

SPECIFICATIONS.

(1) *Channel excavation.*—The channels hereinafter designated, both by geographical location and by Roman numerals, shall be excavated to the depths and widths called for in each case and according to the stakes set by the engineers of the board and to the bottom grades shown upon the profiles which will be exhibited previous to receiving proposals for the work upon which said proposals are asked.

(2) The excavations shall conform to the cross sections prescribed for each of the respective channels, and payment shall be made for material within the prescribed prism or prisms.

(3) *Disposition of material.*—The material excavated shall be deposited in equal quantities upon each bank of the channel being excavated, unless otherwise directed by the engineer.

(4) *Berm.*—A clear berm of 20 feet must be left on each side of the channel.

(5) *Prices.*—The prices bid for excavation must include the cost to the contractor of all clearing and grubbing and removal of obstructions in the line of the work upon the surface included between the spoil banks.

The unit prices bid must cover and include the providing and use of machinery and appliances of every kind necessary to the successful prosecution of the work; and it must also cover and include all explosives, materials, and supplies of every kind consumed or used upon the work, together with the cost of all labor, direction, and superintendence thereon or therefor. Briefly, the compensation paid to the contractor shall be the measured quantities of the several kinds of work done multiplied by the unit price bid upon the kind or classification of work to which the unit price applies.

Locks.—Sheet No. 1 (see p. 79) shows in plan, elevation, and cross section the lock designed for the outlet of the proposed Okeechobee-St. Lucie Canal. It is proposed to determine the location of this lock and to excavate the pit in which it is to be built and build the lock completely before the canal excavation reaches the site. Foundation of this lock to be as shown on the drawing. Details of the miter sills are shown on sheet No. 2 (see p. 80). The miter sills for standard locks are to be constructed exactly like those for the St. Lucie Lock only differing in length—the standard lock being narrower by 5 feet than the St. Lucie Lock. On sheet No. 3 (see p. 81) the construction of the lock gates is shown. The drawing is for the lower gates, and the upper or head gates will be of exactly similar construction but 10 feet shorter; the shortening to be from the bottom. Sheet No. 4 (see p. 82) shows in plan, elevation, and cross section the standard type of lock designed for canals now taking water from Lake Okeechobee, or in the process of construction for that purpose. They are the Miami Canal, the North New River Canal, the Hillsboro Canal, and the projected West Palm Beach Canal. It is proposed to build these locks in caissons, as indicated, and before the construction has advanced far enough to cause them to sink, to float them into exact position over foundations previously prepared and there sink them, making water-tight connections between the locks and the adjacent banks of the canal by rock-filled dam, or sheet piling and earth fill whichever may prove to be the most economical—other things being equal, preference to be given the rock-filled dam. After sinking, the concrete work, the placing of the gates, etc., will be completed; which done, the inside forms will be removed, the end bulkheads removed, and the lock will then be ready for service.

Should the State be required to build a lock in Three-Mile Canal, it must conform in type to the standard lock but in dimensions to the St. Lucie Lock.

FOUNDATIONS FOR THE STANDARD LOCKS.

(7) Foundations for the locks last described will be provided by driving piles and cutting them off at an elevation which will insure that the top of the miter sill, when the lock is in place, is at the elevation of the bottom grade of the canal at the distance from Lake Okeechobee selected for the lock site. The spaces between the pile heads must be filled in with small stone and stone screenings taken from the canal bank. As a preferred alternative to the pile foundation above described, all soft material

should be dredged from an area sufficient to receive the entire base of the lock and the excavation so made should then be filled with broken stone, taken from the rock sections of the canal, up to a level elevation, upon which the lock may rest with the top of its miter sills level with the bottom grade of the canal at that point in its length. The manner of preventing flow around the lock to be as hereinbefore described.

Sheet No. 5 illustrates the gates to be used for these standard locks and some of the cast-iron details to be used for all of the locks (see p. 83).

Sheet No. 6 illustrates the construction of filling and emptying valves, the cast-iron hollow quoins, wrought-iron straps, truss rods, pins, and anchors to be used for all gates (see p. 84).

Sheet No. 7 illustrates the gate-operating mechanism (see p. 85).

(8) No drawing is shown of the snubbing post to be set into the walls of the locks at the places indicated on the plan drawings by small circle with cross passing through center. These posts will be made of 5-inch gas pipe, 5 feet long, with coupling on lower end and cap on top. They must be bedded 4 feet 2 inches in the concrete and be filled with concrete before the cap is screwed on.

(9) *The dam across Okeechobee-St. Lucie Canal.*—The dam shall be constructed at the site selected by the board and shall be built in accordance with the drawings, sheet No. 8 (see pp. 86 and 87), and the following specification:

Piles shall be driven at the places indicated on the plans and cut off and capped as shown on the drawings. A line of triple-lap sheet piling (composed of boards 3 inches thick—the middle board to be dressed on one side to insure uniform thickness throughout) shall be driven as indicated on drawing 8, on the downstream side of the upstream row of bearing piles extending throughout the entire length of the dam and continuing across the entire width of the lock foundation. The masonry of the dam shall be bonded into the masonry of the lock and its northern end shall be bonded into the bulkhead as shown on drawings. The concrete in this entire structure shall conform to the standard concrete specifications hereinbefore prescribed for lock construction. The reinforcing rods used shall be of dimensions shown upon the drawings.

(10) *Caps.*—The caps on top of piles shall be secured to the piles by square steel drift bolts, driven in holes bored to receive them. Drift bolts must be $1\frac{1}{2}$ inches square and long enough to penetrate 10 inches into the vertical center of the pile. Holes to receive these drift bolts must be bored with a seven-eighths-inch auger.

PLANS.

(11) *Checking plans.*—All of the accompanying plans shall be carefully checked by the contractor before the beginning of the work. Should any errors be discovered, the engineer's attention shall be called to the same and corrections made; after which, the contractor shall be responsible for any errors that may occur or which may have occurred. The accompanying plans form a part of these specifications, and, in the event of any discrepancy between the plans and these specifications, the judgment of the engineer shall be decisive thereon. The figured dimensions on the plans are to be taken where given, whether they do or do not agree with the dimensions obtained by scaling from the drawings, provided that such dimensions shall be checked by the contractor.

(12) *Detail drawings.*—With the general drawings submitted as a guide, all detail and shop plans required shall be made at the expense of the contractor. They shall have a uniform size of 26 inches by 40 inches, inside border lines, with a border margin of $1\frac{1}{2}$ inches on the left-hand edge and one-half on all other edges. Small or irregular sized sheets not of standard dimensions will not be accepted for approval. Shop plans shall have noted on each sheet all requirements as to reaming, drilling, milling, planing, riveting, painting, and any special treatment to be given the work shown on such sheet and also any other explanatory notes that are necessary for the proper understanding of the work to be done in the shop in accordance with the specifications and contract drawings. The contractor shall prepare complete general erection plans showing all metal work furnished, with all shop marks, dimensions, and elevations necessary for guidance in the proper setting of same. The contractor shall furnish the board with duplicate copies of all shop bills of materials, showing calculated weights of all material or the scale weight of same.

(13) *Approval of plans.*—All plans made by the contractor shall be submitted for approval and shall be approved by the chief engineer or other designated engineer of the board. Two prints of each drawing shall be submitted to the board for examination and, if found correct, will be approved by the engineer of the board, and no work shall be done, shown on any drawings, until such drawings have been approved as last above specified. No alterations of any drawing shall be made by the contractor

after they have been approved without the written consent of the engineer. The contractor shall furnish the board, as requested, and without extra charge therefor, six complete sets of prints of all drawings, as approved, for office files, for the inspectors, and for use in the field. After completion of this contract the contractor shall furnish the board, free of charge, one complete set of Vandyke negatives of all shop plans and of all other plans of the work hereunder not furnished by the board, corrected to show all final changes thereon and to show the work as finally fabricated and erected.

(14) The approval of any drawing shall not relieve the contractor from the responsibility for any errors thereon nor from any cost or expense of making changes or corrections in the shop or after delivery due to, or on account of, errors on any drawings. Any cutting or drilling of metal work, masonry, timber, or other work necessary to allow erection of any material, due to errors in the plans or in fabrication of the metal work, or on account of any interference of any of the parts of the work, shall be done at the expense of the contractor.

QUALITY OF MATERIALS.

All materials to be used in the work are to be the best of their respective kinds or grades.

(15) All steel shall be made by the basic or acid open-hearth process and shall be of grades known as "structural steel," "rivet steel," "steel castings," and "steel forgings."

(16) The chemical and physical properties of steel shall conform to the following limits:

Elements considered.	Structural steel.	Rivet steel.	Steel castings.	Steel forgings.
	Per cent.	Per cent.	Per cent.	Per cent.
Phosphorous maximum.....	0.04	0.04	0.05	0.06
Basic acid.....	.05	.04	.06	.06
Sulphur maximum.....	.05	.04	.05	.05

	Ultimate tensile strength.			
	Desired.		Not less than—	
	Structural steel.	Rivet steel.	Steel castings.	Steel forgings.
Pounds per square inch.....	60,000.....	50,000.....	65,000.....	60,000.
Elongation:				
Minimum per cent in 8 inches (fig. 1).	1,500,000.....	1,500,000.....		
Minimum per cent in 2 inches (fig. 2).			20 per cent.....	26 per cent.
Character of fracture.....			Silky or fine granular.	Silky.
Cold bends without.....	180° flat.....	180° flat.....	90° d 2 t.....	180° d t.

(17) The elastic limit shall not be less than 55 per cent of the ultimate strength.

(18) If the ultimate strength varies more than 4,000 pounds from the desired a retest shall be made which, to be acceptable, shall be within 5,000 pounds of the desired ultimate.

(19) Chemical determinations of the percentage of carbon, phosphorus, sulphur, and manganese shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector. Check analysis shall be made from finished material, if called for by the board, in which case an excess of 25 per cent above the required limit will be allowed.

(20) *Structural steel.*—Specimens for tensile and bending tests for plates, shapes, and bars shall be made by cutting coupons from the finished product, which shall have both faces rolled and both edges milled to a standard form shown by Figure 1, or with both edges parallel, or they may be turned to a diameter of three-fourths inch for a length of at least 9 inches, with enlarged ends.

(21) *Rivets*.—Rivet rods shall be tested as rolled.

(22) *Steel castings*.—The number of tests for steel castings will depend on the character and importance of the castings. Specimens shall be cut cold from coupons molded and cast on some portion of one or more castings from each melt or from sink heads, if the sink heads are of sufficient size. The coupon or sink head shall be annealed with the casting before it is cut off. The specimens for tensile tests shall be turned to the standard form shown by figure 2. The specimens for bending tests shall be 1 inch by one-half inch in section.

(23) *Steel forgings*.—The specimens for tensile and bending tests shall be the same as for steel castings.

Tests will be required from each furnace heat in the case of eyebar material. The eyebars required for full-size tests, if made, and those required for the structure shall be made at one time. The test bars, to be selected by the inspector, must be fair average specimens of those which would be classed as good bars, acceptable for the work. No bar which is known to be defective in any way shall be selected for testing. These bars will be required to develop a minimum stretch of 12½ per cent before breaking, the elongation to be measured on the gauged length of the constant section of the bar, including fracture. A failure in the requirements for elongation, as given here and in the table, will be sufficient cause for condemning the bars represented by the test. All bars will be required to break in the body. No welds will be allowed in eyebars. Eyebars for full-size tests, when tested to destruction, shall be paid for at cost, less scrap value to contractor, if the test proves satisfactory; otherwise, they will be considered as rejected material and shall be entirely at the expense of the contractor.

(24) Material which is to be used without annealing or further treatment shall be tested in the condition in which it is to be used. When material is to be annealed, or otherwise treated before use, the specimens for tensile tests representing such material shall be cut from properly annealed or treated short lengths of the full section of the bar, or from coupons annealed with the casting.

(25) *Bending*.—Bending tests may be made by pressure or by blows. Rivet steel, when nicked and bent around a bar of same diameter as the rivet rod, shall give a gradual break and a fine, silky uniform fracture.

(26) *Tensile*.—At least one tensile and one bending test shall be made from each melt of steel. When more than one class of material is taken from any melt, each variety shall be separately tested. Every finished piece of steel shall have the melt number and the name of the manufacturer stamped or rolled upon it. Rivet steel and other small parts may be bundled with the above marks on an attached metal tag.

(27) Materials which, subsequent to the above tests at the mills and in acceptance there, develop weak spots, brittleness, cracks, or other imperfections, or are found to have injurious defects, shall be rejected at the shop and shall be replaced by the manufacturer at his own cost.

(28) *Steel castings*.—All steel castings shall be as free as possible from blowholes, true to pattern and size, and of good finish. Any casting having blowholes or other defects which impair its strength shall be rejected. All steel castings shall be annealed and shall be properly supported to prevent warping during the process of annealing.

(29) *Cast iron*.—Cast iron must be of the best quality of tough gray iron, manufactured from pig and not from scrap iron. Castings must be true to pattern, out of wind, free from flaws, blowholes, sand pockets, cracks, imperfections, ragged edges, excessive shrinkage, or any other defects impairing their efficiency or appearance. Tests shall be made on the "arbitration bar" of the American Society for Testing Materials, which is a round bar 1½ inches in diameter and 15 inches long. The transverse test shall be made on a supposed length of 12 inches with load at middle. The minimum breaking load shall be 2,900 pounds, with a deflection of at least one-tenth inch before rupture.

(30) Tobin bronze, phosphor bronze, and babbitt, or any special metal, shall be of the best quality of materials suitable for the purpose. The brand or formula for each shall be submitted to and shall be approved by the engineer.

(31) All patterns shall be finished to give a neat appearance to the castings. The outer unfinished edges of all ribs, bases, etc., shall be rounded off to a radius of one-fourth of the thickness of the metal in same, and the inside corners shall be fitted with wood fillets well fastened and rounded out to a radius of at least one-half the thickness of the thinnest rib forming the corners. All patterns shall be delivered in good condition to the board where directed by the engineer, free of extra charge. A full list of the patterns delivered shall be furnished to the engineer.

LOCK GATES.

(32) The lock gates and gate-operating machinery shall be finished and erected and placed in complete working order.

(33) The miter sills shall be of sound, straight, square-edged white-oak timber, 14 by 16 inches, framed accurately and secured in place as shown on the plans. The anchor bolts will be set with upper ends loose in the concrete. Recesses will be left in the floor of the lock for miter sills. The miter sills shall be bedded in Portland-cement mortar in these recesses and fitted to an even bearing against the lock gates after the gates have been properly hung. The anchor bolts and miter sills shall then be grouted in place to the satisfaction of the engineer.

(34) The timber used in the gates shall be either cypress, long-leaf yellow pine, or Douglas fir. Materials shall be sound and straight, square edged and out of wind, free from decay, large checks or splits, large, loose, or unsound knots, and shall contain not less than 80 per cent of heart. All timber and lumber shall be dressed throughout true to finished sizes, framed and put together neatly and accurately. The metal work shall be properly fitted to the gates and the character of the metal used shall conform to the specifications hereinbefore given for the several kinds of work.

(35) The quoin post of each gate shall be finished to fit accurately into the hollow of the quoin when the gate is in closed position and the center of curved face of quoin post at the top of the gate shall be directly above the center of the pintle in base casting of quoin. The center of the pin at top of gate, about which the gate swings, is eccentric by one-quarter inch in such a way that as the gate passes from the closed to the open position it swings away from its bearings upon the quoin. Care must be taken that this condition is accurately attained and that eyebolts at the top pin are properly adjusted.

(36) The miter post of each gate must be accurately finished to a vertical plane surface lying in the axis of the lock so that surfaces of contact of the two leaves will form a water-tight joint when bearing against the miter sill.

(37) The horizontal frames shall be accurately and strongly framed into the quoin and miter posts and iron straps shall be flush with the timber surfaces.

(38) Sheathing shall be of the size shown on the plans, surfaced on two sides and matched and shall be laid up tight to form water-tight joints.

(39) Step castings shall be of cast steel of the grade hereinbefore specified. The surfaces bearing on the curved surfaces of the quoins shall be accurately finished to radius called for. The holes for pintles shall be accurately turned or bored and then polished to a smooth finish. The bronze bearing disks shall be finished on one face to a concave surface of radius shown and polished all over. The lower surfaces of step castings shall be finished, care being taken to maintain clearance, as shown, between the step and the base casting of the quoin.

(40) The plate at the top hinge of the gate, joining the horizontal frame and the quoin post, is to be welded into shapes shown and finished to the radius of the quoin post without materially reducing the thickness of the plate at any point.

(41) All valves are to be accurately made and carefully fitted to their frames with a minimum clearance for leakage. They shall be so adjusted that they can be opened and closed easily by the means indicated on the plans. The handles of all levers are to be at the same elevation above the walk in their extreme positions.

(42) All finished surfaces of metal work shall be coated with white lead and tallow before taking out of shop. All other surfaces of metal shall be painted before leaving the shop. All surfaces of timber in contact shall be coated with thick white lead, or other approved material, before the gates are assembled. All bolt holes in timber shall be swabbed out carefully and all surfaces of all bolts and washers shall receive a heavy coat of approved paint just before assembling. All surfaces of metal work that will be inaccessible after erection shall receive two coats before assembling in the gates. After erection all surfaces of timber that will remain permanently exposed when the water is admitted and all surfaces of metal work on the gates shall be painted three coats of approved paint.

(43) *Piles.*—All foundation piles supporting masonry, if ordered to be used anywhere in the work, shall be _____, and all others must be of _____ or _____. They must be sound and straight, not less than 14 inches at the butt nor less than 9 inches at the small end, and must taper uniformly from end to end. Piles for the foundations are to be used of such length that they may be driven to rest upon solid rock or hard bottom. All piles must be driven with a steam hammer, unless otherwise permitted by the engineer, and, if used for foundations, shall be driven to refusal on rock or hard substratum. If necessary, in order to drive to hard bottom, a follower and guide box or extension leaders shall be used. If in the opinion of the engineer any piles prove

imperfect or become unfit for use under the hammer, or are not driven straight, they must be removed by the contractor without extra cost. If so directed by the engineer, the piles shall have the bark removed. Should any of the piles rise or change their position after being driven they shall be redriven, if so directed by the engineer, at the expense of the contractor: *Provided*, That if the piles are driven in such a manner and in such order as, in the opinion of the engineer, to cause the least liability of displacement or raising of piles already driven, or if driven in the manner and order directed by the engineer, then the cost of redriving such raised or displaced piles shall be paid for at actual cost with 15 per cent added. All piles must be cut level and at the proper elevation. Payment for piles in foundations and in permanent protections and docking will be made on the following basis:

First. Per linear foot for all piles delivered on the order of the engineer at the site of the work.

Second. For all piles driven, per linear foot of that portion below the point of cut-off.

No payment shall be made for piles excepting in foundations, permanent protections and docking, unless ordered by the Engineer in writing. The cost of all chain, cable or other iron in protection clumps, shall be included in the price for protection piles driven in place and named in the bid. All temporary protection piles or timber in clumps, or otherwise, placed around the cofferdams or the substructure at any time prior to the completion of the work shall be placed and removed at the expense of the contractor free of cost to the board.

(44) *Sheet piles*.—Sheet piles shall be fabricated of three boards spiked together, so as to form that section commonly called "triple lap sheeting." These boards shall be of lengths to be indicated upon bills for material to be given the contractor. They shall not be less than 10 inches wide and 3 inches thick. The middle board—of the same width as the two outside boards, shall be run through a planer to insure a uniform thickness of $2\frac{7}{8}$ inches, and this middle board shall project on one side 2 inches beyond the edges of the two outside boards and parallel thereto, forming a tongue, leaving a corresponding recess or groove on the other side. These boards shall be spiked together with steel boat spikes three-eighth inches square, 8 inches long, two at head of each pile on opposite sides and 4 inches from the top and two at bottom and in the length between top and bottom on each side a spike every 30 inches, staggered. Half of these spikes should enter the pile on one of its broad sides and half on the other.

The point end of these piles must be sawed off at an angle of 45° and, when driven, the point thus formed must be next to the pile last driven, so as to force it close in to said last driven pile and aid in making a tight joint, the tongues and grooves of adjacent piles fitting into each other.

(45) *Timber*.—All timber used in locks, anchors, sheeting, wales, fenders, or elsewhere must be sound, straight, and free from any defects which might impair its strength or durability, and be of such variety and dimensions as hereinafter specified or shown on drawings.

(46) The inspection of timber must depend largely upon the judgment of the inspector, and while the within requirements are given for general guidance as to the class of material desired, the acceptance of any piece of material must depend upon the inspector's judgment as to its strength when in place. The intent of these specifications is that only strong and sound pieces shall be accepted, and where any defects herein admitted are so situated as to impair the strength of any piece for the purpose for which it is to be used in the structure, such piece shall not be accepted.

(47) All timber will be inspected at the site of the work as it is put in place, and if found not to conform with the requirements of the plans and specifications, shall be removed from the premises: *Provided, however*, That should the contractor desire to have timber inspected at other points, such inspection shall be made subject to restrictions as the engineer may require and the extra cost of same to the board shall be paid by the contractor or may be deducted from any amounts to be paid to the contractor under this contract.

(48) *Stone*.—All broken stone for concrete shall be as nearly as possible cubical in shape, free from dirt or other foreign substances, and must be screened free from flat chips or dust. Stones shall not be larger than 1 inch in any direction, and shall be in quality subject to the approval of the engineer.

(49) *Cement*.—The best Portland cement only shall be used throughout this work, brand and quality to have a well-sustained reputation for excellence, and to be subject to the approval of the engineer, who shall cause to be made such tests as are considered the best and most modern practice in cement testing and as may seem to him proper for determining the quality of the cement. The weight of cement shall not be less than 95 pounds per cubic foot. All lumpy, dirty, or damaged cement shall be rejected; also all damaged or short-weight packages. All rejected cement shall be

immediately removed from the site of the work. The contractor shall provide storage capacity for at least 10 days' supply and shall store the cement so as to give easy access for the procurement of samples for tests.

(50) *Sand*.—The sand shall be sharp and clean, free from all clay, loam, or gravel, and of a quality approved by the engineer. Sand shall be coarse for concrete and mortar. For grout in pit linings it may be finer or shall be screened as the engineer will permit.

(51) *Concrete*.—All concrete used in any lock, dam, or other structure required for this work, unless otherwise specified, shall consist of one part cement, two and one-half parts sand, and five parts screened broken stone, bulk measure, not less than 95 pounds of cement to be taken as a cubic foot. Stone shall be moistened before mixing if the engineer so directs. The mass must be turned over often enough to thoroughly incorporate, using a mechanical mixer of type approved by the engineer. If the engineer will permit, the mixing of the concrete may be done by hand on suitable platforms, in which case the cement and sand shall first be thoroughly mixed dry, after which the stone, properly moistened, shall be added with sufficient clean water to make the whole mass, when thoroughly mixed, a tenacious and quaking mixture without surplus water. The concrete shall be immediately conveyed to the proper place in the work in large buckets, boxes, or barrows, or by other means, satisfactory to the engineer, which will not tend to impair the uniformity of the mixture. The concrete shall be deposited in layers not over 12 inches thick, each layer to be thoroughly and compactly tamped until the whole is perfectly solid and free mortar appears on the surface. The material forming all exposed surfaces, excepting such as are to be lined or faced, shall be so placed as to present a solid, smooth finish when the forms are removed and, if the engineer so directs, surfaces found to be rough or porous shall be neatly dressed, or pointed with mortar of the quality specified for pointing, free of cost to the board. No retempering of concrete will be allowed. All loose stone and foreign material lying on the old concrete must be removed and the surface thoroughly drenched with clean water before laying any new concrete thereon. No concrete shall be placed on any surface until a new surface has been picked thereon and properly moistened. Should any concrete become covered with dirt, grease, or other substance that will prevent proper adhesion to new concrete, a new surface shall be picked thereon and properly moistened. All dead concrete must be removed from the work.

(52) *Forms for concrete*.—The contractor shall furnish all forms necessary for the concrete and mortar facing in the substructure. They shall be built true to lines and dimensions, of plank of sufficient thickness (not less than 2 inches), surfaced on one side, and so efficiently braced that they will retain their position and line until all concrete which shall be against them has been placed and has set. All inside forms shall be removed by the contractor before flooding the structures. The cost of all forms with necessary bracing shall be included in the price for concrete named in the bid.

GENERAL CONDITIONS.

(53) *Examination of site*.—Prospective bidders for this work are required to carefully examine the site selected for the structure on which proposals are invited in order to inform himself, or themselves, as to the magnitude and nature of all of the contemplated work and also the facilities for the delivery of material at the site. No plea of ignorance of what is required as a result of failure to make the proper examinations or to discover the conditions at the chosen site will in any case be accepted as a sufficient excuse for any failure or omission on the part of the contractor to fulfill in every detail all the requirements of this contract. Should any part of these specifications be deficient or not clearly expressed, parties making the bids shall apply to the engineer, in writing, for all necessary information before the bids are submitted.

(54) *Measurement*.—Measurement of all masonry shall be by the cubic yard, and all payments shall be made upon the actual cubical contents of the contemplated masonry within the lines as shown on the plans. Measurement of all materials shall be in accordance with the units of the measurements as herein specified.

(55) *Quality*.—All material shall be the best quality of its kind and all workmanship shall be first class. Any material or workmanship which does not satisfy the requirements of these specifications may be rejected by the engineer at any time before the acceptance of the work, and the contractor shall make good all deficiencies at his own cost. The fact that the authorized inspectors have inspected said material or workmanship shall not make the board liable for extra cost for replacing the same with material or workmanship accepted by the engineer on final acceptance.

(56) *Drawings*.—The drawings furnished form a part of these specifications, and any work shown thereon shall be executed the same as if mentioned herein. The

work is to be made complete and to the satisfaction of the engineer, notwithstanding any omissions in plans or specifications.

(57) *Quantities.*—The quantity of work and material figured from the plans is approximate, where quantities are shown, and the board reserves the right to make any changes in the plans or specifications which may be deemed necessary, either before or after beginning the construction thereof: *Provided*, That if alterations are made, the general character of the work as a whole is not changed thereby. If such alterations increase the quantity of the work to be done, such increase shall be paid for according to the quantity of the work actually done and at prices and rates established for such work under this contract. If such alterations diminish the quantity of work to be done, they shall not constitute a claim for damages nor for anticipated profits on the work that may be dispensed with; and in case lump-sum prices are to be paid for work under this contract, the board shall receive credit for work omitted, at a fair price, to be fixed by the engineer. Notice of change of plan must be given to the contractor in writing, and it is expressly agreed that no alterations or additions or extra work are to be paid for unless so directed in writing.

(58) *Extra work.*—All claims for extra labor or material furnished by the contractor, or for damages from any causes whatever, must be reported to the engineer at the time such labor or material is furnished or such damages occur, and they must also be presented to him in writing at the end of the month: *Provided*, That nothing shall be paid for as extra work that can be classified under any of the heads upon which prices are fixed by this contract. When so required, the contractor shall deliver to the engineer each day a signed statement of the extra labor and material furnished during that day. Whenever work is required to be done which is not now contemplated or covered by the prices hereinafter given, the engineer shall fix such prices for the work as he shall consider just and equitable, and the contractor shall abide by such prices, provided he enters upon such work with a full knowledge of the prices so fixed by the said engineer; but if the contractor declines executing said work at the prices fixed by said engineer, then the board may enter into contract with any person or persons for its execution the same as if this contract had never existed; and if extra work or work not provided for in the contract is performed by the contractor before the prices have been fixed for such work, then the engineer shall estimate the same at such prices as he shall deem just and reasonable, and his decision shall be final, and the said contractor shall accept such prices in full satisfaction of all the demands against the board for said extra work: *Provided*, That, if the extra work done under this contract is of such a nature, being distinct from other work being done by said contractor, that the actual cost of the same can be determined, then the said contractor shall receive, and the board shall pay, in full satisfaction for the same, the actual cost of the work estimated as hereinafter specified with 15 per cent added for superintendence, use of tools, and profit: *Provided further*, That nothing shall be deemed extra work which can be measured or estimated under the provisions of this contract.

(59) *Decision of engineer.*—It is further agreed that in cases of question or dispute arising or growing out of this contract in any way regarding the cost or value of extras, variations, allowances, deductions, or the amount of damages in any manner growing out of the violation of this contract, the decision of the engineer shall be final, binding on both parties hereto. In estimating the cost of extra work the cost of material shall be the actual price paid for the same delivered at site of the work. The cost of labor shall be taken as amounts paid for same as shown by the pay rolls, with the cost of insurance added when such case can be shown to have been paid. No charge for cost of administration will be allowed. All work provided for in this contract is to be done under the direction and supervision of the engineer and his properly authorized agents. The contractor is to be guided by the lines, stakes, marks, and grades given by them, and is to carefully preserve the same as far as possible during the progress of the work, and is to furnish all needed facilities, without extra charge therefor, to enable the engineer to properly give lines and grades and measures of the work from time to time.

(60) *Inspection.*—All materials of whatever kind to be used in the work will be subject to the inspection and approval of the engineer. All unsuitable or rejected materials must be removed from the premises at once by the contractor.

(61) All work shall be subject to constant inspection before acceptance. Any unfaithful or imperfect work that may be discovered before its final acceptance shall be corrected immediately, and any unsatisfactory materials used in the work shall be rejected and removed on the requirement of the engineer, notwithstanding they may have been overlooked and estimated. The inspection of any work shall not relieve the contractor of any of his obligations to perform sound work, as herein

specified, and all work which, during its progress and before its final acceptance, may become damaged from any cause, shall be removed and replaced by good and satisfactory work.

(62) *Responsibility.*—The contractor will be responsible for the entire work until completed and accepted by the board. The contractor will be required to give his personal attention to the fulfillment of this contract and to the execution of the work. He is to keep the same under his control, and will not be allowed to sublet all or any part of it, it being distinctly understood and agreed that the subletting of the work covered by this contract, or any part thereof, shall, after 30 days' notice, work a forfeiture of the contract at the option of the board.

(63) *Legal action.*—In the event of any action of law or in equity being taken by any person, persons, or corporation, which would restrain the board from giving or the contractor from securing possession of the site chosen, or in any way delay the execution of this contract, then, in that case, the contractor shall not hold the board liable for any loss or damage by him sustained on account of such interference, and the contractor shall be accorded an extension of the period within which the work was to have been completed by the terms of this contract equal to the time lost by reason of such restraint.

(64) *Contract may not be assigned.*—The contractor, will not be allowed to assign, by power of attorney or otherwise, any portion of the moneys that may become due through the workings of this contract. In the case the contractor fails to comply with the provisions of this contract as to progress and character of work, he shall be duly notified in writing, and 30 days after the giving of said notice the board may declare this contract forfeited, if there is a substantial failure to comply with its provisions.

(65) *Equipment to be furnished.*—The contractor is to furnish all the tools of every description, including pumps, cars and tracks, boats, barges, and tugs necessary to the full and complete carrying out of this contract, and on completion of the work is to remove all tools, buildings, and materials of all kinds from the site of the work.

(66) *Precautions.*—Whatever precautions may be necessary to render any portion of the work more secure in any respect, or to decrease the liability of accident from any cause, or to avoid contingencies which are liable to delay the completion of the work, shall be taken by the contractor.

(67) *Competent employees.*—The contractor shall employ competent foremen and laborers and shall discharge, at the request of the engineer, any incompetent or unfaithful men in his employ. None but men expert in their respective branches of work shall be employed where special skill is required.

(68) *Liability for damages.*—If any damage shall be done by the contractor, or by any person or persons in his employ, to the owner or occupants of land, or to any property adjoining the vicinity of the work herein contracted to be done, or to a neighboring contractor, the engineer shall have the right to estimate the amount of such damage, and to cause the board to pay the same to the said owner or occupant, and the amount so paid for said damages shall be deducted from the money due said contractor under this contract. Said contractor covenants and agrees to pay all damages for any personal injury sustained by any person growing out of any act or doing of himself or his employees that is in the nature of a legal liability, and he hereby agrees to indemnify and to save the board harmless against all suits or actions of every name and description brought against the said board for, or an account of, any such injuries or such damages received or sustained by any person or persons, by or from said contractor, his servant or employees, in the execution of said work; or by or in consequence of any negligence in guarding the same; or by or on account of any omission or act of said contractor, his agents or employees; and the said contractor further agrees that so much of the money due to him and by virtue of this contract as shall be considered necessary by the board may be retained by said board until such suit or claim for damages, as aforesaid, shall have been settled and evidence to that effect furnished to the satisfaction of the said board.

The foregoing specifications do not enter into the minuter details of construction but must be supplemented by those detailed drawings which they require the contractor to provide.

The foregoing specifications are, for the most part, adopted from standard specifications for work with which a member of the commission has been responsibly connected.

USE OF LOCKS TO RELIEVE EXCESS FLOODS IN THE LAKE.

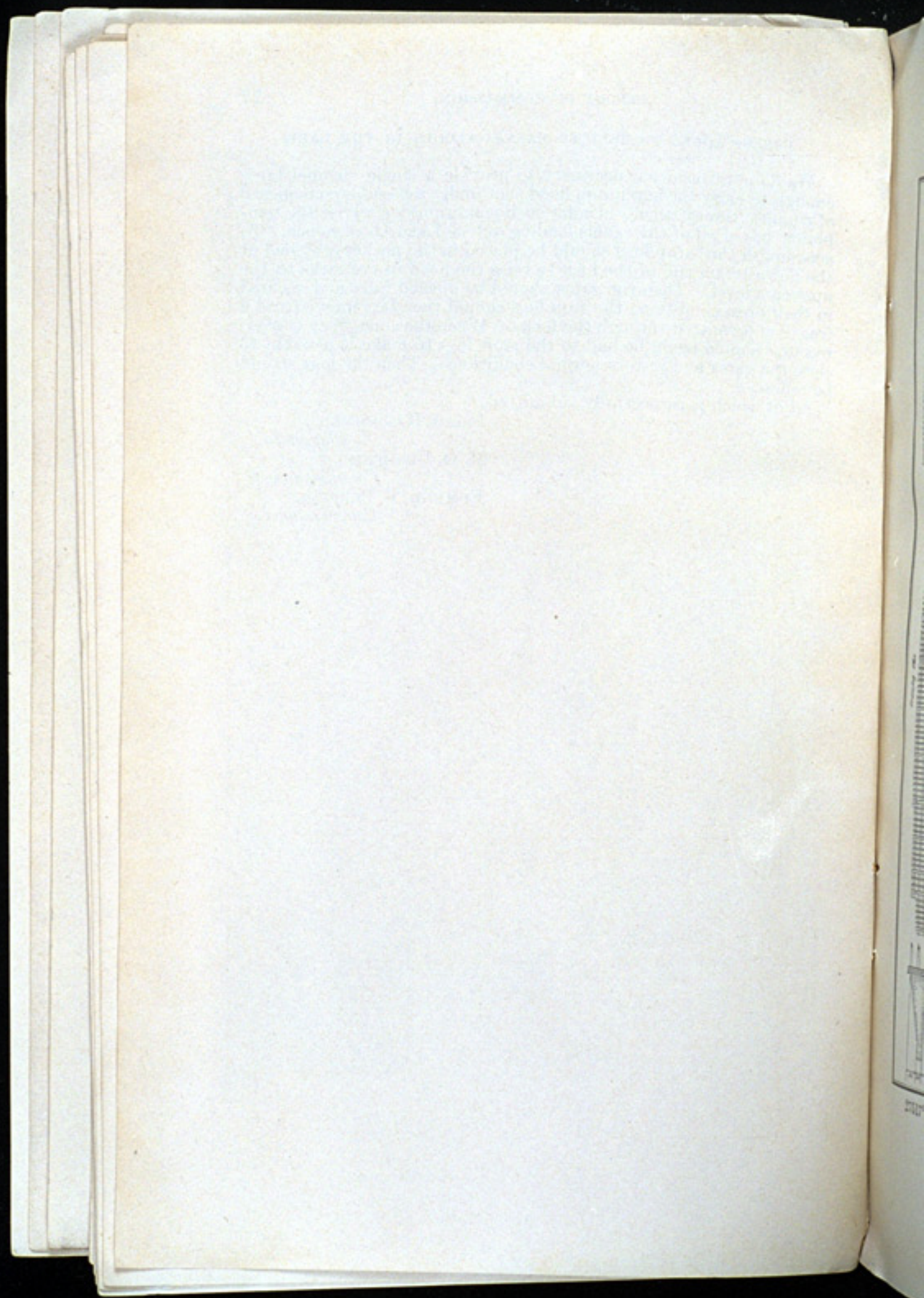
We do not consider it necessary to provide a single channel large enough to carry the maximum flood that under a possible coincidence of conditions may occur. Under such conditions we advise the temporary use of all of the canals leading out of Lake Okeechobee. To accomplish this, stop logs should be placed in the pocket provided at the downstream end of the lock to raise the head in the locks to the upstream level. Then the gates should be opened fully and secured in their open condition; the stop logs should then be removed and a free flow permitted through the locks. When the emergency is over, recourse should again be had to the stop logs to make it possible to close the gates and restore normal conditions. Then the logs should be removed.

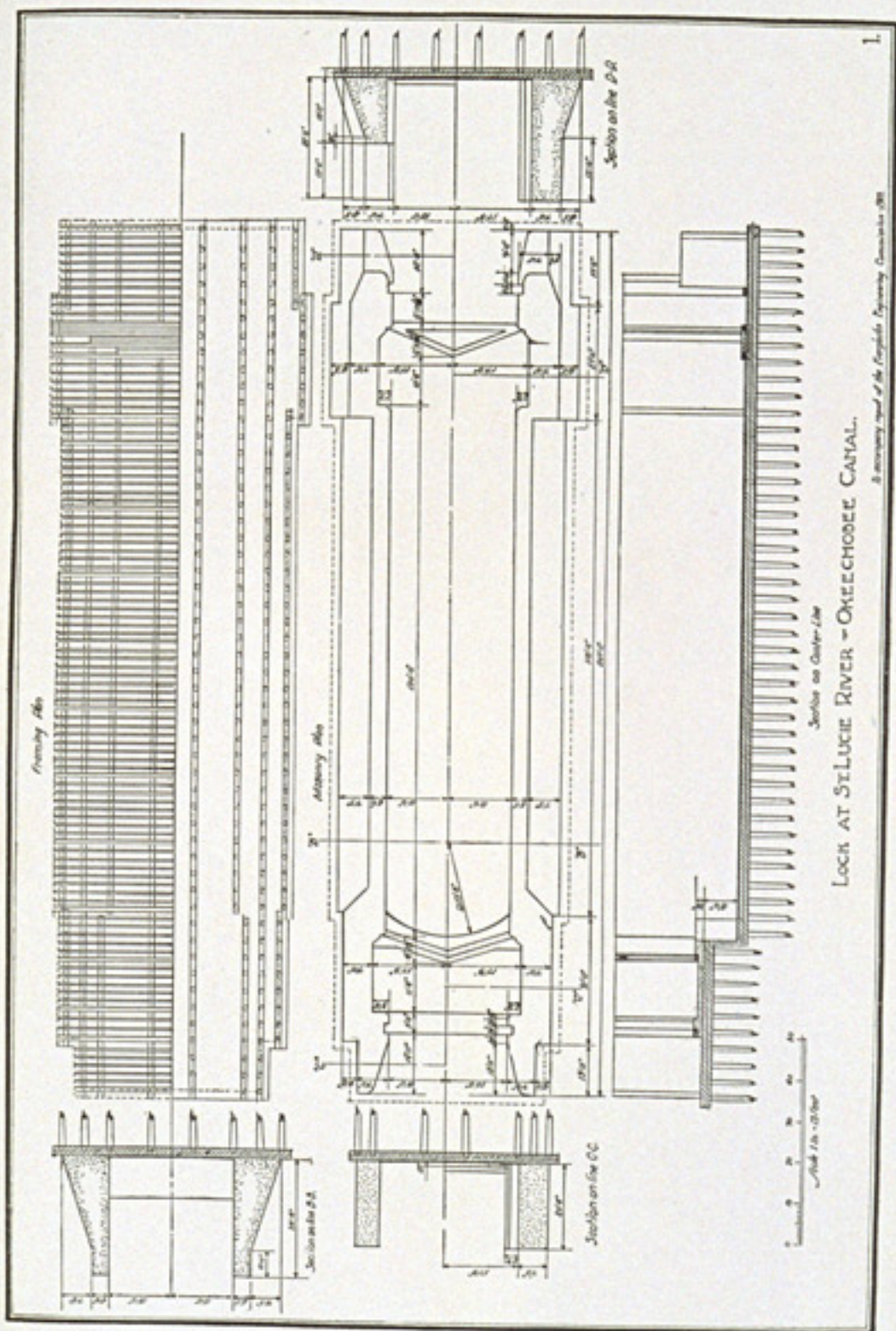
All of which is respectfully submitted.

ISHAM RANDOLPH,
Chairman.

M. O. LEIGHTON,
Commissioner.

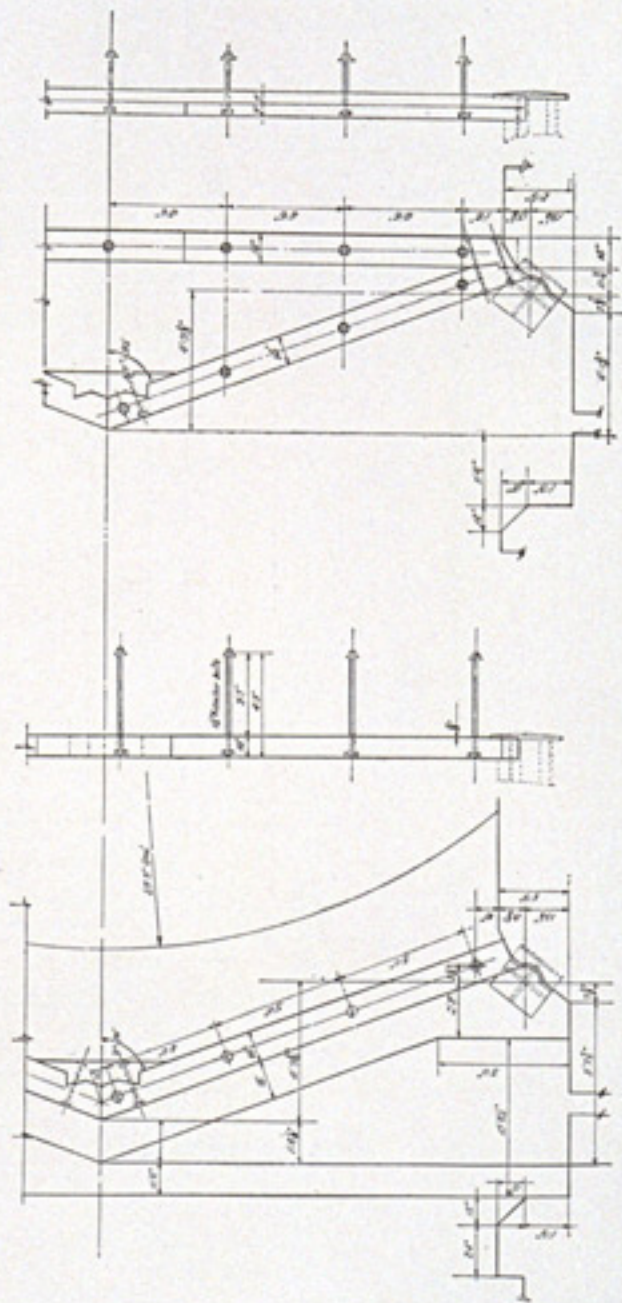
EDMUND T. PERKINS,
Commissioner.



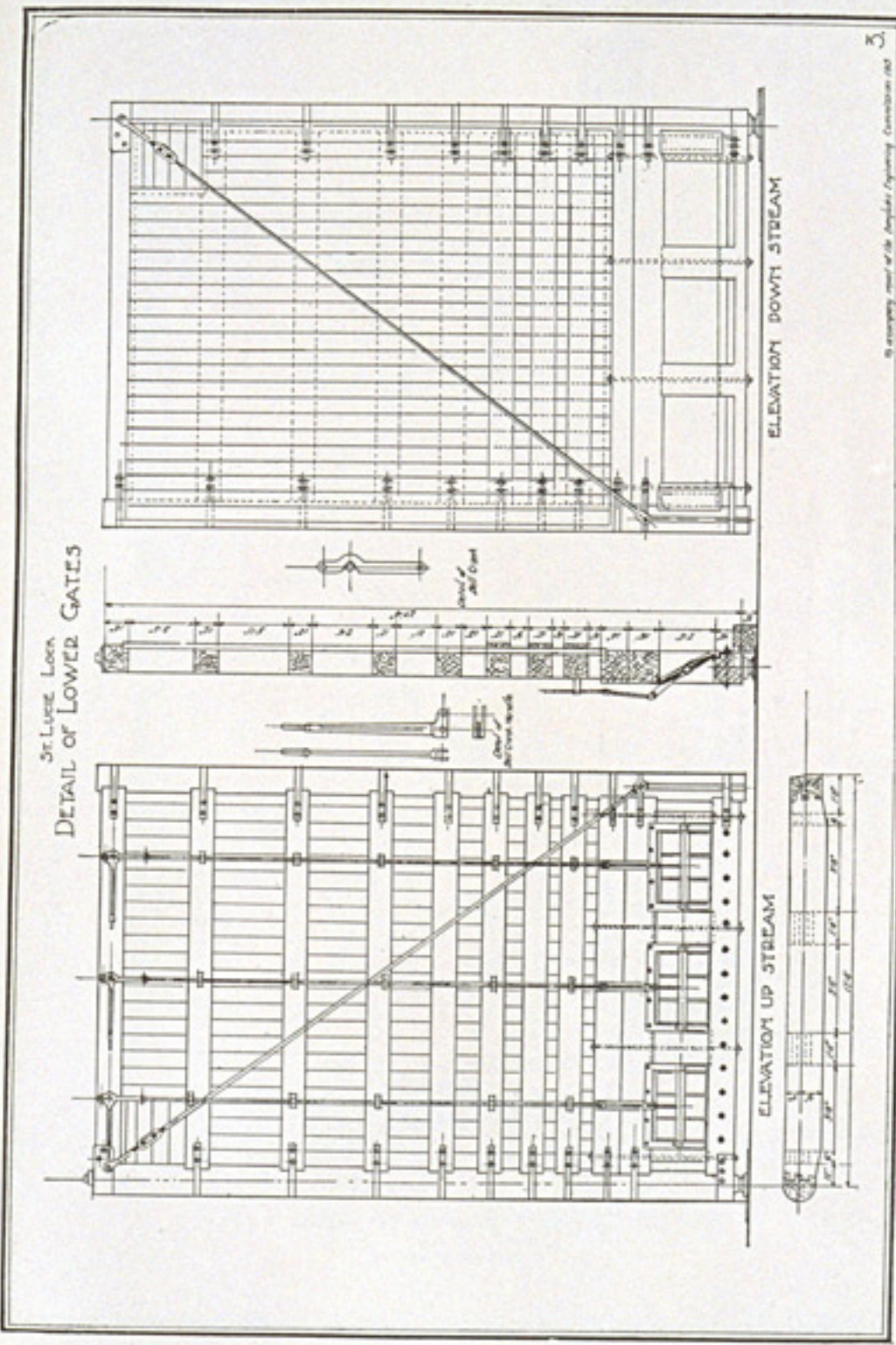


A temporary report of the Reynolds Engineering Corporation, 1911

DETAIL OF MITRE SILL
STILWEE LOCK



2
A necessary part of the Freyhold's Apparatus Description: 1811



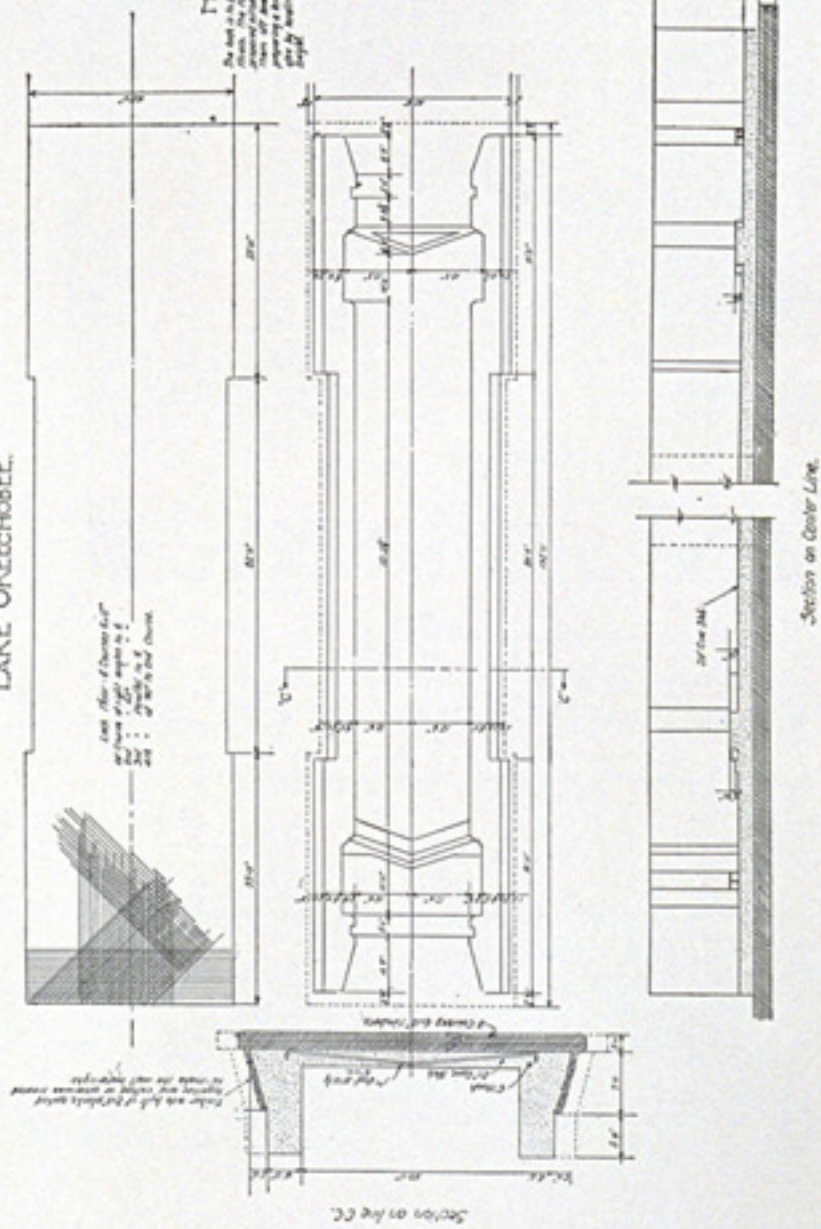
St. Louis Lock
 DETAIL OF LOWER GATES

ELEVATION DOWN STREAM

ELEVATION UP STREAM

By authority of the American Engineering Council 1913

STANDARD LOCK FOR CANALS
FLOWING SOUTH FROM
LAKE ONECHHOBE.



NOTE.

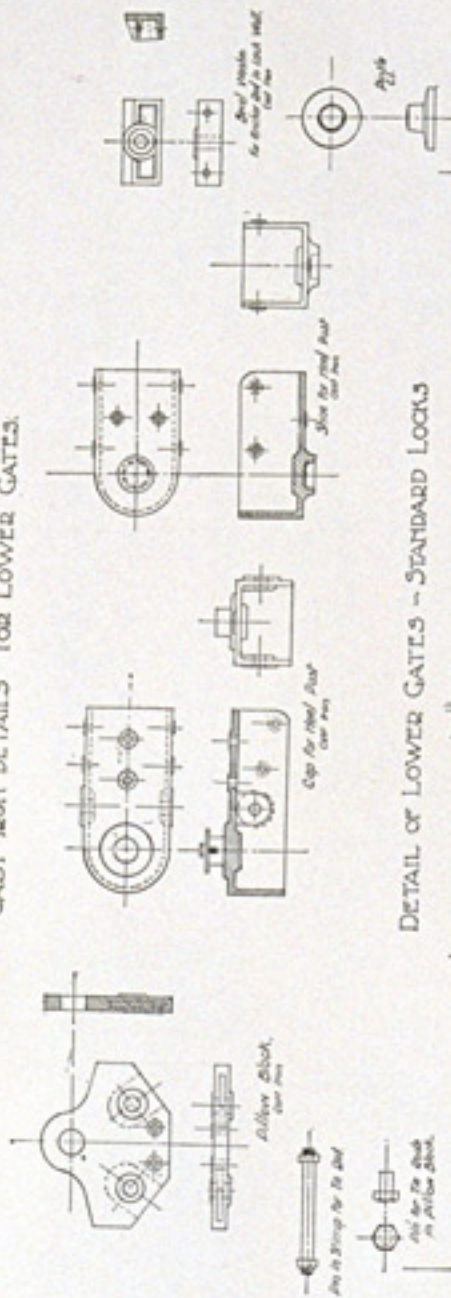
The lock is to be built on the common bed of the stream. The construction of the lock is to be such that the water will flow in the direction of the arrow and will not be prevented from flowing in the opposite direction by the lock gates.

Filler with side of Portland cement
mortar and rubble or concrete masonry
to make the wall impervious.

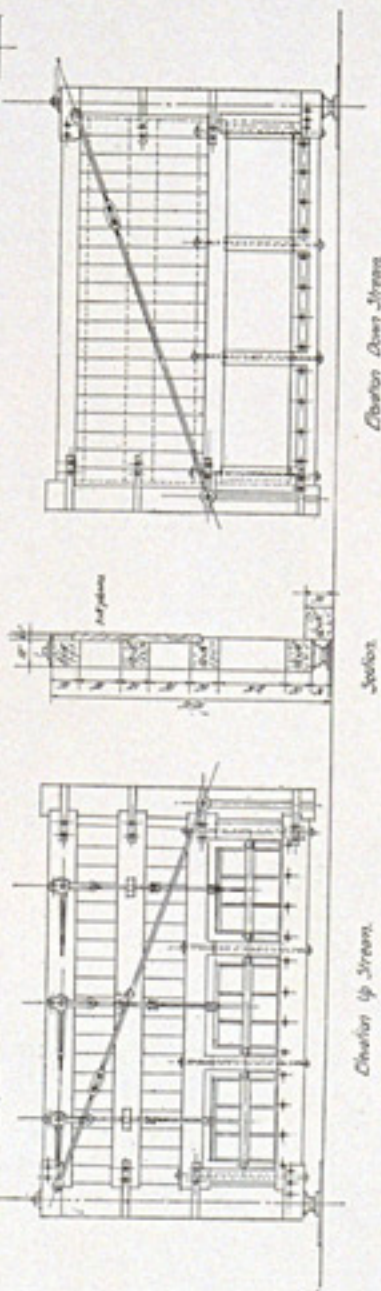
Section on line CC.

Section on Center Line.

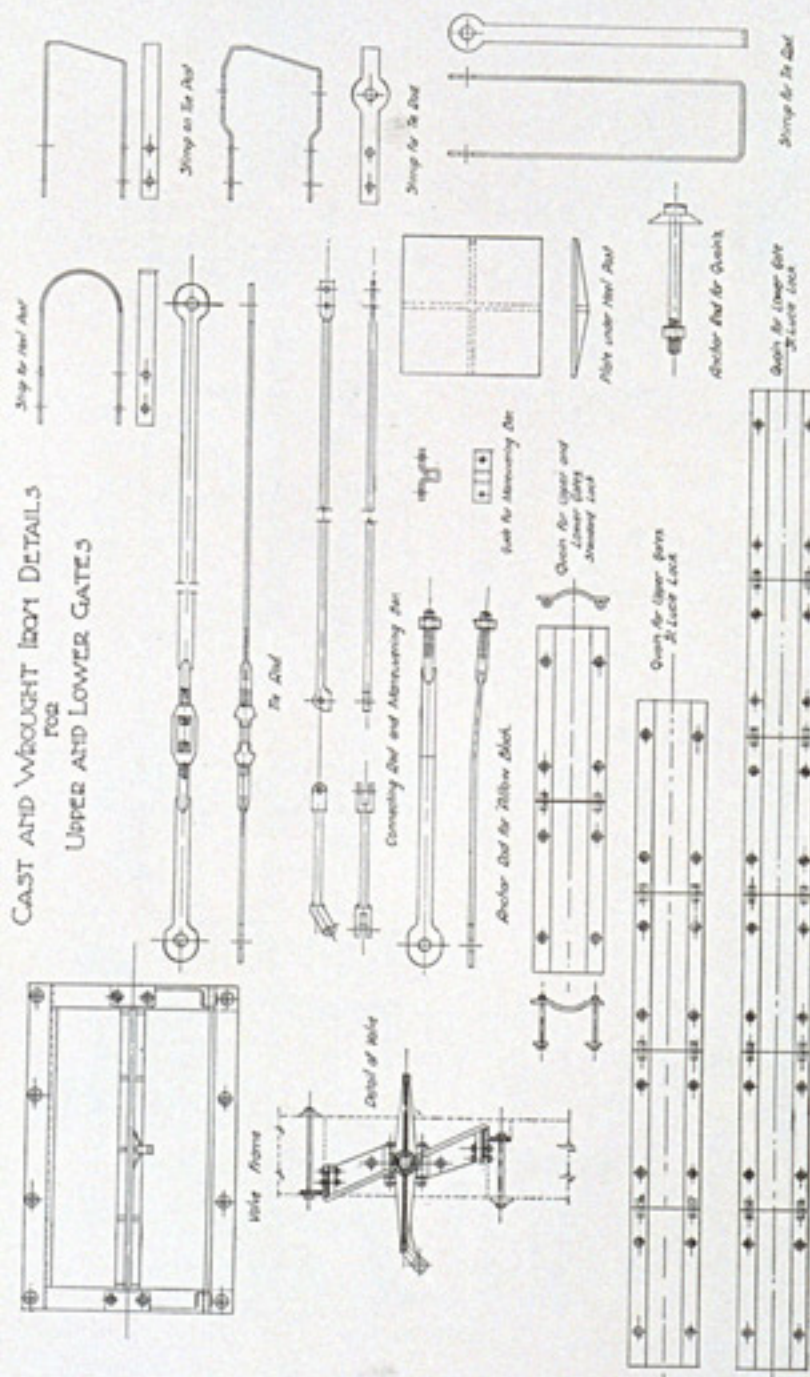
CAST IRON DETAILS FOR LOWER GATES.



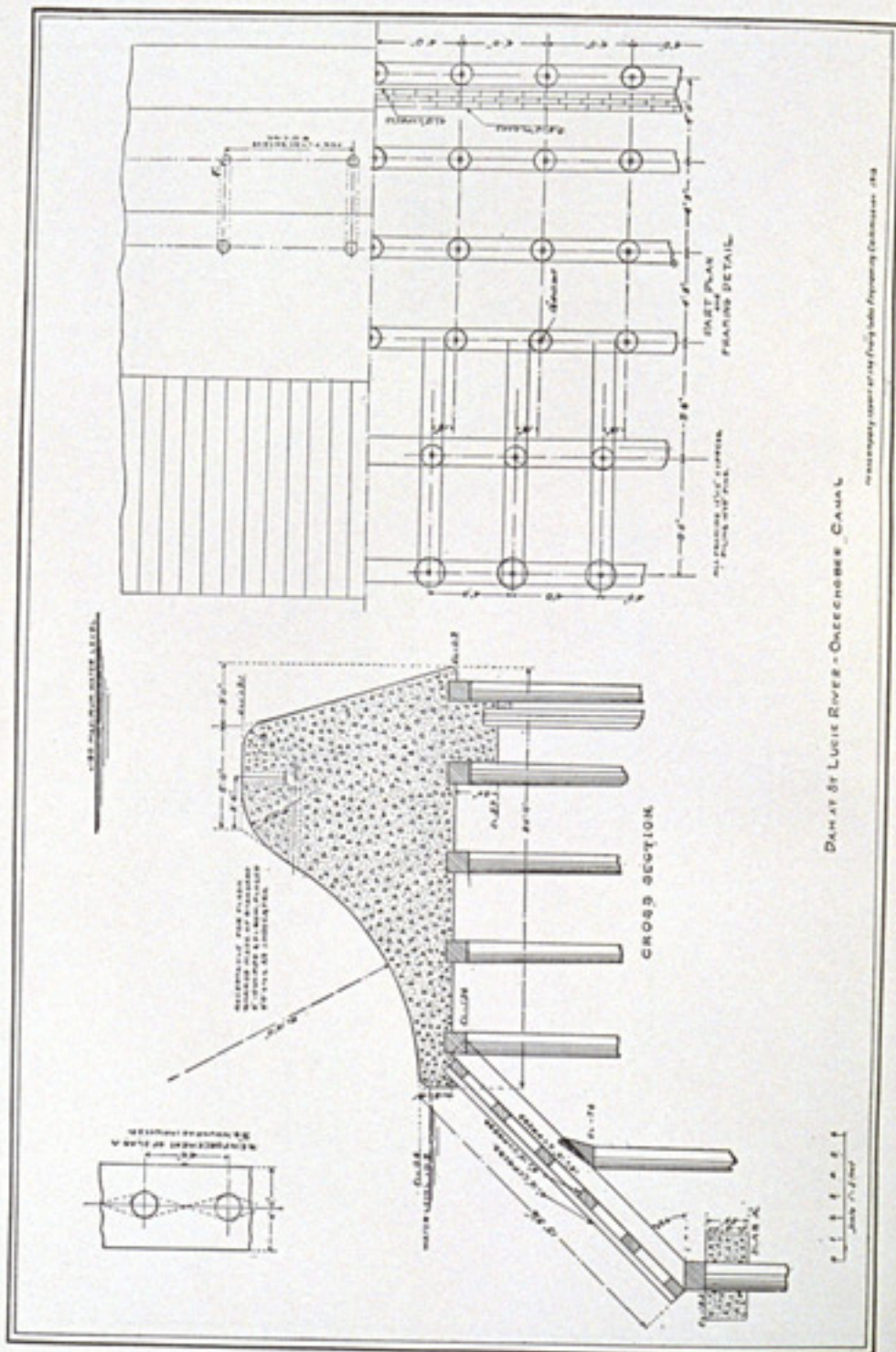
DETAIL OF LOWER GATES - STANDARD LOCKS



CAST AND WROUGHT IRON DETAILS
FOR
UPPER AND LOWER GATES



Details adapted from *Locks on Rivers - Manning's Canal*
By *George W. Manning, Chief of the Forelocks, Engineering Commission, U.S.A.*



DAM AT ST. LOUIS RIVER - ONOCNESSES CANAL
 REINFORCED CONCRETE DAM WITH REINFORCED CONCRETE PIER

