Sept. 20, 1938. G. G. GREULICH 2,130,797

MULTIPLE UNIT BEAM

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FIG. 1.

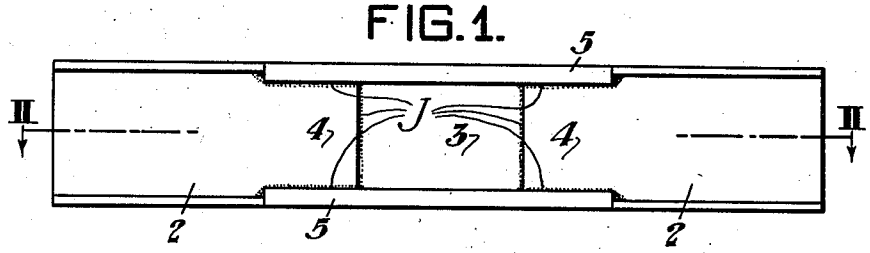


FIG. 2.

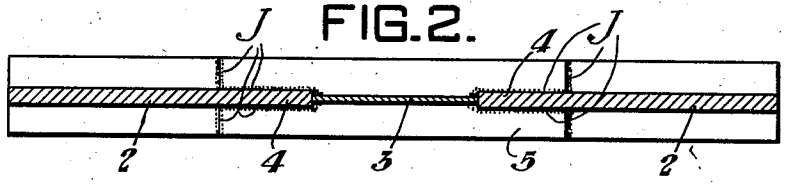


FIG. 3.

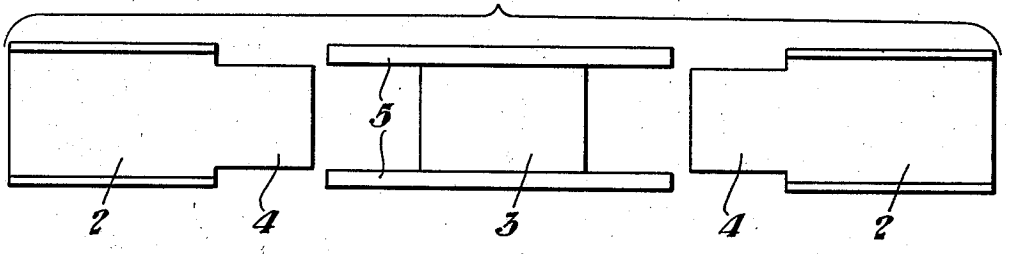


FIG. 4.

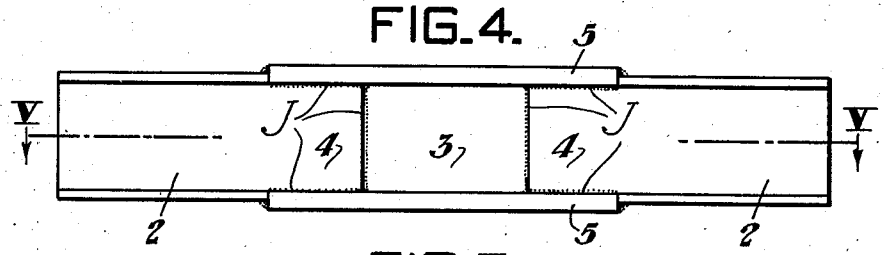
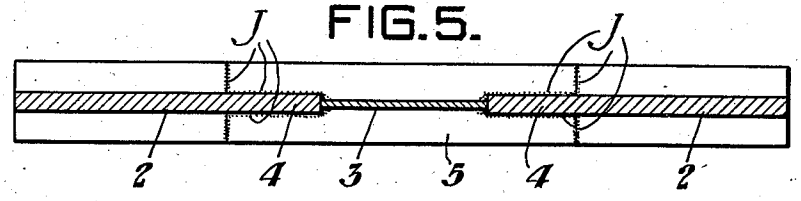


FIG. 5.



INVENTOR.
GERALD G. GREULICH,
BY: Vania & Lauber
HIS ATTORNEYS.

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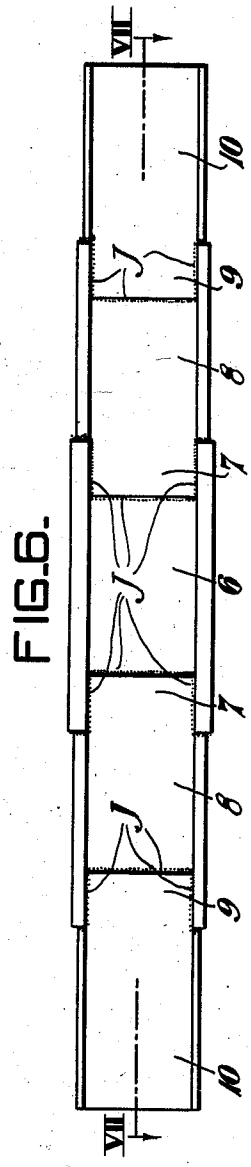


FIG.6.

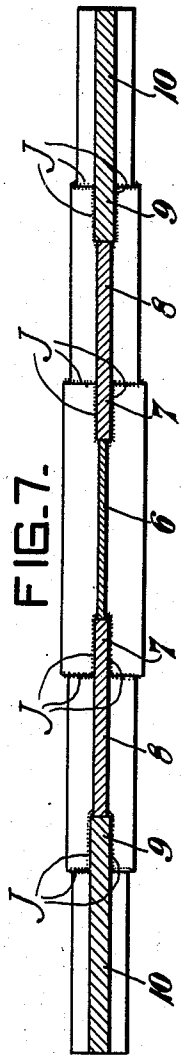


FIG.7.

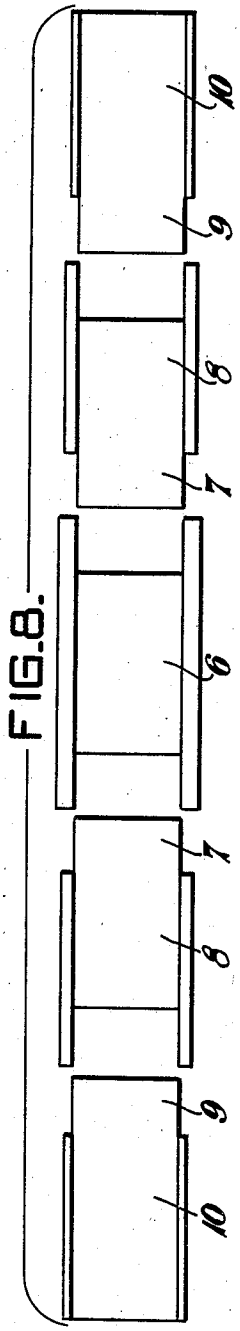


FIG.8.

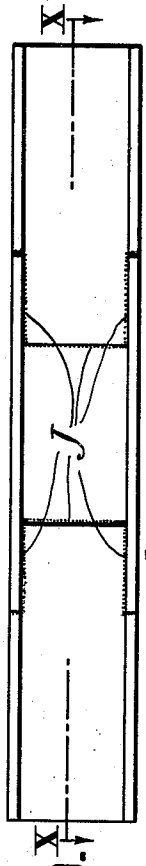


FIG.9.

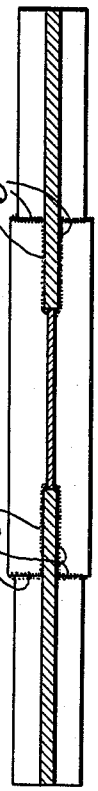


FIG.10.

INVENTOR.
GERALD G. GREULICH,
BY: Usina & Rauber
HIS ATTORNEYS.

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MULTIPLE UNIT BEAM

Gerald G. Greulich, Mount Lebanon, Pittsburgh, Pa.

Application January 21, 1937, Serial No. 121,657

5 Claims. (Cl. 189—37)

This invention relates to structural shapes and more particularly to built-up structural shapes or beams formed by welding standardized sections together.

An object of the invention is the provision of a beam made up from standardized sections and combined so as to produce a completed beam structure having a variable cross-sectional flange and web thickness as well as a variable length.

Other objects and advantages will become apparent as the description proceeds, in which:

Figure 1 is a side elevation of a beam constructed in accordance with the present invention;

Figure 2 is a section on line II—II of Figure 1;

Figure 3 is a separate view, in elevation, showing the spliced ends of the standardized sections preparatory to being assembled and welded;

Figure 4 is a side elevation of another form of beam;

Figure 5 is a section on line V—V of Figure 4;

Figure 6 is a side elevation of still another form of beam;

Figure 7 is a section on line VII—VII of Figure 6;

Figure 8 is a separated view of the standardized sections prior to assembling;

Figure 9 is a side elevation of a still further form of beam; and

Figure 10 is a section on line X—X of Figure 9.

In the drawings, the beam shown in Figures 1 to 3, inclusive, comprises standardized end-sections 2 having the same web and flange thickness and an intermediate or central section 3 having a flange thickness greater than that of the end-sections 2 and a web thickness less than the web thickness of the end-sections 2. The central section 3 has, at each end thereof portions of its web cut away, while an end of each end-section 2 has its flange and web cut away to provide a reduced portion 4 adapted to fit within the space between the flanges 5 at the cut-away portion of the web in the central section 3.

In the showing in Figures 1 to 3, inclusive, the completed beam has a uniform outside depth and width but includes a maximum flange thickness and a minimum web thickness at its central portion, where the greatest flange stress and minimum web stress are present, and a minimum flange thickness and a maximum web thickness on each end thereof where the minimum flange stress and maximum web stress are present. Also, the depth of the web is variable, as shown in Figure 3, the depth of the web on the end-sections 2 being greater than that in the central section 3, due to the latter section having a greater flange thickness than that on the end-sections 2.

The form of beam construction shown in Figures 4 and 5, is similar to that shown in Figures 1 to 3, inclusive, except instead of having a uniform outside depth, the depth is variable due to the height of the webs in each section being the same.

In the showing of Figures 6 to 8, inclusive, the depth of the web, in the various standardized sections, is uniform but owing to the flanges of the respective sections having different thicknesses, the completed beam has a variable outside depth.

In Figure 8, the central standardized section is indicated by the reference character 6 and, as shown, has portions of the web cut away at each end to accommodate the web-portion 7 of the adjacent standardized section 8 which has its flanges cut away, at one end, a distance equal to the cut-away portion on the section 6. The opposite end of this section 8 has its web cut away to receive the web-portion 9 of the standardized section 10, which section has its flanges cut away a distance equal to the cut away web-portion of the adjacent section 8.

In Figures 9 and 10, there is illustrated a multiple unit beam including a plurality of standardized sections provided with webs of uniform depth and flanges of uniform thickness. However, while the flanges are of uniform thickness they are variable in width, the central standardized section having a flange width greater than the adjacent sections.

It is well known that the ordinary beam or girder, as rolled, does not use its metal efficiently in resisting the internal strains and stresses which are set up. Ordinarily, the web stresses are a maximum at the end and reduce to theoretical zero at the center of the beam span. The flange stresses, however, are theoretical zero at the ends of the beam and are a maximum at mid-span. It is, therefore, desirable to reduce the thickness of the web material at the center of the span and increase the thickness of the flange material and its area at mid-span. The critical sections in the design of an ordinary rolled beam are the flange requirements at the center of the span and the web requirements at the ends. The fabricated welded beams, therefore present possibilities of effecting considerable economies in the use of material. It is possible to select web sections which progres-

sively decrease in thickness toward the center of the beam, whereas flange sections can be selected which increase in thickness.

In accordance with the present invention, it is not necessary to maintain a constant width of flange. It may often be desirable to decrease the width of flange material toward the end of the beam. In this case, the beam could be made up with a constant depth of web and also with a constant out-to-out depth of beam, the variation in flange areas being secured by changes in the width of the flange. Such a beam would show a constant thickness of flange from the side but viewed from the top, the sections of the flange would step down progressively in width toward the ends of the beam.

It will be noted from the drawings that under the present invention, it is possible to use standardized sections which are held in stock, and by welding the sections together at their junction along the line "J", a beam of any desired construction may be completed. In the case of the three-section beam, the end section for a considerable range in over-length of the beam can be made of one size and length, the variation coming all in the center section. It will also be seen that in all cases, the corresponding pairs of end sections are identical. In the case of the five-section beam, the two sections at each end of the beam again are identical, while the variation may come in the center section.

While I have shown and described one form of my invention, it will be understood that I do not wish to be limited exactly thereto, since various modifications may be made without departing from the scope of the invention, as defined by the appended claims.

I claim:

1. A multiple unit beam comprising preformed sections having varied web and flange thicknesses, some of said preformed sections having portions of the flanges cut away and at least one of said preformed sections having a portion of its web at each end cut away, the flanges and webs of said preformed sections abutted in end-to-end relationship and welded to form a unitary beam structure.

2. A multiple unit beam comprising preformed sections having varied web and flange thicknesses, some of said preformed sections having portions of the flanges cut away and at least one of said preformed sections having a portion of its web at each end cut away, the flanges and webs of said preformed sections abutted in end-to-end relationship and welded to form a unitary beam structure with the meeting point of the flanges of adjacent sections being in a different vertical plane from the meeting point of the web portions of said sections.

3. A multiple unit beam comprising preformed sections having varied web and flange thicknesses, some of said preformed sections having portions of the flanges cut away and at least one of said preformed sections having a portion of its web at each end cut away, the flanges and webs of said preformed sections abutted in end-to-end relationship and welded to form a unitary beam structure having a maximum flange thickness at its central portion and a maximum web thickness at its ends.

4. A multiple unit beam having a uniform depth comprising preformed sections having varied web and flange thicknesses, some of said preformed sections having portions of the flanges cut away and at least one of said preformed sections having a portion of its web at each end cut away, the flanges and webs of said preformed sections abutted in end-to-end relationship and welded to form a unitary beam structure.

5. A multiple unit beam having a variable depth comprising preformed sections having varied web and flange thicknesses, some of said preformed sections having portions of the flanges cut away and at least one of said preformed sections having a portion of its web at each end cut away, the flanges and webs of said preformed sections abutted in end-to-end relationship and welded to form a unitary beam structure.

GERALD G. GREULICH.