No. 821,869. PATENTED MAY 29, 1906.

H. W. HATHAWAY.

FORM FOR CONCRETE CONSTRUCTION.

APPLICATION FILED DEC. 1, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

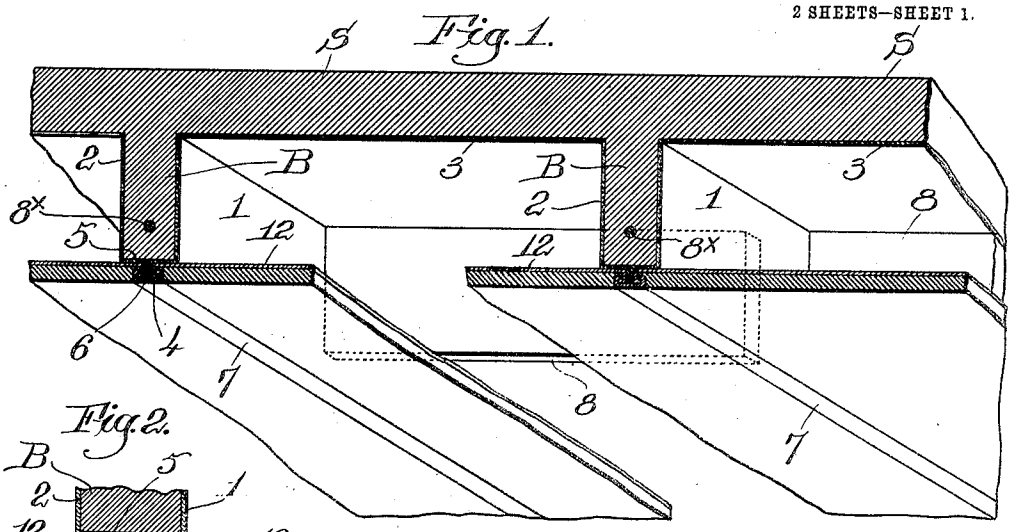


Fig. 2.

Fig. 3.

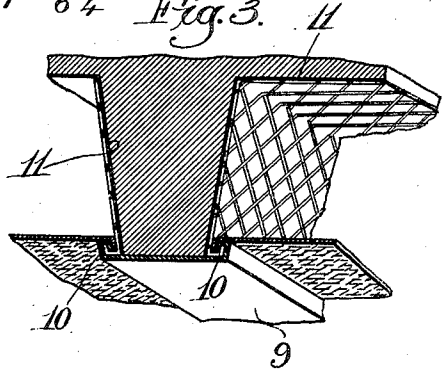


Fig. 4.

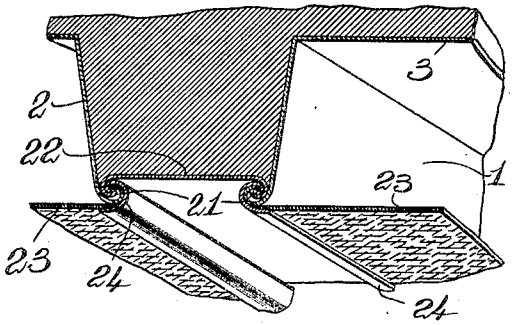


Fig. 5.

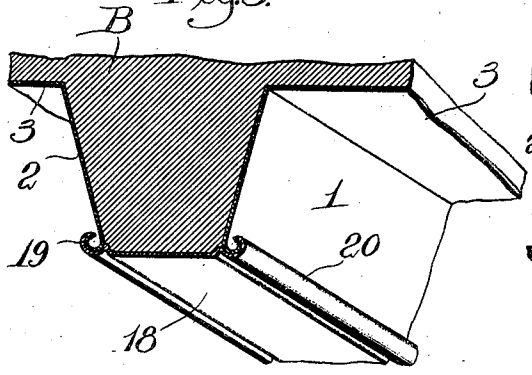
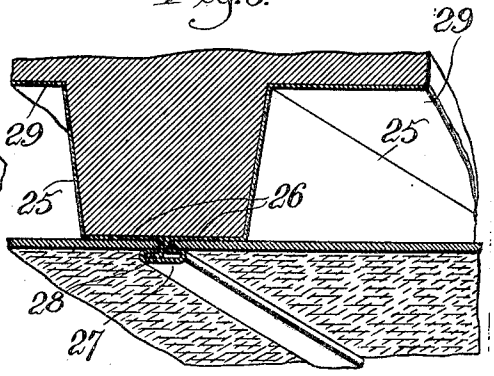


Fig. 6.



Witnesses.
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2 SHEETS—SHEET 2.

Fig. 7.

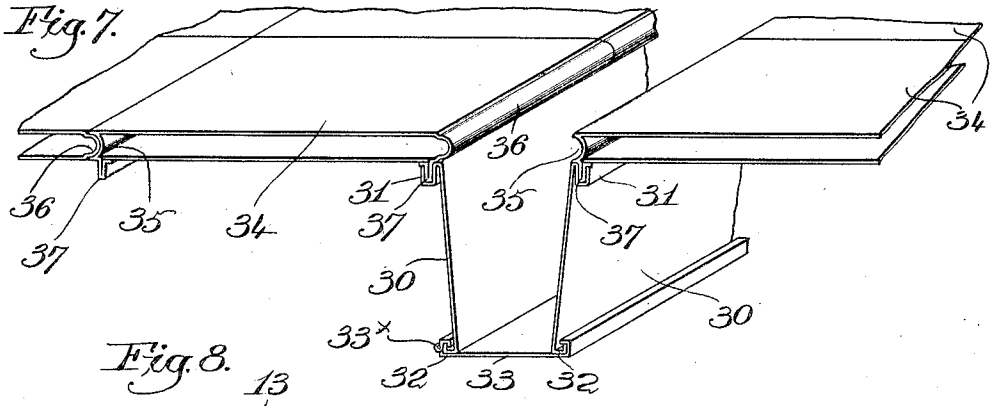


Fig. 8.

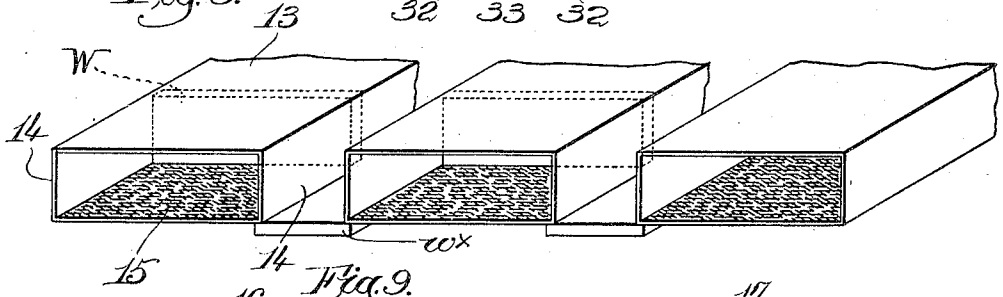


Fig. 9.

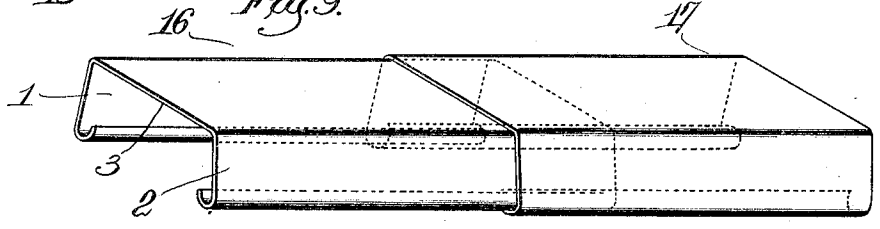
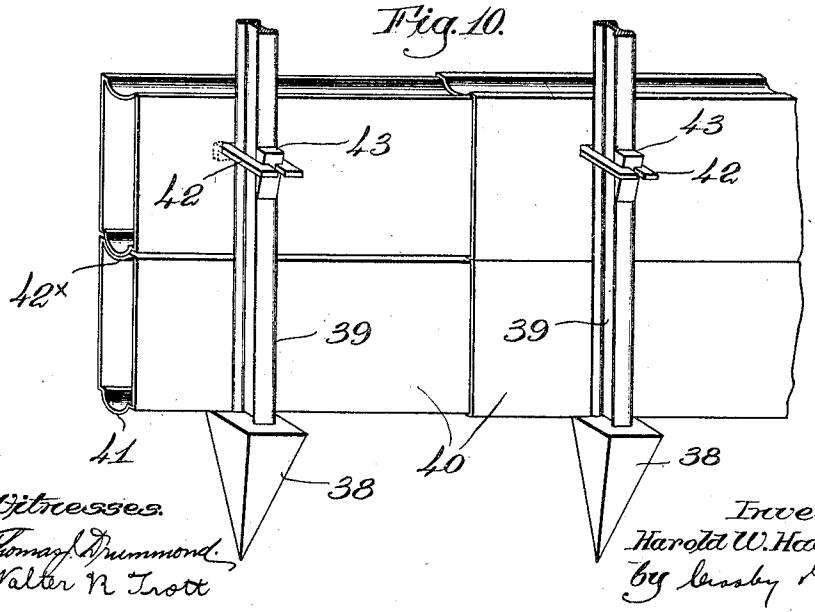


Fig. 10.



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UNITED STATES PATENT OFFICE.

HAROLD W. HATHAWAY, OF DAYTON, OHIO.

FORM FOR CONCRETE CONSTRUCTION.

No. 821,869. Specification of Letters Patent. Patented May 29, 1906.

Application filed December 1, 1905. Serial No. 289,763.

To all whom it may concern:

Be it known that I, HAROLD W. HATHAWAY, a citizen of the United States, and a resident of Dayton, county of Montgomery, State of Ohio, have invented an Improvement in Forms for Concrete Construction, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention has for its object the production of simple, cheap, and efficient forms for use in concrete building construction, whereby the cost of such construction is very materially reduced and the labor diminished.

In the various systems of concrete construction now in vogue it is necessary to build up forms of wood, which are bolted or nailed together, constituting molds for concrete floor slabs and beams and walls, the construction of the forms being an expensive part of the work, requiring much time and labor. By my present invention much of this labor is done away with and time saved, and in accordance therewith the forms are made of a thin, relatively light, and cheap material, preferably sheet-steel, and so constructed that they can be readily set up and temporarily supported in position for the placing of the concrete.

The forms for floor-beams or wall structures can be made of the desired length, or they can be made extensible to accommodate concrete beams of different spans.

By making the sides and bottoms of forms for floor-beams and ceiling-slabs interlocking they can be readily assembled and taken apart and removed after the concrete has set.

The various novel features of my invention will be fully described in the subjoined specification, and particularly pointed out in the following claims.

Figure 1 is a perspective view of forms for beam and floor-slab construction embodying my invention, the adaptation of the forms for supporting ceiling-lathing being shown, the forms in such case remaining permanently in place. Fig. 2 is an enlarged detail showing one mode of locking together the sides of the form and supporting the metal lathing for the ceiling. Fig. 3 shows the form made of wire-netting with a suitable lining and locked by a channel-strip, this form being left permanently in place. Fig. 4 is another arrangement for locking the bottom and sides of the form together for a permanent structure. Fig. 5 shows the locking arrangement for a temporary form intended to be removed after the concrete has set. Fig. 6 is a view of another arrangement, wherein a separate locking member for the form is obviated, the lathing for the ceiling being partly shown. Fig. 7 is a perspective view of forms for beams and floor-slabs locked in position ready for the concrete. Fig. 8 shows in perspective a modified and very simple construction for permanent forms. Fig. 9 is a perspective view of an extension-form whereby its length may be adjusted to the span of the beam; and Fig. 10 is a perspective view showing the mode of utilizing the forms in building walls, to be referred to hereinafter.

In the construction of concrete floors beams are made of the concrete at suitable distances apart, the intervening spaces being filled by what are termed "floor-slabs," the beams being reinforced by steel or iron tension bars or rods embedded in the concrete.

To shape or mold each beam, a form is made having opposite sides and a bottom, and the nearer sides of two adjacent beam-forms are connected by a support for the floor-slab.

Referring to Fig. 1, I have shown the sides 1 and 2 of two beam-forms connected at their upper edges by a transverse slab-support 3, the parts preferably being made of thin sheet-steel, the lower edge of the side 1 being bent laterally and downward at 4, while the lower edge of the side 2 is bent laterally, but in the opposite direction at 5, and then it is also downturned at 6.

When the parts are assembled, the beam form or mold is made by two sides 1 and 2, the bent lower edges contacting to close the bottom, and a locking member 7 is then applied to hold the sides together.

Lateral braces or withes 8 rigidly connect the slab-support 3 and the attached side portions 1 and 2 of the beam-forms. This arrangement of forms is repeated from one to the other side wall, the forms being cut to suit the span of the beams, and temporary supports are employed to hold the forms in position.

In Fig. 1 I have shown tension rods or bars $8^{\times}$ for the beams, the concrete being filled into the beam-forms at B and on the supports 3 to form the floor-slabs S. If these forms are to be removed after the concrete has set, the locking members 7 are detached,

and thereafter the forms can be readily taken down and used over again, and in that case the forms are painted or coated with any suitable preparation which will prevent the adhesion of the concrete thereto. Should the forms be left in place, as may be done, they can be made of sheet metal, as described, or they may be made of stout wire-netting, as shown in Fig. 3, the bottom of each beam-form being made by a metal channel 9, which locks over the bent edges 10 of the form sides. When wire-netting is thus employed, the forms must be lined with heavy paper, as at 11, Fig. 3, to prevent the escape of the concrete before it sets.

A flat ceiling can be readily provided if the beam structure is not to show when the ceiling is finished by fastening wire lathing or netting 12 into the bottoms of the beam-forms, (see Figs. 1, 2, and 3,) the lathing being held in place by the sides of the forms and the locking members coöperating therewith. Manifestly when ceiling-lathing is employed in such manner the forms must be left permanently in place. If the forms are to be removed, however, and a flat ceiling is desired, wires may be bedded in the concrete at the bottoms of the beams in usual manner by supporting such wires on the bottoms of the beam-forms, parts of the wires being upturned to be embedded in the concrete, and after the forms are removed the lower ends of the wires are bent down and the wire lathing is fastened thereby to the beams.

The forms for temporary use are made of heavier steel to stand the wear and tear of repeated handling and use; but for forms remaining in place permanently much lighter construction can be employed, and if of sheet metal no coating or painting is necessary.

Referring to Fig. 9, I have shown an extensible form for beam and floor work, the parts 16 and 17 sliding one within the other, each part presenting two sides for beam-shaping and a connecting slab-support, and in practice lateral braces or withes will be used, as before referred to, to stiffen and strengthen the forms. Such extensible forms can be adjusted to the length of the room without cutting, and a separate bottom for each beam-form can be held in place by supports from the floor below.

Referring to Fig. 5, I have shown an interlocking channel 18 for temporary or removable forms, and in setting up the forms the one at the left will first be positioned and the curved or locking edge 19 of the channel applied thereto. Then the next or right-hand form for beam sides and floor-slabs is locked onto the edge 20 of the channel and set up, the operation being continued across the width of the room.

To remove the forms, the reverse order of procedure is observed, the last form set up being taken down first and unlocked from the channels forming the bottom of the beam forms or molds.

In Fig. 4 I have shown a permanent form with a different arrangement of locking-channel, the lower edges of the form sides being rolled upward and toward each other at 21, and the channel 22 is shaped to lock over the rolled portions, the level or flat ceiling being laid onto wire lathing 23, worked into the downturned edges 24 of the channel and thereby held in place.

A beamed ceiling can be made by the arrangement shown in Fig. 5, and the forms may be either temporary or permanent, as desired.

The various forms herein described and shown have been interlocked by separate channels or locking members; but in Fig. 6 I show an arrangement wherein a separate locking member is not used, the adjacent parts of the forms interlocking directly.

In Fig. 6 the sides 25 of the form for the beam are bent inward, as at 26, to form the bottom face of the beam, and the locking-bend 27 of one of the sides interlocks with the locking-bend 28 of the complemental side, each of the side members of the form having the slab support or form 29, substantially as previously described.

If the beams are to be exposed in the completed structure, the forms shown in Fig. 6 can be taken down with very little trouble; but if a flat ceiling is required it can be made, as shown in Fig. 8, by tie-wires bedded into the concrete of the beams or the metallic lathing can be fastened onto the locking-bends 27 28, Fig. 6, provided the forms are permanent.

To make the lathing secure, the locking-seams are tightened or closed up with a hammer, and clips or wires can also be used to attach the lathing to withes or partitions, &c.

So far I have shown the beam-forms as boxes or made cellular and the floor-slab forms as attached lateral extensions of the sides of the beam-forms; but the slab-forms may be made cellular, if desired, and interlocked with the beam-forms, as in Fig. 7. Therein the sides 30 of each beam-form are separate, each having a locking groove or channel 31 at its upper edge and a locking lip or bend 32 at its lower edge, the lips or bends 32 interlocking with the channel 33, and the latter may have one of its locking edges hinged or readily bent, as at $33^{\times}$, to facilitate removal of the forms.

The slab-forms are shown at 34, Fig. 7, and they are made box-like and telescopic, or they may be made of fixed lengths, with a depression or groove 35 in one edge to receive the tongue 36 on the adjacent edge of the next form. Such slab-forms 34 are also provided adjacent each transverse edge with a depending lip 37 to enter the locking-channel 31 of the adjacent side 30 of the beam-form, where-

by the slab-forms are held in proper position, it being understood that the concrete for the floor-slabs is molded on the tops of the forms 34. Such slab-forms are used when the area to be covered is greater than could be properly supported by the structure shown in the preceding arrangements, wherein the floor-slabs are formed or supported on integral parts of the sides of the beam-forms.

In the drawings simple forms of interlocking bends have been illustrated; but it will be manifest that various other forms of bends or interlocks can be used within the spirit and scope of my invention. Furthermore, in practice the parts where locked together would fit tightly to prevent the entrance of any material portion of the concrete when the forms are to be removed after the setting of the concrete.

Concrete walls can be constructed by means of forms similar to the floor-slab forms illustrated in Fig. 7, and in Fig. 10 I have shown how the forms can be used in wall-building.

Cast-iron sockets 38 are driven into place in two parallel rows along the line of the wall to be built, and into these sockets are set metallic uprights or standards 39 the height of the wall, the standards being shown as channel-bars in Fig. 10 and from three to four feet apart in each row, the rows being separated a distance depending upon the thickness of the wall. The forms 40 are then built up and attached to the standards, said forms being substantially like the forms 34, (shown in Fig. 7,) except that they have no locking-lips, and they are set on edge one above the other in tiers. Thereupon the concrete is introduced in any usual manner into the box or mold thus produced, and in Fig. 10 the forms are shown as telescopic or extensible, with a tongue 41 on one edge and a groove 42 in the other edge. Clamps $42^{\times}$ are secured to the forms and embrace the standards, and wedges 43 are driven in to hold the clamps securely in place. Such forms are coated or painted, as before specified, to prevent the concrete from sticking thereto, and in practice the standards are substantially braced and cross-braced to secure the necessary rigidity.

After the lower portion of the concrete wall has set the clamps for the lower tier of forms can be loosened and released and the forms removed, leaving those above clamped in position, the removed forms being again used higher up on the wall or on other parts of the work. Proper "shapes" for door and window openings are provided, and they can be so constructed that the forms will lock therewith when in use. In the construction herein described the beam sides and floor-slab supports are shown connected together; but in Fig. 8 a very simple and inexpensive arrangement is shown. To produce the same, a sheet of metal is provided of requisite length and wide enough to form the top 13, opposite sides 14, and bottom 15 of a box-like structure, and before the sheet is bent it is run through a stamping or perforating apparatus to perforate the bottom portion 15 substantially like metal lathing. These box-like structures are stiffened and strengthened by wooden withes W, Fig. 8, to which the top and sides are suitably secured by nails. Such boxes are set up side by side, as shown, so that the beam sides are formed by the adjacent sides 14 of two boxes, the bottom being conveniently made by a plank $w^{\times}$, and the concrete is filled into the beam-molds thus provided, while the concrete floor-slabs are supported on the tops 13 of the boxes. Such forms are when set up permanently secured in place, and after the concrete has set the plank bottoms $w^{\times}$ can be removed, leaving the bottom of each beam exposed. The ceiling-plaster is then applied, the perforated bottoms 15 of the boxes serving to sustain the same in lieu of separately-applied lathing. The sides and tops of the boxes can be ribbed or corrugated or perforated at intervals, if desired.

Any suitable mode of securing together the meeting edges of the sheet of metal forming each box can be adopted.

It will be manifest that a set of forms for a particular piece of work can be made in such manner as to conform to the general architectural design and that such forms can be used over and over in other buildings of the same general type.

Various changes or modifications can therefore be made without departing from the spirit and scope of my invention.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In concrete building construction, a series of light metallic forms each comprising two beam side molding portions, and an intervening floor-slab support or molding portion, and elongated channel-like members to lock the lower edges of said forms together from end to end and complete the beam-molding portions.

2. In concrete building construction, a series of metallic forms adapted when assembled to mold a plurality of beams and intervening floor-slabs, means to lock said forms in assembled position, and means to sustain ceiling-lathing between the beam-molding parts of the forms.

3. In concrete building construction, a series of longitudinally-telescopic adjustable sheet-metal forms adapted when assembled to mold a plurality of beams and intervening floor-slabs, and means to lock said adjustable forms in assembled position.

4. A sheet-metal form for concrete construction, comprising two longitudinally-

telescopic members each having a floor-slab-molding portion and at each side a depending portion to mold one side of a beam, and means to lock a depending portion of one form to a similar portion of another form.

5. In concrete construction, separable metallic forms to constitute molds for beams and floor-slabs, means to interlock a plurality of such forms in operative position, and means to sustain metallic ceiling-lathing on such interlocked forms.

6. In concrete construction, separable metallic forms to constitute molds for beams and floor-slabs, the lower edges of the side portions of each beam-mold having longitudinally-extended and continuous locking-lips, and a locking member for each beam-mold provided with portions to interlock with the said extended locking-lips and thereby maintain a series of forms in operative position.

7. A metallic form member for concrete construction, comprising a floor-slab support, a downturned portion at each side thereof to constitute the side of a beam-mold, transverse bracing between such downturned portions, and locking means on the latter whereby two adjacent members may be locked together.

8. In concrete construction, sheet-metal forms comprising depending beam-molding portions having locking means on their lower edges, slab-supporting portions connecting the adjacent sides of two beam-molding portions, and an elongated locking member to coöperate with the locking means on the lower edges of each coöperating pair of beam-molding portions from end to end of said edges.

9. In concrete construction, cellular floor-slab portions, depending sheet-metal portions detachably connected therewith, to mold the sides of the beams, and means extending the length of and to lock together in operative position adjacent pairs of beam side molding portions.

10. A cellular, metallic member for concrete construction, having a depression in one of its longitudinal edges and a tongue on its opposite edge.

11. In concrete wall construction, a series of cellular, metallic members set in upright position one upon another in tiers, one longitudinal edge of each member having a groove and its opposite edge having a tongue, upright standards, sockets in which their lower ends are fixed, and means to detachably clamp the cellular members to the standards.

12. Metallic forms for concrete construction, comprising separable members constituting sides for beam-molds and having integral lateral extensions to support intervening floor-slabs, and means extending longitudinally of the lower edges of the members to lock together said members in pairs along the bottom of the beam-mold.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HAROLD W. HATHAWAY.

Witnesses:

MYERS Y. COOPER,

H. D. POWERS.