W. G. Mann.

Viaduct.

No. 103,350. Patented May 24, 1870.

Fig: 2.

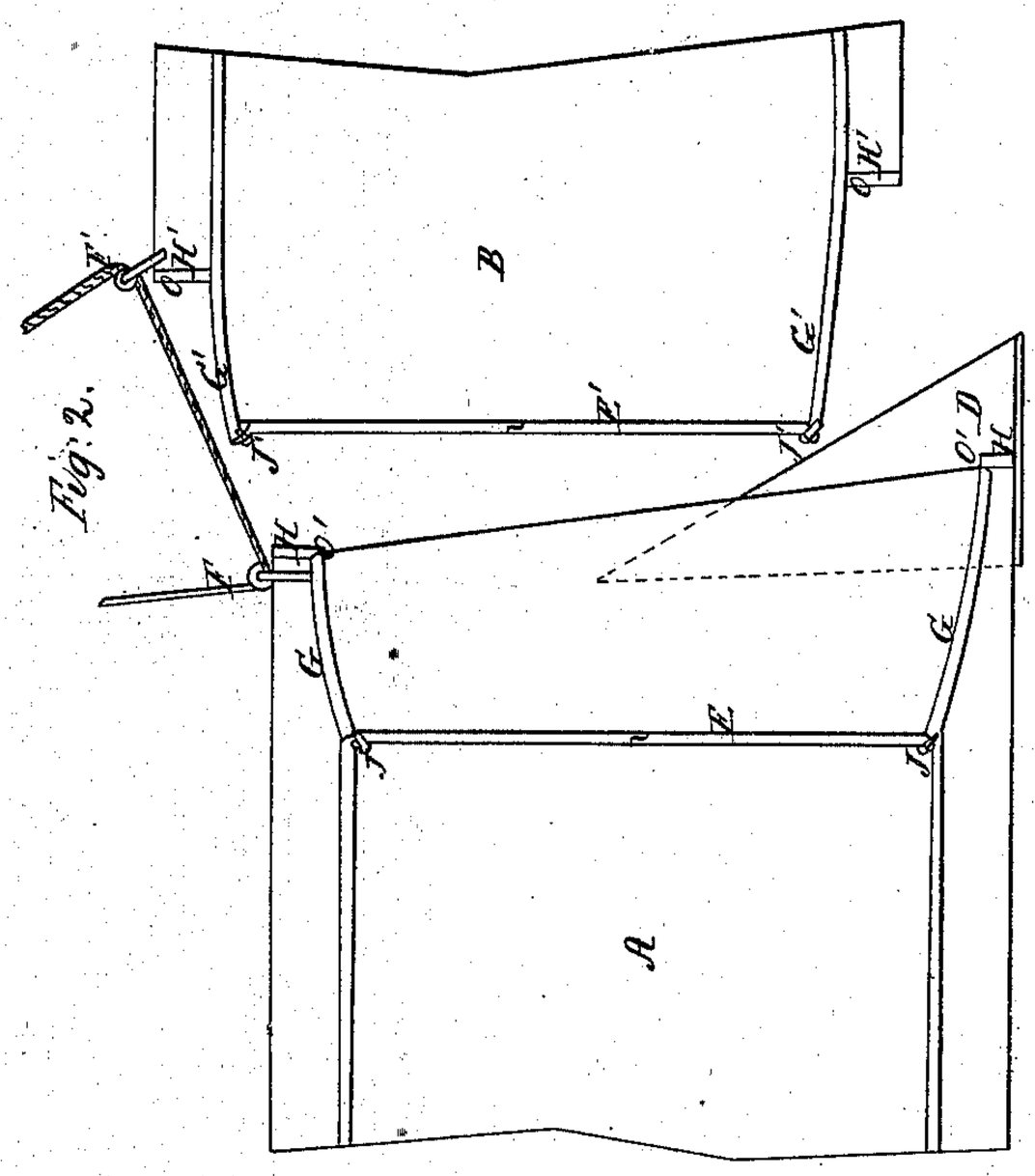


Fig: 1.

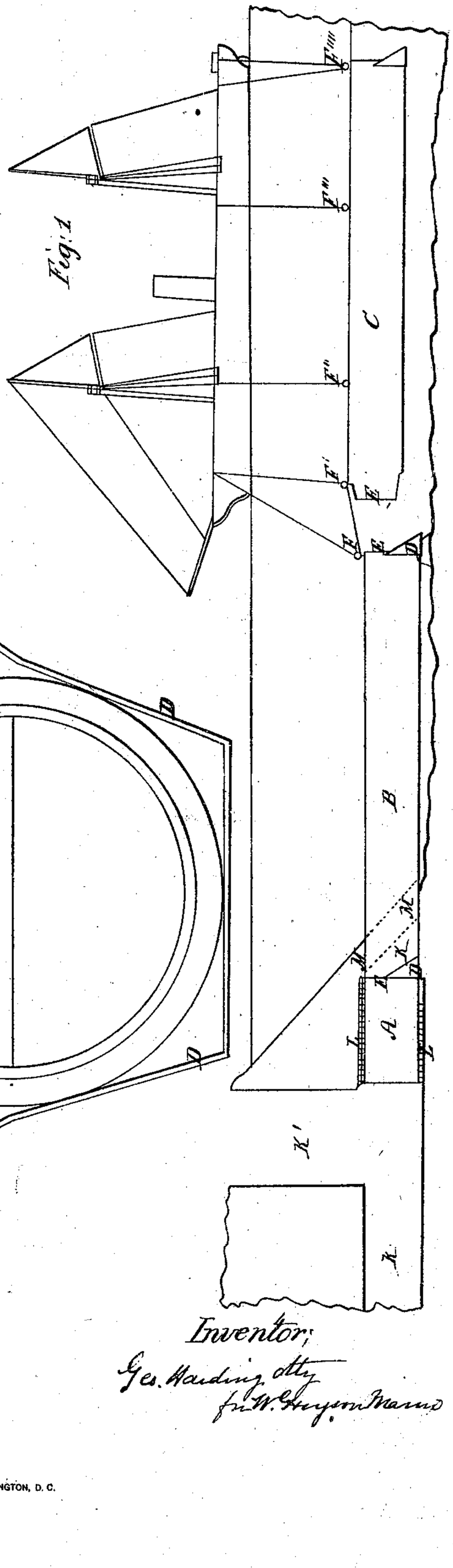


Fig: 3.

Sectional view

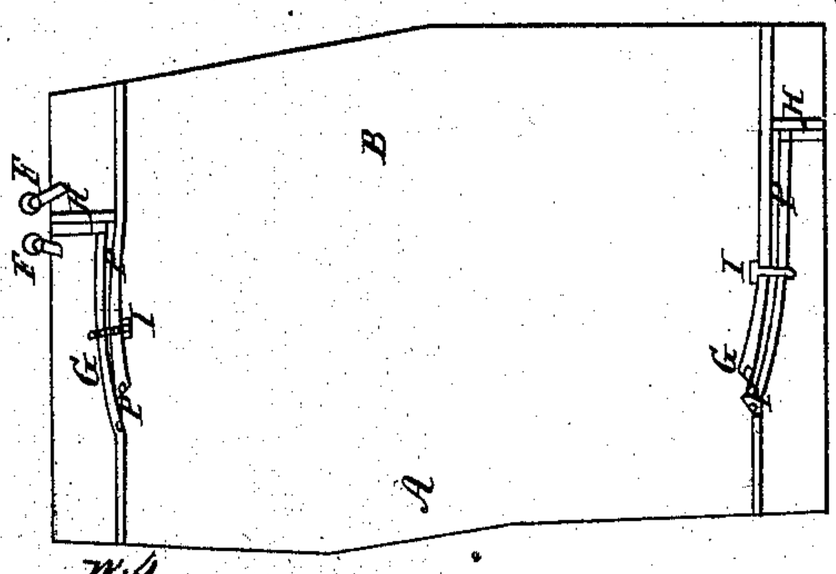
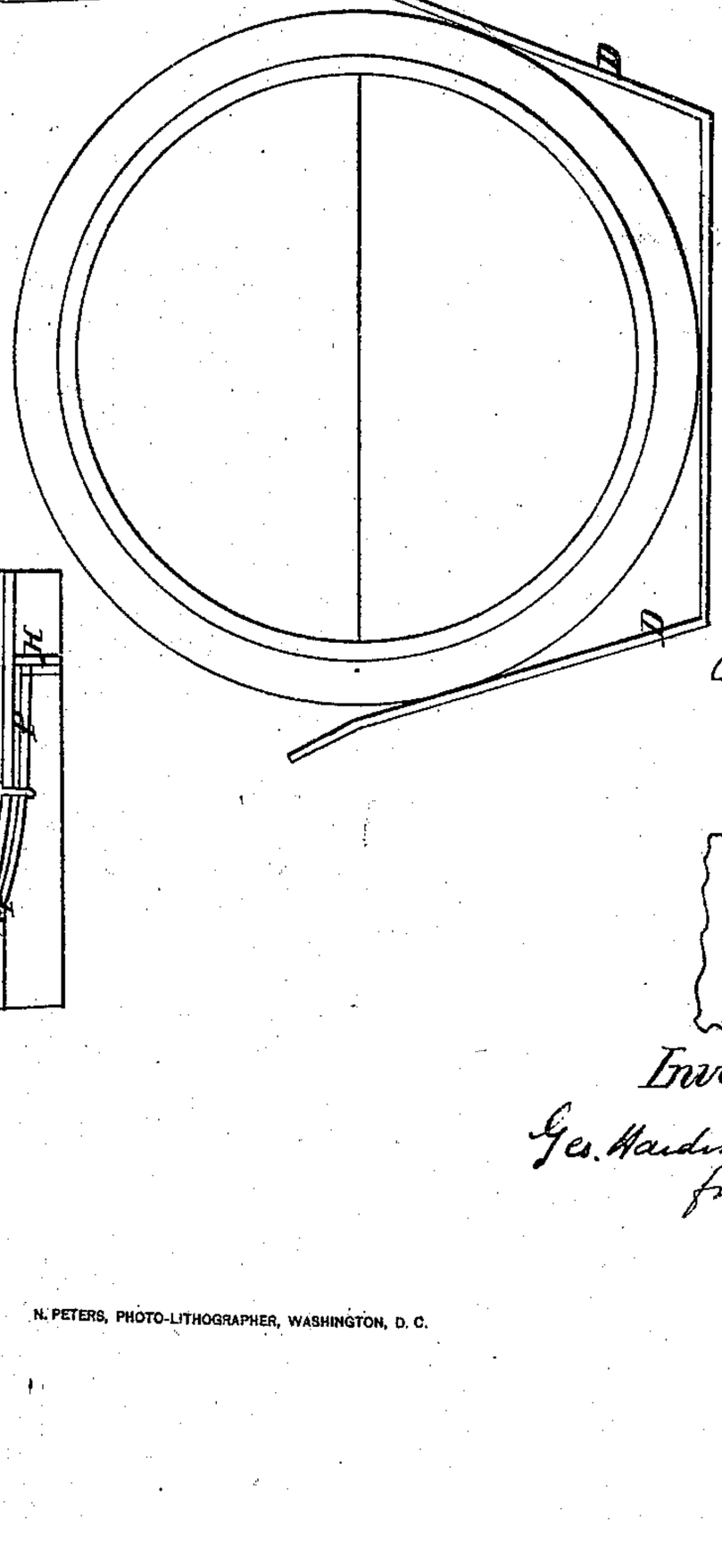


Fig: 4



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UNITED STATES PATENT OFFICE.

W. GRAYSON MANN, OF SAVANNAH, GEORGIA.

IMPROVEMENT IN TUBULAR SUBMARINE VIADUCTS.

Specification forming part of Letters Patent No. **103,350,** dated May 24, 1870.

To all whom it may concern:

Be it known that I, W. GRAYSON MANN, of Savannah, Georgia, have invented a new and useful Improvement in the Construction of Tubular Submarine Viaducts; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the annexed drawings, making part hereof, in which—

Figure 1 represents the manner of laying my improved viaduct; Fig. 2, a longitudinal section, showing the manner of joining the sections together; Fig. 3, a longitudinal section, showing the joint when finished; Fig. 4, a transverse section at the joint.

This invention relates to that class of submarine viaducts which are composed of tubular sections.

Before proceeding to build the tubular sections it will be necessary to make a most accurate and minute survey of the bottom of the stream, &c., which is to be crossed, and the line adopted, as well as the soundings, should be carefully marked by a number of buoys, placed at convenient distances all the way across.

The sections should be built in convenient lengths, say from one hundred (100) feet to three hundred (300) feet each, so as to adapt them to any irregularity at the bottom which might exist.

In case of insufficient length or of great irregularity at the bottom, dredging would have to be resorted to in order to dig out a bed for the viaduct.

The sections should be built on a slip or cradle of wrought or plate iron, such as is used for iron-plated ships, of sufficient thickness—say from one (1) to two (2) inches—this inner skin of iron to be covered before launching with an outer coating composed of brick, concrete, hydraulic cement, artificial stone, or other convenient material, of sufficient thickness and weight to overcome the floating power of the water and sink and secure the viaduct firmly at the bottom. This outer coating, hardening under water, will give great solidity to the whole structure, and if not too porous will prevent the iron frame beneath from oxidizing.

In Fig. 1 of the annexed drawing, K K represents one of the underground termini of a proposed viaduct.

K is a shaft sunk from the surface near the water, through which is lowered a first short tubular section, A, which is pushed forward into K K to within a few feet of the stream or arm of the sea to be traversed, separated from the water by a bank of earth, M M. This first section, being made water-tight at its outer extremity by a removable bulk-head, E, as hereinafter more fully described, will be walled in at L L with hydraulic cement, so as to prevent the subsequent introduction of any water into K K by leakage.

The portion of earth M M, separating A from the sea, will then be removed from the outside by a suitable dredging apparatus, and a diver will be advantageously employed to clean the exterior surface of A and remove any particles of earth adhering to the same.

The workmen who are to make the joint being stationed in the inside of A, another section, B, will then be lowered from the surface by any convenient arrangement of ropes and pulleys, that arrangement shown in Fig. 1 being preferred. By it the section about to be laid is lowered down in such a way that one end will be conducted by the pulleys F and F′, Fig. 2, to the outer end of section already laid, and, by the aid of a diver, will be made to fit accurately into a hood or shoe, D, extending around the lower extremity of A.

Section B, when thus lowered from the surface, is closed hermetically at each end by removable bulk-heads E E, Figs. 2 and 3, which are firmly secured by small screws J J′, and made water-tight by india-rubber packings around the edges, these bulk-heads to be made in pieces closely fitting to each other, so as to be more easily removed.

As will be seen by reference to the drawings, Figs. 2 and 3, the diameter of the extremity G of A is sufficiently enlarged to permit the easy introduction into it of the corresponding extremity G of B, the diameter of which is slightly diminished.

Fig. 2 represents the section B in the act of being lowered from above, and being guided by ropes and pulleys and by a diver into the shoe D of A, so as to fit accurately into the enlarged extremity of A, and being thus held sus-

pended from above, it will be violently pushed forward into A as far as H′ by the action of the steamer or other vessel from which it is suspended above, and held there until the joint is perfected between the two sections by the workmen stationed in A. The smaller extremity of B, thus fitting into A, will necessarily be arrested at H H′ by the vulcanized india-rubber cushions or packings O O, the chief object of which will be to prevent the possibility of leakage while the sections are held together and the joint is being perfected. The two bulk-heads E E being thus brought into close contiguity, and the water between them being in great measure expelled, the workmen in A will proceed to unscrew the small screws J J, holding the bulk-head E in its place. They will then remove that bulk-head by pulling it toward them, and proceed to unscrew the screws J′ J′, fastening the bulk-head E′ of B, and remove the same by pulling it into A. They will then complete the joint by closely calking the vacant spaces L L with hemp or other suitable material, and by driving and hammering lead into the same, so as totally to prevent the possibility of leakage, Fig. 3. The workmen will then firmly secure the two sections together by drilling numerous screw-holes through the two overlapping iron extremities G G′, into which they will insert the large screws I I, Fig. 3, which will give great solidity to the joints and enable them to bear a heavy strain.

This operation of making the joint will be repeated by the workmen whenever a new section is lowered and added. By removing the bulk-heads they will penetrate successively from one air-tight section to another until they reach the opposite shore, where the operation detailed in Fig. 1 will be repeated reversed.

In cases of great unevenness at the bottom, it may be necessary to build iron jetties or stands screwed to the sections, as in Fig. 1, on which they may rest when lowered to the bottom. To prevent the outer layer of brick or other material from breaking away, it will be necessary to rivet thin longitudinal iron stiffeners along the bottom of the sections outside.

By the mode of building a submarine viaduct above described, in addition to the great solidity and economy of the structure, the sections are made to accommodate themselves in a great degree to any slight unevenness at the bottom on which it is desired to rest them, so as, if possible, to save the enormous cost of building piers or jetties.

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

1. The combination of a shoe, D, and the system of ropes and pulleys F F′, substantially as described, for guiding and uniting the end of an additional section of a tubular viaduct to a section already laid, such sections being coated before immersion with an outside layer of brick, stone, or other material, to act as ballast.

2. A tubular submarine viaduct composed of sections so constructed that the viaduct shall be laid by forcing the small end of each section into the large end of the adjoining section, as described.

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