Aug. 29, 1939.

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CONNECTION FOR CONTINUOUS STRUCTURES

Filed Feb. 14, 1938

Fig. 1

Fig. 2

Fig. 3

Fig. 4

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This application is made under the act of March 3, 1883, as amended by the act of April 30, 1888, and the invention herein described and claimed, if patented, may be manufactured and used by or for the Government of the United States for governmental purposes without the payment of any royalty thereon.

This invention relates to a device for connecting continuous structures so that the full continuity can be developed, at the same time mitigating the effect of expansion and contraction due to temperature changes or other causes, and is applicable for use on trusses, beams, girders, suspension bridge stiffening trusses or any other type of structure where continuity is desired.

An important use of this invention is found in relation to pontoon bridges. These bridges consist of individual floating pontoons connected end to end. If these pontoons are joined together in such a manner that the connections will not take a moment stress, heavy concentrations of load on the ends of adjacent pontoons will produce objectionable break in the grade line and vertical movement. One of the objects of this invention is to obviate such an unsatisfactory condition by making the entire bridge act as a continuous beam, thereby eliminating break in grade and reducing vertical movement to a minimum.

Continuous structures, such as trusses and girders, usually consist of a series of continuous spans units. At the ends of these units, it was herefore necessary to break the continuity to provide means for taking care of the effect of expansion and contraction. By utilizing this invention, the effect of expansion and contraction is provided for in addition to making any plurality of spans fully continuous.

The following description, considered together with the accompanying drawing, will more fully disclose this invention, its constructions and operations of parts, and further objects and advantages thereof will be apparent.

In the drawing:

Figure 1 is a front elevational view of this invention in one of its forms shown in a normal position as applied to adjacent ends of two ordinary bridge girders.

Figure 2 is the same view as Figure 1 showing the invention in a closed position.

Figure 3 is the same view as Figure 1 showing the invention in an open position.

Figure 4 is a side view of Figure 1.

Referring with more particularly to the drawing in which like numerals designate like parts, the numerals 5 and 6 designate two adjacent bridge girders. Two rockers 7, 7 are pin-connected to the girder 5 at 8, 8, and one end of each of the horizontal links 9, 9 are pin-connected to the rockers at 10, 10. Each of the other ends of the links 9, 9 are pin-connected to the girder 6 at 11, 11 and a vertical link 12 is pin-connected to the rockers 7, 7 at 13, 13, all substantially as shown.

The operation of this invention is as follows: When there is a relative horizontal movement (Figures 1 to 3) between the girder units as a result of temperature change, or other factors, the equal travel of links 9, 9 produces equal travel of the points 13, 13. This does not produce any stress in the link 12 and, therefore, no stress is set up in the entire system, thus providing perfect freedom of movement horizontally. However, when a moment exists at the joint due to the application of a vertical load, the stress in links 9, 9 becomes equal but of opposite algebraic sign, producing equal and opposite tendencies to move points 13, 13, which are held by link 12. The result of this effect is that no movement occurs.

Under certain conditions a temperature change at the top of a girder may be different from that at the bottom. For example, such a condition may arise in the case of a pontoon bridge where the temperature of the portion under water would be different from that out of the water. This difference would produce a very small angular change in the end of each pontoon which would be equivalent to the application of a moment between the pontoons. When this difference is large enough to require compensation, one of the pin connections 8, 10, 11, or 13 may be provided with a slight amount of play. For example, it may be made slightly slotted. The shear key 14, prevents any vertical movement of the member 5 relative to the member 6.

Since each unit is free to act independently for any movement other than moment, flexibility in a horizontal plane, perpendicular to the principal plane of bending is retained. Thus, deflection caused by wind, fluid pressure, or other forces setting up small angular changes between units produce no stress when this invention is employed.

Should it be desired to limit the amount of movement between each connected unit, ties, bumpers, or other suitable means may be employed.

By the use of this invention, all members except the rockers and pins carry direct stress only. This leads to economy in design.
While for the purpose of illustration the link connections have been shown in single shear, it is to be understood that providing said links with double shear connections is within the scope and spirit of this invention.

Having thus described my invention, I claim:

1. A connection for continuous structural units comprising two congruent rockers in spaced relation, each rocker having two lever arms, said rockers being correspondingly disposed and pin connected to one of said units, a rigid link having its ends pin connected to corresponding lever arms of said rockers, and parallel links each connecting the other lever arm of one rocker to the adjacent structural unit.

2. A connection for adjacent structural units comprising two congruent rockers correspondingly disposed and pin connected near the top and bottom respectively at the end of one of said units, each of said rockers having two lever arms, a rigid link connecting corresponding lever arms of said rockers with each other, and parallel links each connecting the other lever arm of one rocker to the end of the other structural unit.

3. A connection for continuous structural units comprising two congruent double lever rockers in lateral alignment pin connected to one of said units, a rigid link connecting corresponding lever arms of said rockers, parallel links each connecting the other lever arm of one said rockers to the adjacent structural unit.

4. In combination with continuous structural units congruent bell cranks correspondingly disposed and pivoted to one of said units, means linking congruent lever arms of said bell cranks, and parallel links each connecting the other lever arm of one of said bell cranks to the adjacent structural unit, the levers of said bell cranks being so arranged that rotation thereof is normally in the same direction.

5. In combination with continuous structural units congruent double lever bell cranks correspondingly disposed, pivoted to one of said units in vertical alignment, a rigid link connecting the parallel lever arms of said bell cranks, and parallel links each connecting the other lever arm of one of said bell cranks to the adjacent structural unit.

6. A connection for adjacent structural units comprising a plurality of congruent bi-lever bell cranks correspondingly disposed and pivoted to one of said units, a rigid link connecting corresponding lever arms to each of said bell cranks for normal rotation in the same direction, and a plurality of parallel links, each of said links connecting the other lever arm of one bell crank to the adjacent structural unit.

7. A connection for adjacent structural units comprising a plurality of congruent bi-lever bell cranks correspondingly disposed and pivoted to one of said units, a rigid link connecting corresponding lever arms to each of said bell cranks for normal rotation in the same direction, and a plurality of parallel links each of said links connecting the other lever arm of one bell crank to the adjacent structural unit, one of said connections having a slight amount of lost motion.

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