

Jan. 17, 1956

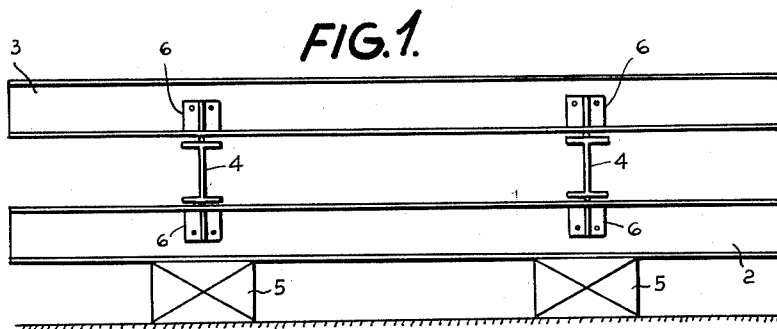
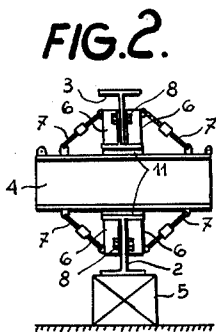
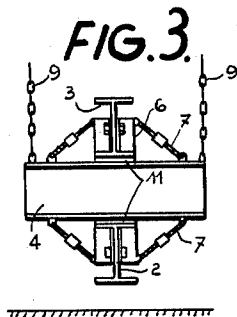
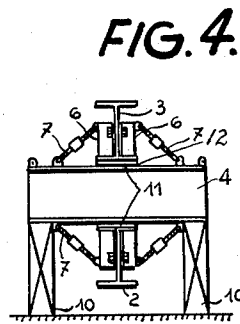
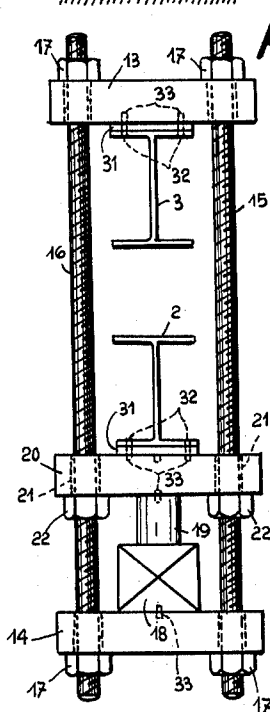
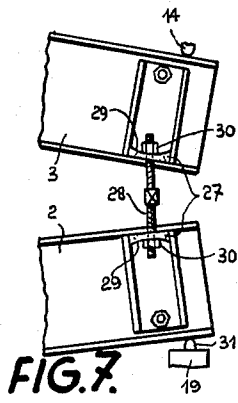
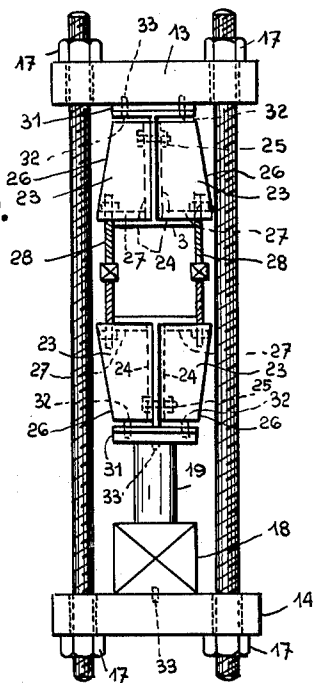
A. LIPSKI

2,730,797

METHOD OF SIMULTANEOUSLY SPRINGING TWO GIRDERS

Filed July 21, 1952

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 8.

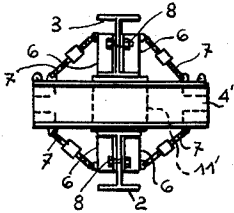


FIG. 9.

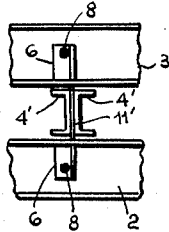


FIG. 12.

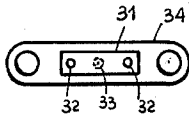


FIG. 13.

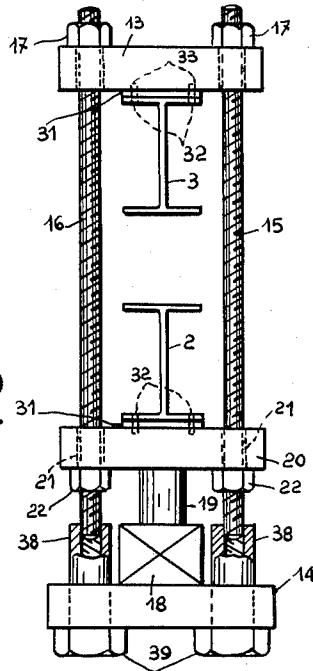


FIG. 10.

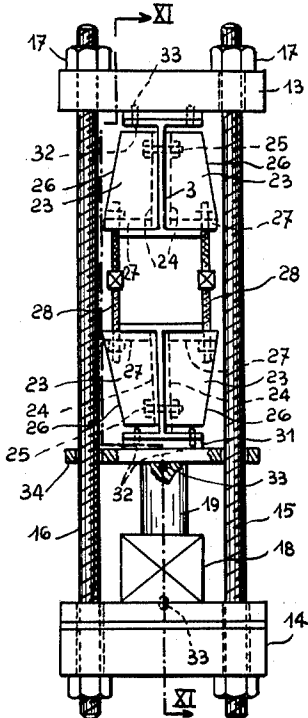
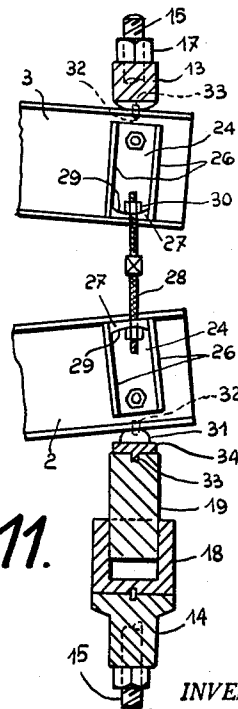


FIG. 11.



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2,730,797

METHOD OF SIMULTANEOUSLY SPRINGING TWO GIRDERS

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Application July 21, 1952, Serial No. 300,049

Claims priority, application Belgium July 25, 1951

10 Claims. (Cl. 29—452)

This invention relates to a method for simultaneously bending two rigid metal reinforcements, which by themselves, are resistant to bending. More specifically the invention relates to a method for simultaneously bending two identical rigid metal girders which are each able to constitute a part of a beam comprising precompressed concrete and a pre-bent rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their mean planes in which they will bend under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girder in such a manner that the ends of each girder are free to move towards each other if the girders are bent, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-piece situated in their proximity, approaching the adjoining ends of the girders, in order to bend the two girders in the direction in which they will bend under the action of the service loads, maintaining the girders in their pre-bent position, by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

In the copending application No. 221,967, applicant proposed to bend rigid metal reinforcements for prestressed reinforced concrete beams in the direction in which they will bend under the effect of the service loads, and to prevent these reinforcements thus bent from returning to their initial position, by causing concrete to adhere to at least one portion of the fibres of the reinforcements, the stresses of which caused during the service are tensions.

More particularly, he proposed to bend two reinforcements of this kind simultaneously by approaching their extremities whilst maintaining their middle part at a constant distance. He has also proposed to approach the middle of the two reinforcements whilst the extremities are maintained at a constant distance. In the case where the extremities are approached towards each other, the reinforcements can, of course, be caused to bend by maintaining them at a constant distance at other points than in their middle, more particularly at one quarter of their length from each extremity.

The object of the present invention is to provide a particular method of construction of the above mentioned cross-piece combined with other characteristics which will facilitate the handling of the reinforcements when they are joined together, as well as the placement of the iron work, the encasing, and concreting of the beams of pre-bent reinforced concrete of which the reinforcements in question form a part.

For this purpose, in the equipment according to the

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invention the above mentioned cross-pieces are arranged in such a way as to project laterally with respect to the reinforcements to be bent.

The parts of the cross-pieces which project laterally relatively to the reinforcements to be bent serve as supporting member with a view to:

(1) The placement of the set of the two reinforcements which have been bent, leaving free along their whole length the fibres to which the concrete is intended to adhere; this eliminates any obstacle to the placing of a continuous casing and of continuous secondary bars for the concrete;

(2) The attachment of the set of the two reinforcements in all displacements and handlings.

These cross-pieces are advantageously connected together by tighteners to stiffening means, which are kept applied against the core of the reinforcement. They then form part of a bracing intended to prevent any lateral slipping away or buckling of the different elements of the two reinforcements.

In the case of the simultaneous bending of two reinforcements by the approach of certain of their parts whilst other parts are maintained at a constant distance, use may advantageously be made for effecting this approach of an equipment which comprises two traverses united together by two screw-threaded rods provided with screw nuts, one of these traverses being so arranged as to lean against one of the reinforcements to be bent whilst the other traverse serves as a support to a jack, the thrust of which is transmitted to the other reinforcement to be bent.

In order to prevent the separation of the corresponding parts of the two rigid metal reinforcements which have been bent one towards the other by the approach of certain parts whilst other parts were maintained at a constant distance by cross-pieces, use is preferably made of an equipment which comprises on the one and the other side of the web of each of the reinforcements at the points to be maintained approached one to the other after bending of the reinforcement, stiffening means, which are kept applied against the web of the same and provided with sole-plates which project laterally relatively to the reinforcements, the sole-plates pertaining to stiffening means situated on the same side of the reinforcements being connected together by ties of adjustable length.

With such an equipment the ties intended to prevent the separation of the reinforcements until the concrete has become set are much shorter than the bolts forming part of the equipment above suggested for effecting the approach of these parts by means of hydraulic jacks.

When the ties above mentioned consist of rods screw-threaded in two opposite directions, this equipment itself can serve as a means for bending the reinforcements, if it is found satisfactory to calculate the forces applied thereto on the basis of the deformations to which they are subjected. It also permits of stopping the effort that caused the bending without the intervention of jacks.

In order to avoid the above mentioned ties of adjustable length being subjected to bending in a plane parallel to the bending plane of the two reinforcements, owing to the angle made after bending by the parts of the reinforcements where the above mentioned sole-plates of the stiffening means shall have concave surfaces, the section of which by a plane parallel to the plane where the bending is effected is a circumference, and that on these sole-plates rest, by complementary convex surfaces screw-nuts which engage with rods screw-threaded in two opposite directions and which traverse the sole-plates with play.

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Other details of construction of the invention are hereinafter described with reference to the accompanying drawings illustrating diagrammatically and by way of example various forms of construction of the equipment according to the invention.

Figure 1 is an elevation showing diagrammatically a pair of reinforcements to be bent and an equipment intended to maintain constant the distance between certain points of the two rigid metal reinforcements, the extremities of which have to be approached towards each other;

Figure 2 is a side view of the reinforcements and of the equipment shown in Figure 1;

Figure 3 is a view similar to the one illustrated in Figure 2 and showing the set suspended;

Figure 4 is another view similar to Figure 2, showing the set resting on supports, which maintain the lower sole-piece of the lower reinforcement free of any contact along its whole length;

Figure 5 is a side view of a pair of reinforcements and of an equipment intended to approach certain points of the two metal reinforcements and to maintain these points at a constant distance after bending of the reinforcements;

Figure 6 shows two reinforcements and another equipment intended for the same action as that shown in Figure 5;

Figure 7 is an elevation of a part of the set shown in Figure 6, being at right angles to that shown in the latter figure;

Figure 8 illustrates, like Figure 2, a modification of an equipment having the same action as that shown in Figures 1 and 2;

Figure 9 illustrates, like Figure 1, part of the set illustrated in Figure 8;

Figure 10 shows an equipment intended to approach certain points, for example the extremities of two metal reinforcements and to maintain these extremities at a constant distance after bending of the reinforcements;

Figure 11 is a section taken along the broken line XI—XI of Figure 10;

Figure 12 is a plan view of a member shown in Figures 10 and 11; and

Figure 13 shows, partly in section, a side view of another modification of the equipment illustrated in Figure 5.

In all these figures, to indicate identical parts the same references are used.

Referring to the drawings, 2 and 3 in Figure 1 are two rigid metal reinforcements which, even by themselves, resist bending. These reinforcements are of I-section profile. They are separated from each other by cross-pieces 4, which are also of I-section profile. As can be seen from Figure 2, these cross-pieces 4 project laterally, relatively to the reinforcements 2 and 3. The lower reinforcement 2 rests on supports 5.

The cross-pieces 4 and the supports 5 are arranged at one quarter of the length of the reinforcements 2 and 3 reckoned from each one of the extremities thereof. The reinforcements 2 and 3 have to be bent by approaching their extremities. During their bending there is the risk of buckling. In order to avoid this, stiffening means 6 are disposed on one and the other side of the webs of the reinforcements 2 and 3. These stiffening means are also disposed at a quarter of the length of the reinforcements reckoned from each one of the extremities thereof. They are connected to the cross-pieces 4 by tighteners 7 which form a bracing. The stiffening means 6 on the one and the other side of the web of the same reinforcement are applied temporarily against this web by means of bolts 8 (Figure 2) traversing the same.

The set constituted by the elements 2 to 4 and 6 to 8 may easily be manipulated, for instance by being suspended by chains 9 (Figure 3) of a rolling bridge. It

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may also be supported by supports 10 (Figure 4) higher than the supports 5 in Figures 1 and 2, so as to facilitate the placement of the iron work, the encasing and the concreting, while the reinforcements 2 and 3 are maintained bent, of the parts thereof subjected to tension owing to the bending.

The cross-pieces 4 are provided, as shown in Figures 1 and 2, with arched supports 11 which allow the angle that the reinforcements in contact with the supports form with the corresponding cross-pieces to be changed. These arched supports form in traverse section a rounded boss at the point that comes in contact with the corresponding crosspiece 4. Flats 12 are interposed between one of the sole-pieces of one of the two cross-pieces 4 and the reinforcement which is in contact with the arched support 11 of this sole-piece, in order to prevent the rocking of the cross-piece relatively to the reinforcement in contact with the flats 12. This prevents the set of the reinforcements 2 and 3 and of the cross-pieces 4 being in unstable equilibrium.

In order to approach the extremities of the two reinforcements 2 and 3, maintained locally at a constant distance by the cross-pieces 4, use may be made of an equipment such as shown in Figure 5. This equipment comprises two traverses 13 and 14 connected by two screw-threaded rods 15 and 16 engaged with screw-nuts 17.

The traverse 13 is supported on the reinforcements 3, whilst the traverse 14 serves as a support to a jack 18, the piston of which is indicated at 19. The thrust of this jack is transmitted to the reinforcement 2 through the intermediary of a third traverse 20 which slides freely relatively to the screw-threaded rods 15 and 16. For this purpose, this third traverse is provided with holes 21 having a diameter slightly greater than the outer diameter of the screw-threaded rods 15 and 16. These are provided with screw-threaded parts at points such that by screwing screw-nuts 22 engaging therewith, the latter can be drawn against the face of the third traverse 20 opposite the one by means of which this traverse is in contact with the reinforcement 2.

When the reinforcements 2 and 3 have been bent under the action of the jack 18—19, the screw-nuts 22 are brought against the traverse 20 in such a manner as to keep the reinforcements bent after removal of the jack.

When it is desired to allow the extremities of the reinforcements 2 and 3 to separate, it suffices to again separate the third traverse 20 from the traverse 14 by means of the jack 18—19, so that the screw-nuts 22 can be easily unscrewed. The piston 19 is then allowed to enter into the jack 18.

In order that it may not be necessary to fix the traverse 13 and 14 as well as the long screw-threaded rods 15 and 16 during the whole of the time that the reinforcements 2 and 3 have to remain bent, in order that the concrete applied on the tensioned part of these bent reinforcements shall have sufficiently been hardened to be able to oppose the tendency of the reinforcements returning to their initial form, a modification has been provided for maintaining the extremities of these reinforcements approached to one another by means of an equipment, as illustrated in Figures 6 and 7. This equipment comprises on the one and the other side of the web of each one of the reinforcements 2 and 3, at the points where the reinforcements have to be maintained close to one another after bending, stiffening means constituted by U-shaped irons 23, the webs 24 of which are kept applied against the webs of the reinforcements by means of bolts 25 and the wings 26 of which project laterally with respect to the reinforcements. These wings have the shape of a trapezium, the large base of which is soldered to a sole-plate 27. The latter projects laterally with respect to the reinforcements 2 and 3. The

sole-plates 27 pertaining to the stiffening means situated on the same side of the reinforcements are connected together by ties of adjustable length constituted by rods 28 which are screw-threaded in two opposite directions. These sole-plates have concave surfaces 29, the section of which by a plane parallel to the plane in which the bending is effected is a circumference. These surfaces 29 support screw-nuts 30 engaging with the screw-threaded rods 28 which traverse the sole-plates 27 with play. The surface of these screw-nuts which abuts against the surface 29 of the sole-plates 27 is convex and complementary to the surface 29. The surface 29 in Figure 6 is cylindrical, having generatrices at right angles to the plane in which the bending is effected.

During the time that the jack 18—19 approaches the extremities of the reinforcements, the screw-threaded rods 28 are turned in such a manner as to maintain the screw-nuts 30 in contact with the surfaces 29 of the sole-plates 27. When the jack 18—19 is caused to cease to operate, the rods 28 keep the reinforcements 2 and 3 bent until these rods are rotated in the required direction to free the reinforcements from the previous bending effort to which they were subjected.

Being provided with two screw-threads in opposite directions, the rods 28 can serve to bend the two reinforcements by approaching their adjacent extremities without it being necessary to use jacks. In this case, one cannot know the efforts applied to the reinforcements, except by calculation based on the deformations they undergo.

The traverse 13 and 20 of the equipment shown in Figure 5, as well as the traverse 13 and the head of the piston 19 of the equipment illustrated in Figures 6 and 7 are advantageously provided with arched supports 31 similar to the arched supports 11 in Figure 2. These arched supports are provided with spurs 32 intended to engage in holes provided in the sole-pieces of the reinforcements 2 and 3 to be bent. In Figure 5 spurs 33 of the same kind ensure the exact position of the arched supports 31 relatively to the traverses 13 and 20, of the traverse 20 relatively to the piston 19, and of the jack 18 relatively to the traverse 14. In Figure 6, similar spurs ensure the exact position of the arched supports 31 relatively to the traverse 13 and to the piston 19, as well as of the jack 18 relatively to the traverse 14.

Figures 8 and 9 illustrate a modification of the equipment shown in Figures 1 and 2, according to which the cross-pieces instead of being constituted each by an I-section iron, are constituted by two U-section irons 4' applied on the one and the other side of an iron flat 11', the width of which is greater than the U-section irons 4', which it separates. The edges of this iron flat 11' are rounded off and thus play the same part as the arched supports 11 shown in Figures 1 and 2.

Figures 10, 11 and 12 illustrate a modification of the equipment according to Figure 6, in which the screw-threaded rods 15 and 16 are guided relatively to the screw-jack 18—19 through the intermediary of a member 34 moving with the screw-jack and which slides along these rods. The member 34 carries the support 31 which allows the angle of the reinforcement 2 to be varied with the piston 19. The member 34 is mounted thereon on the latter in a detachable manner.

The guide 34 prevents the rocking of the rods 15—16 relatively to the jack 18—19 when the effort exerted by the latter would not be directed exactly in the plane passing through the axes of these two rods.

Figure 13 shows a modification of the equipment according to Figure 5, in which the second traverse 14 is mounted on internally screw-threaded members 38 provided with heads 39, against which abuts the traverse 14. The members 38 are screwed on the screw-threaded rods 15, 16 beyond the screw-nuts 22, which abut against the

third traverse 20 through the intermediary of which the effort of the jack 18 is transmitted to the reinforcement 2. When the reinforcements 2 and 3 are bent and the screw-nuts 22 have been screwed against the traverse 20 to keep them bending, the members 38 may be unscrewed and they may be removed at the same time as the traverse 14 and the jack 18—19. The removal of these parts facilitates the handling of the group of the two bent reinforcements.

Of course, the invention is not exclusively limited to the forms of construction illustrated, and modifications may be effected as regards the form, the distribution and the constitution of certain parts used in carrying out the invention, provided that these modifications are within the scope of the invention as claimed in the appended claims.

For example the sole-plates 27 may be provided with a spherical supporting surface instead of the cylindrical one mentioned in connection with Figure 7. In this case, the surface of the screw-nuts 30 in contact with these sole-plates must, of course, be spherical so as to be complementary to the spherical surface of the sole-plate.

The screw-threaded rods 15 and 16 may be made integral with a head, as in the case of bolts.

The temporary fixing of the stiffeners 6 and 25 may be effected otherwise than by means of bolts. In certain cases the fixing might be permanent.

What I claim is:

1. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of pre-compressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girder in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction in which they will deform under service loads, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-piece situated in their proximity, applying a moment to the girders to cause the adjacent ends of the girders to approach each other, in order to spring the two girders in the direction in which they will deform under the action of the service loads, maintaining the girders in their thus sprung position, by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

2. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction in which they will deform under service loads, maintaining locally the two girders at a

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constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-pieces situated in their proximity, applying a moment to the girders to cause the adjacent ends of the girders to approach each other, by acting on their remote faces, in order to spring the two girders in the direction in which they will deform under the action of the service loads, maintaining the girders in their thus sprung position, by means acting on the next portions of said adjoining ends, removing said approaching means of said ends and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

3. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction in which they will deform under service loads, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening by removable means only portions of said girders which will be compressed by bending under the service loads in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-pieces situated in their proximity, applying a moment to the girders to cause the adjacent ends of the girders to approach each other, in order to spring the two girders in the direction in which they will deform under the action of the service loads, maintaining the girders in their thus sprung position by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

4. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these means planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction in which they will deform under service loads, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, connecting the stiffened portions of the girders to the projecting portions of the cross-pieces situated in their proximity by tighteners of adjustable length, applying a moment to the girders to cause the adjacent ends of the girders to approach each other, in order to spring the two girders in the direction in which they will deform under the action of the service loads, maintaining the girders in their thus sprung posi-

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tion by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

5. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction in which they will deform under service loads, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders one of these cross-pieces having on each side and the other on only one side a form permitting a change in the angle which the girder in contact with this cross-piece forms with the mean plane of the latter, stiffening said girders in the proximity of said cross-piece, bracing the stiffened portions of the girders and the projecting portions of the cross-pieces situated in their proximity, applying a moment to the girders to cause the adjacent ends of the girders to approach each other, in order to spring the two girders in the direction in which they will deform under the action of the service loads, maintaining the girders in their thus sprung position by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

6. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction in which they will deform under service loads, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-pieces situated in their proximity, applying arched supports against the remote faces of the adjoining ends of the girders in order to permit a change in the angle of the ends of the girder, applying a moment to the girders to cause said arched supports to be moved towards each other by a hydraulic jack mounted on a traverse through which pass two threaded rods carrying another traverse applied against one of the girders, said jack acting on the remote places of said ends in order to spring the two girders in the direction in which they will deform under the action of the service loads, maintaining the girders in their thus sprung position by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

7. A method for simultaneously springing two identi-

cal rigid metal girders by applying a moment thereto which will deform said girders transversely of their longitudinal axis in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform in a direction transversely of the longitudinal axis of said girders under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction transverse to the longitudinal axis of said girders, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-pieces situated in their proximity, applying arched supports against the remote faces of the adjoining ends of the girders in order to permit a change in the angle of the ends of the girder, preventing said arched supports to slide relatively to the ends of the girders, applying a moment to said girders to cause said arched supports to move towards each other by a hydraulic jack mounted on a traverse through which pass two threaded rods carrying another traverse applied against one of the girders, said jack acting on the remote faces of said ends in order to spring the two girders in the direction in which they will deform under the action of the service loads, maintaining the girders in their thus sprung position by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-piece at such a level that the whole is at a distance from the ground.

8. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders transversely of their longitudinal axis in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform in a direction transversely of the longitudinal axis of said girders under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction transverse to the longitudinal axis of said girders, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-pieces situated in their proximity, applying a moment to said girders to cause said adjacent ends of the girders to approach each other, in order to spring the two girders transversely of the longitudinal axis of said girders in the direction in which they will deform under the action of the service loads, maintaining the girders in their thus sprung position by screwed tighteners of adjustable length whose nuts have a curved face applied against a corresponding surface of the next portions of said adjoining ends, said curved surfaces having a circumference as section by a plane parallel to the plane in which the bending is effected, and supporting the pro-

jecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

9. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders transversely of their longitudinal axis in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform in a direction transversely of the longitudinal axis of said girders under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these mean planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction transverse to the longitudinal axis of said girders, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-pieces situated in their proximity, causing the adjoining ends of the girders to approach each other by a hydraulic jack mounted on a traverse through which pass two threaded rods carrying another traverse applied against one of the two girders, said jack acting on the remote faces of said ends, in order to spring the two girders transversely of the longitudinal axis of said girders in the direction in which they will deform under the action of the service loads, interposing between the piston of the hydraulic jack and one of the girders an arched support in order to permit a change in the angle of the end of the girder against which it is applied, maintaining the girders in their thus sprung position by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

10. A method for simultaneously springing two identical rigid metal girders by applying a moment thereto which will deform said girders transversely of their longitudinal axis in the direction in which they will be deformed by a service load preparatory to coating each girder with concrete to form a part of a beam of precompressed concrete and a thus sprung rigid metal girder, comprising arranging the two rigid metal girders in such a manner that their longitudinal mean planes in which they will deform in a direction transversely of the longitudinal axis of said girders under the effect of the service loads coincide and that they are symmetrical relatively to a plane perpendicular to these means planes, arranging also said rigid metal girders in such a manner that the ends of each girder are free to move towards each other under the application of a moment which will deform said girders in a direction transverse to the longitudinal axis of said girders, maintaining locally the two girders at a constant distance apart by interposition at a distance from their extremities, of cross-pieces projecting laterally relatively to the girders, stiffening said girders in the proximity of said cross-pieces, bracing the stiffened portions of the girders and the projecting portions of the cross-piece situated in their proximity, causing the adjoining ends of the girders to approach each other, by a hydraulic jack mounted on a traverse through which pass two threaded rods carrying another traverse applied against one of the girders, said jack acting on the remote faces of said ends in order to spring the two girders transversely of the longitudinal axis of said girders in the directions in which they will deform under the action of the service loads, guiding said threaded rods relatively to the hydraulic jack by means of a member movable with the piston of the latter and sliding along said threaded rods,

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maintaining the girders in their thus sprung position by means acting on the next portions of said adjoining ends, and supporting the projecting portions of said cross-pieces at such a level that the whole is at a distance from the ground.

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