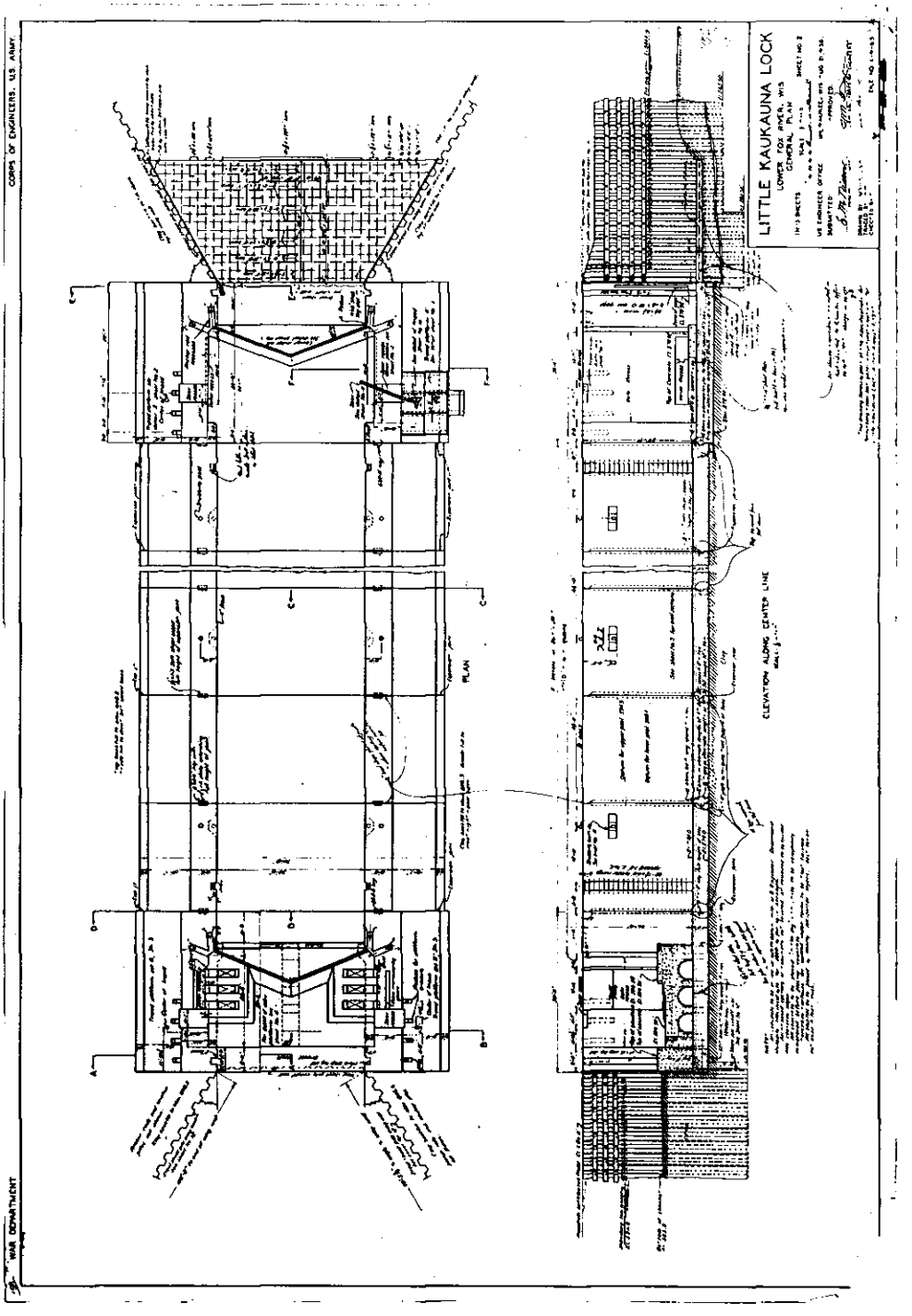
Photocopy of blueprint of Proposed Reconstruction of Little Kaukauna Dam, Steel Details, File #4-N-5.3, sheet 4.



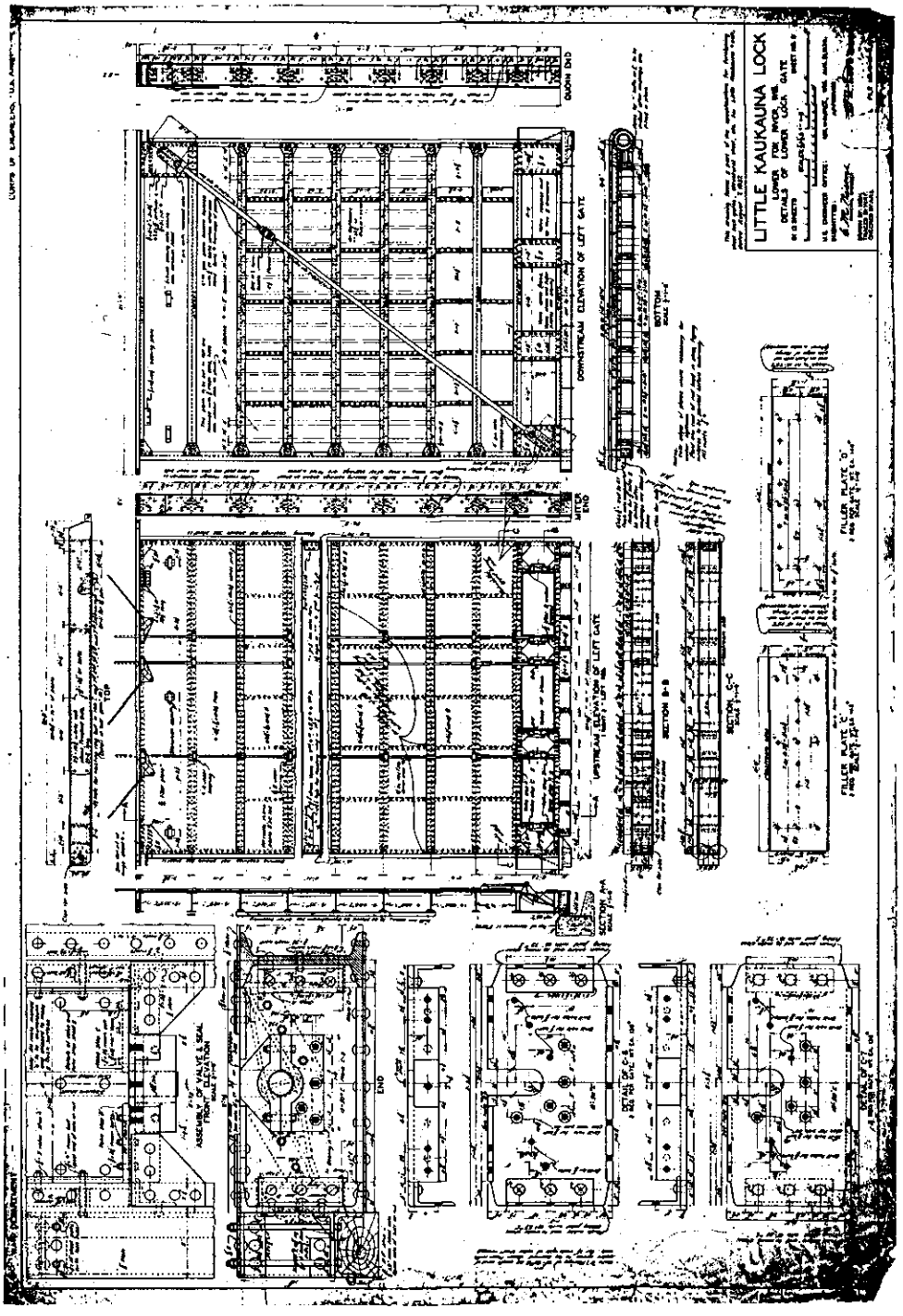
Photocopy of blueprint of Proposed Reconstruction of Little Kaukauna Dam, Steel Sluice Gate, File #4-N-5.3, sheet 5.



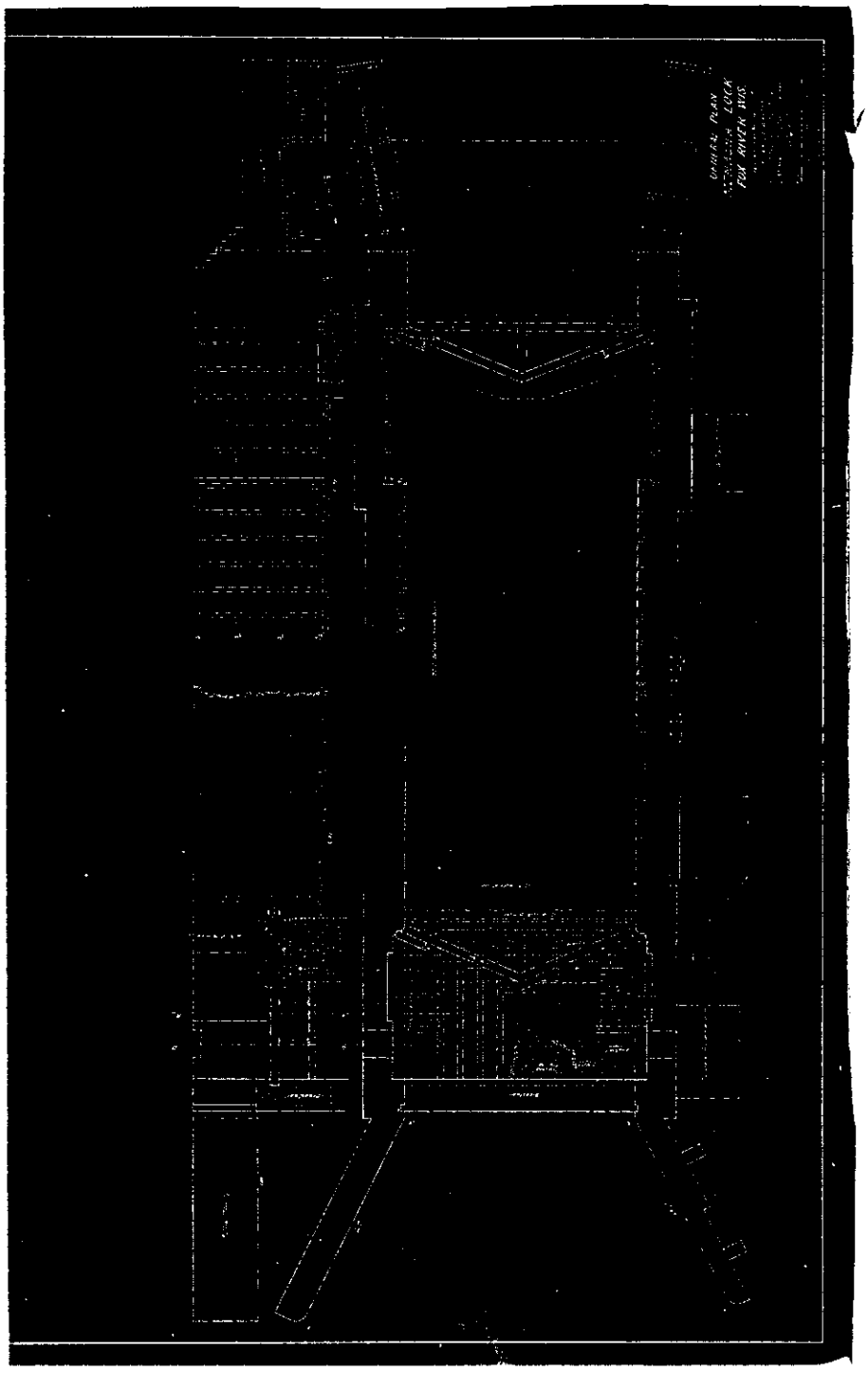
Photocopy of blueprint of Proposed Reconstruction of Little Kaukauna Dam, Forms for Concrete Sluiceways, File #4-N-5.3, sheet 7.



Photocopy of General Plan of Little Kaukauna Lock, File #4-N-5.5, sheet 2.



Photocopy of Details of Lower Lock Gate of Little Kaukauna Lock, File #4-N-5.5, sheet 9.



Photocopy of blueprint of General Plan of Little Kaukauna Lock, File #3440.