(No Model.) 2 Sheets—Sheet 1.

W. W. GREEN

BRIDGE.

No. 458,161. Patented Aug. 25, 1891.

Fig. 1.

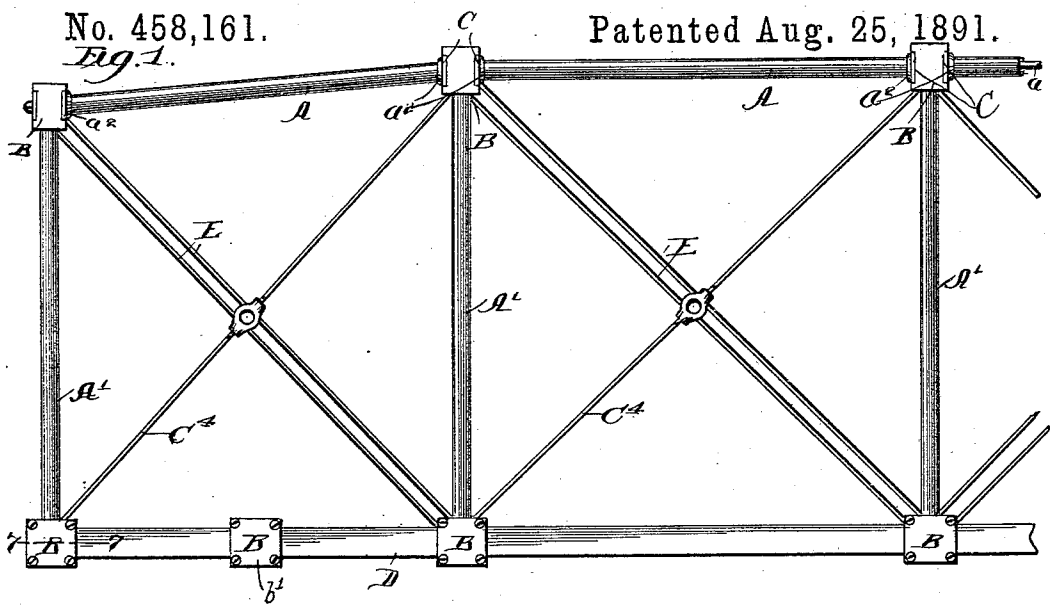


Fig. 2

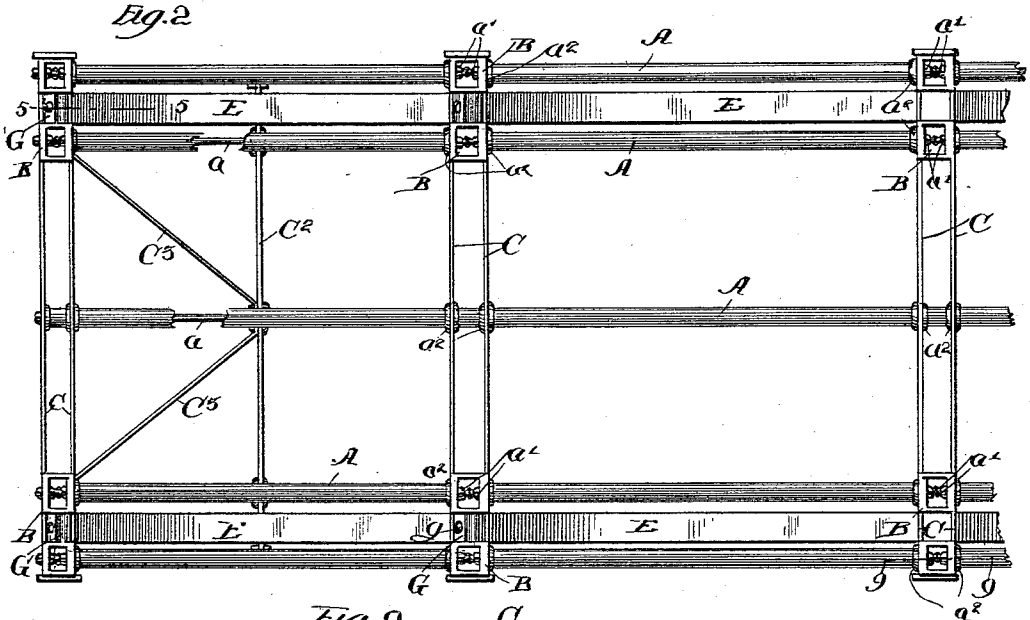
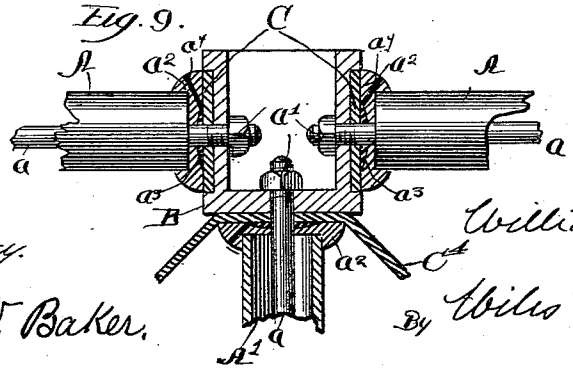


Fig. 9.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

2 Sheets--Sheet 2.

W. W. GREEN.

BRIDGE.

No. 458,161. Patented Aug. 25, 1891.

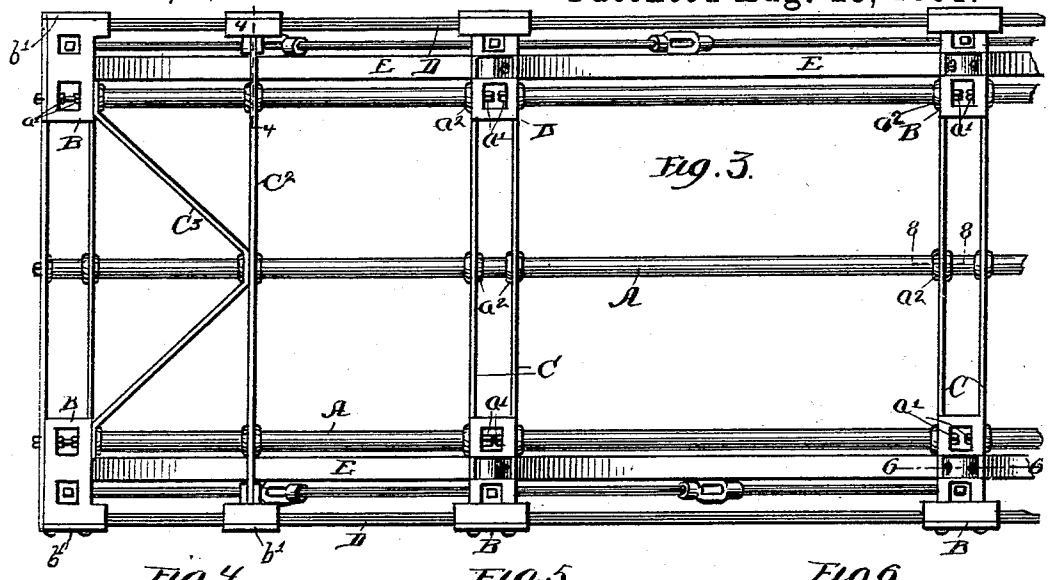


Fig. 3.

Fig. 4.

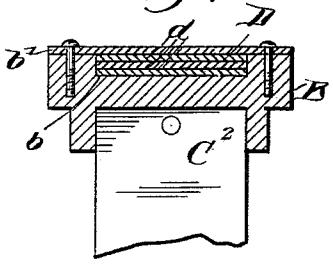


Fig. 5.

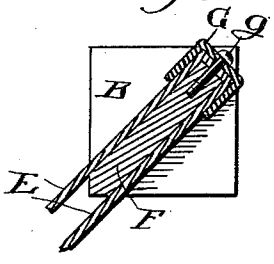


Fig. 6.

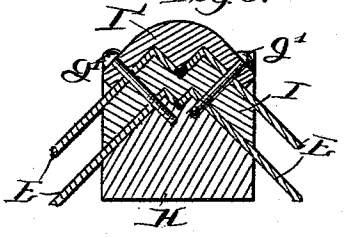


Fig. 7.

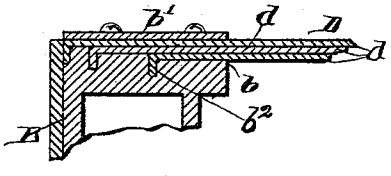


Fig. 8.

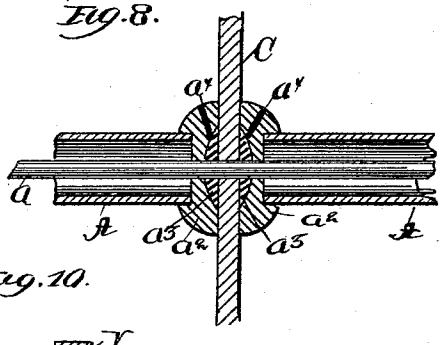
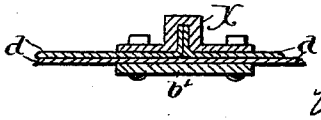


Fig. 10.



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UNITED STATES PATENT OFFICE.

WILLIAM W. GREEN, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO F. H. FOSTER, OF CHATTANOOGA, TENNESSEE.

BRIDGE.

SPECIFICATION forming part of Letters Patent No. 458,161, dated August 25, 1891.

Application filed December 15, 1890. Serial No. 374,800. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. GREEN, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Bridges, of which the following is a specification.

It is the purpose of my invention to reduce the weight and cost of bridges as much as possible without lessening their strength and durability. To such end I have made certain improvements in their construction which are fully described below, and which are embodied in their preferred form in the structure illustrated in the drawings presented herewith, wherein—

Figure 1 is a side elevation of one-half of a bridge; Fig. 2, a top plan of same; Fig. 3, an under view; Fig. 4, a section in line 4 4 of Fig. 3; Fig. 5, a section in line 5 5 of Fig. 2; Fig. 6, a section in line 6 6 of Fig. 3; Fig. 7, a section in line 7 7 of Fig. 1; Fig. 8, a section in line 8 8 of Fig. 3; Fig. 9, a section in line 9 9 of Fig. 2, and Fig. 10 a detail section hereinafter described.

In the ordinary construction of bridges a great waste of material is caused by the holes made for the purpose of joining the different parts together. This weakens the parts at the points where the holes are made, and if said parts are of even size throughout necessarily renders useless a part of the strength of those portions that are not weakened. It is my desire to construct a bridge wherein the different pieces are united with the least possible damage at the joints, and thereby to utilize the entire strength of said pieces and avoid the placing of an unnecessary weight upon the bridge. This will be clearly seen in the construction described below; and besides this main improvement I have also made certain improvements in the form, arrangement, and joining of the different parts of the bridge, all of which are clearly pointed out in the claims which follow the specification. These different improvements are capable of use either conjointly or separately, and I do not limit myself to any combinations thereof, except such as are made the subject of said claims.

Describing my preferred construction minutely and in detail from the drawings and applying a reference-letter to each part throughout the different figures, the longitudinal members of the bridge, with the exception of the main chords at the sides thereof, are composed of a series of metal tubes A, extending between the transverse members of the bridge and acting as struts between the same, said tubes and transverse members being all held tightly together by means of tie-rods *a*, extending through the tubes and transverse members and being drawn up by means of nuts *a'*. To prevent the tubes from splitting at the ends and to keep them in place about the tie-rods, cup-shaped washers a^2, Fig. 8, are interposed between the tubes and the transverse members, said washers being provided with central openings for the tie-rods and being concave upon the sides bearing upon the transverse members to form a cavity a^3, which is filled with molten metal through small holes a^4, provided for that purpose. To enable the tie-rods to be tightened up upon each one of the transverse members, I interpose adjacent to said transverse members, or between them when they are arranged in pairs, as they are in the drawings, castings B, having hollow portions, into which tie-rods pass, within which the nuts *a'* may be applied to the tie-rods. This enables said tie-rods to be made but a trifle longer than the tube-sections which inclose them.

In the side frame of the bridge I prefer to use two longitudinal members side by side at top and bottom, as seen in Figs. 2 and 3, and to space the top and bottom frames apart by vertical posts A', the construction of which is similar to that of the longitudinal members and which are joined to the castings B by means of tie-rods extending into the hollow portions of said castings and there having nuts threaded to them in the same manner as the longitudinal members are secured to the same castings. The transverse members are preferably broad flat metal bars C, arranged at both sides of the castings B. The latter are grooved to receive these bars, as seen in Fig. 9, and the bars are held tightly clamped within the grooves by means of the washers a^2, which abut against them. To

brace the bridge against lateral swing, additional plates, as seen at C^2, may be interposed and braced by means of diagonal braces C^3, and I prefer to place near each end of the bridge one such additional plate and to interpose between it and the end plates of the bridge the braces shown. The chords D are composed of a series of flat metal bars *d*, Figs. 4 and 7, arranged side by side and secured to the castings B by means of grooves *b* in said castings, deep enough so that said chords may lie therein flush with the ends of the castings, and metal plates *b'* are screwed fast to the ends of said castings by means of screws entirely outside of the chords. This, it will be seen, clamps the chords firmly to the castings without boring a single hole through them or weakening them in the least. These chords may extend merely from one transverse member to another, or they may extend past several of such members, or indeed the entire length of the bridge. They can be easily secured at their ends, as shown in Fig. 7, by the use of a casting B, having the groove *b* in the end thereof of different depths in different portions, said groove being at the point where the plates meet it deep enough to accommodate all such plates. At a short distance from said point a recess b^2 is made in the bottom of the groove and the end of one plate turned downward into said recess. From this point the groove *b* is shallower by the thickness of the plate which has terminated, and after another short interval the next plate is turned downward at the end in the same manner as the first. Any number of plates can be thus secured to a single casting, and all clamped thereto by a single covering-plate. It should be noticed, too, that each plate preserves its full strength at the point where it is joined with the casting, as it is merely bent downward and inserted in the recess in the bottom of the groove in the casting. The plates *b'* clamp all of the chords tightly to their castings and render it impossible for any of the inturned ends to be pulled out. In the side frames the straining-rods are also connected with the top and bottom of the bridge-frame by an improved connection. I prefer to make the main straining-rods double, as seen at E in Fig. 1, and to secure them to the castings B between the hollow portions thereof, as seen in Fig. 5, where F is a flat neck formed between the enlarged hollow ends of said castings, on each side of which the straining-rods E are arranged, each being bent around a square shoulder formed upon said neck and clamped thereto by means of a U-shaped clamp G, screwed tightly over the ends of the straining-rods by means of a screw *g*. This fastening also, it will be noticed, preserves the entire strength of the straining-rods E, which are preferably flat plates. At the middle of the bridge, where two sets of straining-rods meet, a slightly different device is necessary, and the same is shown in Fig. 6, where the straining-rods from different sides are all clamped together between the neck H of the casting and two V-shaped plates I and I', one of said plates I being interposed between the members of the pairs of straining-rods and the other being placed outside of both and screwed to the neck H by means of the screws *g'*. Counter-braces C^4 may be added of the same general character as the straining-rods E; but as they are not subject to as great a strain as the latter I have shown them as rods flattened at the ends and secured between the standards A' and the castings B and provided with turn-buckles, by means of which they may be tightened up.

When it is found necessary to splice the main chords between the castings B, an additional casting X (shown in section in Fig. 10) is employed, the form and use of which are clearly seen in the figure. By means of such a casting the chords can be spliced at any point, it being of course preferable to splice only one of the flat bars at a single point. This splicing device is of course applicable only to the outside bars of the chord. If more than two bars are used, the middle ones should be arranged so as to splice at the castings B, after the manner shown in Fig. 7, or if it becomes absolutely necessary to splice the intermediate members of the chords between the castings one of the outside chords will have to be spliced at the same place and the casting X of Fig. 10 will have to be modified so as to receive the bent ends of both the inside and outside members, after the manner shown in Fig. 7.

I claim as new and desire to secure by Letters Patent—

1. In a frame-work of the class described, the combination of a series of tubes, a series of hollow blocks arranged between the ends of the tubes, and tie-rods within the tubes and extending into the blocks adjacent thereto, having nuts threaded to their ends within the said blocks, whereby the blocks and the tubes may be tightly secured together, substantially as described.

2. In a frame-work of the class described, the combination of longitudinal members A, arranged in pairs and connected by blocks B, and diagonal straining-rods E, secured to said blocks between the longitudinal members, substantially as described.

3. The combination, with a block B, forming a part of a frame-work of the class described and having a diagonally-squared neck F, of a diagonal straining-bar E, bent over the square corner of the neck and secured thereto by means of a plate clamped thereupon, substantially as described.

4. The combination, with the castings B, having the necks F, of the straining-bars E, bent over the necks and clamped thereto by means of the U-shaped pieces G, substantially as described.

5. In a structure of the class described, the combination, with a casting having a V-shaped

neck H, of two straining-bars turned in upon said neck and secured thereto by a V-shaped plate clamped thereupon, substantially as described.

6. In a structure of the class described, the combination, with the casting B, having the neck H, of the four straining-bars E, the intermediate spacing-piece I, and the plate I′, clamped securely to the neck H, substantially as described.

7. The combination of the chords D, composed of two or more flat bars arranged side by side, having their ends bent at an angle thereto, the castings B, having faces grooved and recessed substantially as shown, and the superimposed plates *b′*, clamped upon the flat bars by means of devices applied exterior to the bars, substantially as described.

8. The combination of the castings B, grooved to receive the transverse members C, the said members C resting in said grooves, and the longitudinal members A, clamping the transverse members and the castings together, substantially as described.

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Witnesses:
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H. BITNER.