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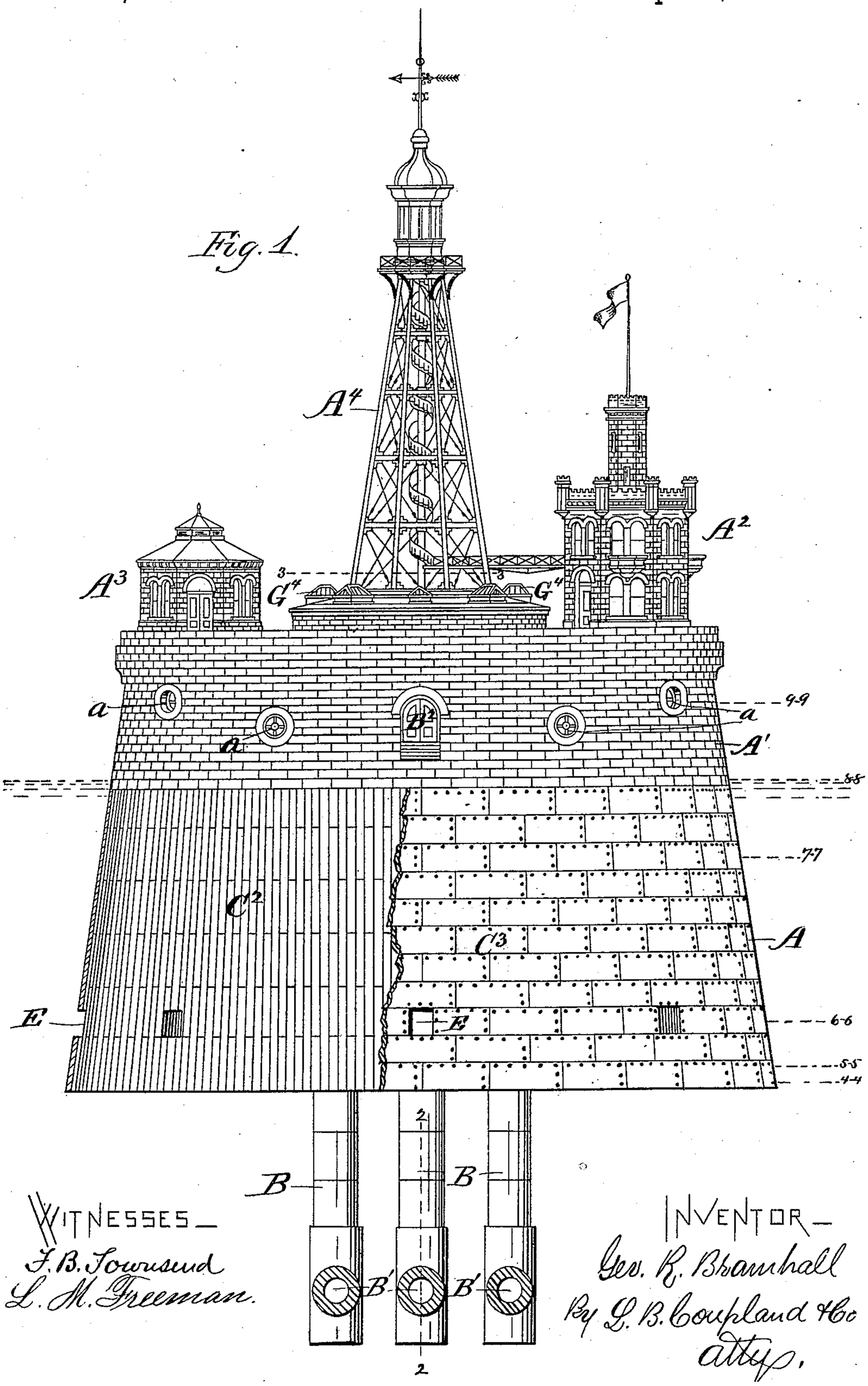
G. R. BRAMHALL.

MARINE STRUCTURE FOR WATER WORKS.

No. 246,655. Patented Sept. 6, 1881.

Fig. 1.



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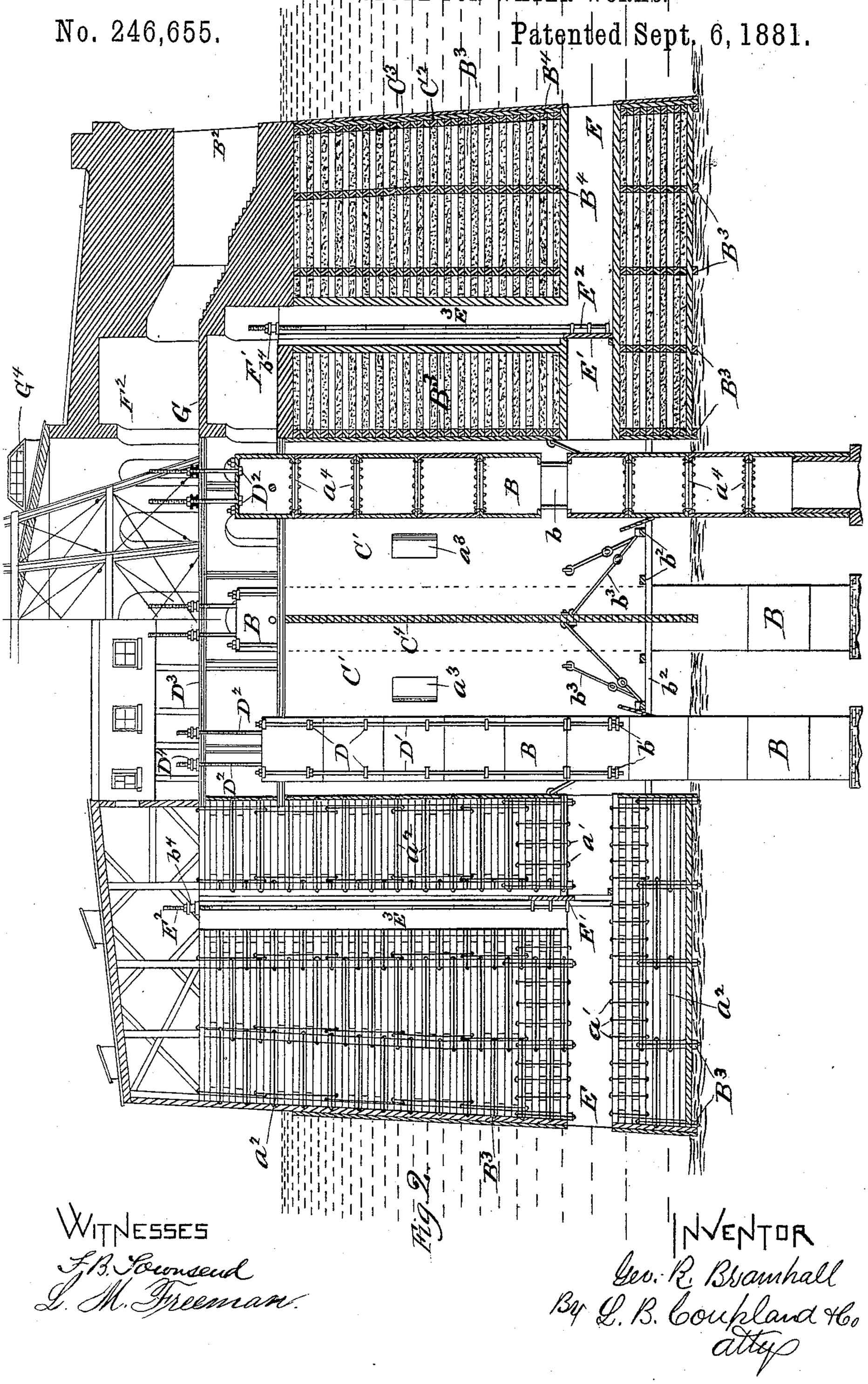

Fig. 2.

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MARINE STRUCTURE FOR WATER WORKS.

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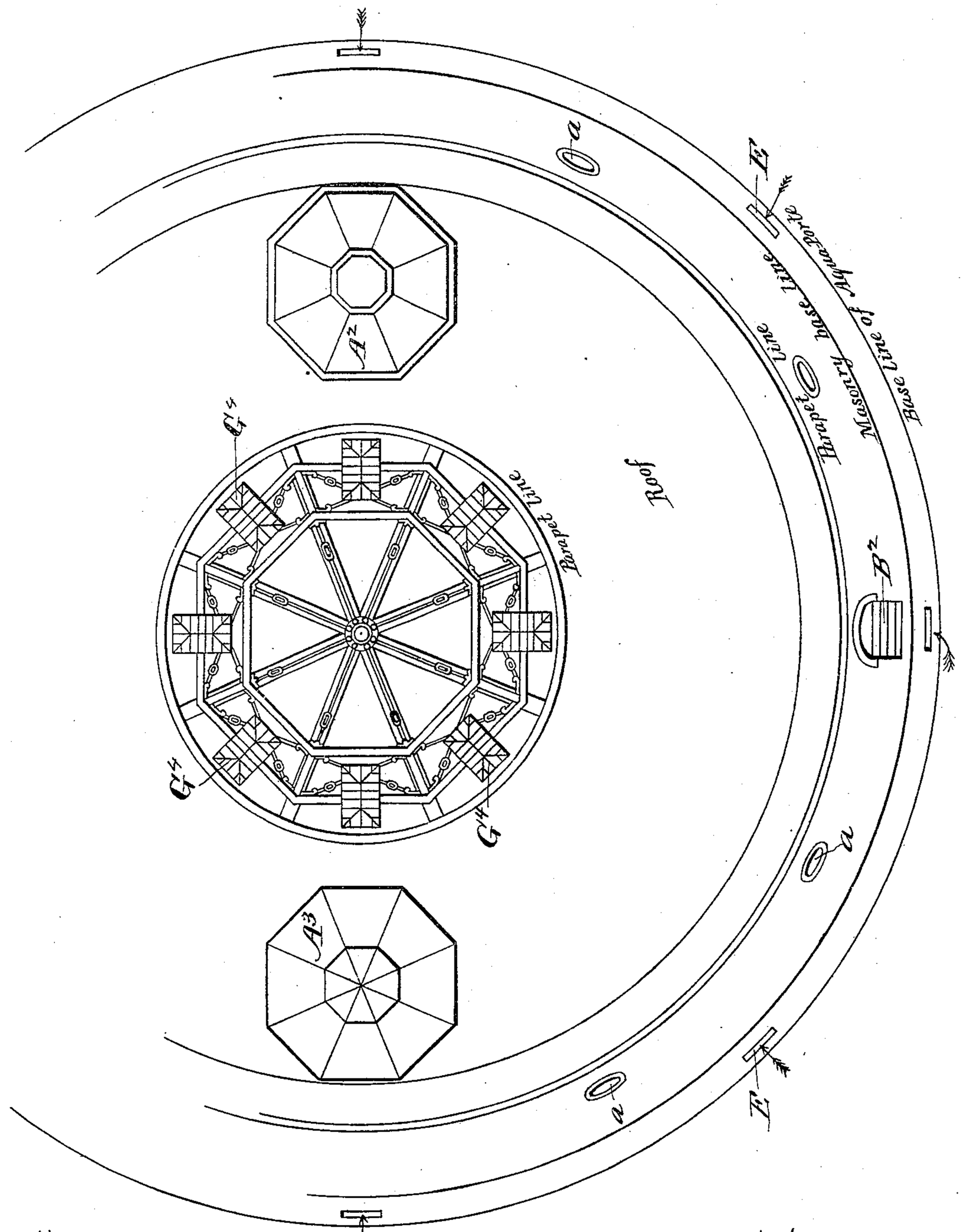

Fig. 3.

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MARINE STRUCTURE FOR WATER WORKS.

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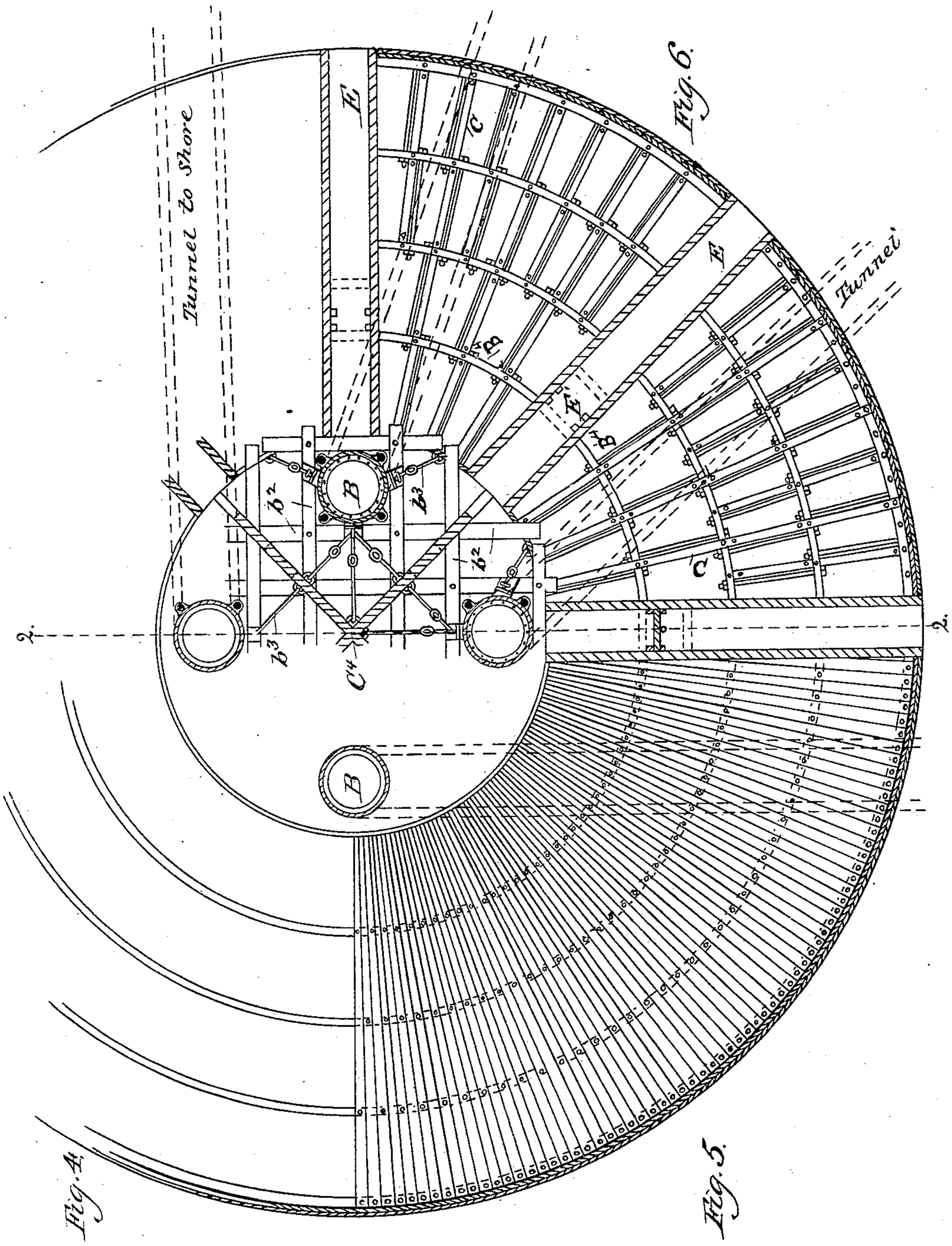

Fig. 6.

Fig. 4.

Fig. 5.

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MARINE STRUCTURE FOR WATER WORKS.

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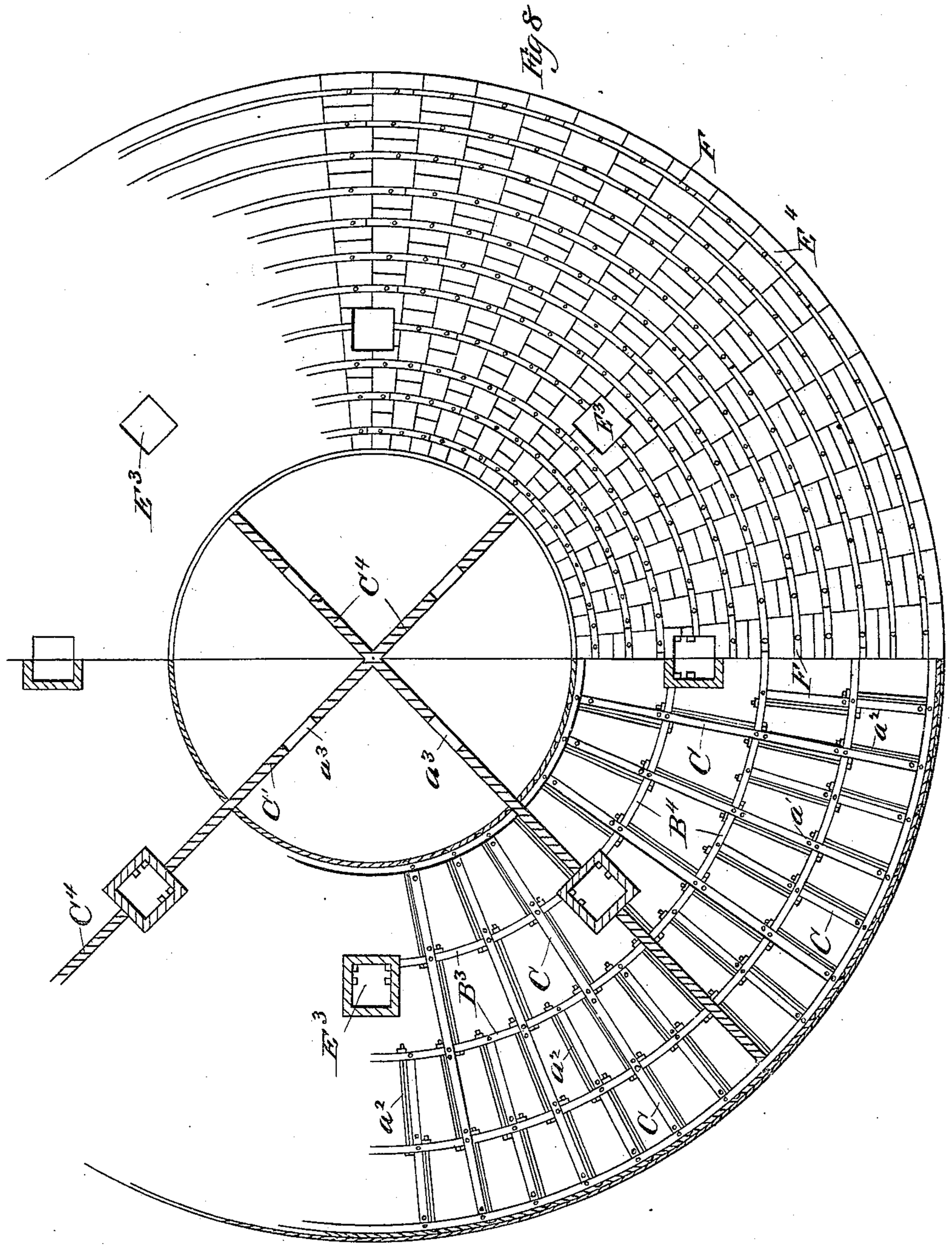

Fig. 7.

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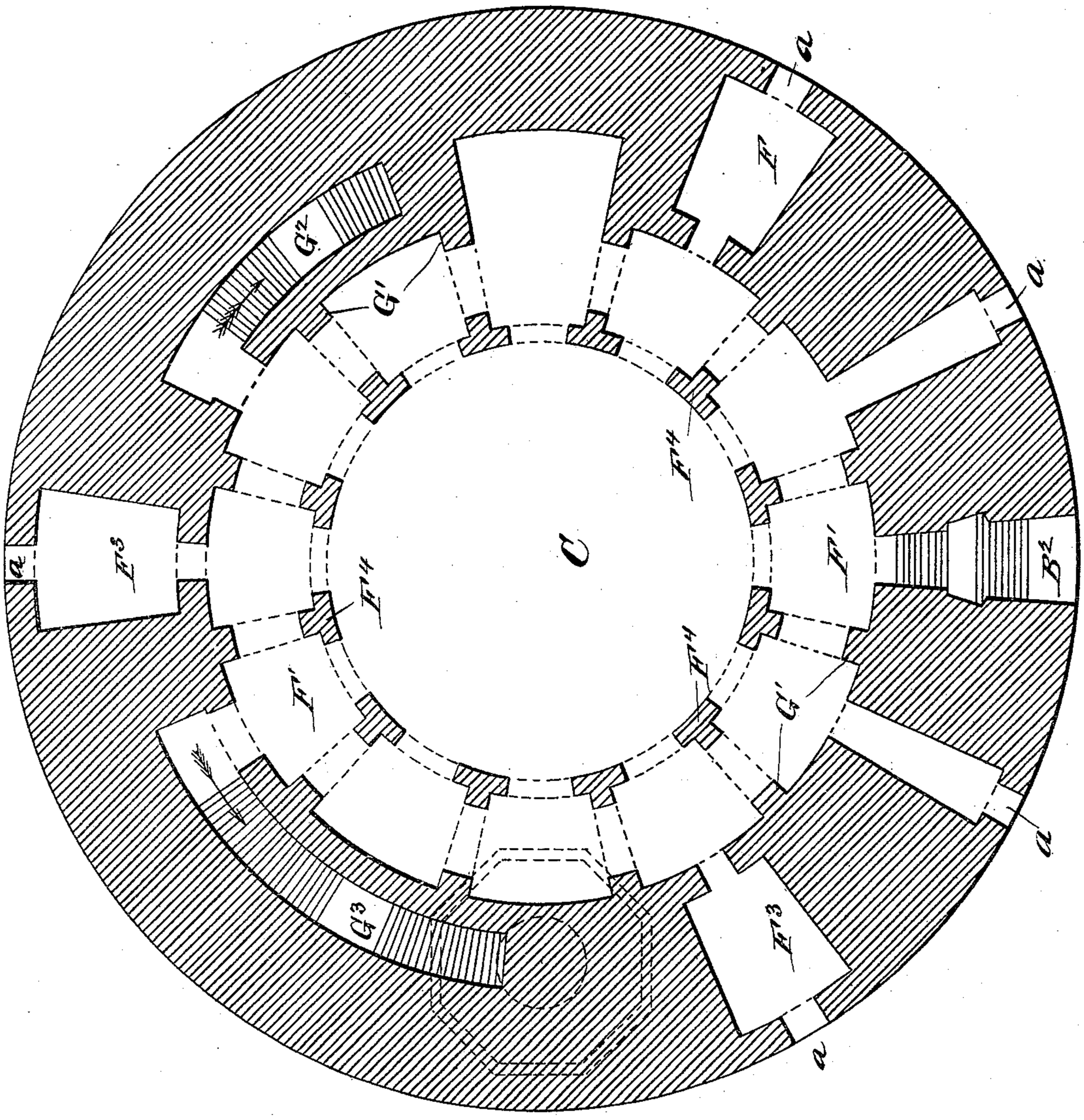

Fig. 9.

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UNITED STATES PATENT OFFICE.

GEORGE R. BRAMHALL, OF CHICAGO, ILLINOIS.

MARINE STRUCTURE FOR WATER-WORKS.

SPECIFICATION forming part of Letters Patent No. 246,655, dated September 6, 1881.

Application filed July 2, 1881. (No model.)

To all whom it may concern:

Be it known that I, GEORGE R. BRAMHALL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in a Marine Structure for Water-Works; and I do hereby declare the following to be such a full, clear, and exact description thereof that it will enable others to understand and construct the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, forming a part of this specification.

The object of this invention is the improved construction of an "aqua-port" adapted to be placed in a body of water at any required distance from the shore, for the purpose of procuring an abundant supply of pure cold water. The structure will be partially submerged, resting solidly on the bottom of the lake, and having a subterranean connection with one or more tunnels extending under the bottom of the lake to the main land, through which the water is conveyed to the pumping mechanism located at the land end of the tunnels.

The principal object is to provide a structure of great strength and durability, that will successfully resist the action of severe storms and floating ice, and to receive the water-supply at such a distance below the surface or water-line as to be always pure and of a uniform temperature at all seasons of the year.

Referring to the drawings, Figure 1, Sheet 1, illustrates an elevation of the structure in perspective.

The structure is circular in form, gradually decreasing in diameter from the base to a point near the top, where it is crowned by a slightly-overhanging wall, the whole being surmounted by a light-house and buildings for the accommodation of the keepers.

A represents the foundation or submerged portion of the structure; A′, the superstructure; A^2, the residence for the keepers; A^3, storehouse; A^4, light-house building; B, vertical iron cylinders, having connection with the subterranean tunnels or passages communicating with the shore, and B′ the openings through which the water passes from the cylinders into the horizontal tunnels. The door B^2 admits of convenient access to the interior of the structure, and the series of circular openings *a* provide means for ventilation.

Fig. 2, Sheet 2, is a vertical central section of the structure proper in the plane 2, Fig. 1. Fig. 3, Sheet 3, is a top view, showing the light-house cut away in the plane 3 3, Fig. 1. Figs. 4, 5, and 6, Sheet 4, are horizontal sections in the planes 4 4, 5 5, and 6 6, Fig. 1. Figs. 7 and 8, Sheet 5, are horizontal sections in the planes 7 7 and 8 8, Fig. 1. Fig. 9, Sheet 6, is a horizontal section in the plane 9 9, Fig. 1.

The structure shown in the drawings is designed to be one hundred and fifty feet in diameter at the base-line, having a well-hole in the center fifty feet in diameter. The submerged portion is composed of a skeleton frame-work, divided into a number of retaining-walls, B^3, consisting of the circular timbers B^4 and the radial timbers C. The base-timbers of the substructure will be first covered by a course of heavy planking, as shown in Fig. 5, of the drawings, upon which will rest the walls and filling.

The timbers entering into the construction of the inner wall inclosing the well-hole C′ and the outside retaining-wall will be of oak, while the inside walls will be of white pine. The timbers composing these walls will be laid in courses, breaking joints alternately, so as to form a perfect bond on each course.

The radial timbers serve two purposes—first, as a tie, and, second, as straining-beams to enable the structure to successfully resist the shocks of the waves and ice and the outward thrust from within.

The radial timbers B^4 are arranged in the manner shown in Fig. 6 of the drawings—the first course running from the outside to the extreme inner wall inclosing the well-hole, and the next course only extending from the outside wall to the third inside wall, and so on, alternately. These timbers are to be dovetailed onto the extreme connecting-walls and gained at each course, alternating from side to side, and locked onto the circular walls by means of the series of vertical tie-rods a', and the retaining-walls are further strengthened and braced by the horizontal rods or bolts a^2. These rods will be provided with suitable heads and nuts, and so distributed and arranged throughout the structure as to impart the greatest possible strength. The timbers entering into the construction of the circular walls will also be doweled together, thus effectually guarding against the possibility of the tim-

bers moving out of plumb. The intervening spaces between the retaining-walls and radial beams are to be filled with concrete, stone, or other material that may be suitable for rendering the structure perfectly solid. The outside surface of the first retaining-wall of the substructure will be covered with a course of heavy pine plank, C^2, of suitable length to break joints and running in a vertical plane, substantially as shown in Fig. 1 of the drawings, the exposed surface of the inside retaining-wall inclosing the well-hole in the center of the structure being also sheathed with plank. The seams in the outside wall and the inner-chamber wall, and also in the planking covering the same, are to be calked in the best manner, using the best material for the purpose, so as to render the structure substantially water-tight. The whole of the exterior surface of the substructure is finally completed by being incased in a steel armor, C^3, as shown in Fig. 1 of the drawings. This armor consists of rectangular plates of any convenient size, being an inch or more in thickness, according to the weight required in the structure. These plates will be attached by bolts, the heads of which will be countersunk, coming flush with the face of the armor.

The well hole or chamber in the center of the structure is divided into four compartments by the strengthening and bracing walls C^4, which run at right angles to each other through the center of the well-hole, and extend clear through to the outer retaining-wall, as shown in Figs. 7 and 8 of the drawings. The four compartments into which the well-hole is divided are common to each other by the openings a^3, (shown in Figs. 2, 7, and 8 of the drawings.) In each of these compartments may be placed one of the cylindrical shafts, B, as shown in Figs. 4, 5, and 6 of the drawings, which connect with the subterranean tunnels. These cylinders will be constructed in sections of convenient lengths for handling, and will be bolted together by inwardly-projecting flanges, a^4, as illustrated in Fig. 2 of the drawings, showing a vertical longitudinal section of one of the cylinders. The water is admitted into these cylinders at *b*, at which point the interior bolting of the sections is dispensed with, in order that the cylinders may separate at this point and permit of the upper part being raised or lowered from above without disconnecting any of the intermediate sections.

The lugs D are cast on the exterior surface of the cylinders, and serve as guides for the bolts or rods D', by means of which the upper and lower parts of the cylinders are united, when it is necessary to shut out the water. The lower end of the rods D' are threaded, and engage with a correspondingly-threaded nut, b', inserted between the lower lugs, as shown in Fig. 2 of the drawings.

The upper end of the cylinders will have an inwardly-projecting flange, slotted, to receive the heads on the lower ends of the screw hoisting-bolts D^2. These bolts are threaded nearly the entire length, and pass up through the hoisting-frame D^3, and are provided with the nuts D^4 on the upper side, by which arrangement the upper portions of the cylinders may be conveniently raised or lowered, as required. The lower ends of the stationary parts of the cylinders are built in with the masonry of the underground passages, while the upper ends are braced by the horizontal timbers b^2 and the diagonal swivel-braces b^3, (shown in Figs. 2, 5, and 6 of the drawings.)

The water-inlets E are controlled by the sliding gates or valves E', which are operated by means of the stems or rods E^2. These upper ends are threaded and provided with the nuts b^4 for opening and closing the gates, and the stems are constructed in sections for convenience in removing and replacing these parts. The vertical passages E^3 are at all times full of water on a level with the body of water in which the structure is located. By closing the gates E' the water is shut out of the well-hole, when the same may be pumped out and entered for repairs or inspection.

Fish and floating objects may be prevented from entering the water-supply by placing suitable screens in the receiving-inlets.

The superstructure will be composed of stone blocks of proper dimensions, laid in regular courses. The first course is to be anchored down to the substructure by strong tie-rods reaching through holes in the stones into the concrete and radial timbers. On the top of the first course of stone, E^4, will be placed the flat iron bands F, as shown in Fig. 8 of the drawings, which will be embedded into the stone one-half the thickness of the iron, leaving a raised surface of the iron bands to fit into corresponding grooves or channels on the under side of the next succeeding course of stone. These series of iron bands are so placed as to bring two bands to each header, thus catching each stretcher about the center of the stone. The courses of stone and iron bands will be carried up in this manner until the required height is reached, dowel-pins being used instead of the tie-bolts in the first course. The masonry is not shown on the left side in Fig. 2, but shows a temporary frame-work and roofed shed for the convenience and protection of the workmen employed in the course of construction. When the substructure is launched preparatory to adding the masonry forming the superstructure this temporary frame-work will be removed. The concrete filling is also left out in this portion of the drawings, in order to better illustrate the arrangement of the permanent frame-work and tie-rods. Only two courses of stone extend into the well-hole, provision being made above this point for two corridors—F' the lower, and F^2 the upper one—as shown in Fig. 2 of the drawings, Fig. 9 being a plan view in the plane 9 9, Fig. 1.

F^3 represents compartments which may be used for various purposes. The piers F^4 (shown

in Fig. 9 of the drawings) are of the form of a cross, and support the inner edge of the floor G of the upper corridor, and the buttresses G′ formed at the back side of the corridor correspond with the shaft of the cross. The stairs G^2 and G^3 communicate with the dwelling-house and store-house placed upon the parapet of the superstructure. The interior of the structure will receive light principally through the skylights G^4, located at the base of the light-house structure, as shown in Fig. 3 of the drawings.

A general description of the light-house is omitted for the reason that nothing particularly new or novel enters into its construction. It will be of open iron-work, thus presenting less resistance to storms, and will have a spiral stair-case placed in the center of the structure, all as shown in Fig. 1 of the drawings.

The substructure shown is designed to be sixty feet in height, taking in the water at a point so far removed from the surface as to avoid all impurities and danger from anchor-ice, and at the same time far enough above the immediate bottom of the lake to escape all contaminations from this direction, thus furnishing a water-supply to cities that will be pure and wholesome beyond all question.

I do not propose to confine myself strictly to the details of construction as herein set forth, but may make such changes as circumstances may require without making a radical departure from the object and principles embodied in the plans.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a marine structure of the character hereinbefore described, the combination, with the substructure A and the well-hole C, of the bracing-walls C^4, running at right angles to each other, dividing said well-hole into four compartments, substantially as herein described.

2. The combination, with the cylinders B, having the lower part thereof rigidly attached to the masonry, connecting with the underground passages of a water-system, of the bracing-timber b^2, the swivel bracing-rods b^3, and the walls C^4, constructed and arranged as herein shown and described.

3. The combination, with the cylinders B, having the interior flanges, a^4, of the exterior lugs, D, the bolts D′, and the nuts b', substantially as and for the purpose described.

4. The combination, with the cylinders B, of the hoisting-bolts D^2, the frame D^3, and the nuts D^4, substantially as and for the purpose described.

5. In a marine structure of the character hereinbefore described, the combination, with the water-inlets E and the water-compartments E^3, of the gates or valves E′, the stems E^2, and the nuts b^4, substantially as herein shown and described.

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Witnesses:
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