C. HUBER.

FRAMEWORK STRUCTURE FOR BALLOONS.

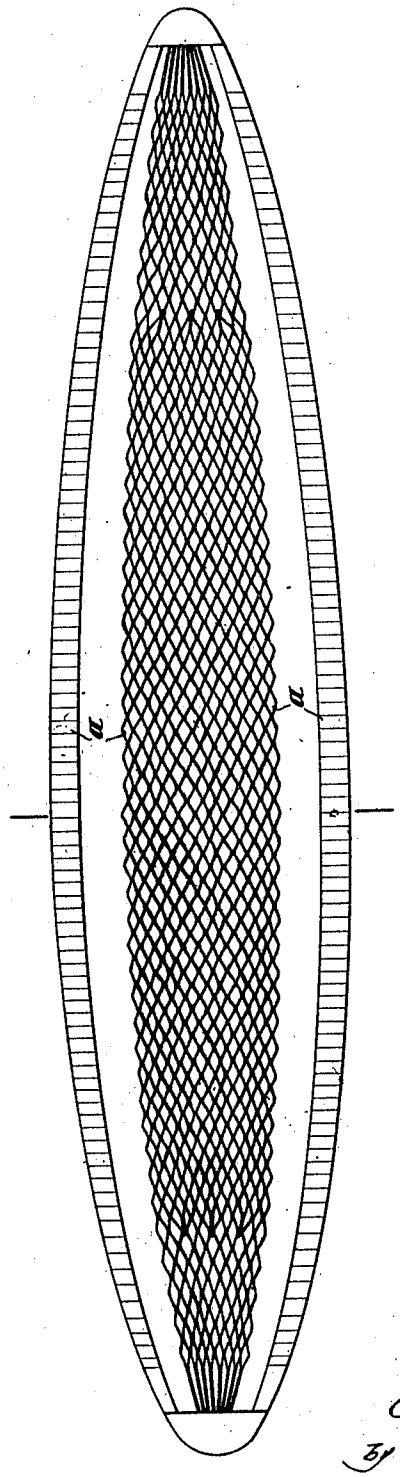
APPLICATION FILED SEPT. 13, 1909.

980,267.

Patented Jan. 3, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



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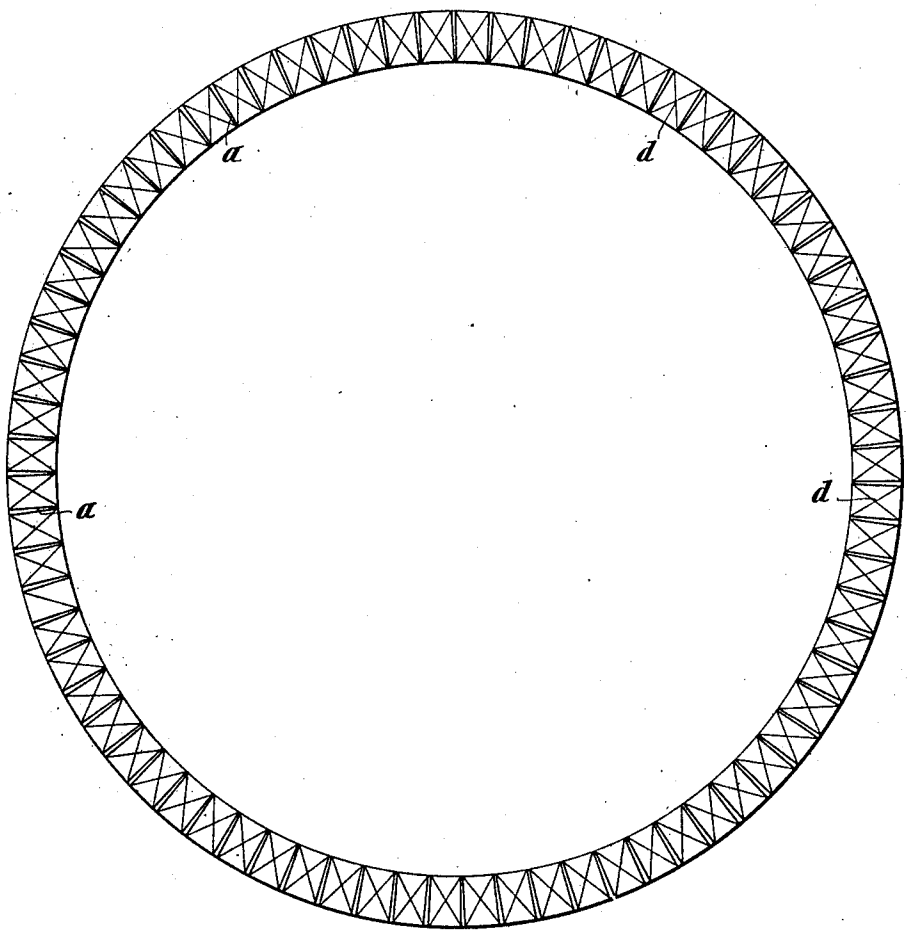
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

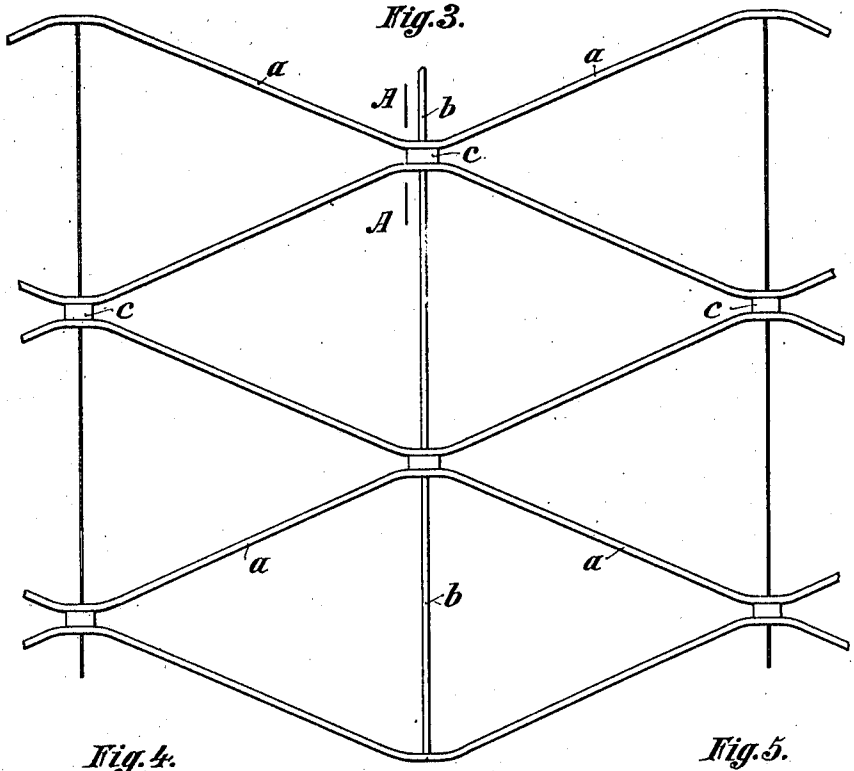


Fig. 4.

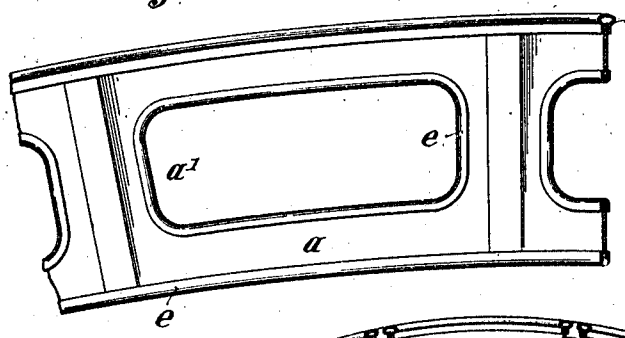
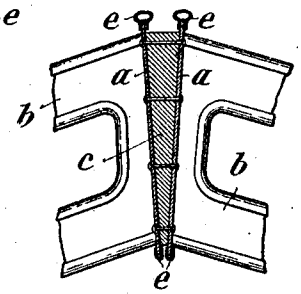


Fig. 5.



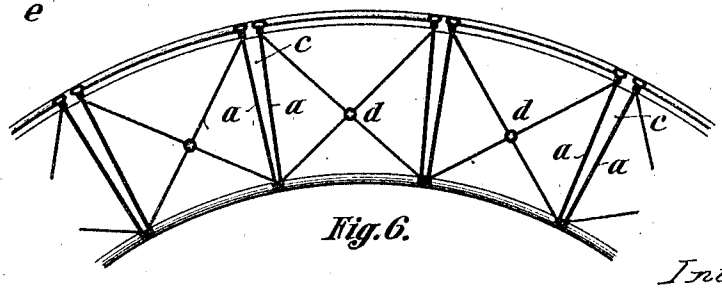


Fig. 6.

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UNITED STATES PATENT OFFICE.

CARL HUBER, OF BERLIN, GERMANY

FRAMEWORK STRUCTURE FOR BALLOONS.

980,267. Specification of Letters Patent. Patented Jan. 3, 1911.

Application filed September 13, 1909. Serial No. 517,389.

To all whom it may concern:

Be it known that I, CARL HUBER, civil engineer, a subject of the Grand Duke of Baden, residing at Nos. 29/30 Schlesischestrasse, in Berlin, in the Kingdom of Prussia, Germany, have invented certain new and useful Improvements Relating to Framework Structures for Balloons, of which the following is a full, clear, and exact description.

The employment of wood and other light materials such as bamboo and the like have already been proposed and employed in the construction of frameworks for balloons; moreover wooden frameworks and the like composed of hollow supports running spirally and intersecting one with another in order to obtain a framework which will serve on the one hand for the reception of the gas balloon, and also for carrying the car, are likewise known. For the latter purpose particularly it is necessary, however, that this frame, while keeping the weight very low should be formed like a girder preferably of parabolic form.

The object of the present invention is the construction of a balloon framework mainly consisting of a series of longitudinal bearers or girders. These bearers (and this constitutes the essential feature of the invention) are corrugated or waved in the longitudinal direction and arranged edgewise and radially. These bearers are arranged side by side with the summits of their corrugations in contact and connected one with the other by riveting or gluing the contacting summits of the corrugations giving the transverse connection. The bearers themselves preferably consist of transversely (spread-out) glued plates (veneer) reinforced on their longitudinal edges by a metal binding such as aluminium. In order to reduce the weight the plates may be recessed at the middle, the edges of these recesses being likewise bound with metal. The longitudinal bearers thus formed which are arranged on edge are connected one with the other radially at their protuberances or the summits of their corrugations and preferably glued where they contact with the interposition of wedge-shaped intermediate pieces, so that without the necessity of transverse bearers, a strong framework adequately stayed in the transverse direction is obtained. A plate framework of this kind is illustrated in the accompanying drawing in which:

Figure 1 is a longitudinal section and Fig. 2 a cross section showing the general arrangement of the system of bearers. Fig. 3 shows a part of the system of bearers with transverse connections. Fig. 4 shows a recessed and reinforced panel of a bearer consisting of wood. Fig. 5 shows the method of connecting the bearers one with the other, and of reinforcing them by distance pieces. Fig. 6 illustrates reinforcement by means of wire or tension rods.

In the construction here illustrated the framework G at its greatest diameter comprises a given number of corrugated wooden plate bearers *a* glued one to the other but as the circumference constantly decreases toward the ends only a very few extend to the entire length between the two ends. The length and number of the bearers are selected in such a manner that their protuberances or corrugations form rhomboidal meshes which as far as possible are of equal width, and by this method of distributing the meshes the number of the bearers is limited in a definite manner on the periphery of the framework. If, for example the framework has a maximum external diameter of 16 meters that is to say, a circumference of approximately 50 meters with a width of mesh of 75 cm. in the middle this gives $50 \div 0.75 = 66$ longitudinal bearers; at the two ends where the longitudinal bearers partly meet with a diameter of three meters and a width of mesh of 50 cm. for example there are 18 bearers, while the 66 longitudinal bearers in the middle are only continued to both sides until these 66 bearers together, with a width of mesh likewise equal to 50 cm. give a circumference of 33 meters or a diameter of about 11 meters. From this point more bearers constantly terminate toward the two points until at the extreme points themselves, only about twelve meet. As already described, the protuberances of these radially arranged parabolic longitudinal bearers *a*, contact and are united to form a framework Fig. 1, and can be held at the proper interval at various places (for example, once in the middle and twice or four times at both sides) by distance pieces *b* which can likewise be reinforced at their edges by a binding of aluminium *c*. At other places the meshes of the longitudinal

bearers *a* arranged edgewise and radially can be connected by crossed wires or tension rods *d* spliced or otherwise fixed at their points of intersection. This mesh framework therefore constitutes an ideal supporting body, capable of bearing a load on all sides; it is of relatively great strength such as it has not heretofore been possible to obtain with an equal weight of other constructional materials.

What I claim as my invention and desire to secure by patent is:

1. A balloon frame having a substantially circular cross-section and comprising in combination, a plurality of girders of zig-zag formation arranged to dispose their apices in abutting relation, and means for connecting said girders to form a rigid structure.

2. An oval or elongated balloon frame having a substantially circular cross-section and comprising in combination, a plurality of longitudinally disposed girders of zig-zag formation arranged radially edge-wise and with their apices in abutting relation, and means for connecting said girders to form a rigid structure.

3. An oval or elongated balloon frame having a substantially circular cross-section and being gradually reduced from a substantially greatest central diameter toward the ends thereof and comprising in combination, a plurality of longitudinally disposed girders of zig-zag formation arranged to bring their apices in abutting relation and radially edge-wise disposed, certain of said girders extending throughout the length of said structure and the remaining girders extending from the center or greatest diameter toward the ends of said frame and being gradually reduced in length, and means for connecting said girders to form a rigid structure.

4. A balloon frame having a substantially circular cross-section and comprising in combination, a plurality of girders of zig-zag formation arranged to dispose their apices in close relation, distance pieces between the apices, and tension means for connecting said girders to form a rigid structure.

5. A balloon frame having a substantially circular cross-section and comprising in combination, a plurality of girders of zig-zag formation arranged to dispose their apices in abutting relation, binding reinforcing elements on the edges of said girders, and means for connecting said girders to form a rigid structure.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

CARL HUBER.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.