No. 672,175. Patented Apr. 16, 1901.

F. MELBER.

CEMENT OR CONCRETE CONSTRUCTION.

(Application filed May 5, 1900.)

(No Model.)

Fig. 1.

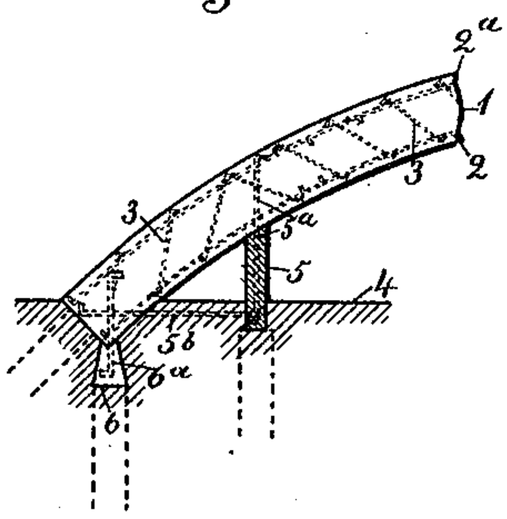


Fig. 2.

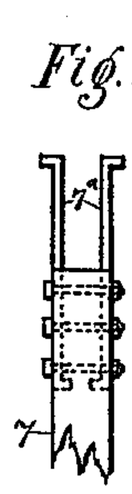


Fig. 3.

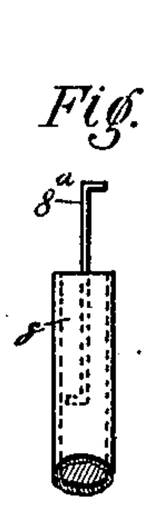


Fig. 4

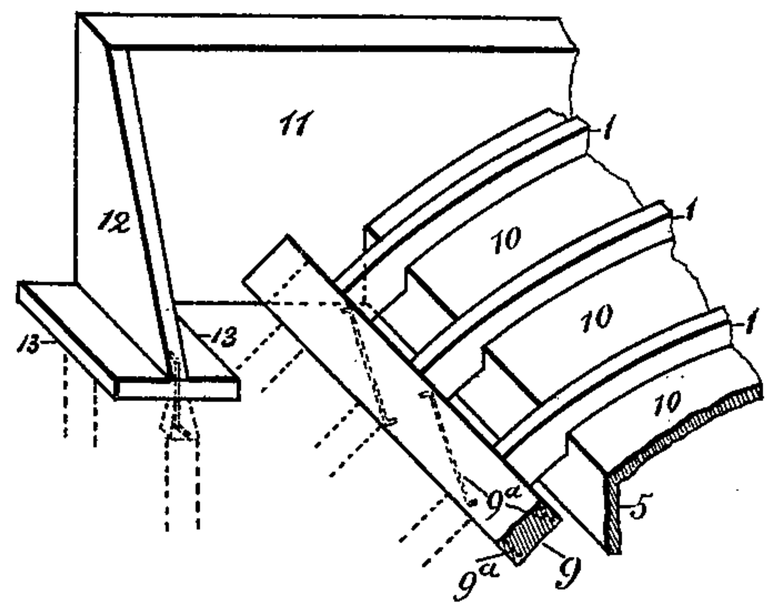


Fig. 5.

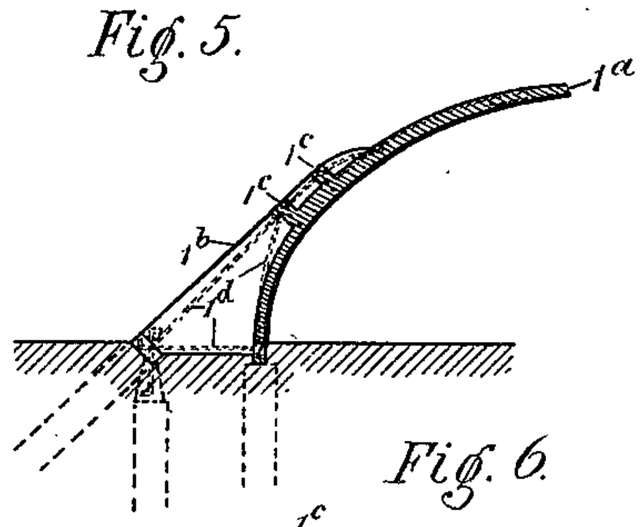


Fig. 6.

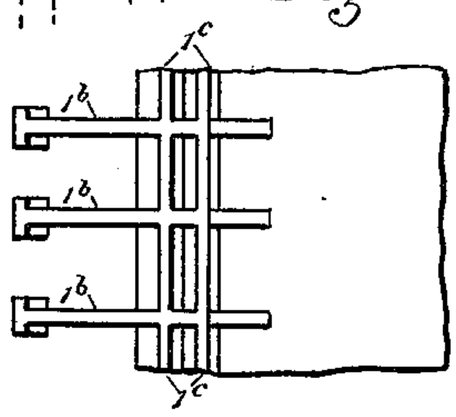


Fig. 7.

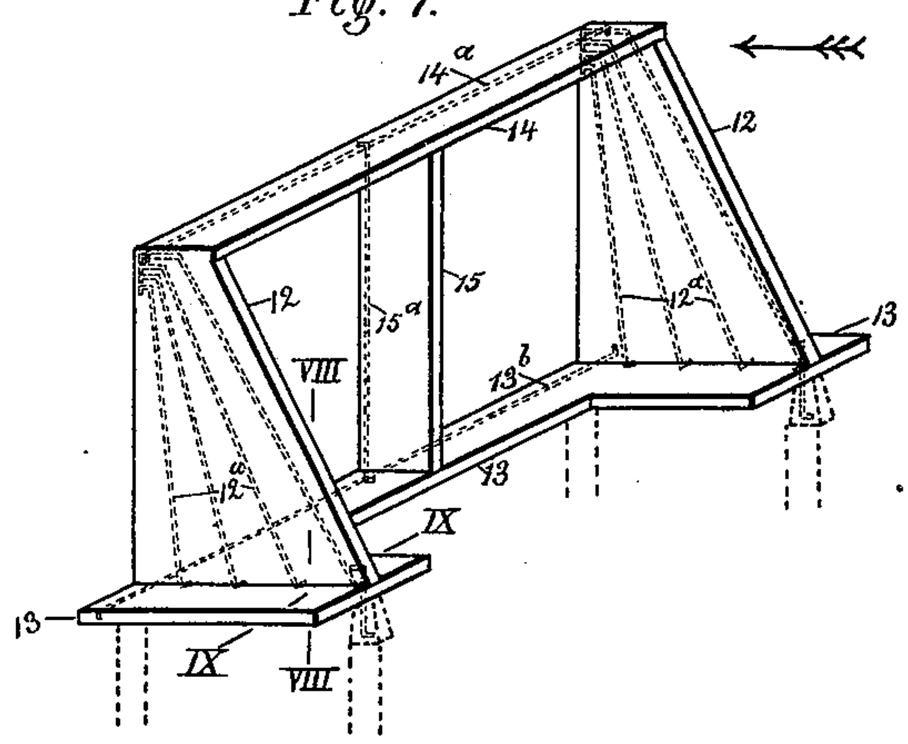


Fig. 8.

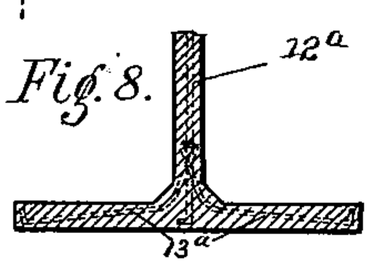


Fig. 10.

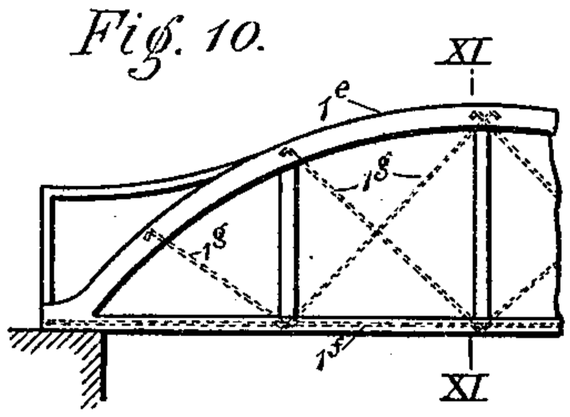


Fig 11.

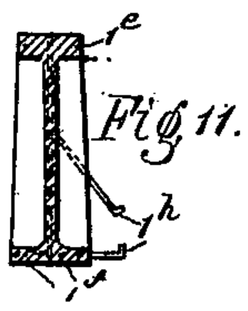
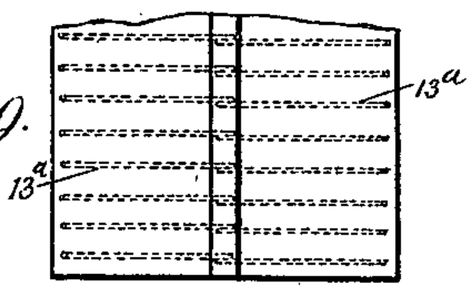


Fig. 9.



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UNITED STATES PATENT OFFICE.

FREDERICK MELBER, OF PITTSBURG, PENNSYLVANIA.

CEMENT OR CONCRETE CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 672,175, dated April 16, 1901.

Application filed May 5, 1900. Serial No. 15,599. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MELBER, a citizen of the United States of America, and a resident of Pittsburg, county of Allegheny, State of Pennsylvania, have invented certain new and useful Improvements in Cement or Concrete Construction, of which the following is a specification.

In the drawings which form part of this specification, Figure 1 is a side elevation of my arch or bridge truss. Figs. 2 and 3 show modified forms of the anchor. Fig. 4 is a perspective showing arches and wing-wall. Fig. 5 shows a modified form of the arch; Fig. 6, a plan of the same. Fig. 7 is a perspective in detail of the wing-wall. Figs. 8 and 9 are sectional details of portions of the same on lines VIII VIII and IX IX of Fig. 7, respectively. Fig. 10 is an elevation of a modified form of bridge-arch, and Fig. 11 is a sectional view of the same along the line XI XI in Fig. 10.

My invention, generally speaking, is a new and improved form of construction in cement or concrete and steel, special reference being had to the construction of bridge or wall work. In reinforcing the cement or concrete I introduce the steel reinforcing rods or bars according to the "Melber system," as described and claimed by me in an application for a patent filed in the United States Patent Office August 14, 1899, Serial No. 727,123.

The following is a detailed description of my invention, reference being had to the accompanying drawings:

1 is an arched girder or truss.

2 is a steel rod or bar embedded in the cement or concrete and assuming the tension strains occurring in truss 1.

2^a is a second rod intended to assume such tension strains as may occur above the neutral axis of truss 1. When the load on truss 1 is superimposed, then tension strains would appear below the neutral axis and would be assumed by rod 2, while compression strains would appear above the neutral axis which would be safely assumed by the concrete itself. If, however, a force should be exerted from below the truss or from an acting concentrated moving load, tension strains would appear above the neutral axis and would be assumed by rod 2^a.

3 3 are rods embedded in the truss to take up or assume the shearing strains. These several rods I introduce according to the Melber system, above referred to.

4 is the surface of the ground, and 5 is a support or abutment-wall of cement or concrete having embedded therein rod 5^a, by which it is made integral with the girder, the upper extremity of 5^a being embedded in the truss 1.

5^b is a second rod connecting or tying together abutment-wall 5 and the extremity of truss 1 and having its ends embedded, respectively, in said wall and said truss.

If the ground 4 is rock, dovetail holes are cut into the rock and anchor 6, formed of cement, is rammed in, having embedded therein rod 6^a, whose upper extremity is embedded in the material of truss 1. It will thus be seen that an integral structure will be formed by the truss, abutment-wall, and anchor, all reinforced by the steel rods. In case the ground 4 is not rock, but so unstable as to make such an anchor liable to pull out, I substitute an anchor composed of a wooden pile 7, Fig. 2, and shown in dotted lines in Fig. 1. This pile is driven at the proper point and tie-rods 7^a 7^a are fixed thereto, these rods having their upper ends incorporated or embedded in the material of the truss. In the dotted lines of Fig. 1 I have shown such form of anchor applied to the abutment-wall and in two directions at the extremity of the truss to take up the thrust. Fig. 3 shows a second modification of the anchor, wherein a tubular pile or pier 8, of any suitable material, is substituted for the wooden pile 7, tie-rod 8^a being inserted therein and having when in position its upper extremity embedded in the material of truss 1. The tubular structure is then rammed full of cement, which when hard holds tie-rod 8^a fast.

Fig. 4 shows my bridge and wing wall construction with additional modifications. 9 is a girder holding in place trusses 1 1 and extending from wing-wall to wing-wall, said girder being likewise of cement or concrete with reinforcing-rods 9^a 9^a. 10 10 are the floor-slabs, made of reinforced concrete and integral at their ends with abutment 5, either arched or plain. Soil may be dumped over girder 9 and the extremities of arches 1 1 as a load or anchor. 11 is the wing-wall, having

brackets 12 12. The wing-wall and strengthening-brackets 12 12 (better illustrated in Figs. 7, 8, and 9) are provided with lateral flanges 13 13, which are intended to be covered with soil or stone to anchor the construction. 12^a 12^a are reinforcing-rods embedded in brackets 12 12, taking up the shearing strains in said brackets and transmitting the same upward to the top of the brackets. The construction of flanges 13 13 is shown in Figs. 8 and 9. 13^a 13^a are rods taking up the shearing strains in said flanges. 14 is a girder connecting the extremities of brackets 12 12 and is provided with tension rod or chord 14^a. Inasmuch as the load or force is exerted in the direction of the arrow, Fig. 7, the concrete would take up the compression strains in girder 14, but the tension strains appearing in the side of the girder opposite to the force would require tension-rod 14^a. A like tension-rod 13^b is embedded in flange 13 for like reasons. 15 is a vertical girder connecting flange 13 and girder 14, having tension-rod 15^a embedded therein. In Fig. 4 and likewise in Fig. 7 I show both the rock and the pile anchors in dotted lines. It will be readily seen that thus the bridge-arch and wing-wall become one solid integral construction bound together and reinforced by the steel reinforcing-rods.

In Figs. 5 and 6 I show the arch 1^a made solid instead of trusses connected by slabs, as in Fig. 4. I provide the same with ribs 1^b 1^b, reinforced and joined by girders 1^c 1^c. These ribs assume the thrust and tension strains in like manner as the extremity of the truss in Fig. 1, and the extremity of the solid arch acts as the abutment-wall 5 in Fig. 1. Reinforcing-rods 1^d 1^d are introduced in said ribs to take up the occurring strains.

In Fig. 10 I show the truss 1^e made with horizontal tension-rod 1^f, which assumes the horizontal thrust. This obviates the use of anchors and abutment-wall. 1^g 1^g are rods in the web connecting truss 1^e with tension-rods 1^f, assuming the shearing strains. 1^h 1^h are rods partially embedded in the construction and intended to be embedded for the balance of their length in the floor slabs or beams connecting the trusses, thus making the entire bridge-arch one integral continuation or truss.

It will be readily seen that my invention is a novel and important advance in cement construction and may be applied to all forms of building or work where great strength is desired to be combined with economy in material. The compression strains occurring in the construction in most instances can be safely carried by the cement, and the tension and shearing strains are determined and taken up by the embedding in the construction of metal reinforcing-rods. The use of such rods also ties the entire construction together, making an integral whole.

I do not confine my invention to use in bridge and wall work or with reinforcing-rods exclusively, but apply it to all forms of cement or concrete construction where great strength and economy of material are desired.

While I have described minutely my invention, I do not limit myself to the construction shown, but claim, broadly—

1. In cement or concrete construction; a girder; metal reinforcing-rods embedded in said girder along the lines the tension strains and other metal reinforcing-rods embedded therein transversely to the shearing strains, said rods being unattached at their extremities; an abutment for said girder, and means for assuming the thrust at the extremity of said girder.

2. In cement or concrete construction, a girder; an abutment-wall; means for anchoring the extremity of said girder, and means for tying the extremity of said girder back to said abutment-wall.

3. In cement or concrete construction, a girder; metal rods embedded in said girder along the lines of the tension strains; other metal rods unattached at their ends, embedded in said girder transversely to the shearing strains, and means for uniting a secondary construction to said girder.

4. In cement or concrete construction, a girder; metal rods embedded in said girder along the lines of the tension strains; other metal rods, unattached at their ends, embedded in said girder transversely to the shearing strains, and other metal rods protruding from the side of said girder whereby secondary construction may be united to said girder.

5. In cement or concrete construction, two or more girders; metal rods embedded in said girder along the lines of the tension strains; other metal rods, unattached at their ends, embedded in said girders transversely to the shearing strains, and floor-slabs connecting said girders.

6. An anchor for cement or concrete construction consisting of a member embedded in the soil in line with the direction of the thrust to be counteracted and a rod or rods fixed to said member and partially embedded in the base of said construction.

7. An anchor for cement or concrete construction consisting of a member of cement or concrete being largest at its base and embedded in the soil and extending in a line with the thrust to be assumed, and a rod or rods embedded partially in said member and partially in the construction to be anchored.

8. In cement or concrete construction; a wall of cement or concrete; brackets attached to said wall, and metal reinforcing-rods embedded in said construction.

9. In cement or concrete construction, a wall of cement or concrete; brackets attached to said wall; metal reinforcing-rods embedded in said wall and said brackets, and means for anchoring said construction.

10. In cement or concrete construction, a

wall; brackets attached to said wall; flanges on said wall and said brackets, and means for anchoring said construction.

11. In cement or concrete construction, a wall, brackets attached to said wall; flanges on said wall and said brackets; means for anchoring said structure and metal reinforcing-rods embedded in said structure.

12. In cement or concrete construction, a wall; brackets attached to said wall; a girder reinforcing said wall; flanges on said wall and said brackets, and means for anchoring said structure.

13. In cement or concrete construction, a wall; brackets attached to said wall; a girder reinforcing said wall; flanges on said wall and said brackets; means for anchoring said structure and metal reinforcement-rods embedded in said structure.

14. In cement or concrete construction; one or more girders; one or more wing-walls, and means for anchoring said structure.

15. In cement or concrete construction; one or more girders; one or more wing-walls, and a beam attached to said wall or walls and superimposed on the extremity of said girder or girders.

Signed by me at Pittsburg, Pennsylvania, this 3d day of May, 1900.

FREDERICK MELBER.

Witnesses:
J. BOYD DUFF,
EDWARD A. LAWRENCE.