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W. HAUPT
SUSPENSION BRIDGE
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Fig. 1

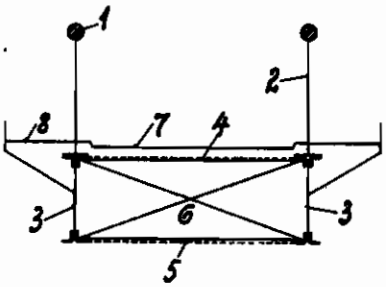


Fig. 2

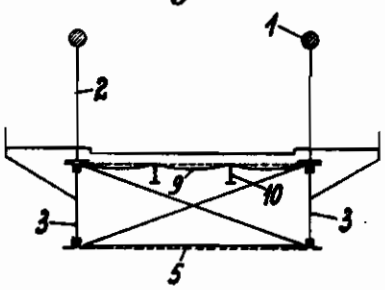


Fig. 3

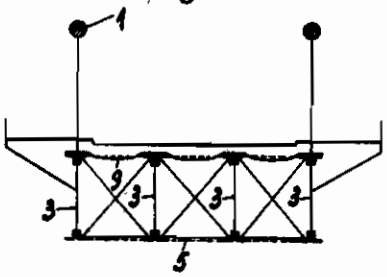


Fig. 4

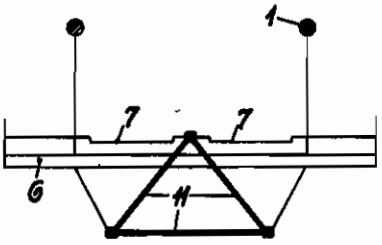


Fig. 5

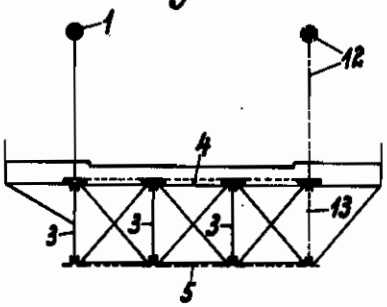
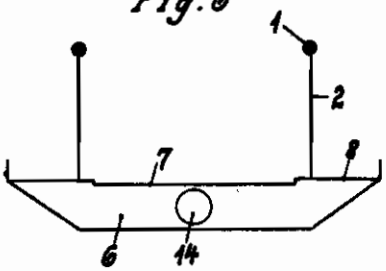


Fig. 6



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ALIEN PROPERTY CUSTODIAN

SUSPENSION BRIDGE WITH TORSION-RESISTING STIFFENING SUPPORTING STRUCTURE

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Application filed September 2, 1938

In patent application Serial No. 126,471 of 18th of February 1937 protection is claimed for bridge supporting structures which in the space between two roadways have a torsion-resisting foot projecting beyond these roadways and which is capable by its torsional strength of taking up the overturning moments imparted by one-sided traffic load. In this patent application a supporting structure for suspension bridges is described, in which the torsion-resisting foot is formed by a torsion-proof stiffening supporting structure. It is absolutely essential, that the stiffening supporting structure is made proof against torsion because the overturning moments occurring in the case of one-sided traffic loading would not otherwise be taken up.

In the suspension bridges hitherto generally known with at least two suspension rod supporting walls between which the main track is arranged, a tension-proof construction of the stiffening supporting structure is not essential because, in the case of one-sided traffic loading, one of the suspension rod supporting walls is merely loaded slightly more than the other suspension rod supporting wall, with the result that the overturning moment is taken up.

However, in this mode of construction the objectionable fact became apparent that the roadway under one-sided traffic loading inclines to a considerable extent in the transverse direction, this transverse inclination attaining under certain circumstances for example the value of 1:30 or even more. It is obvious that such a steep transverse inclination means very great technical disadvantages for high speed traffic, for example high speed electric railways and the like. The extent of this transverse inclination can be considerably reduced if the stiffening supporting structure is made proof against torsion. It is known, that the deformations of a torsion-proof hollow body are exceptionally slight as compared with the saggings of a cable. Therefore, by the torsion-proof construction of the stiffening supporting structure it is possible to attain a transverse inclination of the bridge under one-sided traffic load of only a fraction of the value which occurs when the stiffening supporting structure is not made proof against torsion. The greater the torsional strength of the stiffening supporting structure is made, the more will the one-sided traffic load be relieved on the nearest suspension rods supporting wall and the opposite suspension rods supporting wall is utilized for taking up the vertical load. In the optima case the stiffening supporting structure can be made of such great torsional strength that, if one supporting cable is entirely destroyed, it takes up entirely the strong overturning moments then produced by the continual load. The advantage is enormous, especially in cases of war, as, even in the event of a whole cable being destroyed, the bridge does not collapse (with the result that under certain circumstance the road running under the bridge might also be blocked), but is still even capable of allowing traffic even if on a restricted scale.

The torsional strength of the stiffening supporting structure can be attained in various ways for example

(1) by connecting the upper and lower flanges of each of two vertical stiffening girders by a horizontal connection, it being evident that such a horizontal connection may consist of a solid plate or of a stiff roadway plate,

(2) in that the stiffening supporting structure consists of a three-flange girder or of a tube. As it is known, that the tube cross-section is the most favorable cross-section for taking up torsional stresses, the diameter of this tube can be relatively small and the tube itself can, if desired, be used directly as conduit for gas, water or other fluid. As on the other hand a tube only offers slight resistance to vertical loads, such a construction would offer the advantage of slight transverse inclination even of a suspension bridge unstiffened in the practical sense.

The advantages of a torsion-proof stiffening supporting structure may be ensured even for a supporting structure partly destroyed by bombs, if instead of two vertical stiffening girders more than two such girders are arranged whose upper and lower ribs are connected by horizontal connections. If in such a stiffening supporting structure one or several stiffening girders is or are destroyed by bombs the remaining girders remain torsion-proof with their horizontal connections and are still capable of reducing to a still appreciable extent the transverse inclination of the roadway under one-sided traffic loading.

Several embodiments of the invention are illustrated by way of example in the accompanying drawing in which all Figures show cross-sectional views through suspension bridges.

In the drawings

1 designates a supporting cable,

2 a suspension rod or cable,

3 a vertical stiffening girder which may be constructed as plate girder or a framework girder,

4 an upper horizontal boom,

5 a lower horizontal boom,

6 a transverse girder which may be constructed as a plate girder or as a framework girder,

7 a main track,

8 a footway or auxiliary roadway

9 a stiff roadway plate, for example buckled plate,

10 a secondary longitudinal girder for supporting the roadway plate,

11 a three-flange girder,

12 a destroyed cable,

13 a destroyed vertical stiffening girder,

14 a torsion-proof tube.

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