March 21, 1944. C. G. WEBER 2,344,841

CONCRETE FORM

Filed May 5, 1941 4 Sheets-Sheet 1

Fig. 1.

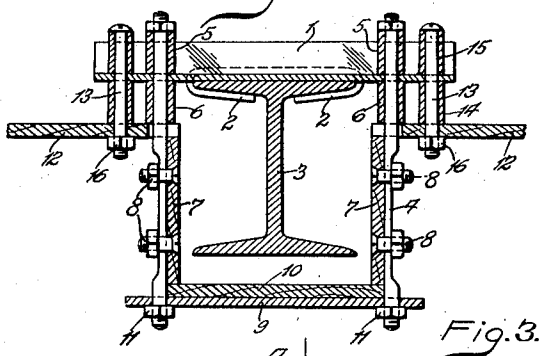

Fig. 2.

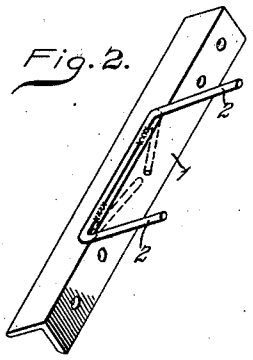

Fig. 3.

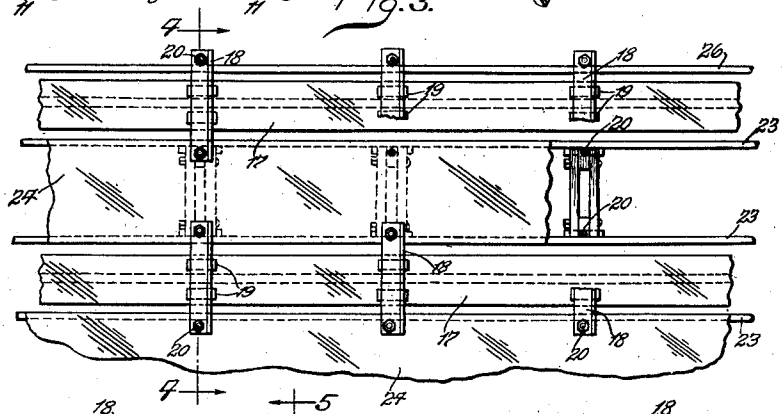

Fig. 4.

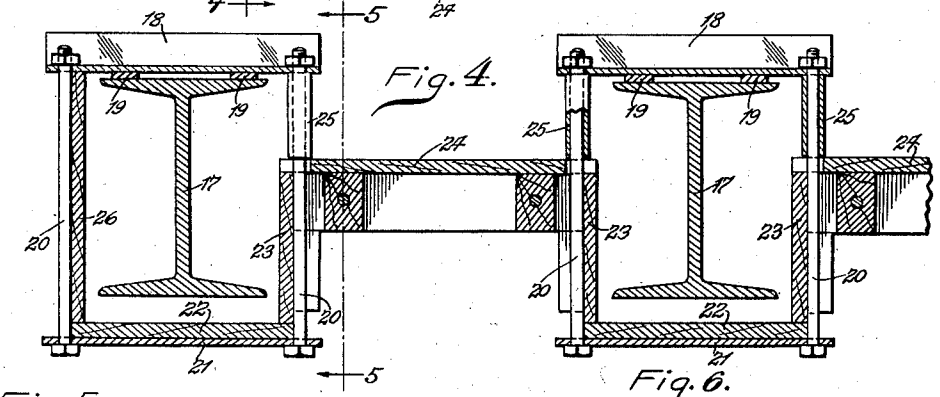

Fig. 5.

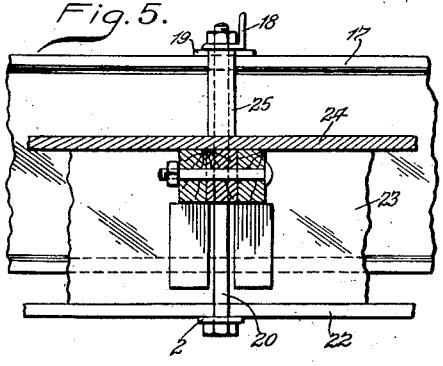

Fig. 6.

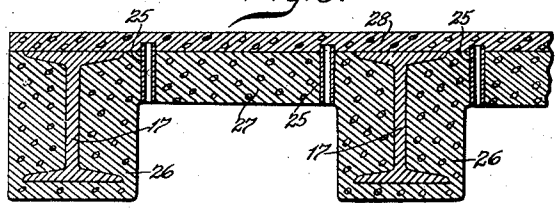

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Fig. 7.

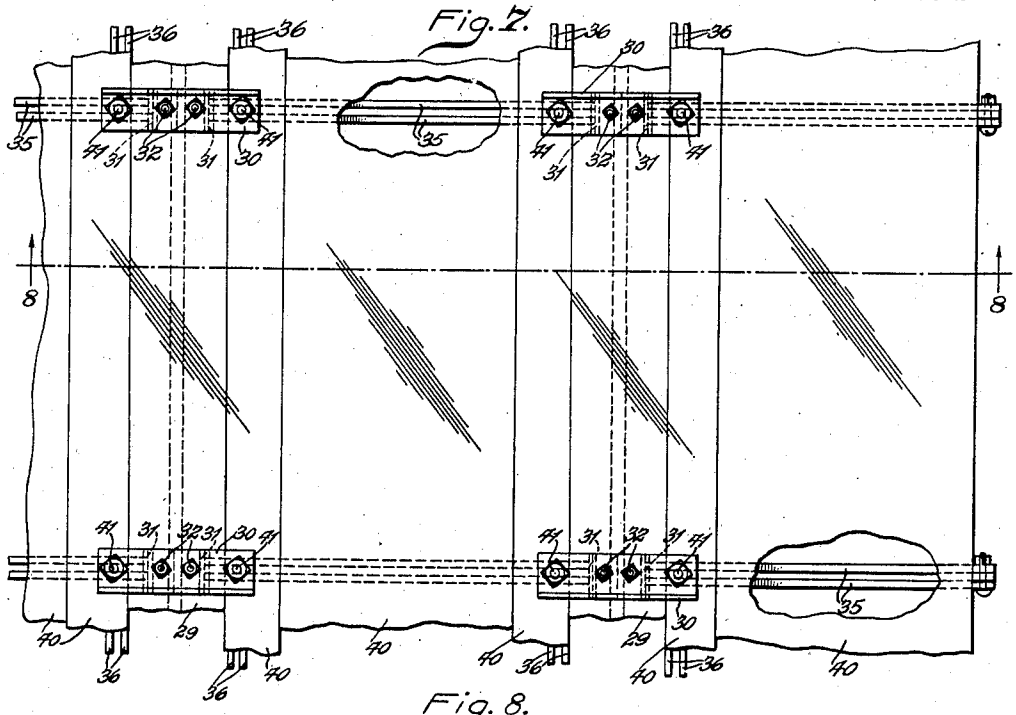

Fig. 8.

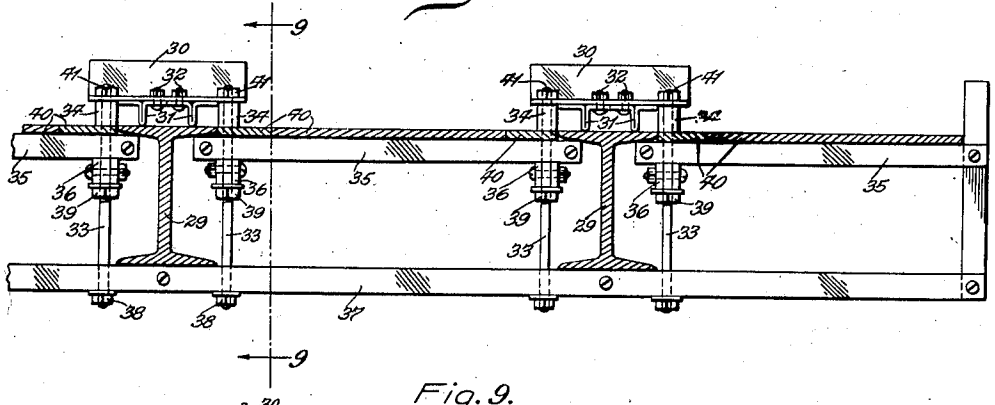

Fig. 9.

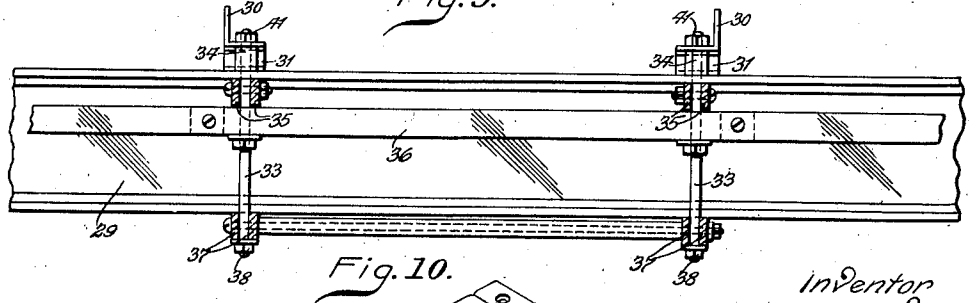

Fig. 10.

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Fig. 11.

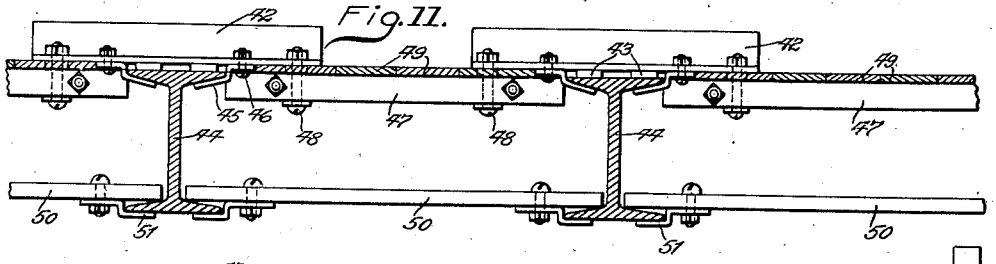

Fig. 12.

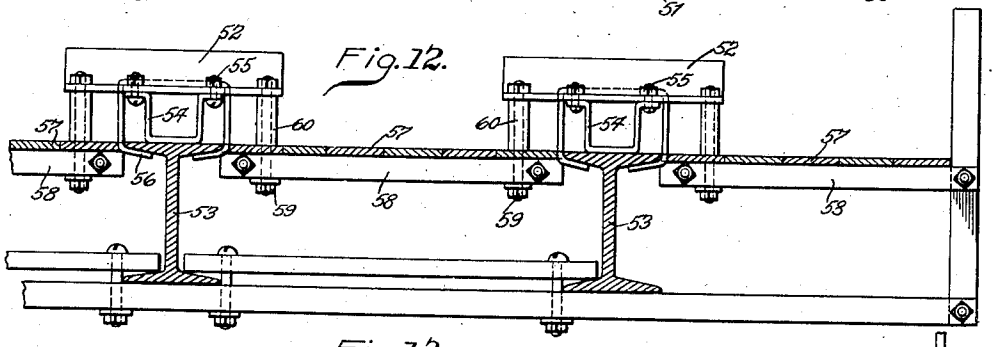

Fig. 13.

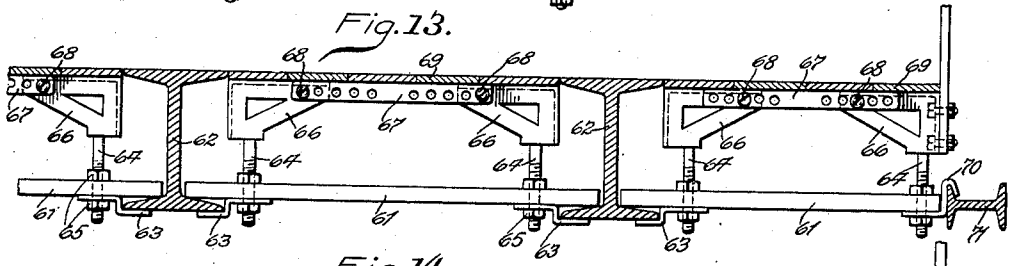

Fig. 14.

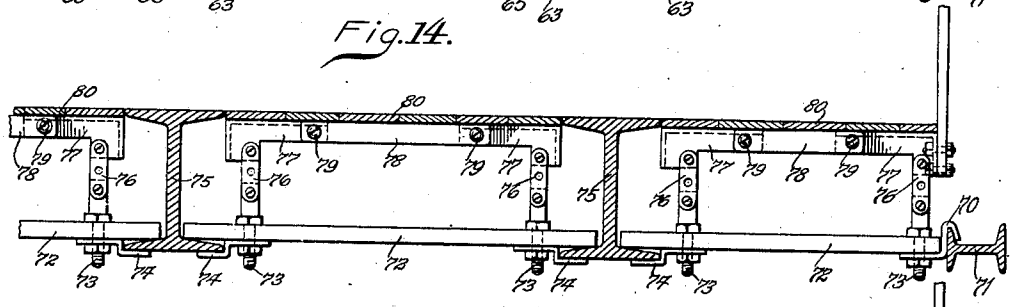

Fig. 15.

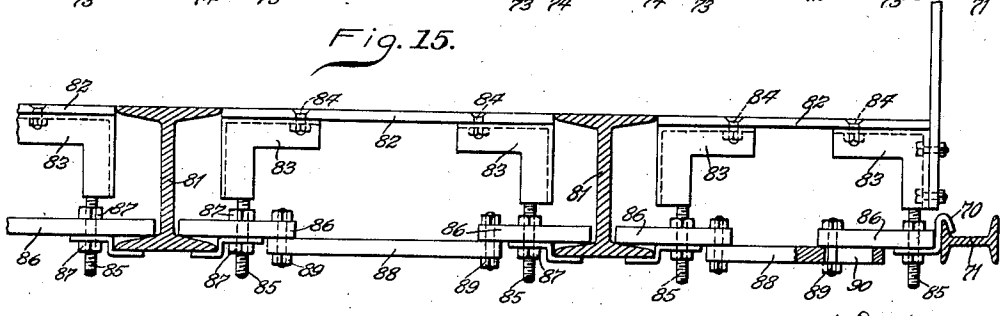

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Fig. 16.

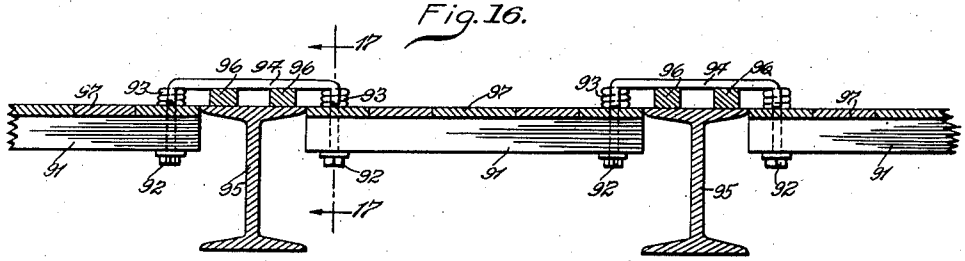


Fig. 17.

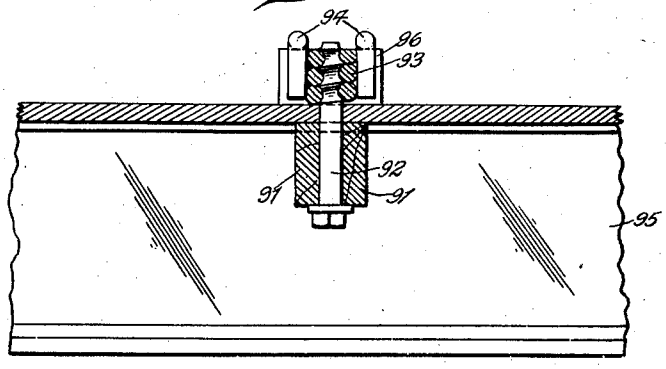


Fig. 18.

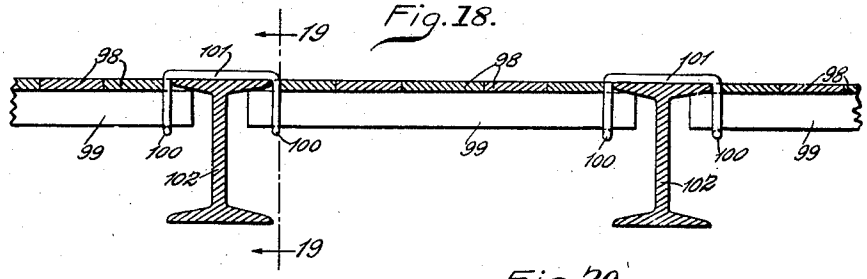


Fig. 19.

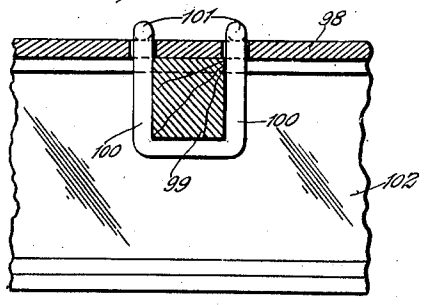
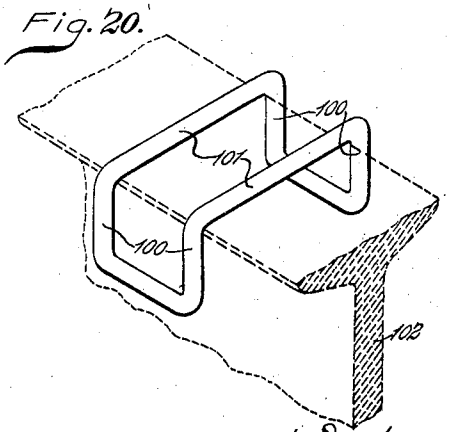


Fig. 20.



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Patented Mar. 21, 1944 2,344,841

UNITED STATES PATENT OFFICE

2,344,841

CONCRETE FORM

Charles G. Weber, St. Louis, Mo.

Application May 5, 1941, Serial No. 391,854

3 Claims. (Cl. 25—131.5)

This invention relates to concrete forms for use in erecting concrete structures, such as viaducts and bridges; and has special reference to forms for use in the erection of concrete structures supported by metallic beams.

Objects of the invention are to provide improved concrete forms including a number of spaced cooperating portions for shaping concrete beams about metallic beams with monolithic connections providing a wall or pavement formation; to provide means for forming the monolithic wall or pavement formation on the metallic beams to be supported thereby but leaving the metallic beams below and outside of the concrete; to provide means for holding the elements of the forms in assembled relationship and leaving them free for ready detachment after the concrete has become hardened; to provide forms which dispense with the necessity of using intermediate supporting structure which becomes damaged as an incident to the erection and dismantling thereof according to present practice; and to attain all the other useful advantages herein made apparent by specific mention or otherwise.

This application is a continuation in part, of my prior application Serial No. 284,196, filed July 13, 1939.

Other objects of the invention will appear from the following description, reference being made to the annexed drawings, in which—

Fig. 1 is a sectional view showing a concrete form for making a concrete beam embedding a metallic reinforcing beam and for making monolithic concrete connecting walls or pavements between adjacent beams.

Fig. 2 is a perspective view of a supporting bracket adapted for use in this specific type of form.

Fig. 3 is a plan view of a slightly modified concrete form for making parallel concrete beams embedding metallic beams and monolithic walls or pavements connecting said beams.

Fig. 4 is a cross-sectional view on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a sectional view of a portion of the concrete structure made by use of these slightly modified forms.

Fig. 7 is a plan view of a concrete form for making a monolithic wall or pavement upon metallic supporting beams.

Fig. 8 is a sectional view on the line 8—8 of Fig. 7.

Fig. 9 is a sectional view on the line 9—9 of Fig. 8.

Fig. 10 is a detached perspective view of one of the supporting clips or spacers for supporting the hanger brackets above the metallic beams so that said hanger brackets will be entirely embedded in the concrete pavement or wall.

Fig. 11 is a view showing a modification of the form shown in Figs. 7 and 8 for use in making a monolithic concrete wall or pavement formation upon the supporting metallic beams.

Fig. 12 is a view of another modification showing means for holding the supporting brackets spaced substantially above the beams.

Fig. 13 is a view showing the form supported by the lower chords of the beams and for forming the concrete wall or pavement upon the upper chords of the beams.

Fig. 14 is a view showing a variation of the form shown in Fig. 13.

Fig. 15 is a view showing another variation of the form shown in Fig. 13, in which the parts extending from the lower chords of one beam to the lower chords of an adjacent beam are detachable.

Fig. 16 is a view showing a different type of form and supporting brackets therefor for use in making a concrete viaduct above supporting metal structural beams.

Fig. 17 is an enlarged sectional view on the line 17—17 of Fig. 16.

Fig. 18 is a view showing a type of form including supporting stirrups.

Fig. 19 is an enlarged sectional view on the line 19—19 of Fig. 18.

Fig. 20 is a perspective view of one of the supporting stirrups in its relationship to the metallic I-beam.

The form shown in Fig. 1 is arranged to shape concrete beams about metallic beams with monolithic connections between adjacent concrete beams providing a wall or pavement formation. This type of concrete form comprises cross members or brackets 1 having bendable clamps 2 attached thereto for securely engaging the upper chords of the metallic beams 3. This prevents displacement of the brackets 1 and the attached portions of the forms supported thereby. Bolts 4 extend through tubes 5 on the brackets 1 and through tubes 6 below said brackets, and are attached to side walls 7 by removable and replaceable fasteners 8. The lower ends of the bolts 4 pass through supporting members 9 complementary to the brackets 1 and which support the bottom walls 10 for the concrete beams. Nuts 11 are screwed on the lower ends of the bolts 4 and may

be removed to permit dismantling of the form after its use has been completed. Walls 12 extend across between the walls 7 of adjacent beam forms in order to support the concrete for the pavement or floor monolithically uniting the concrete beams embedding the metallic beams 3.

The walls 12 are supported on the walls 7 and are additionally supported by bolts 13 passing through said walls and through spacer tubes 14 below the brackets 1 and through spacers 15 above said brackets. The walls 12 are interlocked with the bolts 4 by notches 12a receiving said bolts. After the concrete has been placed to fill the beam forms and to provide the monolithic pavement or floor construction uniting them and embedding the brackets 1 and tubes 5 and 15, and has hardened, the form may be dismantled by removing the nuts 11 from the bolts 4 and the nuts 16 from the bolts 13, leaving the brackets 1 and the metallic beams 3 embedded in the concrete.

In the modification shown in Figs. 3, 4 and 5, metallic beams 17 are placed in position to be completely embedded in the concrete beams, as in Fig. 1. Angular brackets 18 are supported upon blocks or strips 19 seated on the upper chords of the metallic beams 17. Bolts 20 extend through holes in the ends of the brackets 18 and, at their lower ends, carry supporting members 21 complementary to the brackets 18. Bottom walls 22 are mounted on the supporting members 21 between the bolts 20, and side walls 23 are placed against the inner sides of the bolts 20 and upon the bottom walls 22 to provide forms for shaping concrete beams completely embedding the metallic beams 17. Bottom walls 24 are supported by cross members 24' and by the side walls 23 for upholding the concrete between the beam forms and for forming a thinner pavement or floor in monolithic connection with the concrete beams. The walls 24 are interlocked with the bolts 20 by notches 24a receiving said bolts. Above the bottom walls 24, the bolts 20 extend through tubular spacers 25 which remain embedded in the concrete and permit easy removal of said bolts 20 after the concrete has hardened. At desired places, wider walls 26 may extend from the bottom walls 22 to the brackets 18.

After the concrete has been placed in the form thus provided and leveled off or surfaced so as to embed the brackets 18, the form may be dismantled and removed by withdrawing the bolts 20. Obviously, this permits removal of all of the form walls. If desired, the concrete beams 26 and monolithic floor connection 27 made by use of this form may be leveled off even with the upper surfaces of the metallic beams 17, and thereafter a finishing surface 28 may be applied to the top of the monolithic concrete structure to embed the upwardly extended ends of the tubes 25 and cover the upper surfaces of the beams 17.

The device shown in Figs. 7 to 10, inclusive, is for use in forming a concrete pavement or viaduct upon but not embedding the metallic beams 29. These beams support the form during the making of the pavement or viaduct. Angular brackets 30 are seated upon and detachably secured to spaced supports 31 by fasteners 32. The supports 31 rest upon the upper chords of the metallic beams 29 and support the brackets 30 above said beams so that the concrete may enter and fill the spaces between the brackets and the beams. Bolts 33 extend through the ends of the brackets 30 at opposite sides of the beams 29, through spacer tubes 34 below the brackets, between cross members 35 extending between adjacent beams 29, between longitudinal connecting members 36 attached to the series of bolts 33 along the respective sides of the I-beams 29, and through the connections 37 below the beams 29. The nuts 38 on the lower ends of the bolts 33 constitute means for clamping the parts in rigid relationship against the beams 29. Nuts 39 on the bolts 33 support the connections 36 and the members 35. The form walls 40 are seated upon the members 35 and, as shown, are in alinement with the upper surfaces of the beams 29. Assembled in this relationship, the concrete may be laid upon the walls 40 and upon the beams 29 to any thickness desired, even embedding the brackets 30; and a surfacing, such as the surfacing 28 (Fig. 6), may subsequently be laid upon the upper surface of the concrete. Due to the fact that the upper ends of the bolts 33 are screwed into nuts 41, said bolts may easily be detached and the form disassembled and removed after the concrete has hardened. The beams 29 remain as supports for the concrete.

In Fig. 11, the brackets 42 are seated upon blocks 43 on the upper chords of metal I-beams 44. The brackets 42 are held in rigid connection with the I-beams by clamps 45 held by detachable fasteners 46. Cross members 47 are supported by the brackets 42 by detachable bolts 48. The form wall 49 is mounted on the cross members 47 in any desired relationship to the upper surfaces of the I-beams 44 so that concrete may be laid upon said walls and across the I-beams to form a monolithic pavement or viaduct. The lower chords of the I-beams may support the catwalk members 50 for the workmen. The members 50 may be held in rigid relationship with respect to each other and the beams 44 by releasable clamps 51. After the concrete has been laid and has hardened, the members 50 may be removed and the form may be dismantled and detached by removing the bolts 48.

In Fig. 12, the brackets 52 are held at a desired height above the metal I-beams 53 by open frames or spacers 54 attached to the brackets by fasteners 55. The brackets may be held in rigid relationship on the I-beams 53 by clamps 56 attached to said brackets and engaging under the upper chords of the beams 53, as shown. The form wall 57 is mounted on cross members 58 supported by bolts 59 passing through said cross members and through spacer tubes 60 and engaged with the brackets 52, as shown. After the concrete has been laid, the form may be removed by detaching the bolts 59, thereby releasing the members 58 and the walls 59.

In Fig. 13, cross members 61 are held in connection with the lower chords of the metal I-beams 62 by removable clamps 63. Bolts 64 pass through the cross members 61 and are provided with clamping nuts 65 to hold the clamps 63 in engagement with the I-beams 62. Angular brackets 66 are attached to the upper ends of the bolts 64 and adjustably connected with cross members 67 by removable and replaceable fasteners 68. These devices provide means for using the form in connection with I-beams 62 spaced different distances apart. The wall 69 is supported by the brackets 66 and cross members 67 in any desired relationship with respect to the upper surfaces of the I-beams 62. The end member 61 may be supported by a bracket 70 engaged with a special beam 71 along the side of the viaduct or pavement. After the concrete has been laid and has become hardened, this form may be dismantled and removed by

removing the lower nuts 65 and releasing the upper nuts 65.

Fig. 14 shows a slightly modified type of this expandible and contractible form including cross members 72, bolts 73 holding the clamps 74 in engagement with the lower chords of the metal I-beams 75 and connected with links 76 supporting brackets 77. Cross members 78 of different lengths may be attached to the brackets 77 by removable and replaceable fasteners 79 so that the device may be used in connection with I-beams spaced different distances apart. The form wall 80 is supported by the brackets 77 and cross members 78 in any desired relationship with respect to the upper surfaces of the I-beams 75. The form at the side of the pavement or viaduct may be supported by brackets 70 engaged with special beams 71, as in Fig. 13. After the concrete has hardened, the device may be removed by releasing the bolts 73 in the obvious manner.

Fig. 15 shows a slightly modified expandible and contractible form for use in connection with I-beams 81 spaced different distances apart. Walls 82 of different widths may be attached to the angular brackets 83 by fasteners 84. The brackets 83 are supported by bolts 85 secured to clamp members 86 by nuts 87. The clamp members 86 may be connected to cross members 88 of different lengths by removable and replaceable fasteners 89. The side form may be supported by brackets 70 engaged with I-beams 71, as in Figs. 13 and 14. The cross members 88 may be provided with slots 90 to receive the bolts 89 and adjust the device for different widths. After the concrete has been laid and has hardened, the form may be dismantled by releasing the nuts 87 and allowing the walls 82 to be moved downwardly between the I-beams.

In Fig. 16, the cross members 91 are supported by bolts 92 screwed into sockets 93 attached to the downwardly extended ends of brackets 94. The brackets 94 extend across the metallic I-beams 95 and are suppported on blocks 96 so that the bottom walls 97 of the forms are approximately even with the upper surfaces of the I-beams. After the concrete has been laid and has hardened, the form may be dismantled and removed by detaching the bolts 92 from the sockets 93 to permit removal of the bottom walls 97.

In Figs. 18, 19 and 20, the bottom walls 98 are supported on cross members 99 having their ends extending into stirrups 100 formed by rods 101. The rods 101 extend across the I-beams 102 and the stirrups 100 extend downwardly at opposite sides of said I-beams and receive the ends of the removable cross members 99. After the concrete has hardened above the walls 98 and across the I-beams, the form may be dismantled and removed by detaching the cross members 99 from the stirrups 100 in any manner; or, if necessary, the stirrups 100 may be cut and spread apart to permit removal of said cross members.

It should now be apparent that this invention attains all of its intended objects and purposes efficiently, satisfactorily and economically. Viaducts and pavements of different types may be laid and the forms may be removed without damage and used repeatedly, thus accomplishing a considerable reduction in cost, as compared with forms which must be destroyed or damaged after each use.

I claim:

1. A concrete form for making a viaduct or the like that includes a series of laterally spaced metal I-beams extending longitudinally of the viaduct or the like and having their chords along their upper and lower sides; said form comprising brackets extending across each of said beams angular clamps interlocking said respective brackets with both of the upper chords of said respective beams and holding said respective brackets from displacement laterally in either direction across said beams, cross members supported by said brackets and extending transversely across the space between adjacent beams and walls supported upon said cross members for sustaining concrete extending monolithically across the viaduct in engagement with the upper chords of said beams and embedding said brackets.

2. A concrete form for making a viaduct or the like that includes a series of laterally spaced metal I-beams extending longitudinally of the viaduct or the like and having their chords along their upper and lower sides; said form comprising brackets extending across each of said beams and laterally beyond the side edges of the upper chords of said beams, parts attached to said respective brackets and having clamping engagement with the upper chords at both sides of said beams and holding said brackets from displacement, cross members extending transversely across the spaces between adjacent beams, elements attached to said respective brackets and supporting said cross members at opposite sides of said respective beams, and walls supported upon said cross members for sustaining concrete extending monolithically across the viaduct in engagement with the upper chords of said beams and embedding said brackets.

3. A concrete form for making a viaduct or the like that includes a series of laterally spaced metal I-beams extending longitudinally of the viaduct or the like and having their chords along their upper and lower sides; said form comprising brackets, walls supported by said brackets for sustaining concrete extending monolithically across the viaduct in engagement with the upper chords of said beams, and parts attached to said respective brackets and having clamping engagement with certain of the chords at both lateral sides of said beams and holding said respective brackets from displacement laterally in either direction relative to said beams.

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