June 5, 1934. E. H. SCHNEIDER 1,961,986

ADJUSTABLE ELASTIC STEEL FRAME BRIDGE

Filed Nov. 2, 1931 3 Sheets-Sheet 1

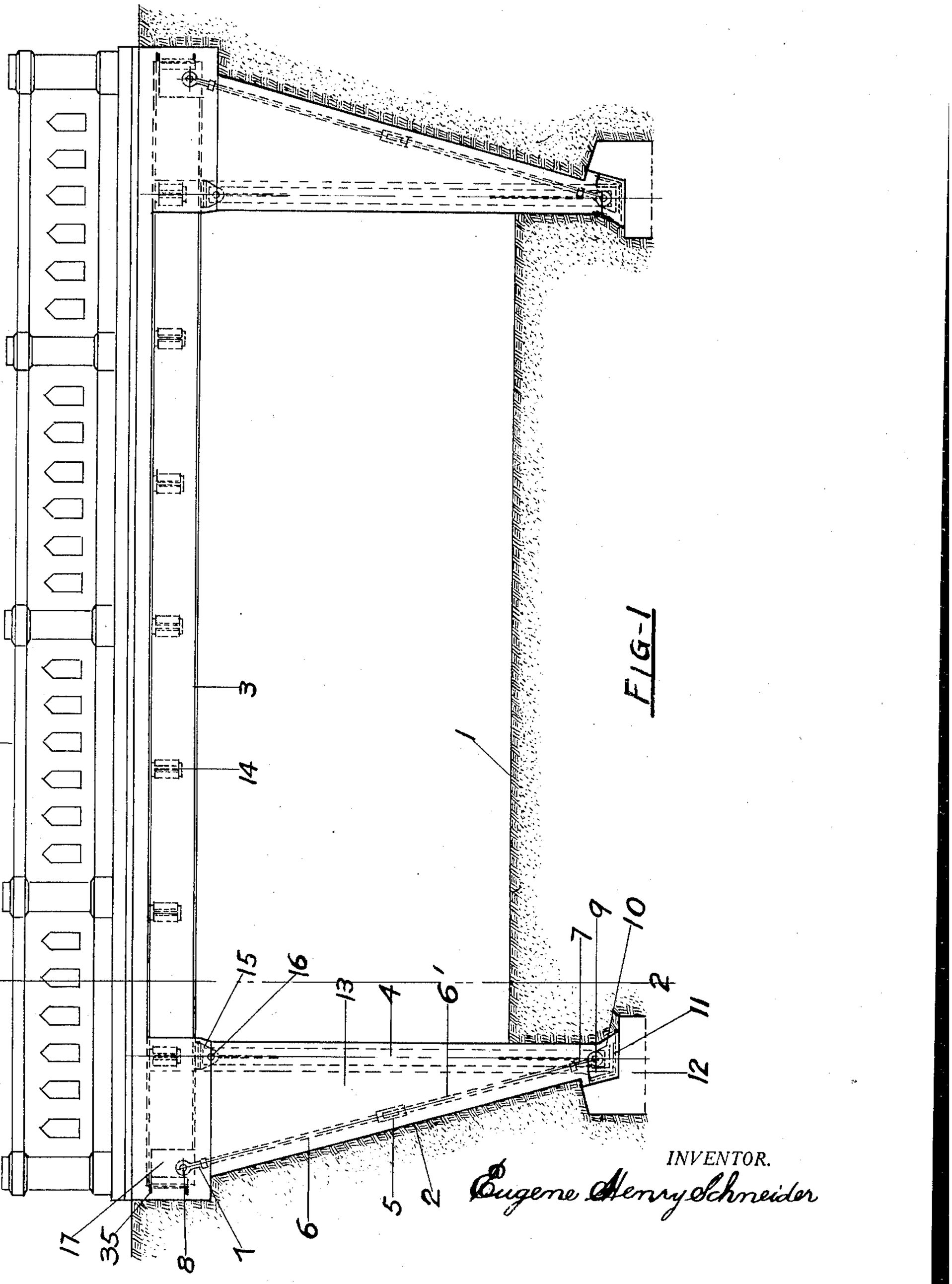

FIG-1

INVENTOR.

Eugene Henry Schneider

June 5, 1934. E. H. SCHNEIDER 1,961,986

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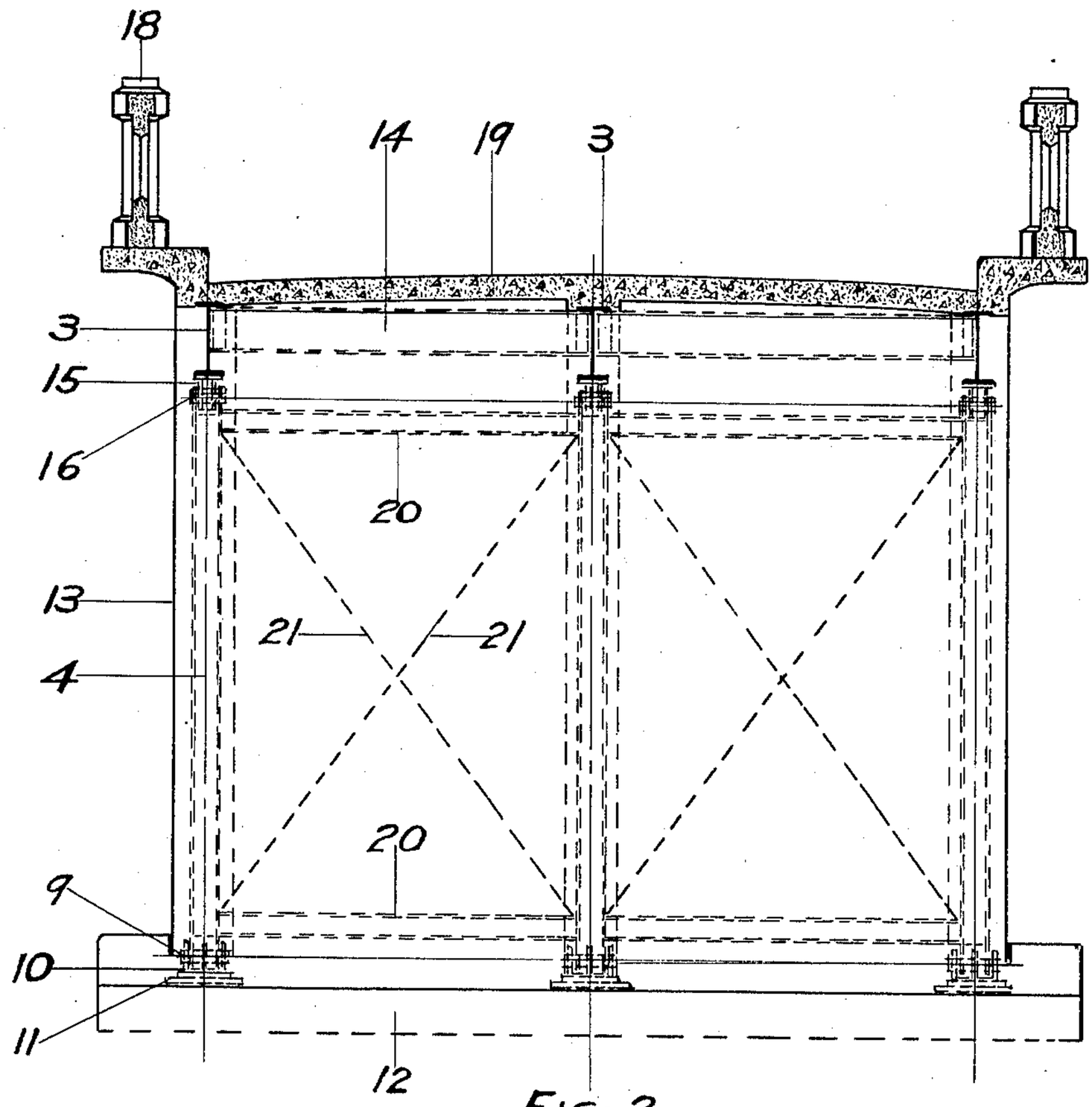

FIG-2

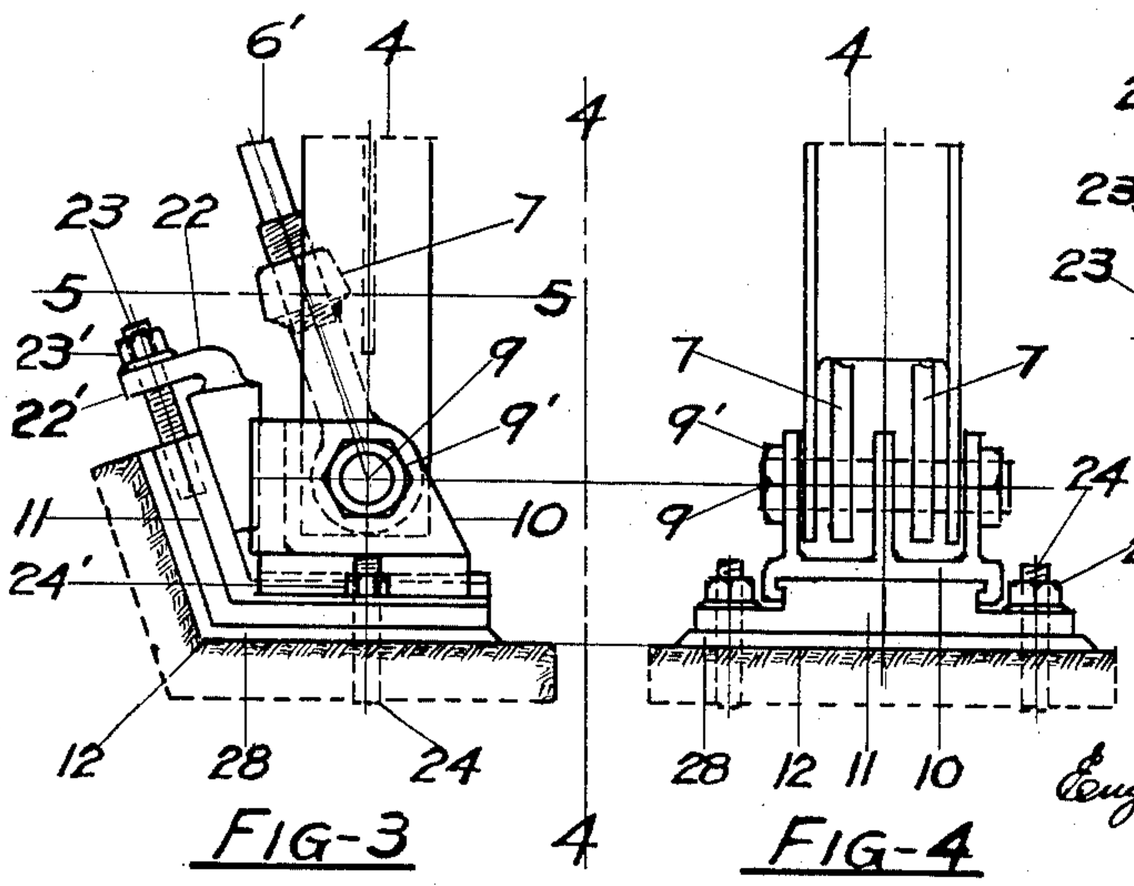

FIG-3

FIG-4

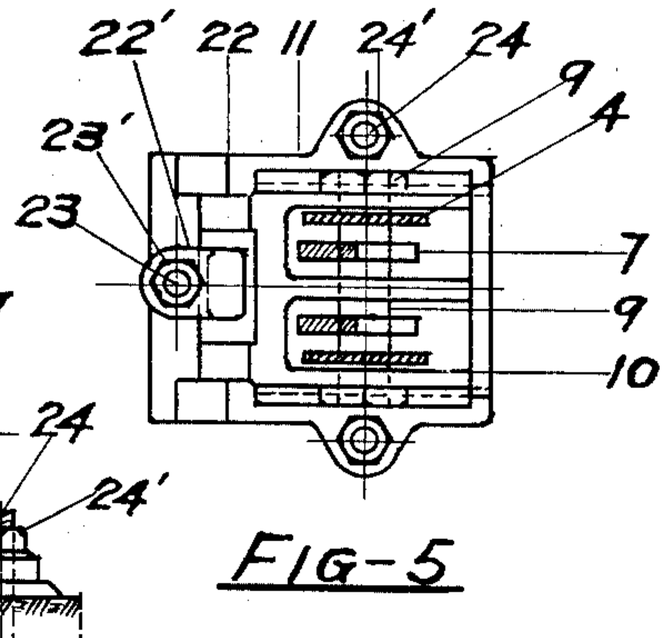

FIG-5

INVENTOR.

Eugene Henry Schneider

June 5, 1934. E. H. SCHNEIDER 1,961,986

ADJUSTABLE ELASTIC STEEL FRAME BRIDGE

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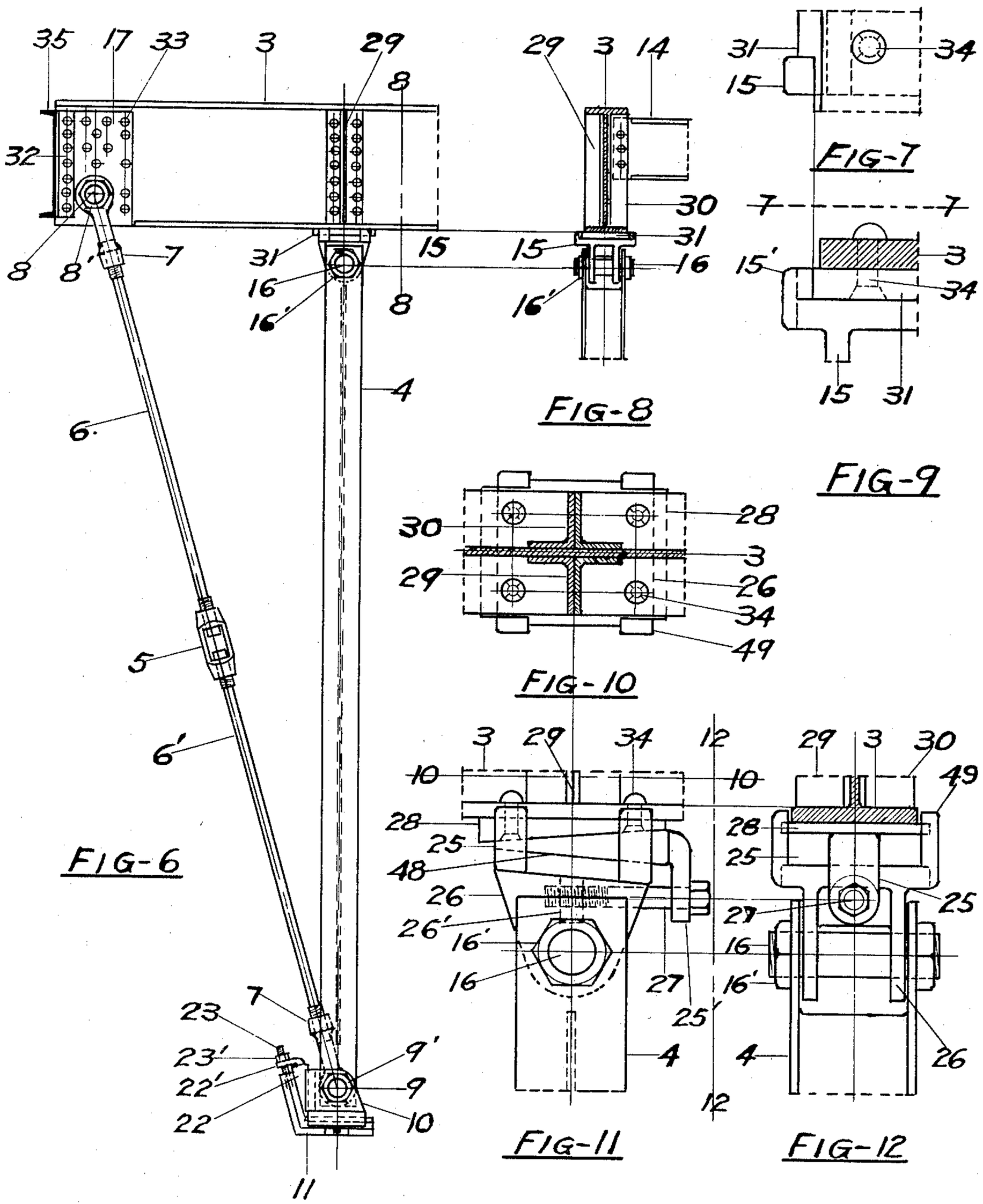

FIG-6

FIG-8

FIG-7

FIG-9

FIG-10

FIG-11

FIG-12

INVENTOR.

Eugene Henry Schneider.

Patented June 5, 1934

1,961,986

UNITED STATES PATENT OFFICE

1,961,986

ADJUSTABLE ELASTIC STEEL FRAME BRIDGE

Eugene Henry Schneider, Denver, Colo.

Application November 2, 1931, Serial No. 572,641

13 Claims. (Cl. 14—1)

The invention relates to steel bridge construction and has for its general object the provision of a novel steel bridgework wherein means is provided for adjusting the moments of force or bending strains applied to the beam or beams so as to compensate for strain imposed upon the middle of the arch and also to compensate for changes resulting from variations in thermal conditions.

An important object of the invention is to provide a steel bridge structure in which the ends of the supporting beams are mounted upon columns or posts, means being also provided for applying a certain predetermined strain upon the ends of the beams outwardly of their fulcrum points so as to apply a bending movement compensating for strains coming upon the middle of the arch so that an extraordinary strong structure will be produced, the expansion and contraction of the beams due to varying changes of temperature being compensated for by the distortion of the structure.

A more specific object of the invention is to provide a bridge structure embodying a column and a novel wedge operated means at its base in conjunction with turnbuckles or the like forming part of tension member means for effecting the desired adjustment.

Another object is to provide a structure of this character in which there may be, if so desired, provided a bridge structure embodying a tension member (without turnbuckles or clevises), and a column in conjunction with a novel wedge operated means at the bottom of the column means for effecting the desired adjustment.

A further object of the invention is to provide a structure of this character in which an adjustment such as is desired may be effected at the time of the erection of the bridge so that the stresses in the structure due to variations in seasonal or weather temperatures will be the same as if the bridge had been erected at the mean normal temperature for the particular locality in which the bridge is being built whatever may be the temperature due to the season of the year or the weather conditions at the time of its erection.

To the attainment of the foregoing and other objects and advantages, the invention preferably consists in the details of construction and the arrangement and combination of parts to be hereinafter more fully described and claimed, and illustrated in the accompanying drawings, in which,

Figure 1 is a view taken across a river bed or highway and showing my bridge in elevation.

Figure 2 is a vertical cross section taken on the line 2—2 of Figure 1.

Figure 3 is an enlarged elevation of the lower end of the supporting structure.

Figure 4 is an elevation taken at right angles to Figure 3.

Figure 5 is a horizontal cross section taken on the line 5—5 of Figure 3.

Figure 6 is an enlarged side elevation of the brace structure at the ends of the beam.

Figure 7 is a cross section taken on the line 7—7 of Figure 6.

Figures 8 and 9 are detail views, and

Figures 10, 11 and 12 are detail views illustrating a modified construction wherein one of the adjusting means is provided at the top of the column supporting the beams instead of in the back tension members 5, 6 and 6′.

Referring more particularly to the drawings, the numeral 1 designates the bed of a stream or a roadway over which the bridge is to be constructed. The numeral 2 designates the sides of the embankment or the shore of the stream, all depending upon where the bridge is located. Of course the bridge comprises any desired number of beams 3 which may be rolled beams, girders, or trusses. Located beneath each of the beams 3 and spaced inwardly from the ends thereof are vertically extending columns or posts 4 which may be either of the rolled section or built up type. The numerals 6 and 6′ designate stay-bar sections connected at their inner ends by some suitable means such as turnbuckles 5 and having their outer ends anchored respectively to the beams 3 and the bottom of the posts or columns 4. In the present instance, particularly as illustrated in detail in Figure 6, the upper ends of of the stay-bars 6 carry clevises 7 connected with the ends of the beams 3 as by bolts 8, or the like. The lower ends of the stay-bar sections 6′ have threaded connections with clevises 7 which have pivotal connections, as for instance by bolts 9, with top shoes 10 slidably mounted on angularly bearing bottom shoes 11 anchored to a masonry foundation 12 by any suitable means such, for example, as the bolts 24.

The upper ends of the posts or columns 4 are pivotally connected at 16 with brackets 15 on the undersides of the beams or girders 3. It should of course be distinctly understood that there are reinforcing plates 17 and stiffener angles 29 and 30 at the connections of the clevises 7 and brackets 15 with the beams or girders 3.

Moreover it is apparent that the beams or girders 3 are intended to support a concrete deck 19 at the sides of which are concrete railings 18. Moreover it is intended that the vertical columns or posts 4 and the stay-bar (or tension) members comprised by the parts 6, 6' and 5 be encased or embedded in concrete indicated at 13. The posts or columns 4 at each end of the bridge may be braced by any desired number of stays or braces indicated at 21.

The construction at the lower end of each of the upright columns or posts 4 is of great importance and it will be observed that the top shoe 10 is slidable along the bottom shoe 11, there being a species of dove-tailed connections as clearly indicated in Figure 4. It is this slidability of the top shoe 10 which renders it possible to vary or adjust the bending moment exerted upon the end of the beam or girder 3. In order that adjustment may be effected, it will be observed that I have disclosed a wedge 22 engaging against the top shoe 10 and the bottom shoe 11, this wedge being provided with a lateral extension 22' through which passes a screw 23 anchored in the top shoe 11 and equipped with an adjusting nut 23. Clearly by turning down the nut 23' the wedge 22 may be forced downwardly so that coacting with or reacting against the bottom shoe 11 and the top shoe 10 it will move the bottom end of the column or post 4 inwardly or toward the center of the bridge so that the stays 6 and 6' connected by the turnbuckles 5 will operate to apply tension to the projecting upper end of the beam or girder 3.

In addition to the adjustment in the back stays or instead of the adjustment in the back stay I may provide the arrangement disclosed in Figures 10, 11 and 12 wherein the numeral 4 designates the post or column of Figure 6 and pivotally connected at its upper end as by a bolt 16 or the like with a shoe 26. In this instance the beam or girder 3 is provided at its under side with a wedge member 28. Moreover the shoe 26 has an inclined seat 48 and carries guides 49 embracingly engaging the projecting side edges of the wedge member 28. Interposed between the wedge member 28 and the inclined seat 48 is a wedge 25 having a lateral extension 25' through which passes a bolt 27 threaded into the central web 26' of the shoe.

In the operation of the second described form of the invention it will of course be readily apparent that when the bolt 27 is screwed in the wedge 25 will be forced between the wedge member 28 and the inclined seat 48 and will coact therewith for forcing the bottom end of the column or post 4 with its shoe back away from the center of the bridge and in proper relation with the bottom shoe 11 so that operating the wedge 22 in the manner hereinbefore described the desired amount of bending strain may be put into the beam or girder 3.

From the foregoing description and a study of the drawings it will be readily apparent that I have thus provided a simply constructed and comparatively inexpensive bridge structure of the steel type in which means is provided for effecting adjustments for various purposes and under different circumstances or conditions. It is thought that the construction, operation and advantages should be readily apparent to one skilled in the art without further explanation.

While I have shown and described the preferred embodiments of the invention, it should of course be understood that I reserve the right to make such changes in the details of construction and the arrangement and combination of parts as will not depart from the spirit of the invention or the scope of the subjoined claims.

Having thus described the invention I claim.

1. In a bridge structure, a plurality of vertically extending columns, horizontally extending beams supported upon the upper ends of said columns and having their ends projecting therebeyond, stay means comprising members pivotally connected with the projecting ends of the beams and also pivotally connected with the lower ends of the columns and having an adjustable connection with each other, and wedge means reacting against the beams and the upper ends of the columns.

2. In a bridge structure, a plurality of vertically extending columns, horizontally extending beams supported upon the upper ends of said columns and projecting therebeyond, adjustable stay members pivotally connected with the projecting ends of the beams and the lower ends of the columns, wedge means reacting against the beams and the upper ends of the columns, and means for shifting the lower ends of the columns laterally.

3. In a bridge structure, a plurality of vertically disposed columns, horizontally arranged beams supported upon the upper ends of the columns, foot members beneath the columns, wedge means reacting against the beams and the upper ends of the columns, shoes at the lower ends of the columns and means for moving the shoes at the lower ends with respect to the stationary foot members.

4. In a bridge structure, a plurality of vertically extending columns, a corresponding number of horizontally disposed beams supported upon the upper ends thereof, stationary foot members beneath the lower ends of the columns, and wedge means associated with said foot members for moving the lower ends of said columns.

5. In a bridge structure, a plurality of vertically extending columns, a corresponding number of horizontally disposed beams supported upon the upper ends thereof and projecting therebeyond, stays pivotally connected with the projecting ends of said beams, stationary foot members anchored at the lower ends of the columns, and means associated with said foot members for moving the lower ends of said columns comprising screw operated wedges.

6. In a bridge structure, a plurality of vertically extending columns, a corresponding number of horizontally extending beams supported upon the upper ends of said columns, stay members pivotally connected at their upper ends with the projecting ends of the beams, shoes mounted at the lower ends of the columns, means pivotally connecting the stays with said shoe members, stationarily mounted foot members, and screw operated wedge means for moving said shoes with respect to said foot members.

7. In a bridge structure, a plurality of upstanding columns, a corresponding number of horizontally disposed beams pivotally supported upon the upper ends of said columns, stay members pivotally connected with the projecting ends of the beams, shoes at the lower ends of the columns pivotally connected with the lower ends of the stay members, and screw operated means connected with said shoes for moving the same.

8. In a bridge structure, a plurality of vertically arranged columns, a corresponding number of substantially horizontally disposed beams pivot-

ally mounted upon the upper ends thereof, stay members embodying turnbuckles, the stay members having their upper ends pivotally connected with the projecting ends of the beams, shoes pivotally connected with the lower ends of the stay members, stationarily mounted foot members and screw operated wedge members cooperating between the shoes and said foot members for moving the shoe at the ends of the columns with respect to the foot members.

9. In a bridge structure, a plurality of substantially vertically extending columns, a corresponding number of horizontally disposed beams pivotally mounted upon the upper ends of the columns, said beams having their ends projecting beyond the columns, stay members pivotally connected at their upper ends with the projecting ends of the beam members and incorporating longitudinal adjusting means, shoes pivotally connected with the lower ends of said stay members, stationarily mounted foot members constituting bearings for said shoes, wedge members interposed between the shoes and the foot members and having lateral extensions, screws passing through said lateral extensions and into said shoes, and nuts on said screws bearing against said extensions for moving the wedge members to shift the position of the lower ends of the columns with respect to the shoe members.

10. In a bridge structure, a plurality of vertically extending columns, a plurality of horizontal beams at the upper ends of said columns, stationary supporting foot members for the lower ends of the columns, stay means pivotally connected with the outer ends of the beams and pivotally connected with the lower ends of the columns, and means at the lower ends of the columns for moving the same with respect to the foot members for applying a bending strain upon the beams.

11. In a bridge structure, a plurality of vertically extending columns, a corresponding number of horizontal beams mounted upon the upper ends of the columns, stays pivotally connected with the ends of the beams and with the lower ends of the columns, adjustable means interposed between the upper ends of the columns and the beams for applying bending strain upon the latter, and adjusting means at the lower ends of the columns.

12. In a bridge structure, a plurality of vertically extending columns, a corresponding number of horizontal beams mounted upon the upper ends of the columns, stays pivotally connected with the ends of the beams and with the lower ends of the columns, selectively operable adjustment means at the upper and lower ends of the columns for applying bending strain upon the beams, both of said means comprising screw operated wedges.

13. In a bridge structure, a plurality of substantially vertically arranged columns, a horizontally arranged beam supported upon the upper end of each column and projecting therebeyond away from the center of the bridge, a pivot mounting for the upper end of each column, a stay pivotally connected at its upper end with the projecting end of each beam and having a pivotal connection at its lower end with the lower end of each column, and wedge means reacting against the outer side of each column for shifting the lower end thereof inwardly toward the center of the bridge for developing tension strain in the stay for counteracting cantilever strains on the beam at the center of the bridge.

EUGENE HENRY SCHNEIDER.