Aug. 11, 1964 R. C. CAPEK 3,144,105

SEPARABLE TWO-PART I-BEAM CONNECTOR

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Fig. 1.

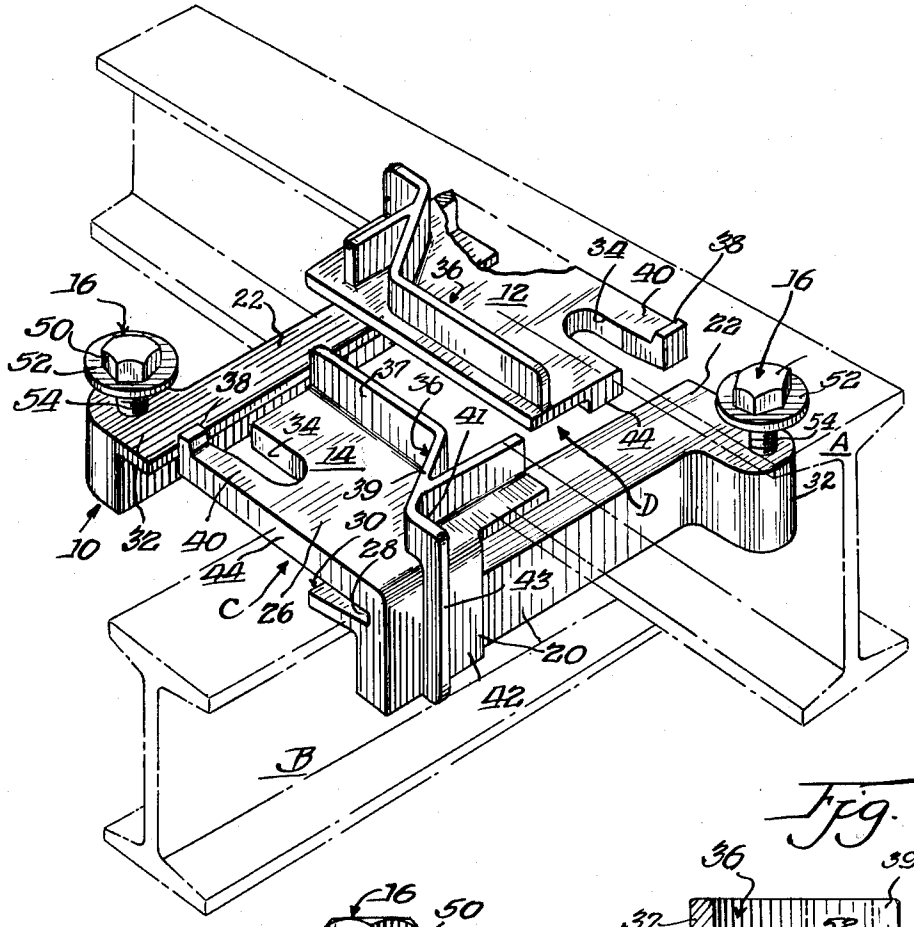
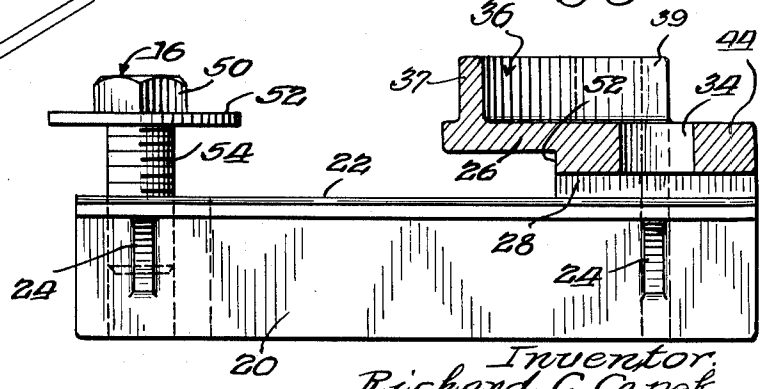


Fig. 3.



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Fig. 2.

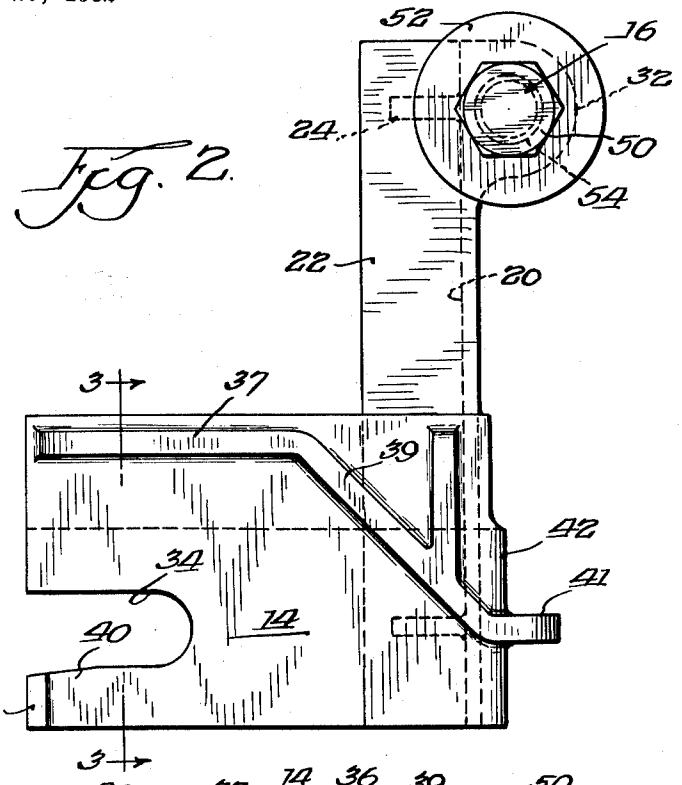


Fig. 4.

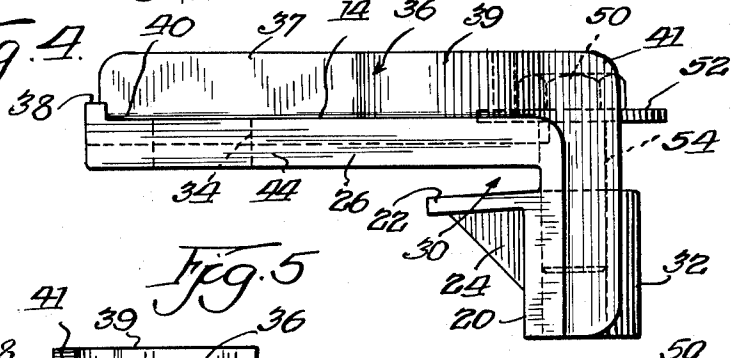
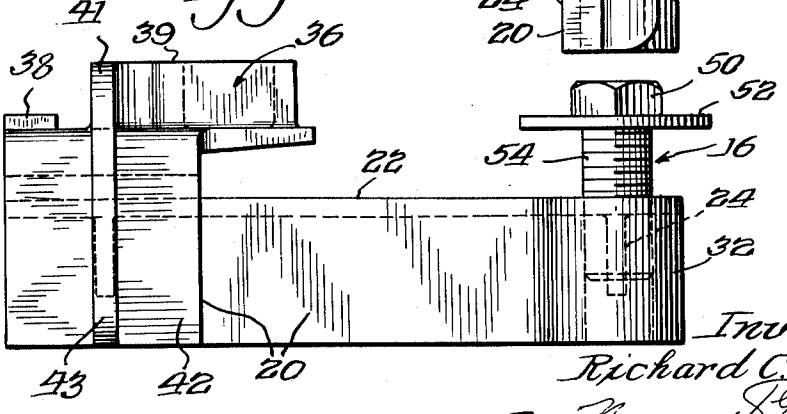


Fig. 5



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3,144,105

SEPARABLE TWO-PART I-BEAM CONNECTOR

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The present invention relates generally to a separable two-part I-beam connector by means of which two I-beams which cross each other at right angles may be connected together in abutting relationship to the end that one of the I-beams may be supported on or suspended from the other I-beam. More specifically, the invention is concerned with an I-beam connector of the aforementioned type and wherein the two connected I-beams which cross each other are positioned with their web parts extending in vertical planes, and with the bottom flange of the upper I-beam traversing or extending across the top flange of the lower I-beam in substantial face-to-face contact in the limited regions of the flanges where the same cross each other.

The connector of the present invention is capable of many applications in industry as, for example, in the erection of temporary steel scaffolding or in the construction of various forms of steel framework; and it has been found particularly useful in the building industry where the connector may be used to suspend one I-beam beneath another I-beam so that the suspended I-beam presents a cantilever support for a bulkhead which, in turn, supports the end framing for a floor slab in the erection of the concrete form for such floor slab. Irrespective, however, of the particular use to which the present invention may be put, the essential features thereof are at all times preserved.

One of the principal objects of the invention is to provide a separable two-part connector which may be operatively applied to the lower flange of an existing or previously erected horizontal I-beam at any selected medial region along the I-beam and, when so applied or installed, presents a combined guide channel and cradle support into one open end of which the upper flange of an I-beam to be suspended may be inserted endwise and slid through the guide channel to a selected position to attain the desired extent of cantilever support.

Another object of the invention is to provide a separable two-part connector wherein the two separable parts thereof are so designed that, when they are assembled upon each other, they establish upper and lower supporting channels for the adjacent crossing flanges of the two I-beams and in which the two parts may be applied directly to either or both I-beams in the medial crossing regions thereof despite the fact that the end regions of either or both I-beams may be provided with obstructions which normally prevent endwise introduction of the I-beam flanges into their respective channels.

A further object of the invention is to provide a separable two-part I-beam connector in which the two parts thereof are identical so that when they are formed of castings they may be produced from the same mold thereby contributing materially toward economy of manufacture.

Another object of the invention is to provide a connector of the type under consideration and wherein the two main parts thereof may be brought together and assembled upon the I-beams to be connected in a selective manner so that the parts may be tightened either from above the level of the upper I-beam or from below the level of the lower I-beam, the connector thus being applicable by a workman at either level.

A further object of the invention is to provide a separable two-part I-beam connector in which each of the two identical parts thereof have associated therewith novel reinforcing means for assimilating such vertical stresses as may be imparted to the parts by the I-beams on which the connector is installed.

Still another object of the invention is to provide a separable two-part I-beam connector which is applicable to the I-beams without requiring drilling, tapping or any other alteration or modification of the I-beams whatsoever.

Numerous other objects and advantages of the invention will become readily apparent from a consideration of the following description.

In the accompanying two sheets of drawings forming a part of this specification, one illustrative embodiment of the invention has been shown.

In these drawings:

FIG. 1 is a perspective view of a separable two-part I-beam connector constructed according to the principles of the present invention, such view showing the connector operatively applied to a pair of standard or conventional I-beams;

FIG. 2 is a top plan view of one of the two identical connector parts;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 2 and in the direction indicated by the arrows; and

FIGS. 4 and 5 are respectively side and end elevational views of the connector part which is shown in FIG. 2.

Referring now to the drawings in detail and in particular to FIG. 1, an I-beam connector embodying the present invention has been designated in its entirety by the reference numeral **10** and it consists of two identical parts **12** and **14**. These parts are preferably, but not necessarily, in the form of one-piece castings. Each part has associated with it a clamping bolt **16**, the nature and function of which will be made clear presently. For purposes of shipment and handling, the castings and their respective bolts may be left assembled and, in the installation of the parts upon the I-beams which are to be connected, there is therefore, no necessity for removal of the bolts. Since the two connector parts **12** and **14** are identical in every respect a description of one of them will suffice for the other.

The connector **10** is adapted for use in establishing a connection between the medial regions of two crossing I-beams such as the I-beams which are shown in dotted lines in FIG. 1 and are designated by the reference letters A and B, respectively. It may be assumed for purposes of illustration and discussion herein that the I-beam A is a fixed I-beam which has previously been installed in an erected structure and that after such installation has been effected it is required that the I-beam B be suspended from the I-beam A so that it passes beneath the latter and at right angles thereto so as to provide an underhanging cantilever portion on one side of the I-beam A.

Each connector part is generally in the form of an L-shaped casting in which the foot portion of the L is offset slightly from the leg thereof. The two castings are capable of being brought together and assembled upon each other in inverted relationship, with the foot and leg portions thereof extending in parallelism and straddling the web of the I-beams, respectively, so as to form a closed rectangular composite structure having overlapping parts near the distal ends of the foot and leg portions. When thus assembled, the two parts **12** and **14** define a wide but flat channel which is indicated by the arrow C in FIG. 1 and is adapted to receive the top flange of the lower I-beam B, and also define a similar wide and flat channel which is indicated by the arrow D and is adapted to receive the bottom flange of the upper

I-beam A. The two channels C and D intersect each other.

Referring now to FIGS. 2 to 5, inclusive, the leg portion of each L-shaped part is in the form of an elongated angle bar having a vertical flange **20** and a horizontal flange **22**, the two flanges being reinforced by gussets **24** near the ends of the flanges as best seen in FIG. 3. The foot portion of each L-shaped part is in the form of a flat and generally rectangular plate **26**, one end of which is connected to the vertical flange **20** by a short vertical web **28**. The plate **26** overlies and is spaced a small distance above the horizontal flange **22** and, in combination therewith, defines a narrow guide slot **30** (see FIG. 4). Insofar as the part **14** is concerned, the guide slot **30** is disposed at the proximate end of the leg portion and constitutes a part of the channel C. Insofar as the part **12** is concerned, the guide slot **30** opposes the guide slot of the part **14** and constitutes a part of the chanel D. The distal end of the vertical flange **20** is formed with a thickened boss **32** (see FIGS. 1 and 2) on the outer side of the angle bar and this boss is tapped and threaded for reception therein of the clamping bolt **16** in an upright position. The plate **26** of each connector part is formed with an open ended slot **34**, the sides of which are adapted to straddle the shank portion of the bolt **16** which is associated with the other part of the composite connector when the two parts **12** and **14** are assembled as will become more readily apparent presently.

The character of the two parts **12** and **14** of the present connector **10** has, in essence, been described above except for the provision of certain stress-assimilating ribbing and other reinforcing means for these parts. As clearly shown in FIG. 1, the plate **26**, the narrow web **28** and the vertical flange **20** of each connector part are formed with a continuous rib **36** which extends along one side edge of the plate as at **37** and then crosses diagonally over the plate as at **39**, then passes around the juncture between the plate and the flange **20** as at **41** and then extends downwardly along the outside faces of the web **28** and the flange **20** as at **43**. A short upstanding transverse rib **38** is formed on the narrow leg **40** which is created by reason of the slot **34**. Additional reinforcement is given to the casting of each connector part **12** and **14** by providing thickened regions **42** and **44** on the flange **20** and the plate **26**, respectively, these thickened regions serving various functions such as enabling the web **28** to have sufficient thickness to give it the necessary strength, and as lending reinforcement to the portions of the plate **26** on opposite sides of the slot **34**.

In the installation of the separable two-part connector **10** upon a given pair of I-beams such as the I-beams A and B of FIG. 1, assuming for purposes of discussion that the I-beam B is to be suspended beneath the I-beam A to provide an underhanging portion as shown in this view, two methods of assembly are available, depending upon whether the ends of the I-beam A are unobstructed and, therefore, available for sliding of the assembled connector into position or whether such ends are obstructed.

If the I-beam A is supported in any given installation so that one end thereof is free and unobstructed and, if there is no obstruction between this free end and the region where the installation of the connector **10** is to be made, the two parts **12** and **14** of the connector may be loosely assembled upon each other by juxtapositioning the two parts as illustrated in FIG. 1. The parts may then be brought closer together so that each bolt **16** on one part enters a slot **34** on the other part, after which the two bolts may be turned to a finger-tight condition to hold the parts thus assembled. At this time, the two intersecting channels C and D which extend at right angles to each other and at substantially the same elevation are established by reason of the provision of the narrow guide slots **30** which oppose each other but which are disposed in diagonally related regions across the generally rectangular structure defined by the two generally L-shaped

parts as previously described. The two juxtapositioned or loosely assembled parts **12** and **14** are effectively retained against separation by reason of the upstanding short ribs **38** which lie behind the flanged head portion **50** which is asociated with each bolt **16**. With the parts thus loosely assembled, the channel D may then be slipped in telescopic fashion over the free end of the bottom flange of the I-beam A and the assembled connector slid along this flange to the desired or selected region where the connection to the I-beam B is to be made. Thereafter, one end of the bottom flange of the I-beam which is to form the cantilever support is threaded or slid, so to speak, into the channel B endwise and the cross-over region of the flange is centered below the top flange of the I-beam A, after which the two bolts **16** may be fully tightened to clamp the flanges together. It will be understood that the intersecting portions of the two channels C and D which are established when the parts **12** and **14** are assembled are of sufficient vertical extent that both the bottom flange of the I-beam A and the top flange of the I-beam B may pass therethrough in face-to-face relationship with each other. The top flange of the I-beam B will rest upon the horizontal flange **22** of the part **12** and it also will extend into the guide slots **30** of both parts **12** and **14**. The bottom flange of the I-beam A will serve as a support for the two plates **26** and these plates will constitute suspension plates by means of which the composite connector **10** as a whole may be suspended from the upper I-beam.

It is to be noted at this point that when the connector **10** is asembled upon the two I-beams A and B, one edge of the bottom flange of the I-beam B abuts against the shoulder **52** (see FIGS. 1 and 3) which is established by reason of the thickened portion **42** of the plate **26** which is associated with the part **12**, thus preventing lateral shifting of the connector with respect to the I-beam. Where the I-beam B is designed to provide a cantilever support for framing or other parts, the height of the shoulder **52** may be slightly greater than the thickness of the adjacent edge of the bottom flange of the I-beam A, in which case the flange will not be securely clamped in the channel D, even though the bolts **16** be tightened. In such an instance, the connector **10** may be slid longitudinally along the I-beam A after the connector installation has been made so that small adjustments of the position of the I-beam B may be effected at any time subsequent to the installation.

In instances where it is desired that the two I-beams A and B be fixed in position after the connector **10** has been assembled thereon, the thickness of the shoulders **52** may be slightly less than the thickness of the adjacent edges of the bottom flange of the I-beam A so that, when the bolts **16** are tightened, they will serve to draw the abutting flanges of the two I-beams together between the plate **26** of each part and the underlying flange **22** of the other part.

If the I-beam A is supported in its installation in such a manner that both ends thereof are obstructed, thus preventing endwise threading of the assembled connector **10** onto the I-beam, the two parts **12** and **14** of the connector may be brought together around the bottom flange of the I-beam in the manner illustrated in FIG. 1. One convenient way of doing this is to slide the non-thickened portion **54** (see FIGS. 1 and 3) of the plate **26** of one part over an edge of the bottom flange of the I-beam A on one side of the I-beam web. Thereafter, a similar placement of the other part may be effected by sliding the non-thickened portion of its plate over the bottom flange of the I-beam A on the other side of the web. These placements of the two parts **12** and **14** may be made at regions which are widely separated longitudinally along the I-beam and on opposite sides of the region where the two I-beams are intended to cross each other. With the two parts thus placed on the bottom flange of the I-beam A, the pairs of bolts **16** and slots **34** will be in longitudinal

register so that, by sliding the two parts longitudinally along the I-beam and toward each other, the bolts **16** will enter the slots **34**.

If the I-beam B has a free and unobstructed end, the assembly of the two parts **12** and **14** on the I-beam A may be completed by sliding the top flange of this I-beam endwise into the channel C as previously described, but if the ends of the I-beams are obstructed or otherwise are unavailable for passage endwise into the channel C, the I-beam B may be manipulated in such a manner that the edge region of the top flange of the I-beam enters at least one of the guide slots **30**, after which the part embodying the other guide slot **30** may be shifted toward the I-beam B to effect entry of the edge region of the top flange thereof into the other guide slot. Thereafter, the bolts **16** may be tightened.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Neither is the invention to be limited to the specific environment in which it has been illustrated herein. For example, although the two parts **12** and **14** have been shown and described as being employed for suspending one I-beam beneath another I-beam so that the upper I-beam carries the weight of at least a portion of the lower I-beam, the connector may be employed for supporting the upper I-beam from the lower I-beam. In such an instance, the installation of the connector may be made by first applying the parts **12** and **14** to the upper flange of the lower I-beam and then effecting placement of the lower flange of the upper I-beam in position within the composite connector assembly. Furthermore, in the illustrated and described environment after the loosely assembled parts **12** and **14** are in position on the I-beams, the clamping bolts **16** project upwardly so that they may be manipulated from above the I-beams. If desired, however, the entire composite connector **10** may be inverted from the position in which it is shown in FIG. 1 so that the bolts **16** project downwardly to the end that they may be adjusted from beneath the I-beams. Still further, while the connector **10** has been illustrated and described as serving the function of connecting two I-beams together in their angular relationship, the connector is capable of use in connecting a pair of elongated flat plates or beams in such overlapping cross-relationship. Therefore, only insofar as the invention has particularly been pointed out in the accompanying claims is it to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A composite separable two-part I-beam connector comprising two identical connector parts, each part being in the form of a generally L-shaped casting and including an elongated horizontal leg portion and a horizontal foot portion projecting laterally from said leg portion at a right angle thereto and spaced upwardly therefrom a slight distance, the proximate end region of said foot portion overlying the proximate end region of the leg portion, each part also including a narrow web extending between the proximate end edge of the foot portion and one side edge of the leg portion and serving to maintain the leg portion and foot portion in their slightly spaced relationship, the underneath face of said foot portion and the upper face of the leg portion, in combination with the web, establishing a guide slot therebetween, the distal end of said foot portion being formed with a void therethrough, said connector parts being juxtapositioned, each upon the other, with the two foot portions and the two leg portions respectively extending in parallelism and projecting in opposite directions so as to define a closed generally rectangular loop, and with the distal end of the foot portion of each part overlying the distal end of the leg portion of the other part, and a clamping bolt projecting through the void in the foot portion of each part and threadedly received in the distal end region of the leg portion of the other part.

2. A composite separable two-part I-beam connector as set forth in claim 1 and wherein the voids in the distal ends of the foot portions of the two parts are in the form of open-ended slots.

3. A composite separable two-part I-beam connector designed for attachment to the bottom flange of a fixedly supported first horizontal I-beam and to the top flange of a second horizontal I-beam for suspending the second I-beam beneath the first I-beam in substantial contiguity and with the two I-beams extending at right angles from each other, said connector comprising two identical connector parts, each part being in the form of a generally L-shaped casting and including an elongated horizontal leg portion and a horizontal foot portion projecting laterally from said leg portion at a right angle thereto and spaced upwardly therefrom a slight distance, the proximate end region of said foot portion overlying the proximate end region of the leg portion, each part also including a narrow web extending between the proximate end edge of the foot portion and one side edge of the leg portion and serving to maintain the leg portion and foot portion in their slightly spaced relationship, said parts being adapted for juxtapositioning in the vicinity of the region of contiguity of the two I-beams with the foot portions straddling the web of the first I-beam and resting on the bottom flange thereof, and with the leg portions straddling the web of the second I-beam and serving to support the top flange thereof, and means for releasably clamping said parts in their juxtapositioned relationship.

4. A composite separable two-part I-beam connector designed for attachment to the bottom flange of a fixedly supported first horizontal I-beam and the top flange of a second horizontal I-beam for suspending the second I-beam beneath the first I-beam in substantial contiguity and with the two I-beams extending at right angles from each other, said connector comprising two identical connector parts, each part being in the form of a generally L-shaped casting and including an elongated horizontal leg portion and a horizontal foot portion projecting laterally from said leg portion at a right angle thereto and spaced upwardly therefrom a slight distance, the proximate end region of said foot portion overlying the proximate end region of the leg portion, each part also including a narrow web extending between the proximate end edge of the foot portion and one side edge of the leg portion and serving to maintain the leg portion of foot portion in their slightly spaced relationship, said parts being adapted for juxtapositioning in the vicinity of the region of contiguity of the two I-bears with the foot portions straddling the web of the first I-beam and resting on the bottom flange thereof, and with the leg portions straddling the web of the second I-beam and serving to support the top flange thereof, and with the distal end of the foot portion of each part overlying the distal end of the leg portion of the other part, and a clamping bolt projecting through the distal end of the foot portion of each part and threadedly received in the distal end of the leg portion of the other part for releasably clamping said parts in their juxtapositioned relationship.

5. A composite separable two-part I-beam connector designed for attachment to the bottom flange of a fixedly supported first horizontal I-beam and to the top flange of a second horizontal I-beam for suspending the second I-beam beneath the first I-beam in substantial contiguity and with the two I-beams extending at right angles from each other, said connector comprising two identical connector parts, each part being in the form of a generally L-shaped casting and including an elongated horizontal leg portion and a horizontal foot portion projecting laterally from said leg portion at a right angle thereto and spaced upwardly therefrom a slight distance, the proximate end region of said foot portion overlying the proximate end region of the leg portion, each part also includ-

ing a narrow web extending between the proximate end edge of the foot portion and one side edge of the leg portion and serving to maintain the leg portion and foot portion in their slightly spaced relationship, the distal end of said foot portion being formed with an open-ended slot therein, said parts being adapted for juxtapositioning in the vicinity of the region of contiguity of the two I-beams with the foot portions sraddling the web of the first I-beam and resting on the bottom flange thereof, with the leg portions straddling the web of the second I-beam and serving to support the top flange thereof, and with the distal end of the foot portion of each part overlying the distal end of the leg portion of the other part, and a clamping bolt projecting through each open-ended slot in the plate of each part and threadedly received in the distal end of the leg portion of the other part for releasably clamping said parts in their juxtapositioned relationship.

6. A separable two-part I-beam connector designed for attachment to the bottom of a fixedly supported first horizontal I-beam and to the top flange of a second horizontal I-beam for suspending the second I-beam from the first I-beam in substantial contiguity and with the two I-beams extending at right angles to each other in crossing relationship, said connector comprising two identical connector parts, each part being in the form of a generally L-shaped casting and including an elongated leg portion in the form of an angle piece having a vertical flange and a horizontal flange, and a horizontal foot portion projecting laterally from said leg portion and in the form of a generally flat horizontal rectangular plate, said plate being spaced upwardly a slight distance above the horizontal flange of said leg portion in overlying relationship and defining in combination therewith a guide slot in the proximate region of the leg and foot portions, the distal end of said plate being provided with an open-ended slot therein, said parts being adapted for juxtapositioning in the vicinity of the region of contiguity of the two I-beams with the plates straddling the web of the first I-beam and in coplanar relationship and resting upon the bottom flange thereof, with the horizontal flanges of the leg portions straddling the web of the second I-beam and supporting the top flange thereof, with said guide slots receiving the opposite longitudinal edges of said top flange therein, and with the distal end of the plate on each part overlying the distal end of the horizontal flange on the other part, and a clamping bolt projecting through each open ended slot in the plate on each part and threadedly received in the distal end of the leg portion of the other part for releasably clamping said parts in their juxtapositioned relationship.

7. A separable two-part I-beam connector designed for attachment to the bottom flange of a fixedly supported first horizontal I-beam and to the top flange of a second horizontal I-beam for suspending the second I-beam from the first I-beam in substantial contiguity and with the two I-beams extending at right angles to each other in crossing relationship, said connector comprising two identical connector parts, each part being in the form of a generally L-shaped casting including an elongated leg portion in the form of an angle piece having a vertical flange and a horizontal flange, and a horizontal foot portion projecting laterally from said leg portion and in the form of a generally flat horizontal rectangular plate, said plate being spaced upwardly a slight distance above the horizontal flange of said leg portion in overlying relationship and defining in combination therewith a guide slot in the proximate region of the leg and foot portions, the distal end of said plate being provided with an open-ended slot therein, the underneath side of said plate being provided with a laterally facing shoulder, said parts being adapted for juxtapositioning in the vicinity of the region of contiguity of the two I-beams with the plates straddling the web of the first I-beam and in coplanar relationship and resting upon the bottom flange thereof, and with the leg portions straddling the web of the second I-beam and supporting the top flange thereof, with the guide slots receiving the opposite longitudinal edges of said top flange therein, with the shoulders on the plates straddling said bottom flange and confining the same therebetween, and with the distal end of the foot portion of each part overlying the distal end of the leg portion of the other part, and a clamping bolt projecting through each open-ended slot in the plate of each part and threadedly received in the distal end of the leg portion of the other part for releasably clamping said parts in their juxtapositioned relationship.

8. The combination with upper and lower I-beams which cross each other in right angular relationship with the bottom flange of the upper I-beam directly opposing the top flange of the lower I-beam in substantial contiguity, of a two-part separable connector for maintaining said I-beams in their right angular relationship, said connector comprising two substantially identical connector parts each of which is in the form of a generally L-shaped casting having an elongated leg portion and an elongated foot portion connected together at their proximate ends, said parts being juxtapositioned in the region of contiguity of the I-beam flanges with the foot portions thereof extending parallel to and straddling the web of the upper I-beam and with the leg portions thereof extending parallel to and straddling the web portion of the lower I-beam, the leg portions of the thus juxtapositioned parts being provided with opposed guide slots within which the side edges of the top flange of the lower I-beam are received and supported, the foot portions of the thus juxtapositioned parts overlying the bottom flange of the upper I-beam and being supported on the latter, the distal ends of the foot portions overhanging the edges of the top flange of the lower I-beam, the distal ends of the leg portions overhanging the edges of the bottom flange of the upper I-beam and underlying the respective overhanging edges of the foot portions, and cooperating means extending between the overhanging edges of the foot portions and the underlying distal ends of the leg portions for releasably clamping said parts in their juxtapositioned relationship.

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