Nov. 10, 1931. C. I. WILLIAMS 1,831,153

CONCRETE FORM CLAMP

Filed June 20, 1929 3 Sheets-Sheet 1

Fig. 1.

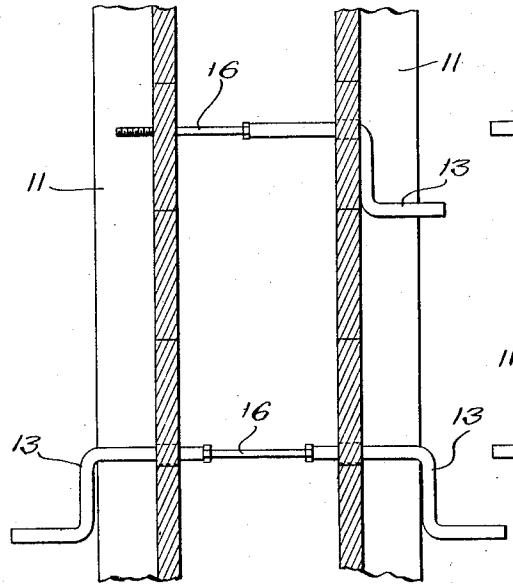
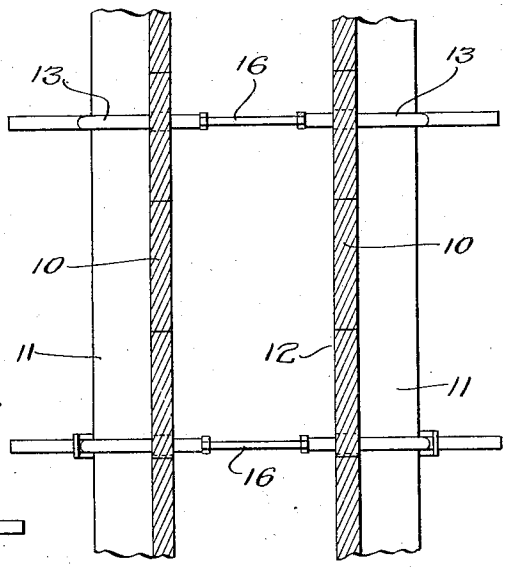


Fig. 2.



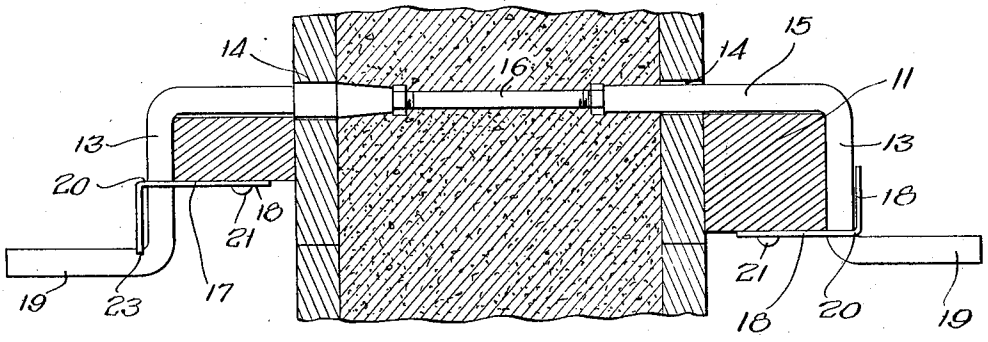
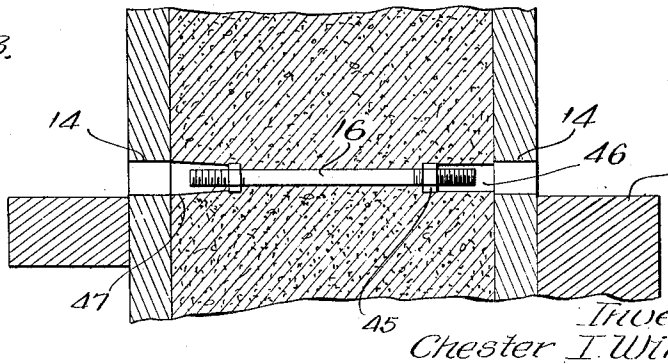


Fig. 3.



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CONCRETE FORM CLAMP

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Fig. 4.

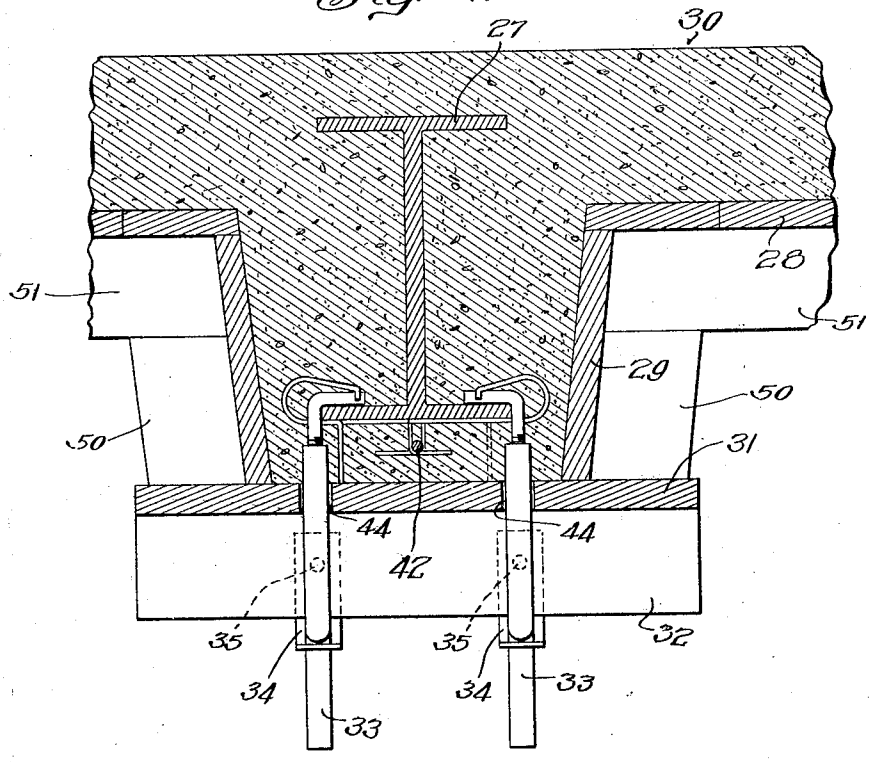
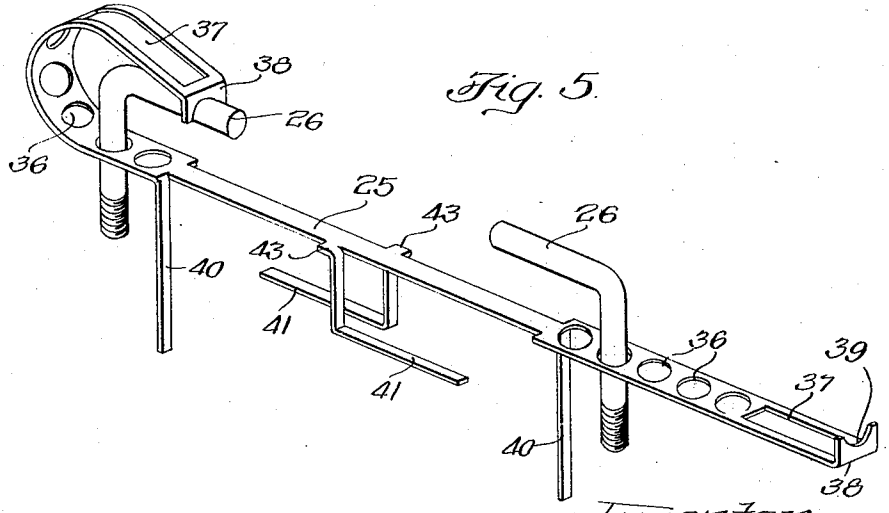


Fig. 5.



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CONCRETE FORM CLAMP

Filed June 20, 1929 3 Sheets-Sheet 3

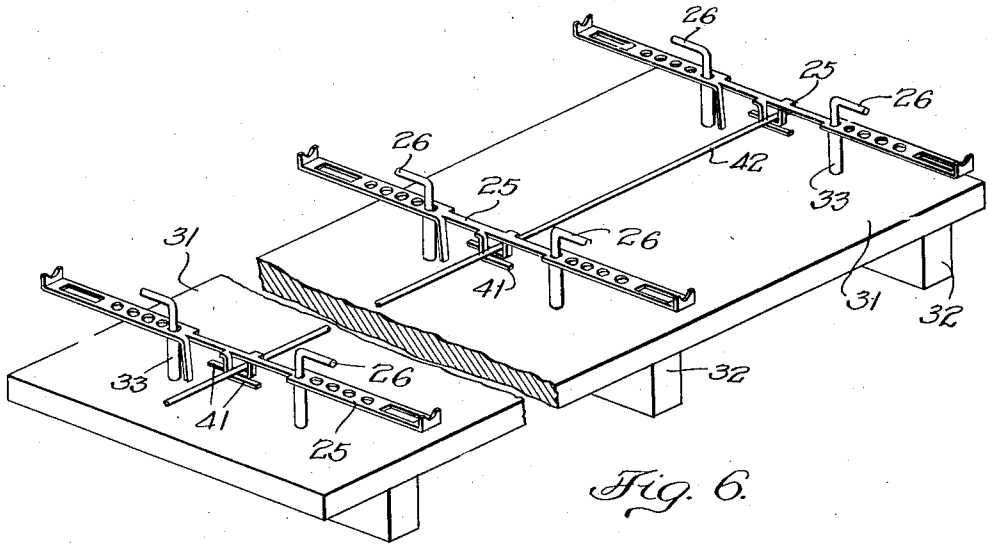


Fig. 6.

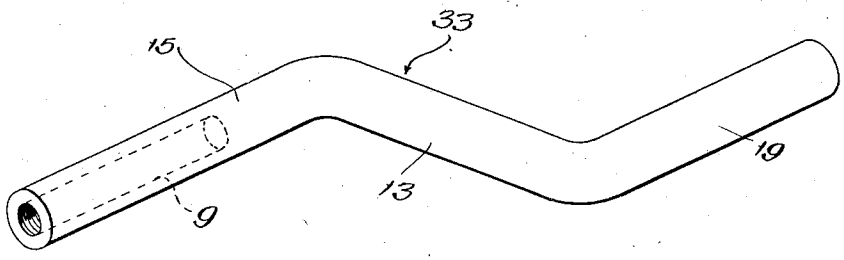


Fig. 7.

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UNITED STATES PATENT OFFICE

CHESTER I. WILLIAMS, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR OF ONE-HALF TO GOODSPEED INVESTMENT COMPANY, OF GRAND RAPIDS, MICHIGAN, A CORPORATION OF MICHIGAN

CONCRETE FORM CLAMP

Application filed June 20, 1929. Serial No. 372,432.

My invention relates to concrete forms and more particularly it relates to concrete forms which may be easily dismantled after the concrete has set and the forms again employed in other operations.

The invention has among its objects the production of devices of the kind described which are simple in construction, reliable, durable, and economical.

A particular object of the invention is the provision of improved clamping devices which are operable to secure oppositely disposed forms together by means operable from outside of the forms.

Another particular object of the invention is the provision of improved clamping devices whereby oppositely positioned concrete forms may be spaced in their operative positions from outside the forms.

A further particular object of the invention is the provision of improved clamping devices of the kind described which may be removed from the forms without injury either to the forms or to the clamping devices.

Another particular object is to produce devices of the kind described which will be satisfactory for use interchangeably in connection with the molding of either vertical or horizontal walls.

Still another particular object of the invention is to provide improved clamping devices of the kind described for use in connection with forms for concrete floors wherein the devices are operable to suspend the forms and the concrete from I beams forming part of the floor construction and thereby making the use of scaffolding or shoring unnecessary.

In building construction wherein structural steel is used for I beam supports for floors and as supporting columns, such I beams or columns are frequently imbedded in concrete to provide fire protection and where so used it is desirable to provide reinforcement of some sort to prevent the encasing material from cracking and scaling off in the event of a fire and thereby exposing the steel beams and columns directly to heat. When used as reinforcement for fire-proofing material my clamping device includes elements, some of which are to be imbedded in and retained permanently in the concrete as reinforcement and others of which are to be detachably connected with the permanently retained elements in order that they may be removed and utilized in other operations. The permanently retained portion of my device comprises means for holding the devices in position while the concrete is being poured and also includes elements adapted to reinforce the layer of fire-proofing material, thereby making it unnecessary to provide any additional material for such purpose.

A still further object of the invention is the provision of clamping devices including means for positioning the devices in fixed relation to structural steel members to be encased in fire-proofing material, such devices being adapted to serve both as a support for concrete forms and as a spacer to gauge or determine the thickness of the encasing fire-proofing material.

The devices are adapted to be suspended from a framing member such as an I beam or the like to provide supports for forms and for a concrete floor wherein the under surface of the floor forms the ceiling of a room underneath. Upon removal of such clamping devices apertures remain in the concrete which may be utilized for inserting hangers for attaching same to the retained portion of the device in case it should be desired to suspend scaffolding or other objects from the ceiling. If not desired to be thus utilized, the holes may or may not be grouted with concrete, and another object of the invention is the provision of clamping devices of the kind described having elements retained in the structure as reinforcing material for fire-proofing, such elements being accessible for suspending hangers therefrom.

Many other objects and advantages of the construction herein described and shown will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described, and more particularly pointed out in the claims.

Referring now to the drawings forming part of this specification:

Fig. 1 is a fragmentary elevation section taken through the concrete forms showing the clamping devices embodying one form of the invention in various stages of installation;

Fig. 2 is a view similar to Fig. 1, wherein the clamping devices are shown as installed in operative position preparatory to pouring of the concrete;

Fig. 3 is a fragmentary plan section taken through concrete forms fastened with the devices embodying my invention and illustrating the clamps in their operative position and also the forms as they appear after detachment of the removable portions of the device;

Fig. 4 is a fragmentary cross section of a floor showing an alternative embodiment of my invention;

Fig. 5 is a perspective view of that portion of the device shown in Fig. 4 which is to be permanently retained in the concrete;

Fig. 6 is a perspective view of a form board having a plurality of the devices mounted therein preliminary to being placed in operative position as a bottom form for an I beam or a side form for a column flange or the like; and

Fig. 7 is a perspective view of a crank member interchangeable for use with all embodiments of my invention in connection with molding vertical, battered or horizontal walls.

Referring now more particularly to the drawings, one embodiment of the invention operable as a clamping device for forms for vertical and battered walls is shown in Figs. 1, 2 and 3. A plurality of longitudinally extending boards 10 are fastened to vertical studding members 11 by nails 12 or the like to form oppositely positioned spaced apart members between which concrete is to be poured. While the forms are described as constructed of longitudinally extending boards and vertical studding, other material than timber can be used as, for example, steel plate and steel framing members.

The oppositely positioned form members are held in spaced apart relation by clamping devices forming one embodiment of my invention. Each of the devices includes an inner spacing rod 16 adapted to have a crank member 33 mounted on one or both ends thereof. The spacer rods 16 act both as ties and struts and are intended to be permanently retained in the structure, while the crank members 33 are intended to be removed and utilized interchangeably in connection with the moulding of other walls, either vertical, battered, or horizontal. Since the spacer rods 16 are to be permanently retained in the concrete it is desirable for the sake of economy to utilize as little material in their construction as is consistent with providing the necessary rigidity to hold the form members apart.

The rods 16 have a burr 45 on each end forming a stop, for a purpose hereinafter described. The burrs 45 may be constructed integrally with the rods 16 or may be nuts threaded onto the rod. Burrs 45 are spaced apart a predetermined distance depending upon the thickness of the wall to be moulded.

The crank members 33 comprise an arm 13 having a handle 19 and a shank 15. The shank 15 is provided with a threaded socket 9 adapted for connection with the threaded ends of the spacer rod 16. The spacer rod 16 preferably stops short of the inner edges of the form walls an inch or two at either end. The burr 45 on each end of the spacing member 16 provides a stop limiting the amount of threaded engagement of the crank members 33 with the rod 16. The diameter of the burrs 45 is less than the diameter of the aligned holes 14 in the oppositely positioned form members through which the rod 16 is projected as a preliminary to installing the clamp member. While the crank members 33 are shown as having a socket 9 providing a threaded connection with the ends of the spacer rod 16, it is to be understood that any other means may be utilized for detachably mounting the crank member on the rod 16.

The vertical studding 11, which form framing members to which the boards 10 are fastened by nails or the like, may be given any spacing necessary to meet the requirements of the particular construction. It is desirable that the studding be oppositely disposed on the respective form member in order that the projecting ends of the crank members be attached to the studding. A plurality of the clamping devices are provided for attachment to each of the studdings 11. The devices are spaced apart vertically in accordance with the requirements of the particular installation. For this purpose the holes 14 in the oppositely positioned form members are in alignment adjacent one edge of the studding 11.

The first step in the installation of one of the devices consists in threading the shank 15 of the crank member onto one end of the rod 16, until the crank member contacts with the burr 45, then inserting the rod through oppositely positioned aligned holes 14 as indicated in the upper portion of Fig. 1. The next step in the assembly of the device consists in threading the shank 15 of a second crank member onto the projecting end of the rod 16, until it is stopped by the adjacent burr 45. The burrs 45 are so positioned that the arms 13 of the crank members are in substantial alignment with the outer edges of the studding 11 when the crank members have been threaded until the ends of the shanks 15 come into contact with the burrs 45.

An angle iron 18 is mounted on the arm 13 of each of the crank members by inserting the

crank member through an aperture 20 provided for this purpose in one leg of the angle iron. This arrangement of the angle iron 18 on the arm 13 of the crank member permits the angle iron to be fastened to studding of different sizes.

In Fig. 3 the studdings 11 are shown as square timbers in which case the angle iron 18 is mounted as shown in the right hand portion of Fig. 3. Studding 17, perferably constructed of 2 x 4 or 2 x 6 timbers, are shown with the angle iron 18 fastened thereto by turning the angle iron oppositely to the position taken when fastened to the square studding 11. The efficiency of the angle iron 18 as a fastening device, as mounted on the studding 17, is increased by utilizing a semicircular notch 23 on its projecting end in which the handle 19 of the crank member is positioned and locked.

The square studding 11 is preferable to an oblong studding because of its greater rigidity. The studding 11 is preferably of substantially the same dimensions as the length of the crank arm 13 thereby permitting the angle iron 18 to be nailed or otherwise fastened to the studding in the position shown in the upper right hand portion of Fig. 3. The arms 13 of the crank members and the angle irons 18 which are nailed to the studding cooperate to hold the forms in fixed spaced apart relation.

The thickness of the wall, being molded, is thereby determined by the spacings of the burrs 45 on the spacer rod 16. The lengths of the rods 16 may be varied to suit different thicknesses of walls. The dimensions of the studding are such that the inner edge of the crank arm 13 contacts with the outer face of the studding when the crank members have been turned into contact with the burrs 45. The contact of the studding 11 or 17 with the arms 13 transfers the thrust from the concrete directly to the crank member and prevents the form members spreading apart. Movement inwardly of the oppositely positioned wall forms is prevented by the angle irons 18 which are fastened to the studding by nails 21. The angle irons 18 also function as means locking the crank members with the arm 13 in horizontal position.

In practice, it is desirable to place the clamp members on opposite sides of alternate studding 11 or 17 in order to avoid the tendency of the device to warp or turn the forms which would otherwise result if the devices are all mounted on one side of the studding.

The lower portion of Fig. 3 shows the spacer rod 16 as imbedded in the concrete after the crank members have been removed. After the concrete has set the crank members are detached by first removing the nails 21 to release the angle iron 18 and then turning the crank members until they are disconnected from the rods 16. The cylindrical shank 15 of the crank member may be cylindrical in which case it leaves a corresponding cylindrical hole 46 in the concrete. The shank 15 may, if desired, be tapered as shown in the left hand portion of Fig. 3, in which case a correspondingly tapered hole 47 is left in the concrete. The crank member is more easily released from the concrete in which it is imbedded if the shank is thus tapered.

Only an occasional hole 14 is required in the boards 10 and since the boards 10 and studding 11 and 17 are easily disassembled by withdrawing the nails fastening the boards 10 to the studding the greater portion of the boards and studding are suitable for use in other construction. The device shown in Figs. 1, 2, and 3 not only is easily assembled and inexpensive to manufacture but is conducive to economy by permitting the form material to be thus repeatedly used. After removal of the form material the holes 46 and 47 surrounding the ends of the rods 16 may be grouted, if desired.

Another embodiment of my invention, adapted for use in moulding fire-proofing about both steel beams and columns, is illustrated in Figs. 4, 5 and 6. This embodiment of the device is also adapted for supporting concrete floors while being molded and for erecting and supporting the forms and floors without the use of shoring, scaffolding, or false work.

A cross section through one of a plurality of parallel extending I beams 27, between and around which the concrete forming a floor 30 is to be poured, is shown in Fig. 4. The I beams 27 support the concrete floor 30 and the forms project downwardly below the lower flange of the I beams to permit the concrete to serve as fireproofing for the beams. Both the forms and the concrete are carried by the I beams 27 by suspending from the beams a plurality of the devices forming another embodiment of my invention.

The forms for molding the concrete include a board 31 extending substantially the full length of the I beam 27 with a plurality of the clamping devices embodying my invention mounted therein. In addition to the board 31, the forms include a vertically extending board 29 on each side of the I beam 27 and a plurality of horizontal boards 28 between each of the boards 29. The weight of the floor 30 is carried to the boards 31 by spaced apart struts 50 and transversely extending joists 51. The boards 28 rest directly upon the joist 51, which arrangement permits the entire weight of the floor and forms to be suspended from the I beam 27 without the use of shoring to support the forms or the use of scaffolding to erect the forms. The form board 31 is strengthened by a plurality of cross members 32 which are nailed or otherwise fastened to the board

for a purpose hereinafter more particularly described.

The portion of the device intended to be permanently retained in the concrete after removal of the forms is shown in Fig. 5. This permanently retained portion of the device includes a pair of hook bolts 26, each mounted in one of a plurality of apertures 36 formed in a strap iron spacer bar generally designated by the numeral 25. The ends 38 of the bar 25 are turned up and each have an oblong aperture 37 formed adjacent thereto. The apertures 37 permit the bars 25 to be easily bent and facilitate the bonding with the concrete, in which the bars are imbedded. A notch 39 is formed in each upturned end 38 of the bar 25. When the ends of the bar 25 are bent over as indicated in the left hand portion of Fig. 5, the horizontal portion of the hook bolts 26 are positioned in the notches 39 and the bolts thereby locked against rotation.

The middle portion of the bar 25 has a pair of spaced apart strips 40 severed therefrom except at their outer ends. The strips 40 are turned downwardly with their ends resting upon the board 31 to form supports for the bars 25 while the devices are being assembled, and mounted on the bar. The strips 40 thereby also gauge or determine the thickness of fire-proofing material beneath the flange of the I beam 27. Strips 41 corresponding to the strips 40 are severed from the bar 25 except at an end near the middle of the plate. The strips 41 are cut substantially longer than the strips 40 and as a result their unsevered portions 43 are positioned on opposite sides of the bar 25 and each at some distance from and on opposite sides of the center line. The strips 41 are bent downwardly and then horizontally to form L shaped members providing reinforcement for the concrete or fireproofing underlying the I beam 27. The horizontal portion of the strips 41 also provide supports for such longitudinal reinforcing rods 42 as may be considered necessary or desirable.

The apertures 36 are arranged symmetrically relative to the middle of the bar 25 and by mounting a pair of hook rods 26 in a corresponding symmetrically positioned pair of apertures 36 I am enabled to provide means for fastening the device to I beams having different widths of flanges. For relatively wide I beam flanges the hook rods 26 may be positioned in one of the outer oppositely positioned pairs of apertures 36 and for I beams having narrower flanges the hook rods will be inserted in apertures positioned nearer the center of the device. The lower end of the vertical portion of the rods 26 is threaded for connection with one of crank members 33 already described.

The devices are mounted on the board 31 by providing holes 44 arranged in pairs on either side of the longitudinal center line of the board. The holes 44 are given the same transverse spacing as the apertures 36 in which the hook rods 26 are positioned. A cross member 32 is provided for each of the devices to be mounted on the board 31. The relative spacing of the clamping devices is best shown in Fig. 6, the distances apart of such devices being dependent upon the weight of the floor being carried and the thickness of material to be used for the forms.

The crank members 33 are projected through the holes 44 with the crank arms 13 bearing against the under face of the cross members 32. The crank members 33 are fastened to the cross members 32 by means of angle irons 34. The angle irons 34 are fastened to the members 32 by nails 35, or, if preferred, bolts or screws may be used. The bar 25 and hook rods 26 are then positioned on the board 31. The rods 26 are turned to slightly engage the socket 9 of the crank member 33 and with the horizontal portion of the rods turned outwardly, as shown in Fig. 6.

The board 31 with the clamping devices mounted thereon, is then swung up underneath the beam to which it is to be fastened by means of ropes or the like, thereby eliminating the necessity for the use of scaffolding. The board 31 having been positioned with the outwardly turned rods 26 on either side of the flange of the I beam 27 the hook rods 26 are further threaded into the socket 9 of the crank members 33.

Threading of the hook rods 26 is continued until the bar 25 is drawn into contact with the under surface of the flange of the I beam 27, thereby making the downwardly extending strips 40 spacers to gauge or determine the thickness of fire-proofing underneath the beams 27. The hook rods 26 are left with their horizontal portion turned inwardly as shown in Fig. 4, after which the ends of the bars 25 are turned upwardly and inwardly to the position shown in the left hand portion of Fig. 5. The bent ends of the bars 25 are snapped over the hook rods 26 with the notches 39 locking the hook bolts against further rotation. After the board 31 has been suspended from the I beam 27 the struts 50 and joists 51 are then mounted in place and the form boards 28 and 29 fastened thereto. The hook rods 26 having been locked against further rotation, the concrete can be poured and tamped around the I beam 27 without danger of the device being loosened or displaced. The oblong apertures 37, as well as the unused apertures 36 enable the ends of the bar 25 to be bent more easily and provide bonding surface for the concrete.

The forms are removed by the simple expedient of loosening the angle irons 34 and threading off the crank members 33. The form board 31 and crank members 33, as well

as the other form material may be used in pouring other sections of the floor. It is obvious that the entire operation of dismantling the forms can be quickly and easily done without damage to the material.

The holes remaining in the concrete after removal of the crank members 33 may be closed with grout, or may be left open. In the event that the holes are left open the threaded ends of the hook rods 26 may be utilized for suspending hangers or bracket devices therefrom for the purpose of suspending scaffolding or other objects from the ceiling.

Thus it will be seen that I have provided clamping devices of the kind described comprising elements which are inexpensive to manufacture and are to be retained in the concrete permanently, such retained elements, in some cases, functioning as reinforcing rods for fireproofing material, and other elements which are detachable and interchangeable in connection with the molding of either a vertical, battered, or horizontal wall.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with oppositely disposed form members, of means for securing the form members in adjusted relative positions, said means comprising a rod extending transversely of the form members, crank members operatively engaging the ends of said rod, each of said crank members arranged to extend through the adjacent form member with its arm engaging the exterior face of said form member.

2. The combination with oppositely disposed form members, of means for securing the form members in adjusted relative positions, said means comprising a rod extending transversely of the form members, crank members operatively engaging the ends of said rod, each of said crank members arranged to extend through the adjacent frame member with its arm engaging the exterior face of the form member, and an element mounted on said crank members, said element being engageable with the form members to hold the crank members against movement relative to the form members.

3. The combination with oppositely disposed form members, of means for securing the form members in adjusted relative positions, said means comprising a rod extending transversely of the form members, means operable to fasten one end of said rod to the adjacent form member, a crank member operatively engaging the other end of the rod, said crank member arranged to extend through the adjacent form member with its arm engaging the exterior face of said form member.

4. The combination with oppositely disposed form members of means for securing the form members in adjusted relative positions, said means comprising a rod extending transversely of the form members, means operable to fasten one end of said rod to the adjacent form member, a crank member operatively engaging the other end of the rod, said crank member arranged to extend through the adjacent form member with its arm engaging the exterior face of said form member, and an element mounted on the crank member said element being operatively engageable with the adjacent form member to hold the crank member against movement relative to the form member.

5. The combination with oppositely disposed form members of means for securing the members in adjusted positions relative to each other, said means comprising a rod having threaded ends, crank members threadedly engaging the ends of said rod, said crank members arranged to project through said form members with their arms engaging the outer surface of the form members, and an element mounted on said crank members said element being engageable with the form members to secure said crank member to said form members.

6. The combination with oppositely disposed form members of means extending through the form members for securing the members in adjusted positions relative to each other, said means comprising a rod having threaded ends, crank members each having a socketed end threadedly engaging one end of said rod, said crank members arranged to project through said form members with their arms engaging the outer surface of the form members and an element mounted on said crank members said element being engageable with the form members to secure said crank member to said form members.

7. The combination with oppositely disposed form members of means for securing the members in adjusted positions relative to each other, said means comprising a rod having threaded ends, crank members threadedly engaging the ends of said rod, said crank members arranged to project through said form members with their arms engaging the outer surface of the form members, a burr at the inner terminii of the threaded portion of said rods forming stops for the crank members, and an element mounted on said crank members said element being engageable with the form members to secure said crank members to said form members.

8. The combination with oppositely disposed form members comprising boards fastened to exterior framing members of means for securing the form members in adjusted positions relative to each other said means comprising a rod having threaded ends, and crank members having their socketed ends threadedly engaging the end of said rod, said crank members arranged to project

through said form members adjacent said framing members, the arm of said crank members engaging the outer surface of the adjacent framing members.

9. The combination with oppositely disposed form members comprising boards fastened to exterior framing members of means for securing the form members in adjusted positions relative to each other said means comprising a rod having threaded ends, crank members having their socketed ends threadedly engaging the end of said rod, said crank members arranged to project through said form members adjacent said framing members, the arm of said crank members engaging the outer surface of the adjacent framing members, and an element mounted on said crank members, said element being engageable with the form members to secure said crank member to said form members.

10. The combination with oppositely disposed form members comprising boards fastened to exterior framing members of means for securing the form members in adjusted positions relative to each other said means comprising a rod having threaded ends, crank members threadedly engaging the ends of said rod, said crank members arranged to project through said form members adjacent said framing members, the arm of said crank members engaging the outer surface of the adjacent framing members, an angle iron mounted on each of said crank members by inserting the crank member through an aperture in said angle iron, and means operable to fasten said angle iron to the framing member.

11. The combination with oppositely disposed form members comprising boards fastened to exterior framing members of means for securing the members in adjusted positions relative to each other, said means comprising a rod having threaded ends, crank members having their socketed ends threadedly engaging the end of said rod, said crank members arranged to project through said form members adjacent said framing members, the arm of said crank members engaging the outer surface of the adjacent framing members, an angle iron mounted on each of said crank members by inserting the crank member through an aperture in said angle iron, and means operable to fasten said angle iron to the framing member, one end of said angle iron having a notch in which the handle of the crank member is positioned.

In witness whereof, I hereunto subscribe my name this 24th day of May, A. D. 1929.

CHESTER I. WILLIAMS.