

Jan. 2, 1940.

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2,185,860

SHUTTERING DEVICE FOR THE BUILDING OF FERROCONCRETE STRUCTURES

Filed Dec. 29, 1936

4 Sheets-Sheet 1

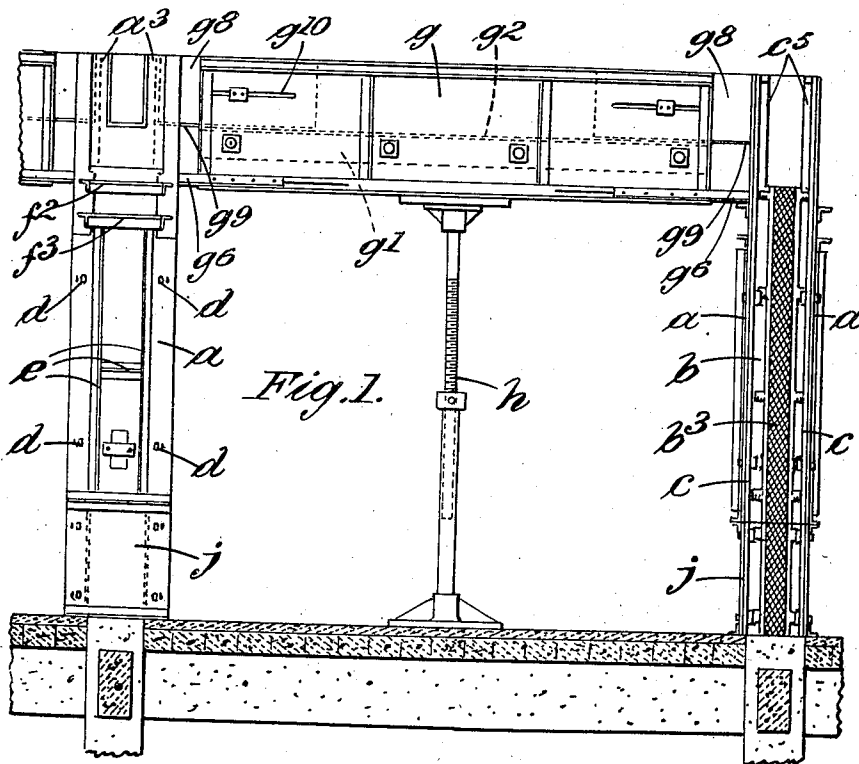


Fig. 1.

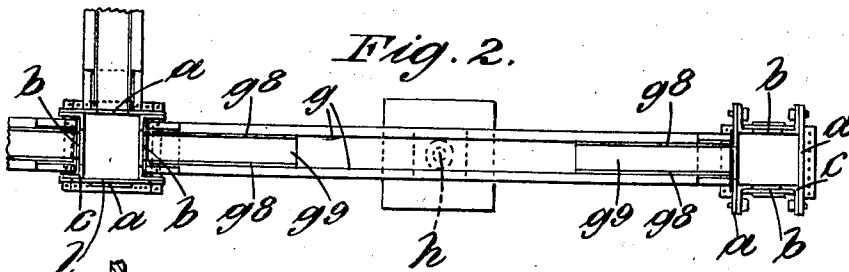


Fig. 2.

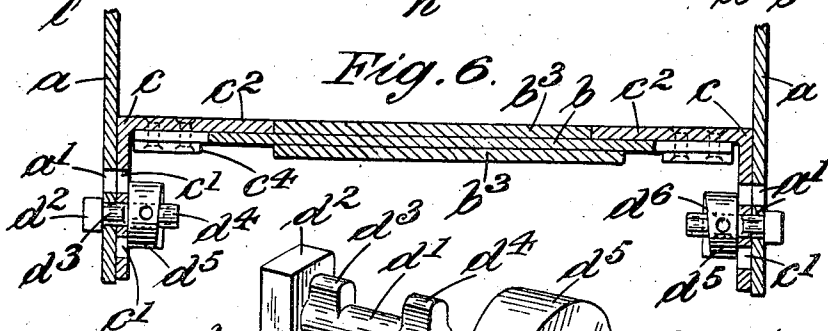
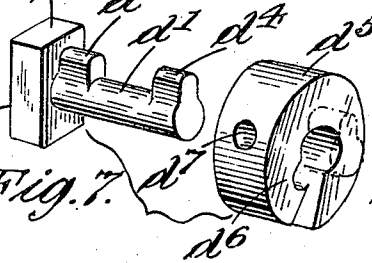


Fig. 6.

Fig. 7.



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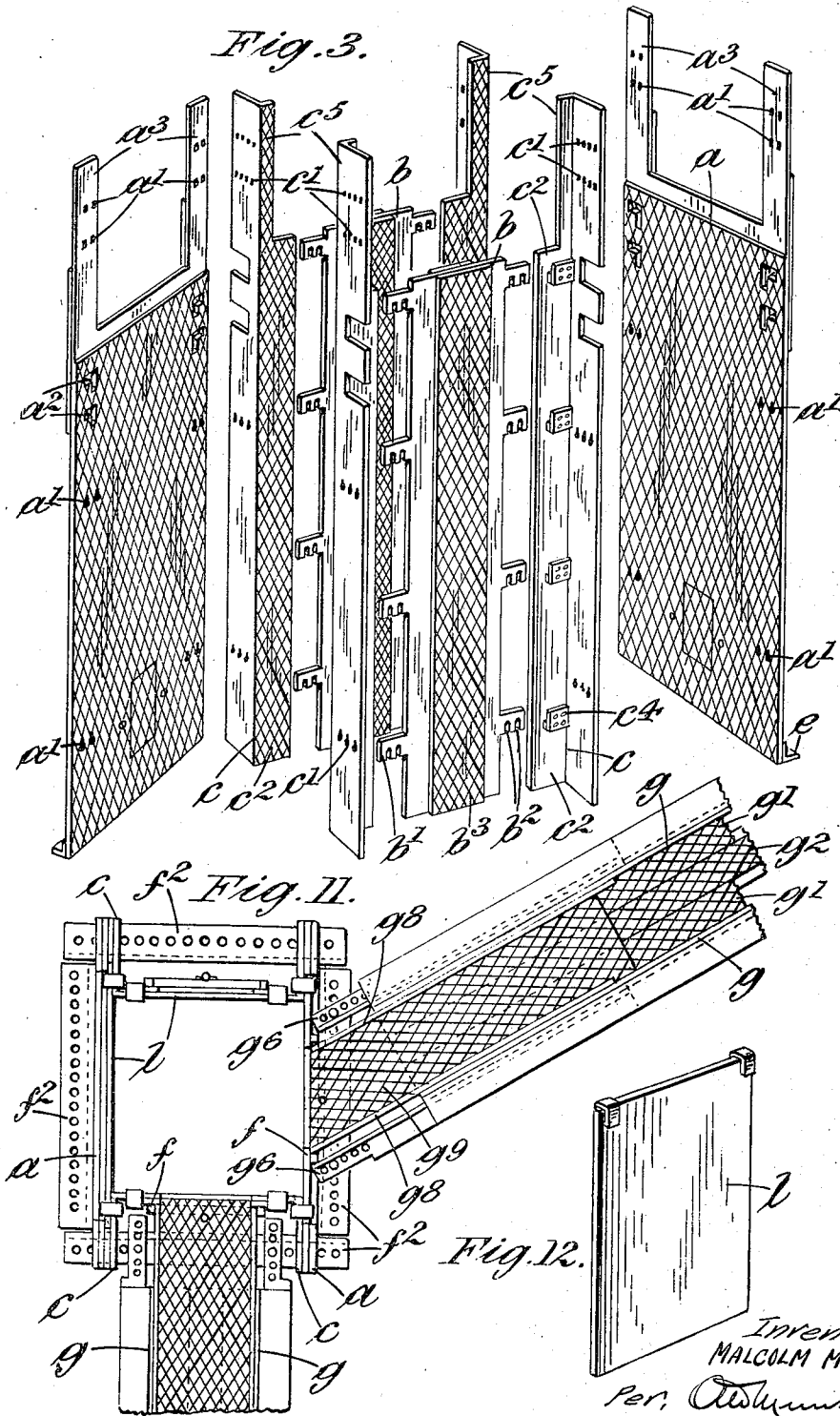
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4 Sheets-Sheet 2



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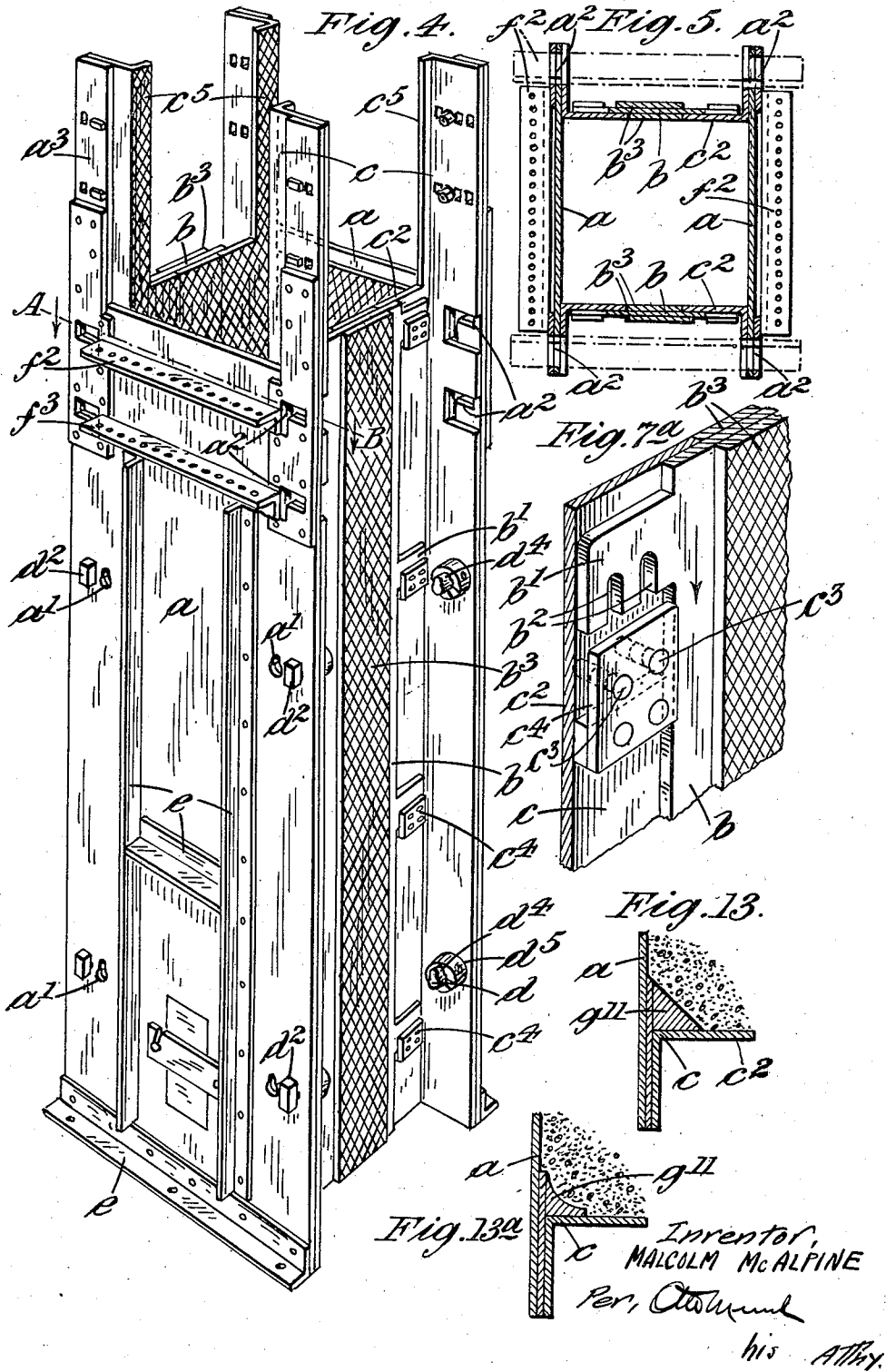
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4 Sheets-Sheet 4

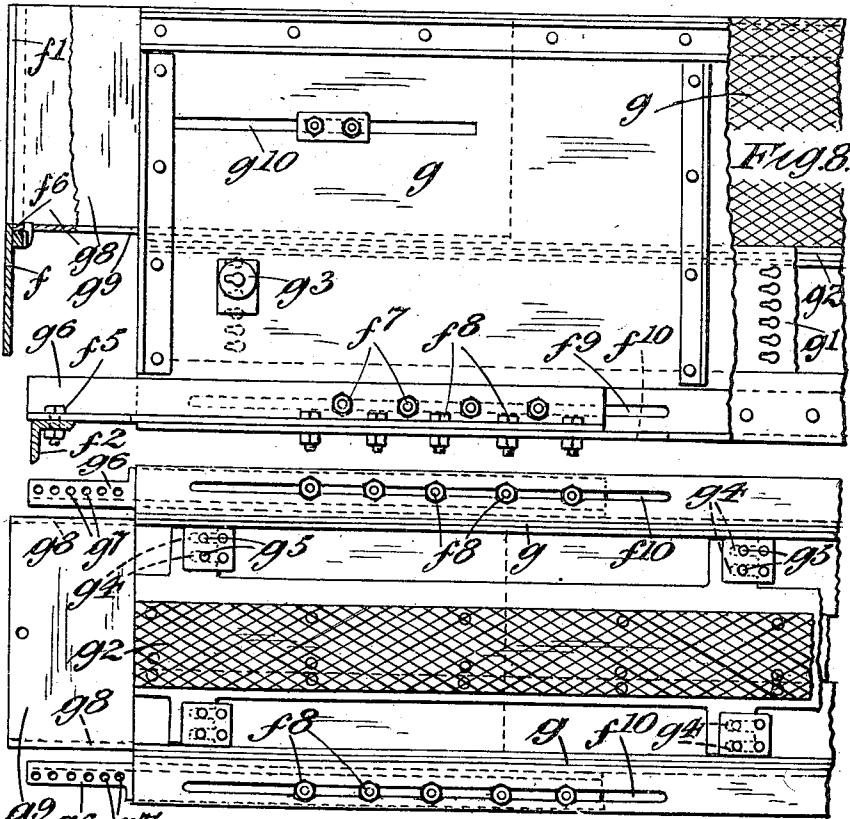


Fig. 8.

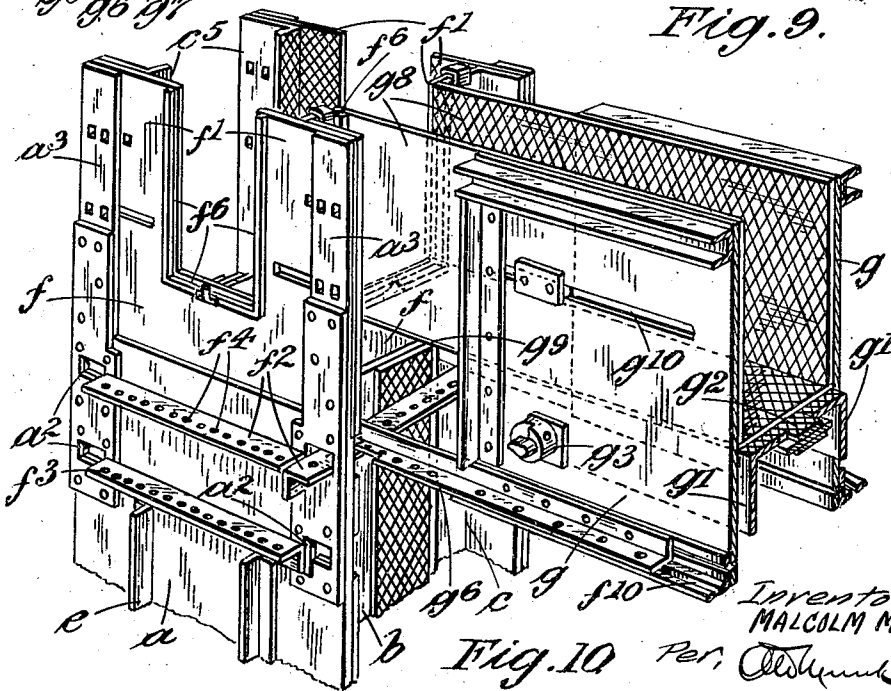


Fig. 9.

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UNITED STATES PATENT OFFICE

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SHUTTERING DEVICE FOR THE BUILDING OF FERROCONCRETE STRUCTURES

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Application December 29, 1936, Serial No. 118,098
In Great Britain December 30, 1935

5 Claims. (Cl. 25—131)

This invention relates to shuttering devices for the building of columns and beams of ferroconcrete structures and has for its object the construction and arrangement of parts of shuttering devices of standard size capable of dimensional alterations within a given range so that shutter elements of a standard character and of great durability can be continuously used on various parts of the structure of a building or buildings and thus avoid the heavy expense, short life of and great variety of wooden shuttering devices used in building operations under present conditions.

This invention consists in a shuttering device for the building of ferroconcrete structures having pairs of rectangular plates, an angle member adjustably mounted adjacent to each side of one pair of plates adapted to vary the distance apart of the angle members on each plate, clamping means to fixedly hold the angle members in place, another pair of plates having laterally extending portions adapted to detachably engage the said angle members to form a shuttering device on all sides. It also consists in a shuttering device for beams comprising two side plates, two angle members associated therewith, a bottom plate of selected width, means for varying the space within the shuttering to vary the dimensions of the cast beam, registering and clamping means for holding the side and bottom plates together so as to be capable of dimensional alterations and supporting members slidably held on the side plates adapted in their extended position to rest on the landings on the column shuttering plates. It further consists in the constructional details of the shuttering structures as hereinafter described and illustrated.

In order that the invention may be the better understood I will now proceed to describe the same in relation to the accompanying drawings, reference being had to the letters and figures marked thereon. Like letters refer to like parts in the various figures, in which:

Fig. 1 is a diagrammatic elevation of shuttering as fabricated and erected for use according to this invention.

Fig. 2 is a plan of Fig. 1.

Fig. 3 shows in perspective the separated parts of the column shuttering before erection.

Fig. 4 is a perspective view to a slightly larger scale of column shuttering erected ready for the reception of the concrete.

Fig. 5 is a sectional view on the plane A—B of Fig. 4.

Fig. 6 is an enlarged sectional view of one side

of the column shuttering showing the means of attachment to the two other sides and the facilities for dimensional alteration.

Fig. 7 is an enlarged view of one of the clamps for the angle members.

Fig. 7A shows the means of attachment of one of the side plates to the angle member.

Fig. 8 is a side elevation of one end of the beam shuttering with parts broken away.

Fig. 9 is an underneath view of Fig. 8.

Fig. 10 is a perspective view showing the upper parts of the column shuttering adapted for use with the beam shuttering, one end of the latter engaging therewith.

Fig. 11 shows in plan how the beam shuttering may be adapted for casting beams at an angle to the column.

Fig. 12 is a perspective view of a panel plate hereinafter referred to as part of the column shuttering.

Figs. 13 and 13A are sectional plan views showing examples of how the corners of the work may be modified in form.

In accordance with this invention shuttering devices for columns of rectangular section consist of two pairs of plates *aa* and *bb*, the plates of each pair being disposed opposite to one another and are associated together by means of four angle members *c*. Each plate *a* has at each side a series of apertures or holes *a*¹ transversely disposed at intervals between the top and bottom of the plate *a*. In one of the flanges of the angle member *c* a hole *c*¹ is, or holes *c*¹ are, transversely disposed at intervals to correspond with the holes *a*¹. The holes *a*¹ and *c*¹ are preferably of key-hole shape in order to engage the registering and clamping device *d* which consists of a round stem *d*¹ having a head *d*² at one end and two nibs *d*³ and *d*⁴ at the ends of the stem *d*¹ as shown in Fig. 7. A collar *d*⁵ has a bore hole of similar shape to the holes *a*¹ and *c*¹ and its outer face *d*⁶ is of helical formation. When the clamping device *d* is passed through one of the holes *a*¹ in the plate *a* and a corresponding hole *c*¹ in the angle member *c*, the nib *d*³ engages in the holes *a*¹, *c*¹ and prevents the stem *d*¹ from turning, the collar *d*⁵ is now placed onto the stem *d*¹ until it has passed the nib *d*⁴ (as shown in dotted lines) when it is turned by means of a tommy bar inserted into the hole *d*⁶ and the plate *a* and angle member *c* are registered and clamped together.

Each of the plates *b* has on each side two or more lateral extensions or lugs *b*¹ having notches *b*² on the under side thereof. The angle mem-

bers c have each on their free flange c^2 a series of studs c^3 transversely disposed and a cleat c^4 at intervals corresponding to those of the lugs b^1 on the plates b . The dimensions of the column to be cast depends therefore on the distance of the angle members c from one another on the plate a and the distance of the plates a from one another as determined by the particular notches b^2 and studs c^3 engaged by a relative sliding motion behind the cleat c^4 as shown in Fig. 7A.

When the free flanges of the angle members c touch one another this is the condition of the smallest dimension of the column in this direction. If it is desired to increase the dimension the plate b has attached to it a filling plate b^3 to fill the space between the edges of the free flanges. In order to reduce the number of elements required the plate b may have a filling plate b^3 on each side but these two plates have a different width as shown clearly in Fig. 6.

To prevent the distortion of the shuttering during use stiffening members e are provided at the necessary parts as shown in the drawings.

To enable the plates a and the angles c to be adapted for and to co-operate with shuttering for the casting of beams of various dimensions, extensions a^3 and c^5 are provided respectively thereon. Across these extensions and at each side of the column on which a beam is to be constructed the plates a or angles c and/or plates b as the case may be, have at their upper end a plate f having upwardly extending portions f^1 at its sides forming an U shaped aperture. These plates f are placed between or are hooked over the extensions aforesaid to fill that part of the gap not required. Around the upper part of the shuttering are arranged two sets of laterally extending members such as angle irons f^2 and f^3 at different levels to form landings for supporting the shuttering for the beam and the floors. The angle irons f^2 and f^3 relative to the plates a are fixedly attached thereto while the angle irons f^2 and f^3 relative to the plates b are supported in suitably shaped apertures a^2 in the sides of the plates a .

The beam shuttering consists of a pair of plates g provided with two angle members g^1 and one bottom plate g^2 and are held together adjustably by clamping devices g^3 (similar in construction to d) and notches g^4 and studs g^5 in the same way as has already been described with regard to plates a and b of the column shuttering.

At each end and at the bottom of the plates g a sliding member g^6 is arranged and is guided and fixed by bolts f^7 and f^8 engaged respectively in slots f^9 and f^{10} , so that it can be drawn out and rested upon either of the angle irons f^2 or f^3 in a fixed condition to support the beam shuttering device as a whole upon the column shuttering device. The outer end of the sliding member g^6 is provided with means such as holes g^7 adapted to register with one of a series of holes f^4 provided in the angle irons f^2 or f^3 by the insertion therein of a bolt f^5 . The plates g have at their ends a loose panel plate g^8 adapted to slide along thereon and be guided by slots g^{10} so as to close up the gap between the end of the plate g and the plate f . Floor extension plates g^9 which slide upon the bottom plate g^2 to extend the floor to the plate f are provided. The outer ends of the plates g^8 , g^9 fit into a recess f^6 formed by a rim around the inner edge of the extensions f^1 , and the parts are otherwise adapted to conform to

the conditions set up by any particular arrangement of the beams relative to the columns.

When it is desired to form a keying surface the inner faces of the columns and beams shuttering plates are chequered where the parts of the shuttering directly support the concrete forming said columns and beams.

When a chamfered or moulded corner is required on the column or beam filling-in pieces g^{11} such as shown in Figs. 13 and 13A can be fixed in the corner of the shuttering.

When the shuttering is erected as shown in Figs. 1 and 2 for casting columns and beams before the casting operation of the beams takes place in some cases it is advisable to support the centre portion of the beam shuttering with an adjustable strut or struts h as shown in Fig. 1 in order to take the weight of the beam shuttering and the beam cast therein.

Fig. 11 illustrates that, by retracting on one side and extending on the other side the side-plate g^8 and sliding member g^6 the beam shuttering is adapted for beams at an angle to the column the bottom plate g^9 being cut at the appropriate angle. This figure also serves to show the use of the panel plate i (Fig. 12) which covers the gap between the extensions in the column plate or angles when no beam on that side is to be cast. When it is desired to carry the column above the floor level as in the lower part of Fig. 1 short lengths of shuttering having the principal features of the main shuttering are first employed as indicated at j and the main shuttering erected there-upon. Or, alternatively, the short length j may be removed after this section is cast and the main shuttering erected therearound thus acting as a support and guide for the latter.

I claim:

1. An adjustable shuttering device for use in the building of ferroconcrete structures, comprising two elongated plates disposed facing each other in parallel planes, at least one transverse element associated with said plates, said transverse element including a transverse plate disposed at right angles to said elongated plates and two angle members, serving respectively to connect said elongated plates to said transverse plate, each of said angle members having one web lying on the inner face of one of said elongated plates adjacent one side edge of the latter with its free edge directed outwardly and the other web directed transversely towards the corresponding web of the second angle member disposed on the other plate, means adjustably securing said angle members to said elongated plates, and projections on the outwardly facing sides of the transversely directed angle member webs, said projections engaging in a selection of a plurality of recesses transversely spaced apart in said transverse plate and so positioned that all are covered by said last mentioned webs when the shuttering is adjusted to its maximum transverse dimension.

2. An adjustable shuttering device for use in the building of ferroconcrete columns, comprising a pair of elongated plates disposed facing each other in parallel planes, a pair of transverse plates disposed facing each other in parallel planes at right angles to said first-mentioned planes, and four angle members having their corners disposed along the lines of intersection of the planes of said transverse plates with said elongated plates, each of said angle members having one web adjustably secured to the inner face of one of said elongated plates adjacent one side

edge of the latter with its free edge directed outwardly, the other web being disposed in contact with the inner face of the corresponding transverse plate and connecting means for adjustably securing said transverse plate to said angle member, said connecting means being arranged on the side of said other web that faces away from the interior of the shuttering and engaging in a selection of a plurality of recesses transversely spaced apart in the transverse plate and so positioned that all are covered by said other web when the shuttering is adjusted to its maximum dimension.

3. An adjustable shuttering device for use in the building of ferroconcrete structures, comprising two elongated plates disposed facing each other in parallel planes, at least one transverse element associated with said plates, said transverse element including a transverse plate disposed at right angles to said longitudinal plates and having on its longitudinal edges lateral extensions provided with notches disposed in transversely extending series, and two angle bars serving respectively to connect said elongated plates to said transverse plate, each of said angle bars having one web lying on the inner face of one of said elongated plates adjacent one side edge of the latter with its free edge directed outwardly and the other web directed towards the corresponding web of the second angle bar, means adjustably securing said angle bars to said elongated plates, cleats secured to the outwardly facing sides of said other webs of the angle bars, and studs spanning said cleats and said other webs, said studs being selectively engaged with said notches to maintain said angle bars at a selected spacing from each other and overlapping said transverse plate.

4. An adjustable shuttering device for use in

the building of a ferroconcrete column and a ferroconcrete beam supported thereby, comprising column shuttering, a landing bracket secured to said column shuttering adjacent to an aperture therein, and beam shuttering including two side plates, a bottom plate, two angle bars serving respectively to secure said side plates to said bottom plate, each of said angle bars having one web downwardly directed and adjustably secured to the inner face of one of said side plates and the other web horizontally disposed and adjustably secured to the upper face of said bottom plate, two supporting members attached to said side plates respectively for adjustment longitudinally thereof and secured to said landing bracket, and three adjustable extension plates slidably mounted on the inner faces of said side and bottom plates and adjusted to fill the space between said last-mentioned plates and the column shuttering.

5. In a form for receiving fluid concrete, a plurality of corner angle members for spaced arrangement relative to each other to provide a symmetrical grouping, supports on the exterior faces of adjacent web portions of said angle members, filler plates between said portions and having securing means adjustably engaging means on said supports wholly exterior and unexposed to the receiving space for the concrete, closing plates for the remaining spaces between the adjacent webs of the angle members, and locking means remote from and unexposed to the concrete for securing the plates and angle members in assembled fluid tight relation whereby filling of the mold leaves the securing means free of contact with any concrete.

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