(No Model.) 2 Sheets—Sheet 1.

E. FONTAINE.

WINTER BRIDGE.

No. 508,929. Patented Nov. 21, 1893

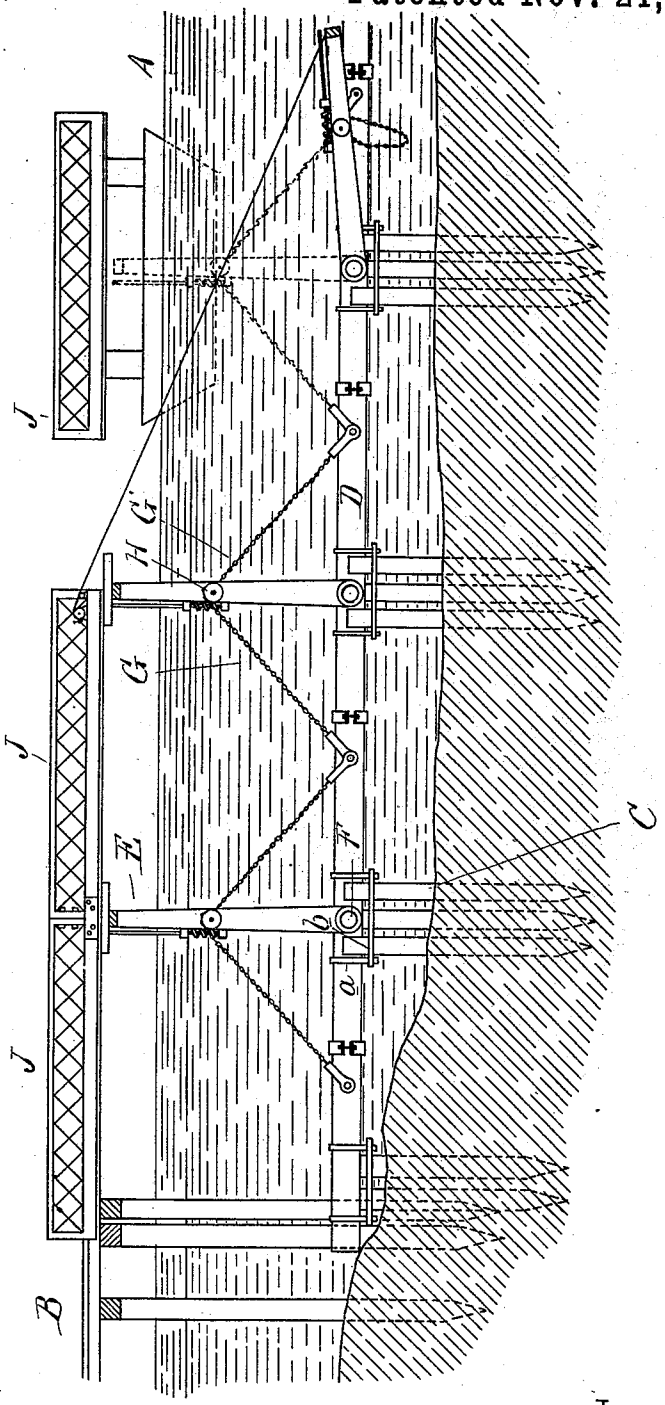

Fig. 1.

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Fig. 2.

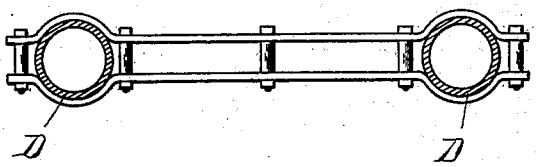


Fig. 3.

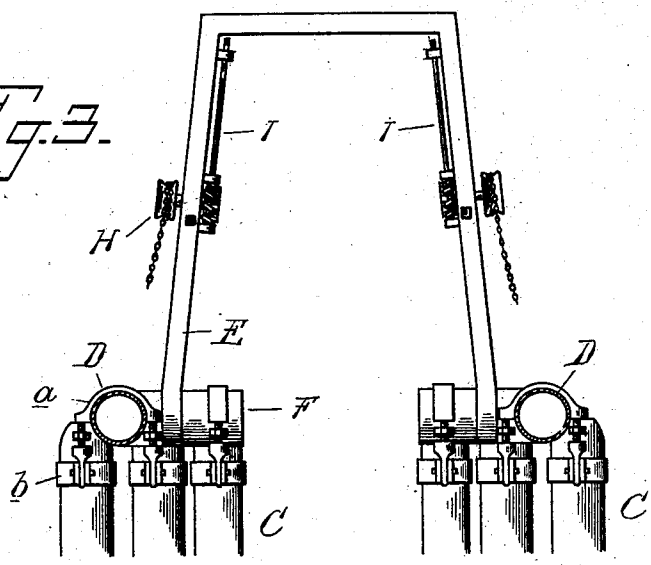
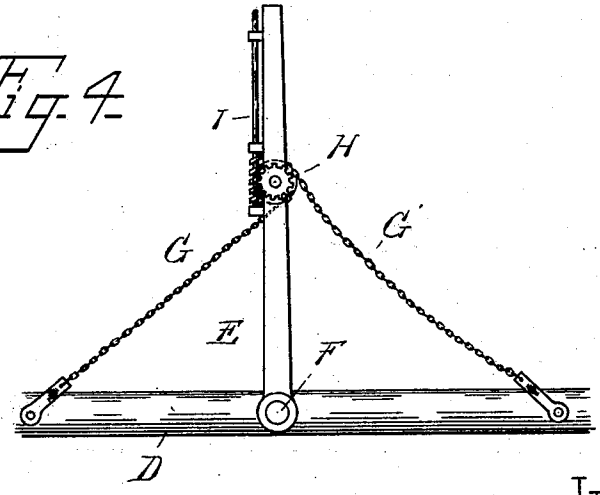


Fig. 4.



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UNITED STATES PATENT OFFICE.

EUGENE FONTAINE, OF DETROIT, MICHIGAN.

WINTER BRIDGE.

SPECIFICATION forming part of Letters Patent No. 508,929, dated November 21, 1893.

Application filed March 7, 1893. Serial No. 464,993. (No model.)

To all whom it may concern:

Be it known that I, EUGENE FONTAINE, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Bridges for Crossing Maritime Highways in the Winter, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention refers more particularly to the construction of what I call a winter bridge, whereby I mean a bridge which can be readily placed in position for use during the season of closed navigation. It is a well known fact that the conditions imposed by the vessel interests have made it impossible to cross many maritime highways by means of bridges in the usual manner and as subaqueous tunnels are generally considered only as a last resort, the parties most at interest, that is the railroads resort to the use of car ferries as a means of crossing our maritime highways. This mode is in common use and it would be quite satisfactory if it were not for the expense and delays caused by ice in the winter time.

The object of my invention is to provide a bridge for use in the winter time that is during the season of closed navigation which generally extends from the last of November to the last of April. Under the circumstances pointed out, such a bridge must be removable to such an extent that it will form no obstruction to navigation during the open season.

To this end my invention broadly stated consists of a permanent substructure submerged entirely below the water line at a depth sufficient for all vessels to pass over it, and of a temporary superstructure which can be readily removed and replaced and which can be securely supported on the substructure.

For the substructure I use one or more horizontal members supported and secured at suitable intervals upon fixed piers preferably bunches of piles. The superstructure I construct of trestles supported upon the substructure and hinged thereto, so that when not in use they may be tipped over out of the way, and when in use they are held in position by suitable connections with the horizontal members. Upon these trestles I support the bridge way which is made complete in sections removably secured in place.

The construction and arrangement of the parts are such as to facilitate the putting up and taking down of the temporary parts of the bridge with comparatively little expense and trouble and in the shortest space of time, while the expense for the whole bridge requires only an oulay of expense commensurate with the advantages derived from its use.

As a detailed specification of a bridge built in accordance with my invention would be of no practical use I will confine myself to a comprehensive description of the underlying principles involved in my invention and I have illustrated the same in the accompanying drawings, in which—

Figure 1 is a diagram section of a portion of a bridge of my construction. Fig. 2 is a cross section through the horizontal member thereof. Fig. 3 is a similar cross section showing one of the trestles in elevation, and Fig. 4 is a side elevation of the trestles.

A represents the water course over which the bridge is to be built.

B represents one of the shore ends of the bridge, which are of any suitable permanent construction and are preferably made to extend as far as is permissible so as to shorten the intervening gap which is to be occupied by my winter bridge as much as possible.

The substructure of the winter bridge consists of piers C and horizontal members D supported thereon. The substructure is entirely submerged below the water line a sufficient distance for vessels of maximum draft to pass over under all conditions of navigation. Where the bridge is across flowing water it must be a skeleton structure to prevent the water from being dammed up and prevent the formation of bars. To this end where the conditions are favorable I construct the piers of piles driven in bunches at intervals corresponding with the supports of the superstructure. Upon these I support the horizontal members D which in the drawings are represented by two lines of pipe securely fastened on top of the piers in any suitable manner, such as shown in the drawings where *a* are shackles extending over the pipes and secured to cross bars *b* which are

secured to the top of the piles. I deem the use of iron tubing for the horizontal members most suitable as they present the least engineering difficulties in submerging them into position, if they are suitably bulk headed. These horizontal members should be continuous, the whole length of the substructure parallel with each other and cross tied together at suitable intervals. The superstructure supported upon this substructure consists of the trestles E which are of suitable strength and formed according to the surrounding conditions. These trestles are hinged to the substructure and to this end I preferably form suitable trunnions F on the horizontal members and suitable bearings on the legs of the trestles to engage therewith and form a hinge joint on which the trestles may be tipped over into the water when the bridge is to be dismounted, the construction being such that the trestles when tipped over are supported upon the substructure out of the way of passing vessels. The trestles E are formed of open frame work and are tapered, being smaller at the top than at the bottom, so when the trestles are lowered the upper end of one will lie within the lower end of the other, thereby affording the least amount of obstruction to the current or passing vessels. When in position to form the bridge, these trestles are then firmly secured by means of diagonal braces or chains connecting them with the horizontal members. To this end I preferably use two chains G G′, for each leg of the trestle. The chains G′ which are on the side toward which the trestles are to be tipped over may be permanently secured to the trestles and to the horizontal members and are made of a suitable length to be taut when the trestles are in vertical positions. The chains G on the opposite sides are wound upon drums H on the trestles and these drums are adapted to be operated by a worm gear through a vertical shaft I which extends up to the top of the trestles, all so arranged that the chains may be wound or unwound from the drums as required either for the purpose of providing the slack required to tip the trestles over, or to tighten them firmly so as to hold the trestles firmly in their operative position.

The bridge way is constructed in sections J each forming a complete span reaching from the center of one trestle to the center of the next trestle. Each section is removably secured and suitable means are provided for connecting the adjoining ends of the sections. In practice this plan of building a bridge has peculiar advantages for the purpose it is intended for. The principal advantage is that a bridge of this character can be built with a reasonable outlay of money while at the same time it presents a satisfactory compromise between conflicting interests. It is especially adapted for crossing the straits connecting our northern chain of lakes and the crossing can be made at a grade. Here the greatest depth of water averages about forty feet and the current is moderate so that it is not difficult to protect the bridge in case there is danger from moving ice. To this end ice breaking piers constructed and operating on the same plan as my bridge trestles may be placed in advance of the bridge trestles, but as such provision is not a necessary part of my invention I will omit further reference thereto.

When the time arrives for putting the bridge in commission, the work can be accomplished in a few days' time and it will be noted that my construction readily permits of doing the work without working in the water, as the trestles can be readily raised from the standing end of the bridge. The sections of the bridgeway may be readily floated into position with the aid of suitable scows.

What I claim as my invention is—

1. In a bridge of the character described, the combination with a permanent sub-structure, of a series of movable supports secured thereto, means connected on the sub-structure for retaining the supports in an upright position and a sectional super-structure removably held on the supports, substantially as described.

2. In a bridge, the combination with a fixed sub-structure, of a series of supports movably connected and supported thereby, means for retaining the supports in an upright position and a sectional road-way, removably secured on the supports, substantially as described.

3. In a bridge of the character described, the combination with the horizontal members of a substructure supported below the water line, of the trestles hinged thereto and the chains or cables G G′ provided with means for tightening the same, substantially as described.

4. In a bridge, the combination with a fixed substructure, of supports consisting of tapering open frames pivoted to the structure, means for retaining the supports in an elevated position and a super-structure on the supports, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EUGENE FONTAINE.

Witnesses:
M. B. O'DOGHERTY,
N. L. LINDOP.