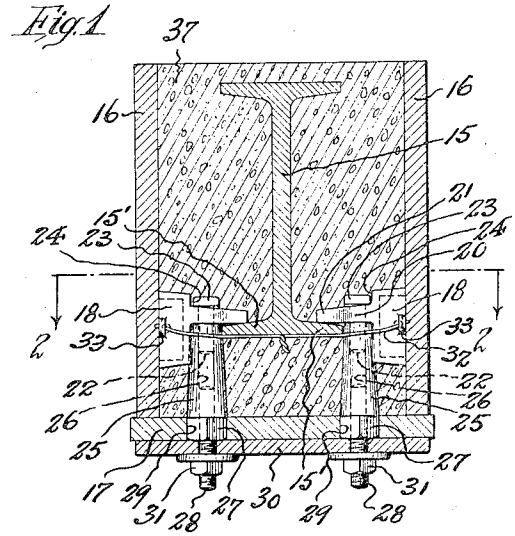
April 21, 1936. S. S. COLT 2,037,965

FORM SUPPORT

Filed Oct. 6, 1933 2 Sheets-Sheet 1

Fig. 1



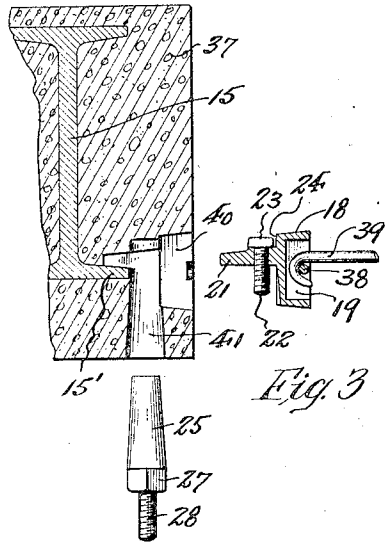
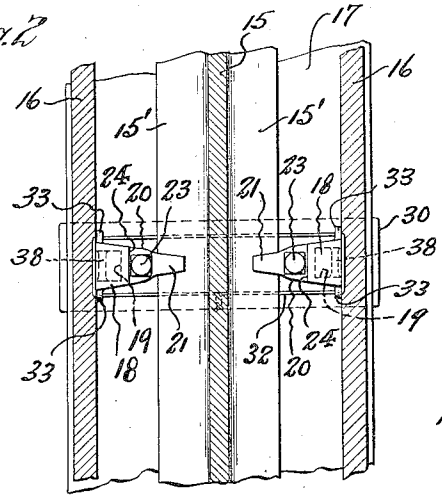


Fig. 3

Fig. 2



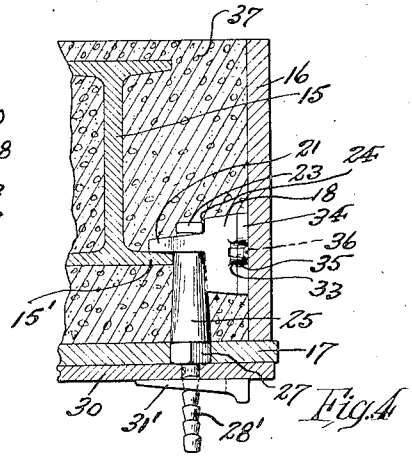
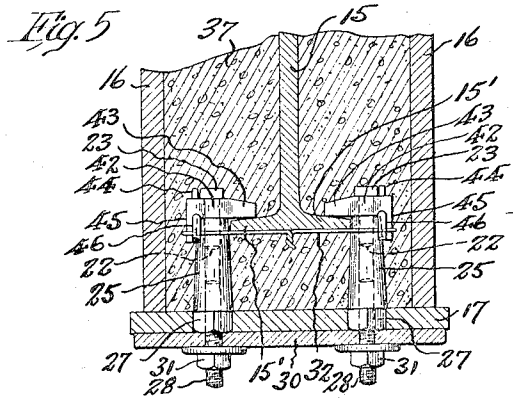


Fig. 4

Fig. 5



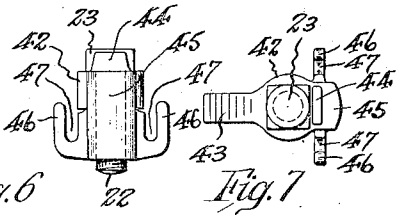


Fig. 6 Fig. 7

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April 21, 1936. S. S. COLT 2,037,965

FORM SUPPORT

Filed Oct. 6, 1933 2 Sheets-Sheet 2

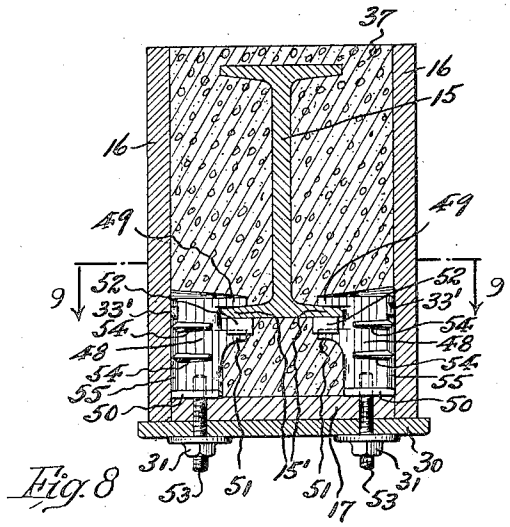


Fig. 8

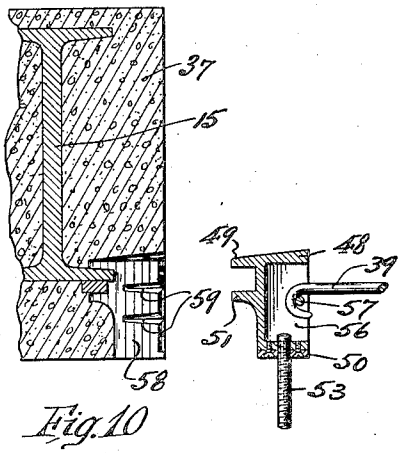


Fig. 10

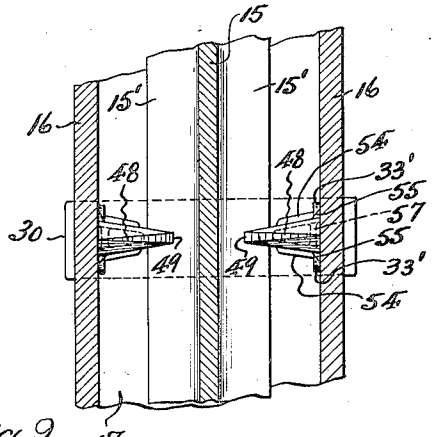


Fig. 9

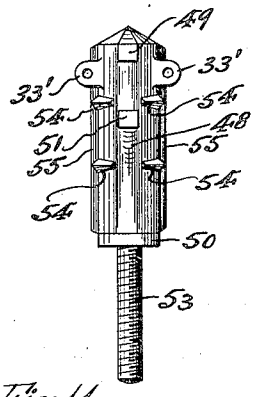


Fig. 11

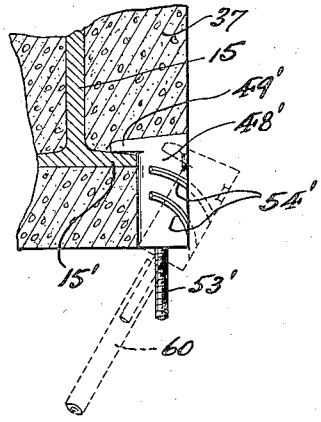


Fig. 12

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FORM SUPPORT

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6 Claims. (Cl. 25—131.5)

This invention relates to means for assembling concrete casting forms around structural steel; and the invention has reference, more particularly, to means for retaining forms in operative relation to I-beams, girders, columns and similar elements entering into the construction of fabricated steel buildings and similar structures.

This invention has for its principal object to provide a novel means for attaching form walls in secured and desired spaced relation to structural iron or steel, such as channel beams, I-beams, girders, columns and the like, to permit of the casting of concrete about the same.

This invention has for a further object to provide form retaining and assembling devices, for the purposes mentioned, which are easily and quickly manipulated for the setting up or dismantling of the forms; which may be provided either in types which can be removed from the finished concrete and used over again, or in types adapted to be left, in whole or in part, imbedded in the finished concrete.

Other objects of this invention, not at this time more particularly enumerated, will be disclosed in the following detailed description of the same.

Illustrative embodiments of this invention are shown in the accompanying drawings, in which:—

Fig. 1 is a transverse vertical section of a concrete form as operatively applied about an I-beam and retained in operative relation thereto by one type of retaining means according to this invention; Fig. 2 is a fragmentary horizontal section, taken on line 2—2 in Fig. 1, the poured concrete being omitted; and Fig. 3 is a fragmentary sectional view, similar to that of Fig. 1, but showing the form walls removed from the concrete casting, and the retaining means withdrawn from the latter.

Fig. 4 is a sectional view of a concrete form as operatively related to an I-beam, similar to that of Fig. 1, but showing certain modifications with respect to the retaining means.

Fig. 5 is a sectional view of a concrete form as operatively related to an I-beam, but showing a modified type of retaining means having non-removable parts; Fig. 6 is an outer end elevation of the anchor or suspension element of the type of retaining means shown in Fig. 5, and Fig. 7 is a top plan view of the same, these figures being drawn on an enlarged scale.

Fig. 8 is a sectional view of a concrete form as operatively related to an I-beam, but showing a modified type of removable retaining means; Fig. 9 is a fragmentary horizontal section, taken on line 9—9 in Fig. 8; Fig. 10 is a fragmentary sectional view, similar to that of Fig. 8, but showing the form walls removed from the concrete casting, and the retaining means withdrawn from the latter; and Fig. 11 is an inner end elevation of the suspension body of this type of retaining means, drawn on an enlarged scale.

Fig. 12 is a sectional view of a concrete casting showing another modified form of retaining means suspension body, and illustrating in dotted outline the manner of withdrawing the same from the finished concrete.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

Referring to the drawings, the reference character 15 indicates an I-beam about which it is desired to apply a form for casting concrete in enveloping relation to said beam. The form comprises side walls 16 and bottom or transverse wall 17, the same being outwardly spaced from the beam for distances corresponding to the dimensions of the concrete casting desired to imbed the beam. The retaining means of this invention are employed to support the form walls directly from the I-beam itself; such retaining means being adapted to engage with a flange of the beam. The retaining devices are arranged in sets of opposed members at opposite sides and along the length of the beam, the members of each set being respectively engaged with oppositely extending portions 15' of a given flange of the beam.

In the form shown in Figs. 1 to 3 inclusive of the drawings, each retaining device consists in a combined hanger and spacer block comprising a laterally exteriorly tapered hollow spacer block portion 18 open at its outer face to expose its hollow interior 19. Integrally formed with said spacer block portion 18, to project inwardly and horizontally from the inner face thereof and intermediate its upper and lower ends, is a perforate suspension ear 20 which terminates at its free end in a hanger lug 21. Inserted downwardly through said perforate suspension ear 20 is a hanger bolt having a threaded shank 22 and a polygonal head 23, the latter engaging upon the top surface of said ear 20 whereby said bolt is supported thereby. That portion of the inner face of the spacer block 18 which extends above the top level of said ear 20 provides a stop shoulder 24, which closely opposes a side face of the head 23 of the inserted bolt, whereby the latter is retained against axial rotation relative to the combined

hanger and spacer block. Detachably engageable with the dependent threaded shank 22 of the bolt, by screwing onto the latter, is a suspension member 25, preferably of upwardly tapered or conical shape, and having an internally threaded axial bore 26. At its lower end, said suspension member is provided with a squared head 27 to receive application of a suitable wrench or other tool for turning the same. Threaded into the lower end of said suspension member 25 is a downwardly extending threaded stud 28. In the use of the retaining devices, having the above recited structural features, the suspension member 25 is assembled with the combined hanger and spacer block by means of the hanger bolt 22—23, whereupon the hanger lug 21 is engaged over a marginal portion of the beam flange 15' in such overlapping relation thereto as is determined by the lateral abutment of the suspension member 25 with the flange edge. In this manner, a pair of the retaining devices is arranged with the members thereof in opposed relation at opposite sides of the beam 15 so as to depend therefrom, whereupon the bottom or transverse form wall 17, which is suitably perforated, as at 29, to receive the squared heads 27 of said suspension members 25, is applied, and then a cross batten 30 suitably perforated to pass the threaded studs 28 is applied beneath the form wall 17 and butted against the lower ends of said suspension members, whereupon retaining nuts 31 are screwed upon the free ends of said studs 28 to secure the batten in place; all so that the bottom or transverse wall of the form is supported from and in spaced relation to the bottom or adjacent face of the beam 15. After the bottom or transverse form wall is thus secured in place, the side form walls 16 are applied upon and in upstanding relation to the bottom or transverse wall, and spaced outwardly from the sides of the beam 15, by butting the inner faces thereof against the outer faces of the spacer block portions 18. Said side walls 16 may be secured by any desired means or in any desired manner against spreading or outward displacement. If desired, a wire or other flexible tie 32 may be extended around and between the opposed retaining devices to assure against any outward displacement of the latter from their operative engaged relation to the beam pending the application and final assembly of the form walls thereto. Perforate internally threaded wings 33 are provided to project from the sides of the spacer block portions 18, preferably flush with the outer face of the latter. If desired, the wire tie 32 may be passed through these perforate wings 33, as shown in Figs. 1 and 2, although this is not essential. The main purpose served by said perforate wings 33 is to provide means for applying and securing to the outer face of the spacer block portions 18 one or more shim plates 34, as illustrated e. g. in Fig. 4; said shim plates having corresponding perforate wings 35 to register with the wings 33 for the reception of fastening screws 36. These shim plates may be used where it is desired to increase the distance of outward spacing of the form side walls 16 relative to the sides of the beam. In Fig. 4 another modification of the retaining device structure is shown, wherein, instead of employing the screw threaded stud 28 and cooperating retaining nut 31, a laterally notched stud 28' is provided to receive engagement of a retaining wedge 31', by means of which the batten 30 and bottom or transverse form wall are secured to the suspension members.

After a form is applied about the beam 15, by the retaining devices as described, the concrete mass 37 is poured thereinto. When the concrete casting has set, the form walls may be removed by screwing off the retaining nuts 31 and thereupon removing the supporting battens 30, whereupon the form walls may be stripped off. The type of retaining device shown in Figs. 1 to 4 inclusive is of a kind adapted for removal from the finished concrete casting 37. To effect such removal thereof, the suspension member 25 is screwed off of the hanger bolt. This is done by applying a suitable wrench to the squared head 27 thereof to effect the necessary turning of the same relative to said hanger bolt. The tapered or conical form of said suspension member facilitates its withdrawal from the concrete mass. After said suspension member is detached and withdrawn from its affixed relation to the combined hanger and spacer block, the latter may be laterally withdrawn outwardly from the side of the concrete mass by application of a suitable pulling or extracting tool thereto. To permit of the connection of such a tool thereto, the hollow interior of the spacer block portion 18 is provided with a cross-bar 38 with which may be engaged a hook-like extractor tool 39 (see Fig. 3), by means of which outwardly withdrawing force is applied to the spacer block. The tapered conformation of the spacer block 18, suspension ear 20 and hanger lug 21 will facilitate the withdrawal of these parts. These withdrawing operations are indicated in Fig. 3 of the drawings, and when completed leave voids 40—41 in the concrete casting which may be subsequently plugged or pointed up with cement. It will be obvious that the removable combined hanger and spacer block and removable suspension member 25 may, upon withdrawal, be used over and over again.

Referring now to Figs. 5 to 7 inclusive of the drawings, I have illustrated a modified form of retaining device according to this invention which comprises a hanger lug element which is cooperative with the removable suspension member, but which per se is non-removable from the finished concrete casting, and is therefore adapted to be left imbedded therein. In this form, the retaining device comprises a perforate suspension ear 42 to support the hanger bolt comprising the threaded shank 22 and head 23. The suspension ear 42 terminates at its inner end in a hanger lug 43 to engage a flange portion 15' of the beam 15. Integrally formed with said suspension ear 42 is an upstanding element 44 which closely opposes a side face of the hanger bolt head 23, to retain the bolt against axial rotation relative to said suspension ear 42. At its outer end, said suspension ear is provided with a depending portion 45 having laterally offset upwardly directed hook-like elements 46, the bights 47 of which provide seats engageable by the wire or other flexible tie 32, which is applied for the purposes and in substantially the same manner as already set forth with respect to the first described construction. After the suspension ears 42 are applied to the flanges of the beam 15, suspension members 25 are attached thereto by connection to the hanger bolts, and thereupon the bottom form wall 17, batten 30 and retaining nuts 31 are assembled therewith, and the side form walls 16 set up, ready for casting the concrete. After the concrete is cast and set, the suspension members and battens are removed, and the form walls stripped off, leaving the sus-

pension ears and hanger bolts imbedded in the concrete casting. The voids left by the removal of the suspension members **25** may be then plugged or pointed up with cement. It will be obvious that the suspension members might be made integral with the suspension ears **42**, in which case, they too would remain imbedded in the concrete after the form walls were stripped away.

Referring now to Figs. 8 to 11 inclusive, there is shown therein another modified form of the novel retaining means, which is adapted to provide a removable type thereof. In this form, each retaining device comprises a combined suspension and spacer block in the form of a laterally and inwardly tapered body **48** having at its upper inner end an inwardly projecting hanger lug **49** to engage the beam flange portions **15'**. The width of this block from its inner to its outer side or face is determined in accordance with the desired spacing of the form side walls **16** outwardly of the beam sides, and the vertical dimensions of the block is determined in accordance with the desired spacing of the transverse or bottom wall **17** from the beam **15**. If it is desired, to increase the latter spacing, one or more shim plates **59** may be secured to the lower end of the body **48**. If desired, the body **48** may be further provided at its inner end and spaced from and beneath said hanger lug **49** with an inwardly projecting abutment lug **51**, which, when the body is applied to the beam flange **15'**, will underlie the latter in spaced away relation thereto. This abutment lug **51** may be utilized to purchase a fastening wedge **52** which can be driven between the same and the beam, thereby to hold the body against displacement from operative assembled relation to the beam. Such arrangement is alternative to preliminarily securing the retaining devices by means of a wire tie as heretofore mentioned. Suitably secured to and dependent from the lower end of the body **48** is a threaded stud **53**, which extends downwardly through the bottom or transverse form wall **17** and associated supporting batten **30**, and which receives the retaining nut **31** for holding said latter parts in assembled relation to the beam **15**. The form side walls **16** are applied against the outer face of the body **48**, and if it is desired to increase the spaced distance thereof relative to the beam, shim plates may be attached to said body **48**, internally threaded perforate wings **33'** being provided in connection with the body **48** to receive such shim plate fastening means. It is desirable to provide the opposite side faces of the body **48** with transverse tapered ribs **54**, the purposes of which will be subsequently made known. The body **48** may also be provided along the vertical margins of its outer face with additional ribs **55** which are preferably inwardly and rearwardly chamfered. The body **48** is open at its outer face to expose its hollow interior **56**, and extending through said hollow interior is a cross-bar **57** to permit of the engagement of an extractor tool, as **39**, thereto.

After a form is applied about the beam **15**, by means of the modified form of retaining means above described, and the concrete mass **37** has been poured thereinto and has solidified, the form may be dismantled by removing the retaining nuts **31** and battens **30** to permit the form walls **16** and **17** to be stripped away, whereupon the retaining devices may in turn be withdrawn from the concrete mass, subject to renewed use. To effect removal of this form of retaining device, a suitable extractor tool, as **39**, is engaged with the cross-bar **57** by means of which outwardly withdrawing force is applied to the body **48**, whereby the same is drawn out of the concrete mass, as indicated in Fig. 10 of the drawings. The tapered form or contour of the body **48** facilitates such withdrawal. When the body **48** is thus withdrawn from the concrete mass, a void **58** (see Fig. 10) is left therein which may be plugged or pointed up with cement. By the provision of the ribs **54** in connection with the body **48**, lateral grooves or channels **59** are formed in the sides of the void **58**, into which the cement utilized to plug or point up the void enters, thus keying the plug to the sides of the void, and thus better assuring against subsequent accidental breaking away of the filling plug therefrom.

Referring to Fig. 12 of the drawings, there is illustrated therein a somewhat modified form of the type of retaining device last above described, the same comprising a similar laterally tapered combined suspension and spacer body **48'** having the inwardly projecting hanger lug **49'** at its upper end, but provided with arcuate side ribs **54'**, described from the lower inner corner of the body **48'** as a center. The body **48'** may be made solid throughout as distinguished from the heretofore described hollow form of such body. Removal of this form retaining device from the cast concrete may be effected as follows:

After the retaining nuts and battens have been removed, and the form walls stripped away, a length of pipe **60** may be engaged telescopically over the threaded stud **53'** and utilized as a lever for turning the block or body **48'** about its lower corner as a fulcrum, to thereby pry and swing the same out of the concrete mass, all as indicated in dotted outline in Fig. 12.

From the above description it will be apparent that this invention provides, in various specific forms, all involving, however, certain broad common structural and functional characteristics, novel retaining means whereby a form may be supported directly from structural iron or steel beams, girders, columns or the like which form the skeleton of building structures, and which it is desired to cover with or imbed in concrete by casting the latter into the thus supported form.

Having now described my invention, I claim:—

1. In a form for casting concrete in enveloping relation to structural iron or steel beams and the like, means for supporting the form directly from the beam, comprising a laterally and inwardly tapered suspension body having an inwardly projecting hanger lug at its inner side and spaced below its upper end to provide a stop shoulder, a threaded bolt dependent through said lug with its head laterally abutting said shoulder to prevent rotation of the bolt, said bolt being of a length less than the vertical dimensions of said suspension body so as to be withdrawable laterally from cast concrete with said body, an upwardly tapered suspension member detachably threaded by its upper end to the thread bolt, said suspension member being vertically withdrawable from cast concrete by turning the same off said bolt, and means at the lower end of said suspension member to detachably connect the form structure thereto.

2. In a form for casting concrete in enveloping relation to structural iron or steel beams and the like, means for supporting the form directly from the beam, comprising an inwardly tapered hollow body open at its outer face and having an internal cross-bar for application of an ex-

tractor tool thereto for withdrawing the same from concrete cast in the form, said body having a hanger lug at its inner side to engage over marginal portions of a beam flange to support said body therefrom, the outer face of said body providing an abutment to engage and space form side walls relative to the beam, and means engaged with body to support a form bottom wall in spaced relation to the beam.

3. In a form for casting concrete in enveloping relation to structural iron or steel beams and the like, means for supporting the form directly from the beam, comprising an inwardly tapered hollow body open at its outer face and having an internal cross-bar for application of an extractor tool thereto for withdrawing the same from concrete cast in the form, said body having a hanger lug at its inner side to engage over marginal portions of a beam flange to support said body therefrom, the outer face of said body providing an abutment to engage and space form side walls relative to the beam, means engaged with said body to support a form bottom wall in spaced relation to the beam, and shim plate means attachable to said body to vary the form wall spacing effects thereof.

4. In a form for casting concrete in enveloping relation to structural iron or steel beams and the like, means for supporting the form directly from a beam and spacing walls thereof relative to said beam, comprising an inwardly tapered hollow body open at its outer face and having an internal cross-bar for application of an extractor tool thereto for withdrawing the same from concrete cast in the form, said body having a horizontal perforate suspension ear at its inner side, said ear terminating in a hanger lug to engage over marginal portions of a beam flange to support said body and its ear therefrom, a threaded bolt dependent through and from said ear, said body having means to engage the head of said bolt to prevent rotation thereof, an upwardly tapered suspension member detachably threaded by its upper end to said bolt to depend from said ear, and means at the lower end of said suspension member to detachably connect the form structure thereto.

5. In a form for casting concrete in enveloping relation to structural iron or steel beams and the like, means for supporting the form directly from a beam and spacing walls thereof relative to said beam, comprising an inwardly tapered hollow body open at its outer face and having an internal cross-bar for application of an extractor tool thereto for withdrawing the same from concrete cast in the form, said body having a horizontal perforate suspension ear at its inner side, said ear terminating in a hanger lug to engage over marginal portions of a beam flange to support said body and its ear therefrom, a dependent bolt carried by said ear, means to prevent rotation of said bolt, an upwardly tapered suspension member detachably threaded to said bolt to depend from said ear, a stud dependent from the lower end of said suspension body to engage through a form bottom wall, and retaining means detachably engageable with said stud.

6. Means for supporting forms in connection with and around structural iron or steel beams and the like, comprising a pair of retaining devices adapted to be arranged respectively at opposite sides of a beam, each retaining device comprising an inwardly tapered hollow body open at its outer face and having an internal cross-bar for application of an extractor tool thereto for withdrawing the same from concrete cast in the form, said body having a horizontal perforate suspension ear at its inner side, said ear terminating in a hanger lug to engage a beam flange to support said body and its ear therefrom, a threaded bolt dependent through and from said ear, said body having means to prevent rotation of said bolt, an upwardly tapered suspension member detachably threaded by its upper end to said bolt to depend from said ear, means at the lower end of said suspension member to detachably connect the form structure thereto, and tie means extending between and around said opposed bodies of said retaining devices to initially hold the same in operative relation to said beam and to each other.

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