(No Model.)

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H. J. HARRISON.

COLUMN, SHAFT, GIRDER, &c.

No. 256,478. Patented Apr. 18, 1882.

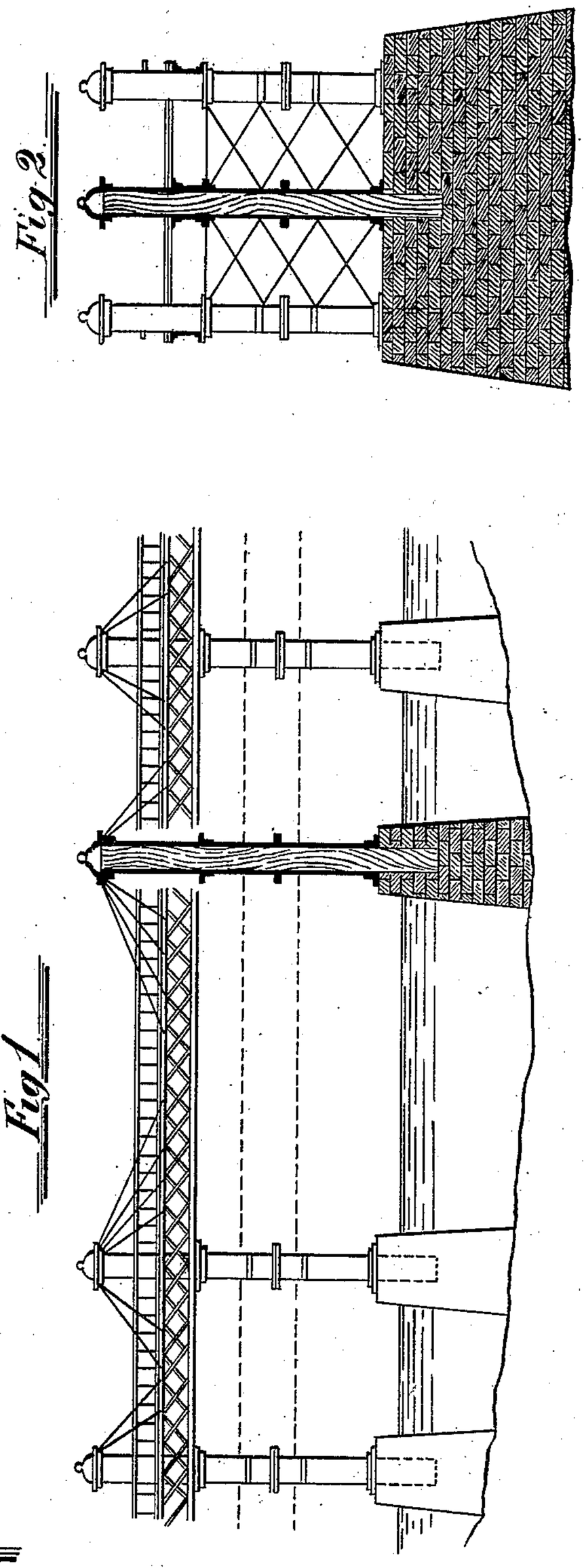

Fig 2.

Fig 1.

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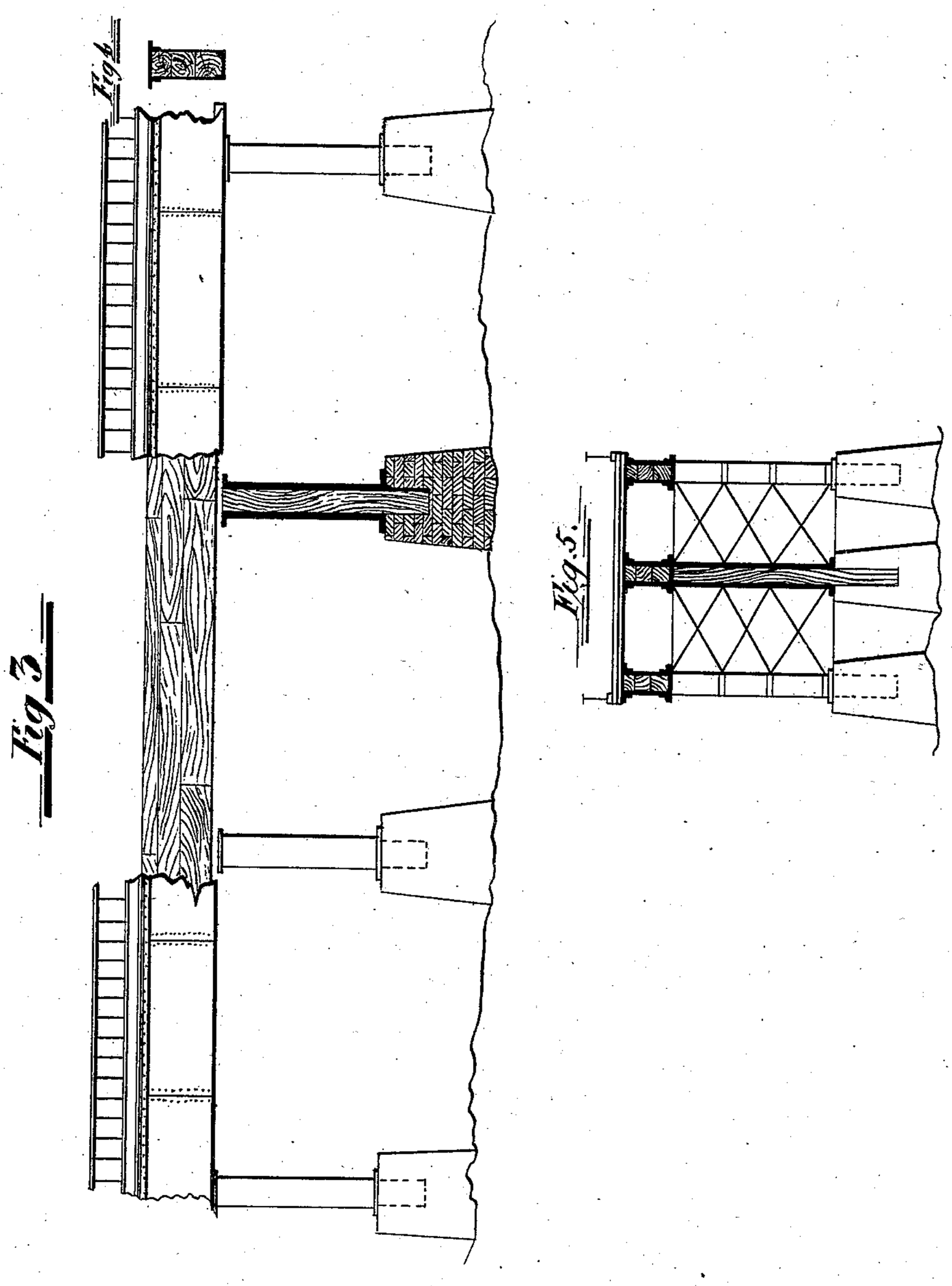

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Fig 6.

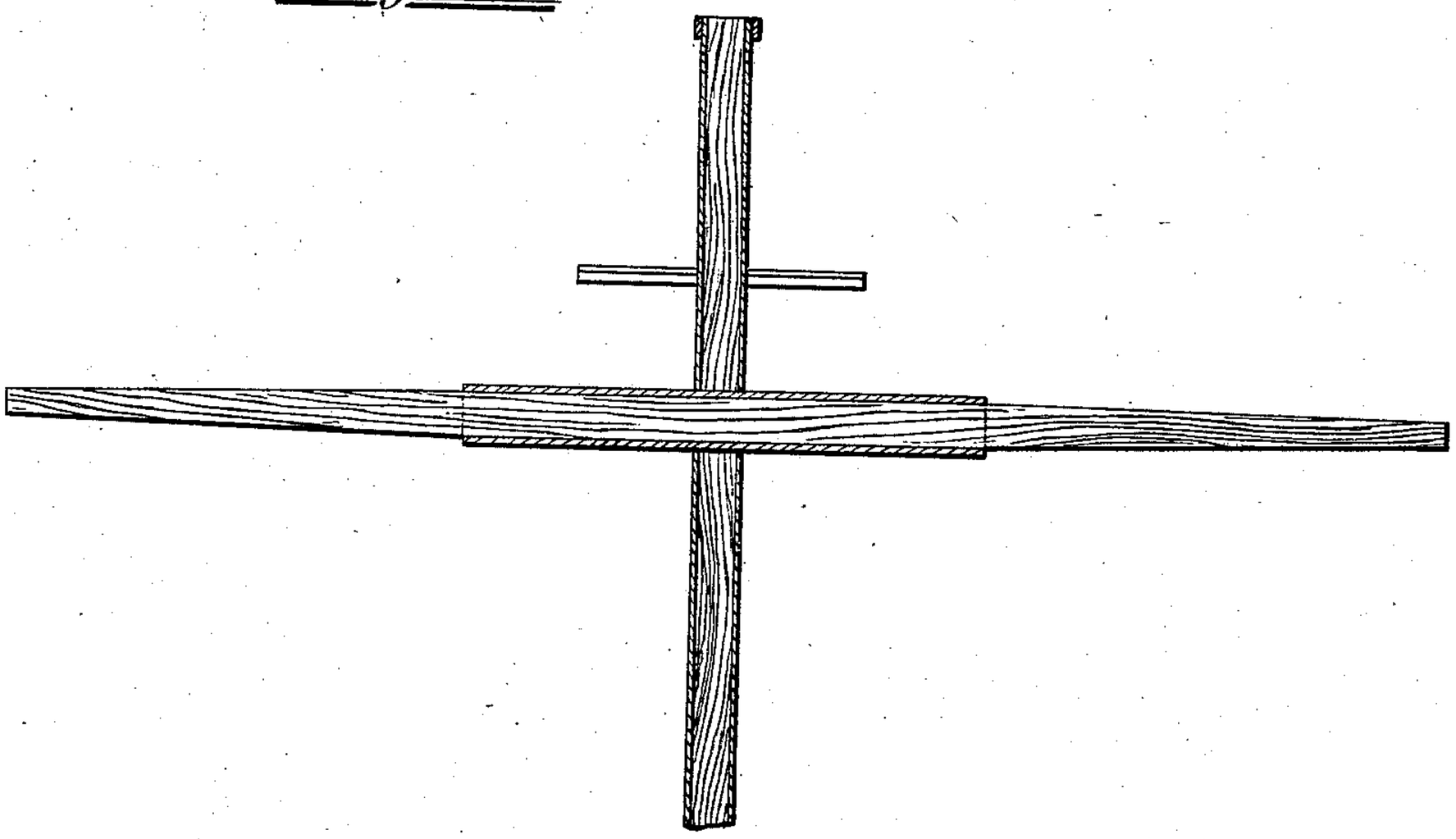

Fig 7.

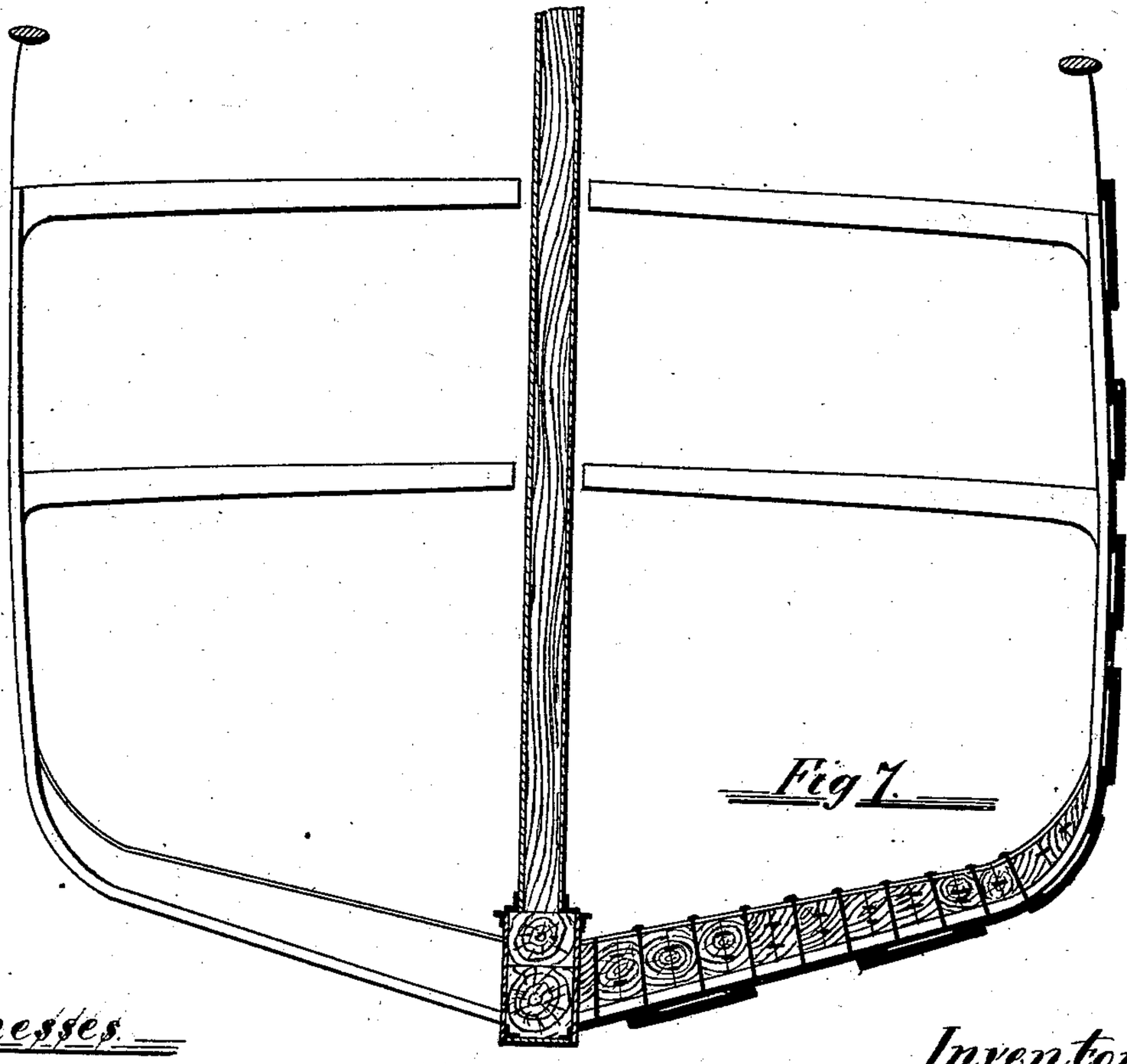

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Fig. 9

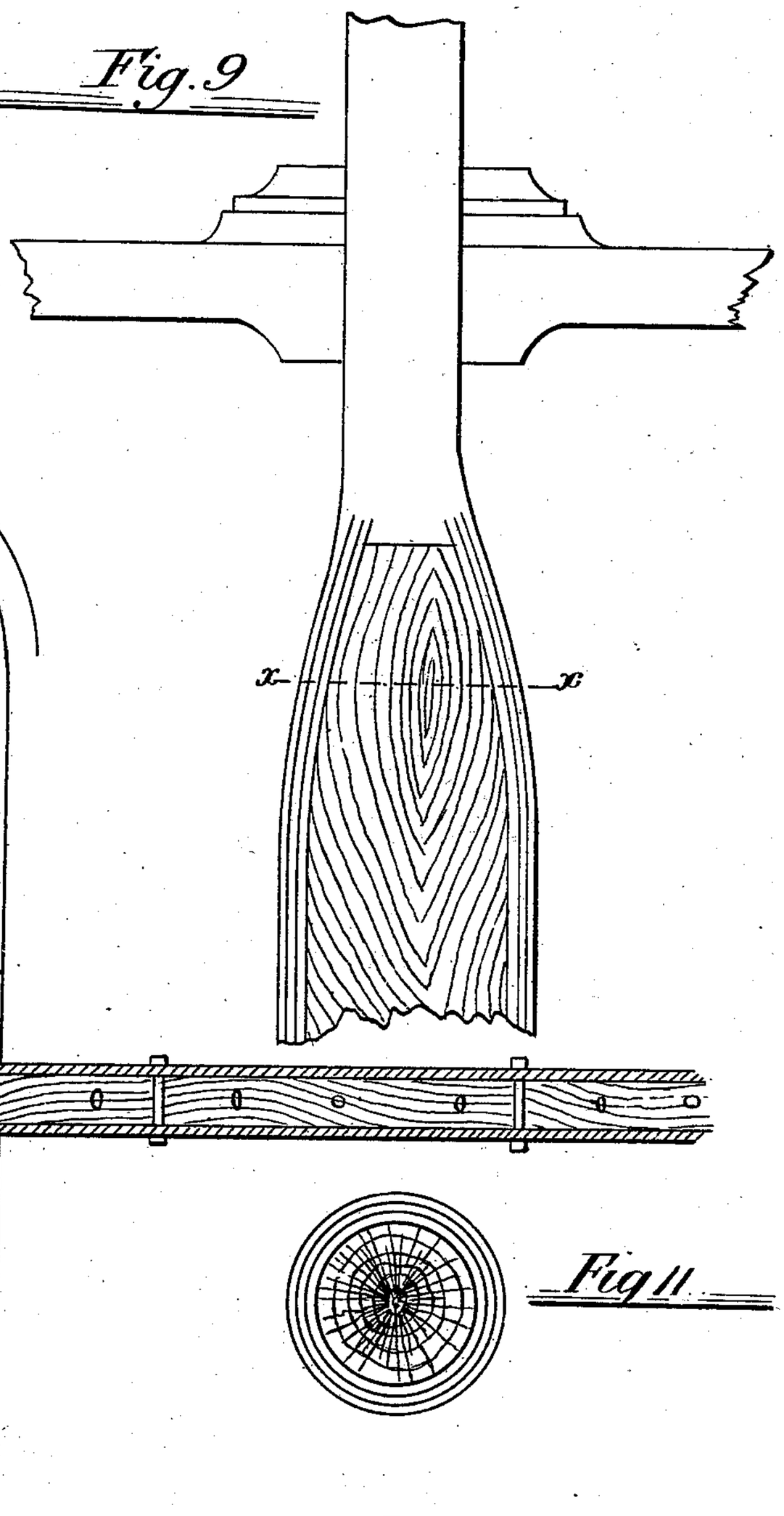

Fig 8.

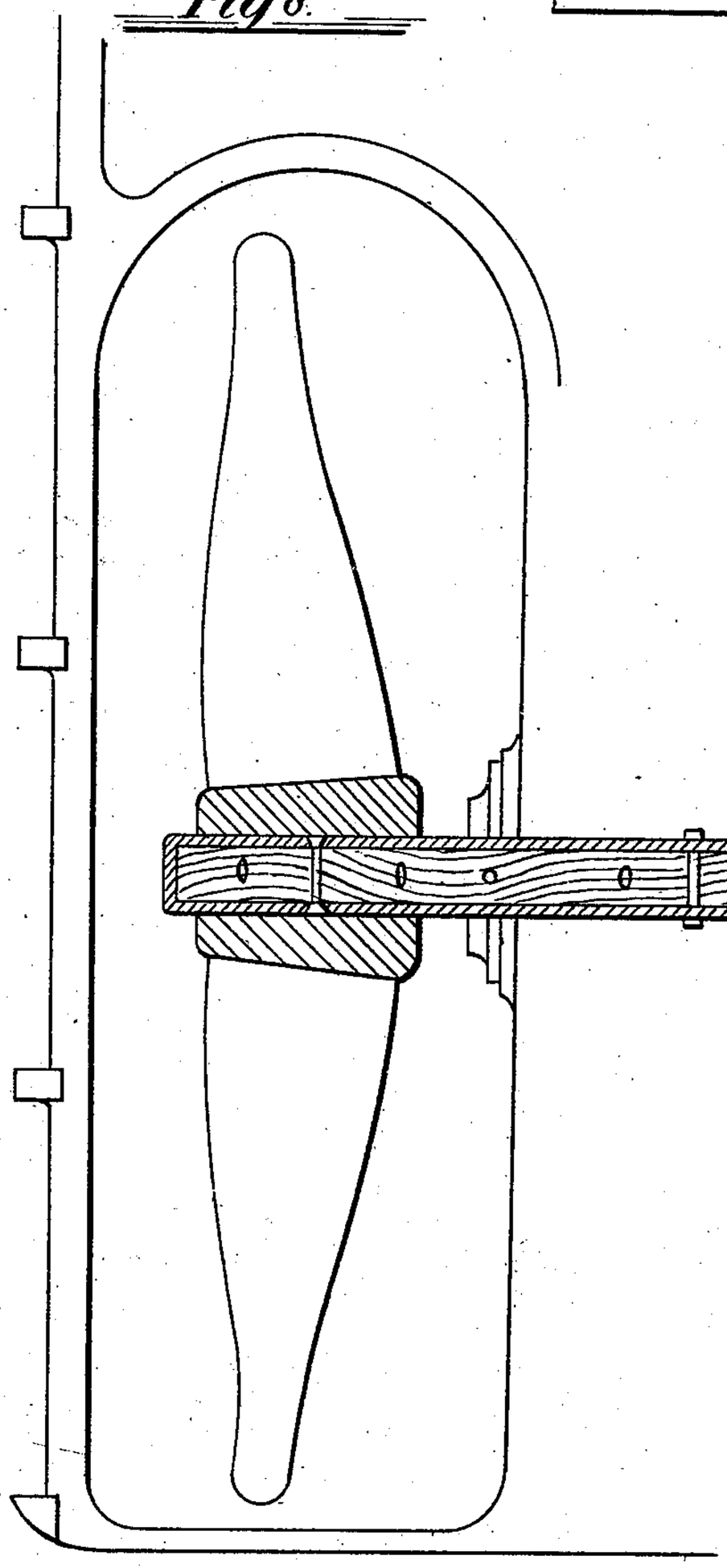

Fig 11

Fig 10

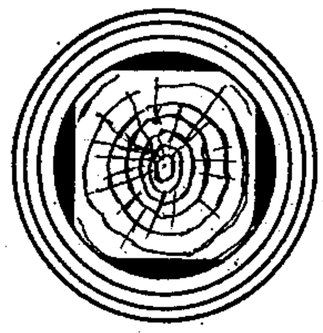

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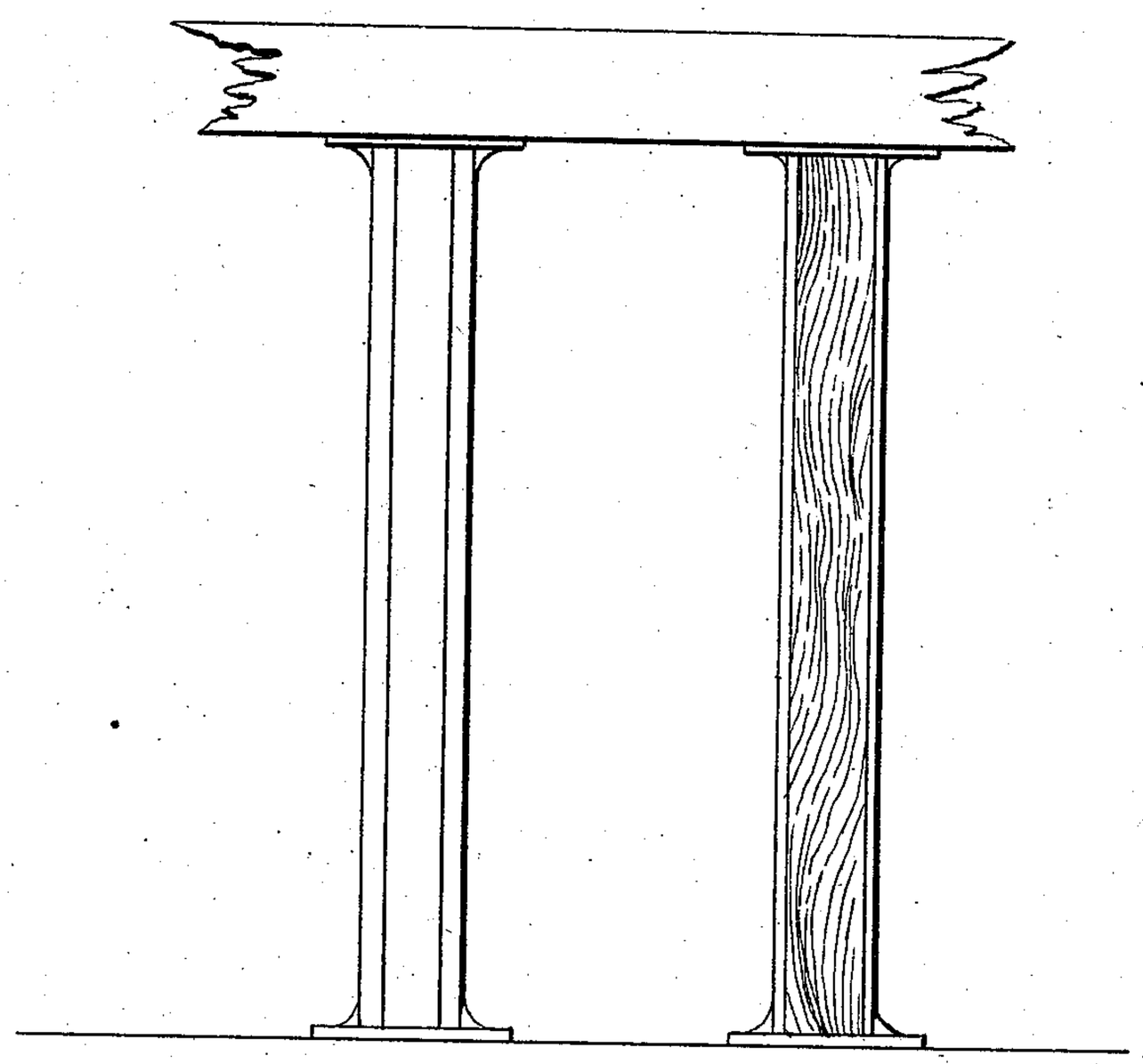
Fig 12.



Witnesses.

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UNITED STATES PATENT OFFICE.

HENRY J. HARRISON, OF LIVERPOOL, COUNTY OF LANCASTER, ENGLAND.

COLUMN, SHAFT, GIRDER, &c.

SPECIFICATION forming part of Letters Patent No. 256,478, dated April 18, 1882.

Application filed November 8, 1881. (No model.) Patented in England March 4, 1881.

To all whom it may concern:

Be it known that I, HENRY JAMES HARRISON, of Liverpool, in the county of Lancaster, England, have invented certain new and useful Improvements in Columns, Shafting, Girders, Piers, Masts, Spars, Posts, and other like structures; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention consists essentially in giving to the metal structure a core of wood firmly secured to the metal throughout the entire contact-surface or at the ends, so as to prevent the one moving on the other, and enable the wood to form not merely a tension member in a girder, but by its superior elasticity to hold the column, shaft, or beam in position after the iron has snapped by a sudden blow or strain. Up to the present time wooden girders have been strengthened by having a bar of iron fastened to them by screws, and have frequently in roofs been made the compression member with a tie-rod to take the tensile strain; but I am not aware that a metal girder, shaft, or other like structure and a wooden core have heretofore been combined and united as herein explained.

In vertical piers or columns and other struts requiring to withstand a longitudinal compressive strain with occasional or constant side strains—such as the piers of a bridge—I secure the core to the iron column at each end, so that it can form a tension member of the girder, while at the same time it fills up the hollow center, and thus prevents in great measure a collapse of the structure.

The way in which I secure the core to the iron column, girder, or shaft is to place the core loosely in the iron shaft and then completely fill the interstices with melted pitch or any bituminous cement of a tough character that will set hard and tough when cold. Preferably the shaft may be heated to a little below redness before introducing the core and the pitch.

This pitch cements the iron and wood together so that the column can be actually broken with a transverse strain without the wood being drawn from either end. If the wood draws out of the ends, it is of little or no value in strengthening the column, the wood when fast acting mainly as a tension member. I have not yet calculated or found from experiment the comparative thicknesses of iron and wood that give the best results, but would state that the best results will probably be obtained, provided the pitch be sufficiently adhesive, when the tensile strength of the wood, taken as a whole, equals at least half the compressive strength of the iron column. In this way the thickness of iron for any given diameter of column can be calculated from the ordinary tables of strength of materials. Furthermore, the wood is made to project beyond the iron-work, as shown in Figures 1 and 2, into the pier and into the superstructure, into each of which it is firmly secured.

In the case of girders the core is preferably firmly secured into the next girder or abutment, so as to make a continuous girder to some extent, as shown in Fig. 3. The object of this core is not merely to strengthen the column or girder, which it does to a remarkable and altogether unexpected extent, but should the iron-work of the girder be cracked with a sudden strain or side blow, the wooden core remains to keep the broken pieces in position.

In employing my invention for shafts I prefer to drill holes right through the wood and iron at intervals of, say, half or a third of the diameter, and in various directions perpendicular to the axis of the shaft, and place therein closely-fitting bolts, securely screwed up. These assist the pitch in preventing the iron from moving on the wood.

If there be any fear of damp getting into the wood, especially where the structure is to be placed in water, it is best either to entirely fill the pores of the wood with hydrocarbonaceous or silicious matter under pressure, or saturate them with moisture before inserting the core in the pillar, and then prevent the water from evaporating out by incrusting the outer surface well with pitch and placing it in its position as soon as possible. The object of this is that if the wood be inserted perfectly dry and is then allowed to imbibe moisture it is apt to strain or fracture the iron-work inclosing it. The kinds of wood I prefer are rock-elm, oak, greenheart, and teak; but other woods will do nearly as well.

In adapting the invention to ships' spars, as

the main strain comes upon the central part of the spar, I only incase this part, as shown in Fig. 6. The pitch in this case should be assisted by putting bolts through at intervals as in shafts, and for columns, masts, spars, &c., exposed to the full glare of the sun or the heat of tropical regions, pitch or asphalt of a high melting-point should be employed, and where practicable should be assisted by bolts or other fastenings, so that the entire strain should not fall upon the pitch, but should be taken up in part and the iron and wood prevented from moving upon each other by metal fastenings, especially at and near the ends, in addition.

My invention can even be used in ships, tubular bridges, and ships' hulls, which are really girders, only in these cases, as of course the entire tube or hull cannot be filled up like a small girder, the cellular spaces in the top and bottom members of the tubular bridge and the space between the outer and inner skin of a ship are utilized for this purpose.

Although the invention can be well understood from the foregoing description without drawings, I have added the accompanying diagrams to illustrate it more effectually. In these, Figs. 1 and 2 are views of a bridge crossing a broad, shallow stream, in which the timber cores are seen built into the piers. In practice a hole is left in the pier for the timber, and after the core is inserted hot pitch or asphalt mingled with stone chippings is poured and rammed in till all the interstices are filled. The upper part of the column carries the cap from which the tension-bars are hung. This cap is placed round the wood core and bolted to the sleeper. Figs. 3, 4, and 5 show a trestle-bridge built over a valley usually dry and where a side pressure is not so likely to be expected. This shows the continuous wooden core inside the iron girder, which has been broken away for the purpose. Figs. 6 and 7 show a mast, spar, and hull-bottom formed on my principle. The space between the ribs of the ship I fill up with wood lagging or composition of any kind. Over this I place the beams, laid longitudinally close together and doweled together, as shown. I then thoroughly saturate the whole with hot pitch and apply the inner skin, bolting the whole together; or, instead, I build the whole up, as shown, and then force in the hot liquid pitch, after first heating the two iron shells in any convenient manner. Fig. 8 shows a screw-shaft made on this principle; Fig. 9, one made on the principle of an Armstrong gun, built up of coils, but with a wooden core; Figs. 10 or 11, section of same; Fig. 12, pillars for mills, warehouses, &c., made on my principle. The advantage of these is that if a fire takes place the iron columns cannot bend and snap with the heat, as they do at present, the wood holding them upright.

I am aware that piers and like structures have hitherto been formed with a central wooden core driven into the earth or bed of the water-basin and surrounded by a metallic sheathing or casing, the intervening space being filled with concrete; but I am not aware that the metal and the wood of a compound structure such as herein described and shown have hitherto been cemented together so as to prevent the movement of one upon the other.

I am also aware that it is not new to employ a wooden strengthening or stiffening core in a metallic column or like structure, and that light strips suitable to receive lath and flooring nails, but of insufficient strength to materially assist in supporting weight or strains, have been combined with and spiked or bolted to metallic floor-beams.

I claim as my invention—

1. In a column, beam, or other structure, substantially such as described, the combination of a metallic body or casing and an internal wooden core secured to the metal throughout its length by a strongly-adhesive cement, and adapted to carry a material portion of the weight or strain to which the structure is subjected.

2. A hollow metallic column, shaft, girder, mast, strut, stay, post, pole, spar, or like structure, in combination with an internal core of wood, firmly cemented to the same by a strongly-adhesive tough pitch or asphalt introduced in the liquid state and setting hard, substantially as described.

3. A hollow metallic column, shaft, girder, strut, stay, post, or like structure, provided with an internal core of wood projecting beyond the end of the metal and firmly cemented to the metal, substantially as and for the purpose explained.

4. A hollow metallic structure, substantially such as shown and described, having a wooden core filling its interior, and held therein by strongly-adhesive cement and transverse bolts, as set forth.

5. The mode of attaching internal wooden cores securely to hollow metallic structures, consisting in heating the iron structure to a heat barely sufficient to char the wood, and then pouring in melted pitch or asphalt, so as to fill up all the interstices and securely cement the core to the metallic structure.

6. The iron girders filled with wooden planks or beams, breaking joint with each other, and having the interstices filled up with cementing material, substantially as described.

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Witnesses:
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