

(No Model.)

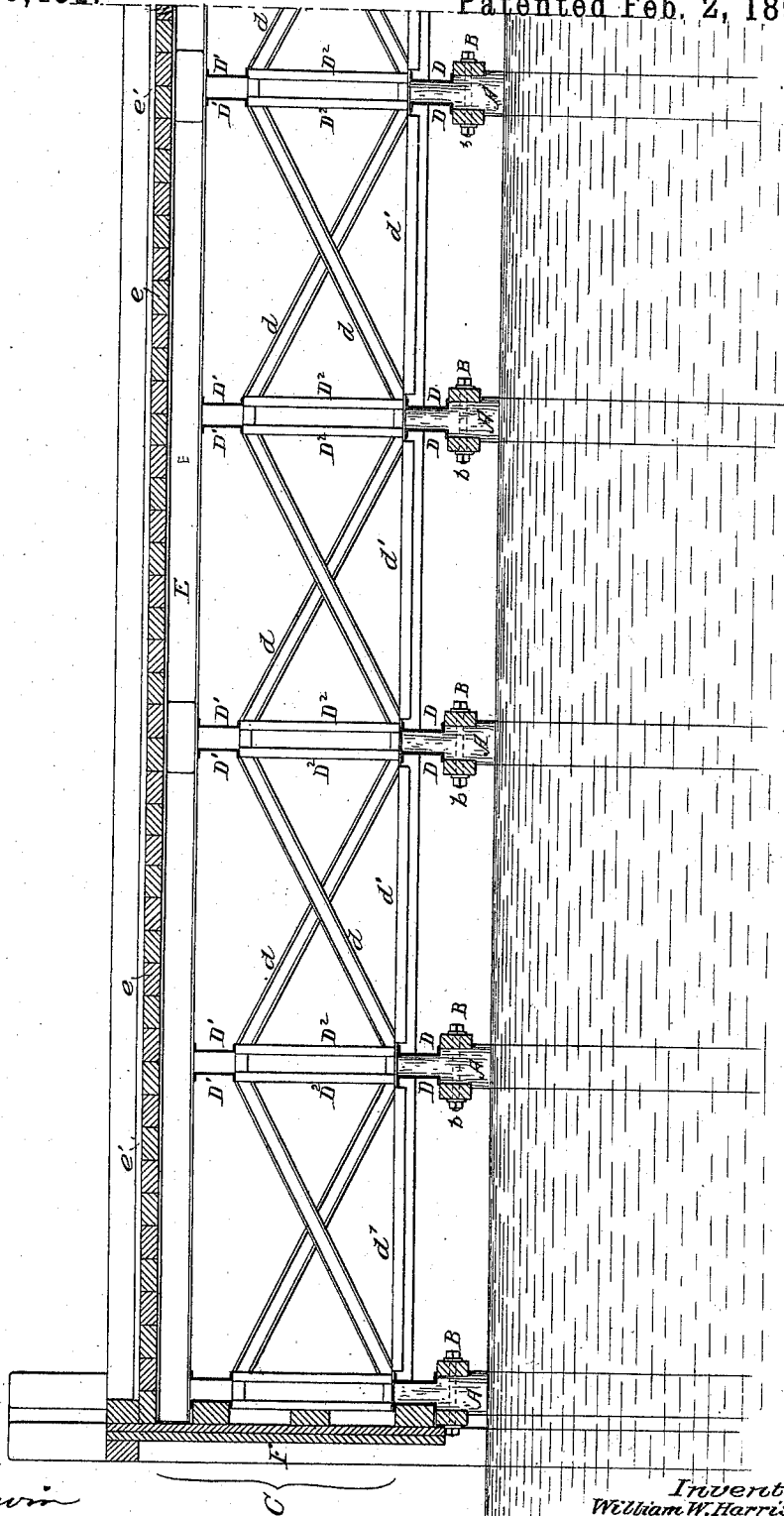
2 Sheets—Sheet 1.

W. W. HARRISON & J. KEERS.
WHARF STRUCTURE.

No. 576,451.

Patented Feb. 2, 1897.

FIG. 1.



Witnesses:

C. D. Goodwin
Will. A. Barr.

Inventors:
William W. Harrison and
John Keers by their
Attorneys *Houston & Houston*

(No Model.)

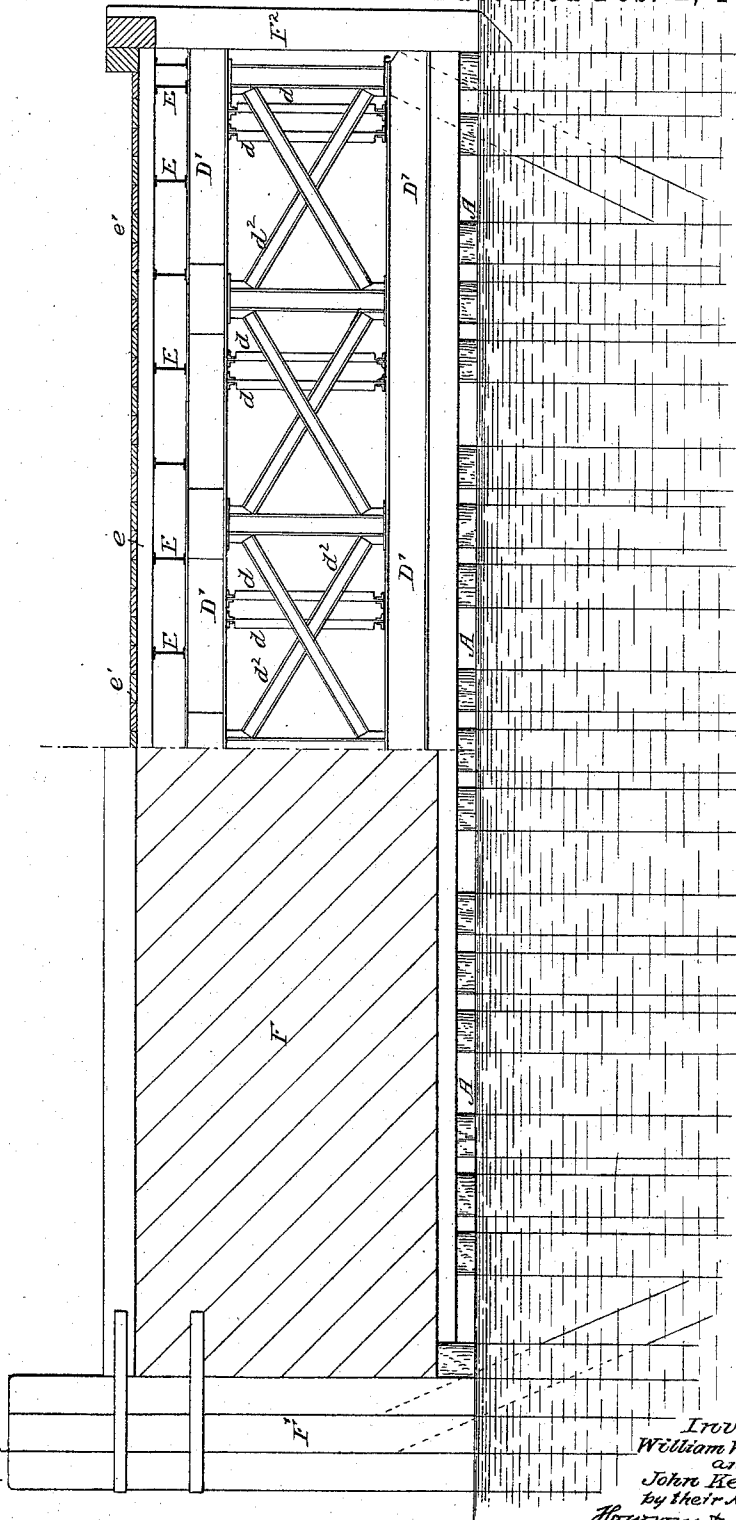
2 Sheets—Sheet 2.

W. W. HARRISON & J. KEERS.
WHARF STRUCTURE.

No. 576,451.

Patented Feb. 2, 1897.

FIG. 2.



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William W. Harrison
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UNITED STATES PATENT OFFICE.

WILLIAM W. HARRISON AND JOHN KEERS, OF PHILADELPHIA, PENN-
SYLVANIA.

WHARF STRUCTURE.

SPECIFICATION forming part of Letters Patent No. 576,451, dated February 2, 1897.

Application filed January 15, 1896. Serial No. 575,579. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM W. HARRISON and JOHN KEERS, citizens of the United States, and residents of Philadelphia, Pennsylvania, have invented certain Improvements in Wharf Structures, of which the following is a specification.

The object of our invention is to construct a combined wooden and metallic pier so that the main body of the wooden piles will not be exposed to the atmosphere, the portion of the pier between high and low water being made of structural ironwork, as fully described hereinafter.

A further object of the invention is to so construct the superstructure that the water will freely pass through the pier as it ebbs and flows.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of sufficient of a pier to illustrate our invention; and Fig. 2 is a view of the end of the pier, partly in section, so as to illustrate the superstructure more clearly.

Heretofore in the construction of piers it has been customary to extend the piles to a point at or above high water. Consequently the upper portions of the piles were subjected to the alternate action of water and air, and the portions thus exposed would soon decay, and consequently the life of the pier would be shortened. Furthermore, the structures heretofore made have been mainly of wood, so that all the cross-pieces and stringers would be exposed in the same manner, but by our invention the extension of the piles to a distance a trifle above low water enables the swash of the water to keep the entire surface of the piles practically submerged.

The superstructure is constructed, preferably, of steel and can be much lighter than that made of wood, and the steel will not be affected by the alternate subjection to water and atmosphere to the same extent as wood, and as piers as now constructed must have a certain clearance to allow for the free flow of water under the pier the superstructure of steel gives a much greater space for the free flow of water than when the wooden structure is used.

Referring to the drawings, A are a series of

piles, preferably tied together by wooden stringers B, secured to the piles by bolts *b*. The heads of the piles are notched to receive these stringers, as shown clearly in Fig. 1.

The head *a* of the pile is reduced, and clamped to this head are the lower girders D of the superstructure C.

D' are the upper girders of the superstructure, supported by vertical columns D², which rest upon the beams D.

d are diagonal braces extending from an upper transverse beam D' to a lower transverse beam D. The several beams are tied together by angle-bars *d'*, extending from one lower beam of one pile D to the lower beam of an adjoining pile throughout the length of the pier.

The beams D D' extend the full width of the pier, and angle-braces *d*² are arranged across the pier, similar to the angle-braces *d*. Thus the superstructure C is made rigid and is firmly secured upon the piles, and the piles are not only tied together by wooden stringers B, but also by the superstructure.

E are the floor-beams, being in the form of I-beams running longitudinally, and are spaced a certain distance apart to allow for the proper support of the material to be carried by the wharf. On these metallic I-beams B are supported the wooden planks *e*, which extend transversely, and the flooring-boards *e'*, which extend longitudinally upon the planks, so that a firm and substantial floor is thus produced.

The end of the pier is suitably sheathed by diagonal boards F in the ordinary manner, and the pier is provided with corner piles F', and at intervals throughout the length of the pier are fenders F², which are securely strapped to the main structure.

The details may be slightly modified without departing from our invention, and a shed for the pier may be provided, if necessary.

We claim as our invention—

1. The combination in a pier structure of a series of wooden piles extending to or slightly above low water, said piles being arranged in rows, the heads of the piles being reduced, metallic beams secured to the reduced portion of the heads of the piles, metallic standards extending from said beams, the upper

beams mounted on said standards and forming a support for the floor above high water and braces for the metallic structure thus formed, substantially as described.

- 5 2. The combination of the piles, extending to or slightly above low water, wooden stringers extending from one pile to the other and firmly secured to the several piles, the heads of the piles being reduced, metallic beams se-
10 cured to the reduced portion of the heads of the piles, metallic standards extending from said beams, the upper beams mounted on said

standards and forming a support for the floor above high water and braces for the metallic structure thus formed, substantially as de- 15 scribed.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WILLIAM W. HARRISON.

JOHN KEERS.

Witnesses:

WILL. A. BARR,

JOS. H. KLEIN.