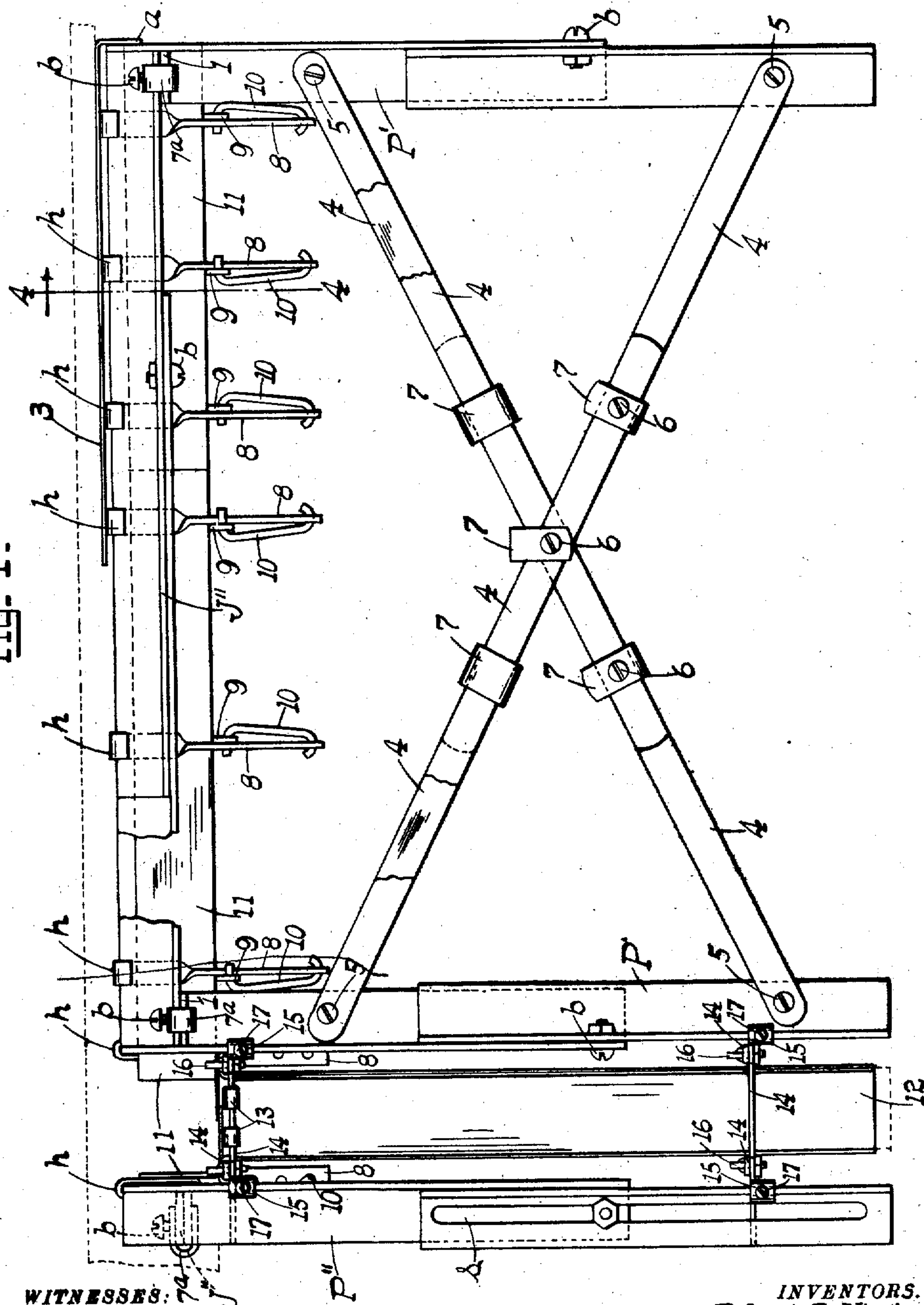


R. B. HIGGINS & H. ALBERS.
ADJUSTABLE CONCRETE FORM.
APPLICATION FILED FEB. 25, 1910.

975,242.

Patented Nov. 8, 1910.
4 SHEETS—SHEET 1.

FIG. 1.



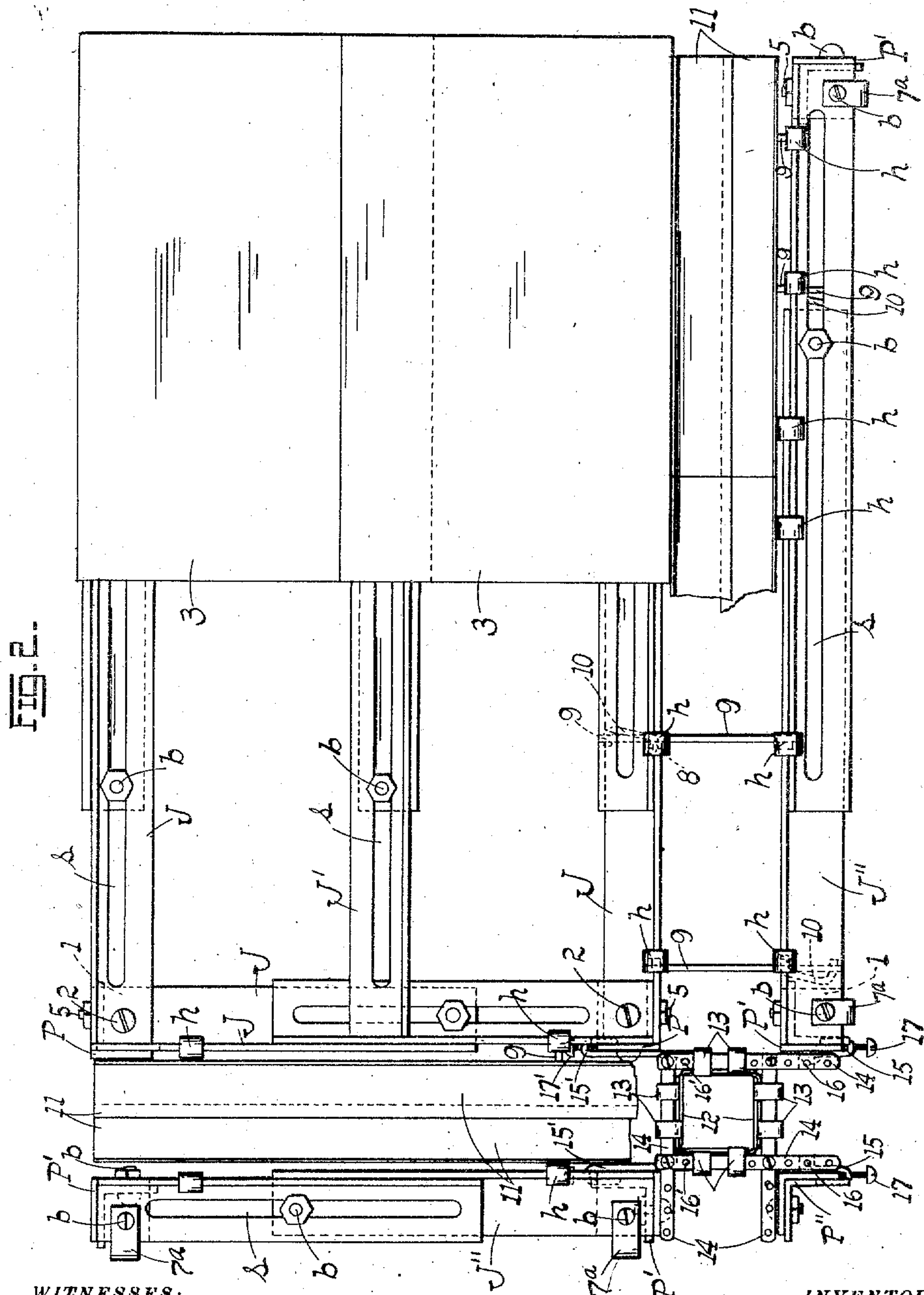
WITNESSES:
Harry A. Barnes
Josamias

INVENTORS.
Robert B. Higgins
Herman Albers
BY *Emil Starck*
ATTORNEY.

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WITNESSES:
Harry A. Beimes.
Jos. Amichet.

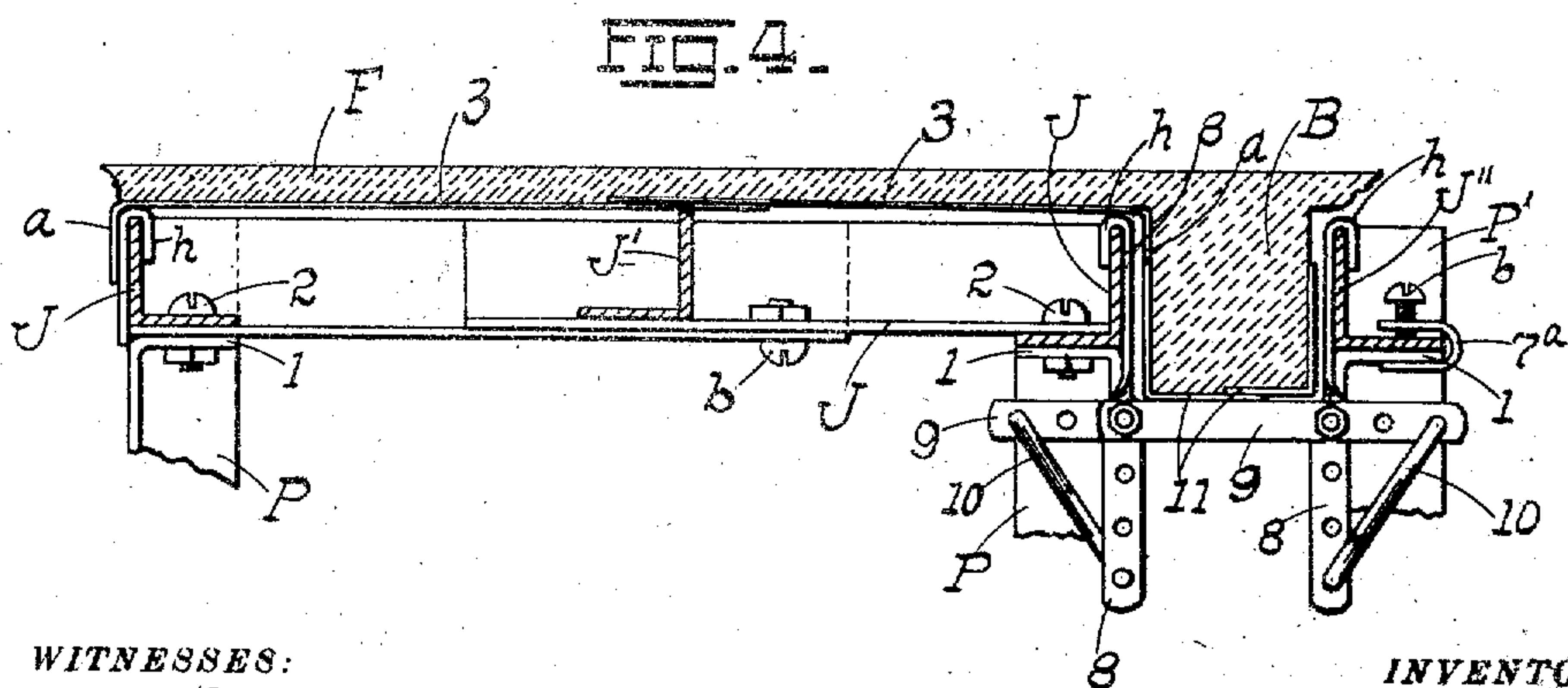
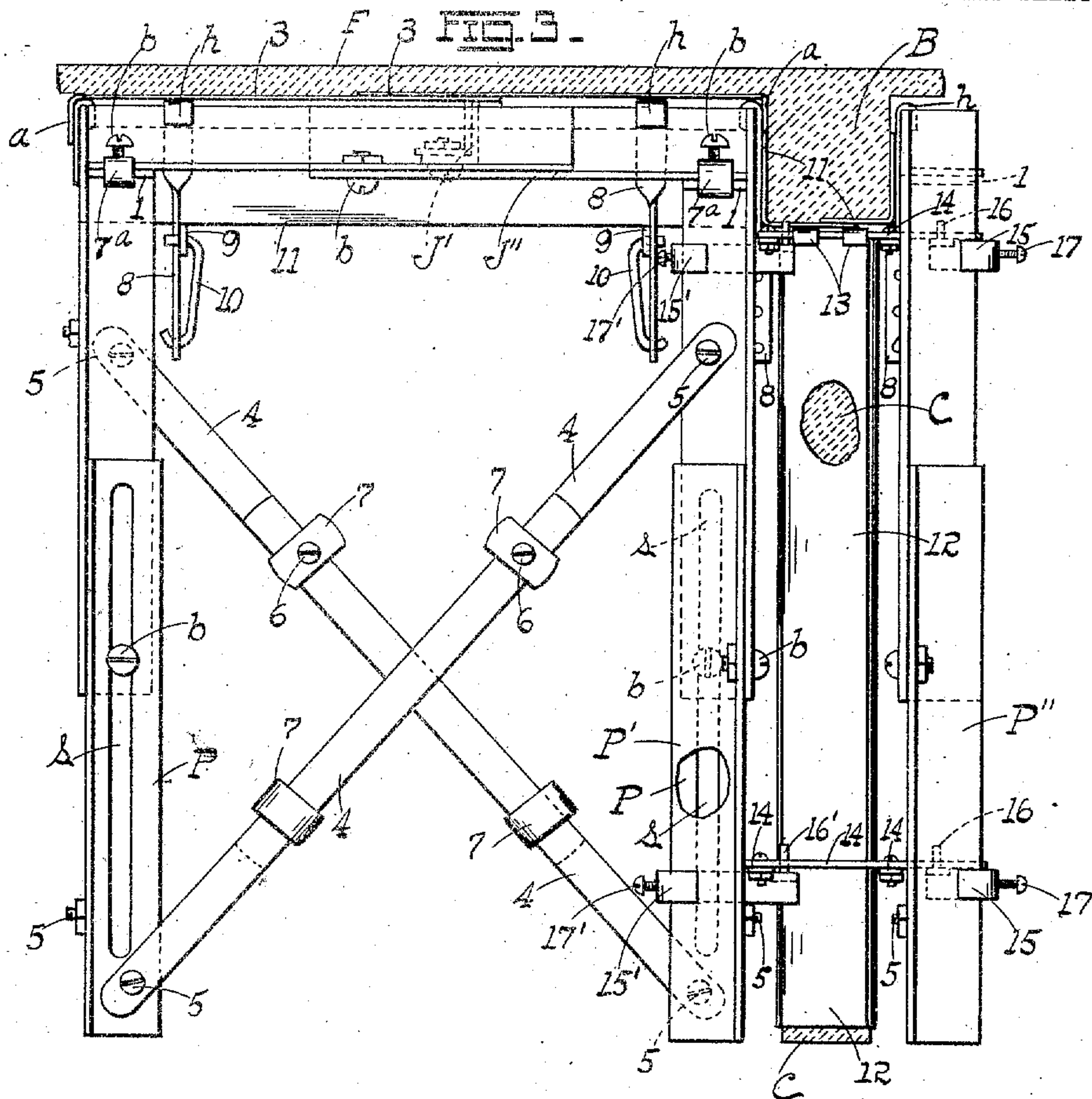
INVENTORS.
Robert B. Higgins
Herman Albers.
BY
Eugene L. Larn
ATTORNEY.

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4 SHEETS—SHEET 3.



WITNESSES:
Harry A. Beimes
Jos. Amich

INVENTORS:
Robert B. Higgins
Herman Albers
BY *Emil Stora*
ATTORNEY.

R. B. HIGGINS & H. ALBERS.
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4 SHEETS—SHEET 4.

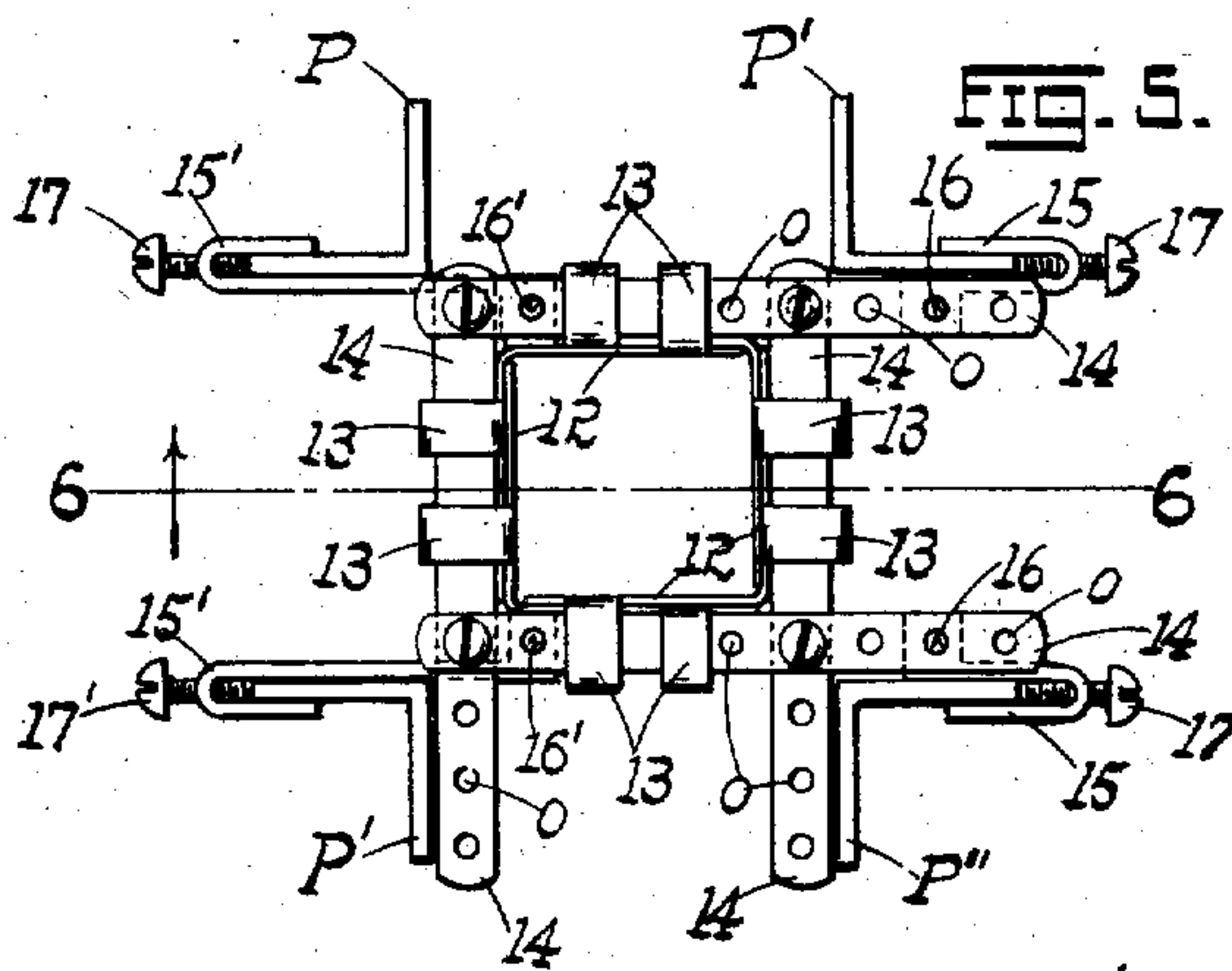


FIG. 5.

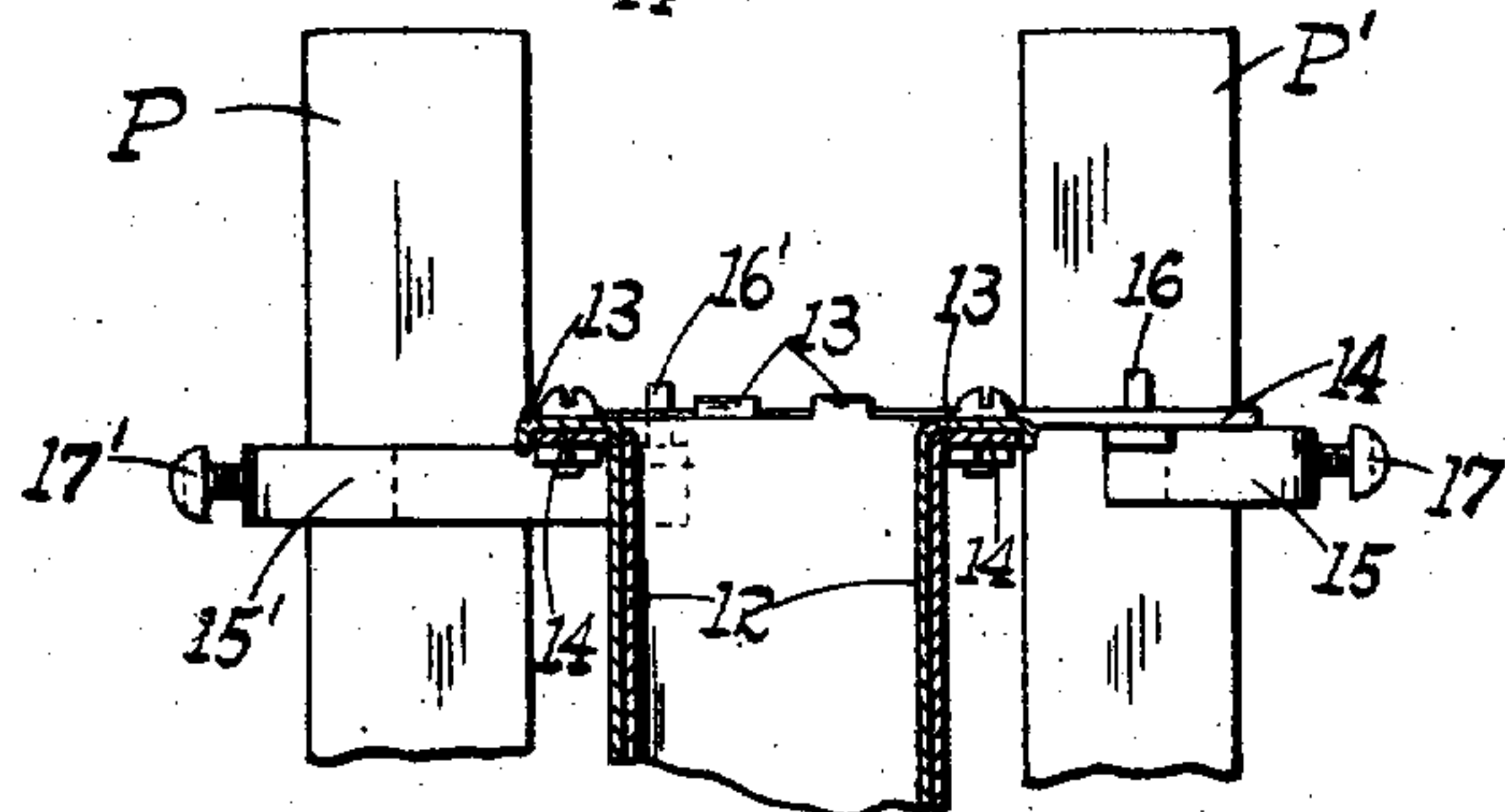


FIG. 6.

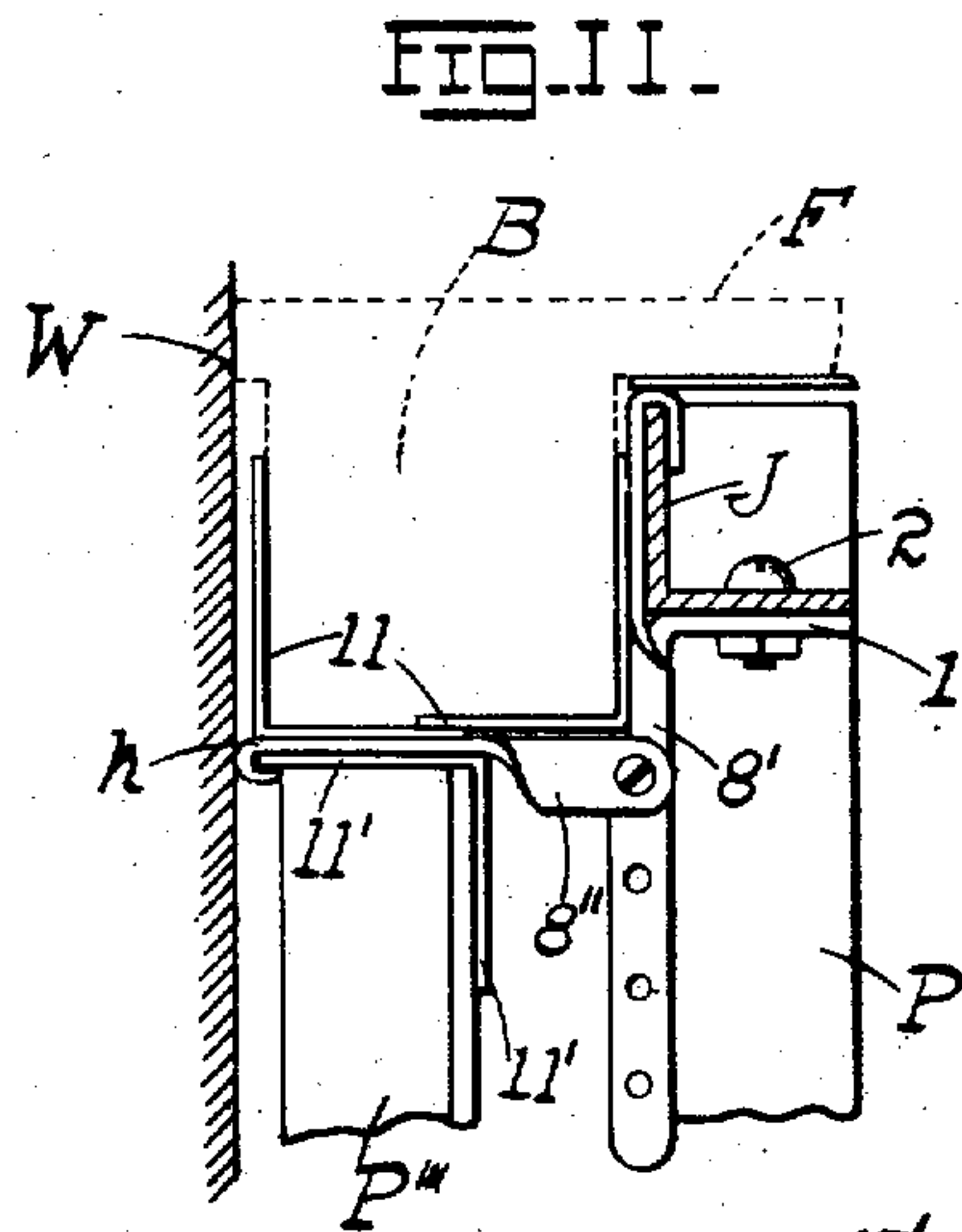


FIG. 11.

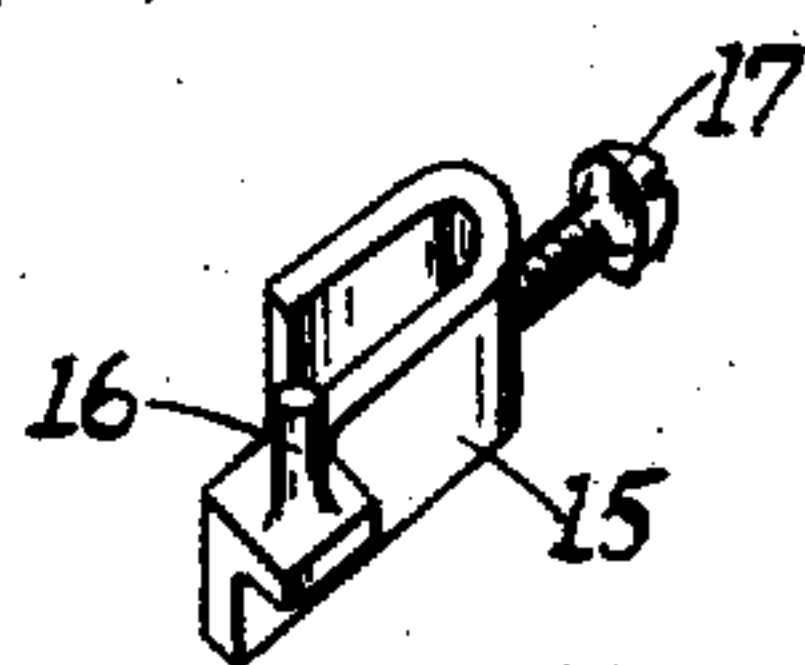


FIG. 8.

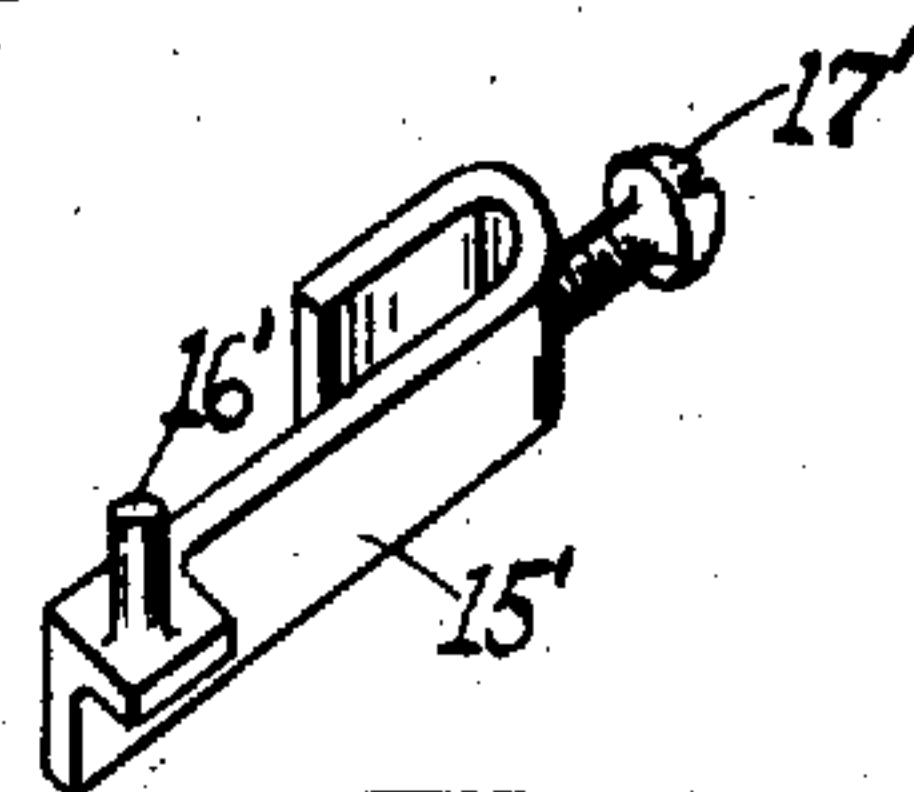


FIG. 9.

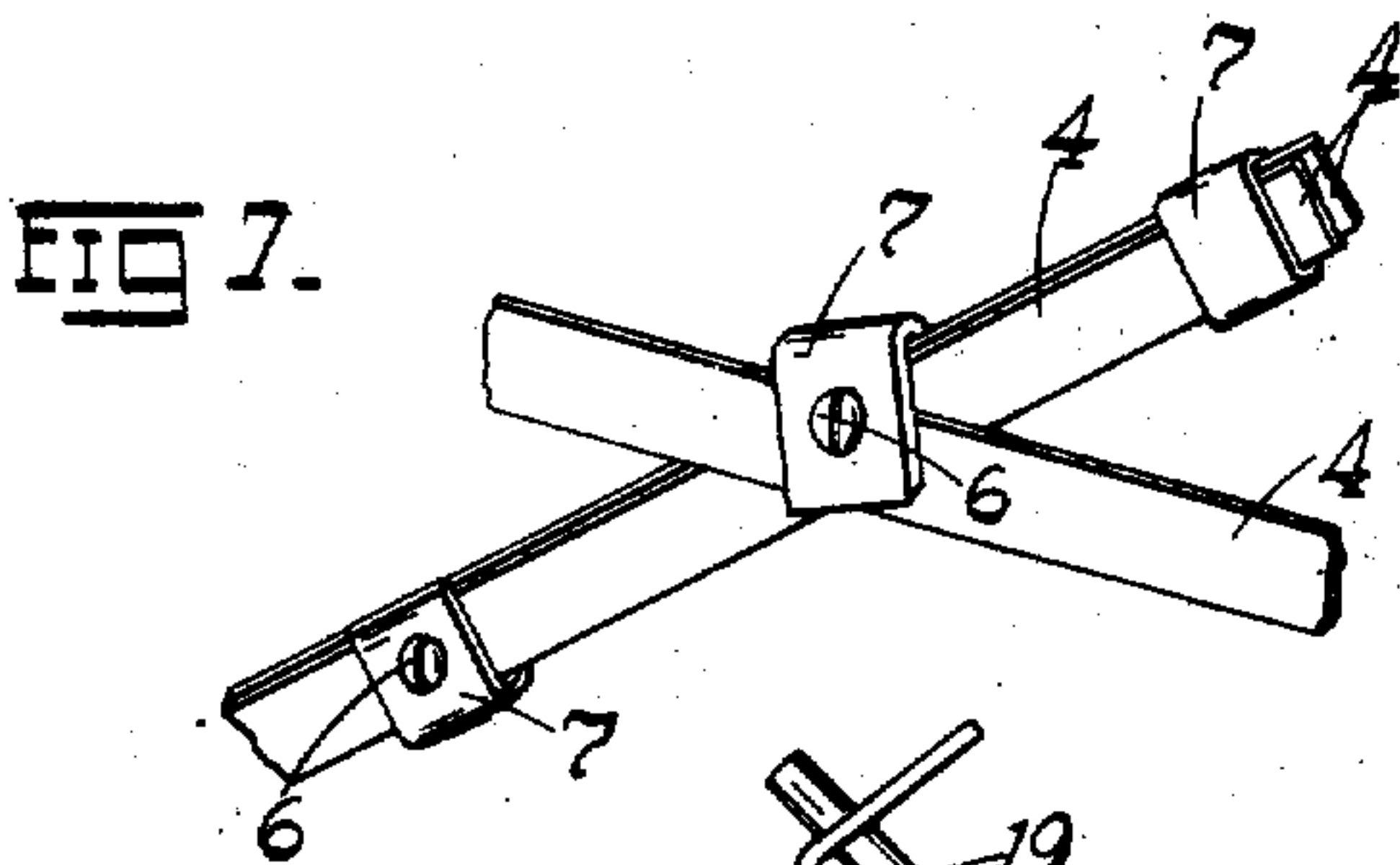


FIG. 7.

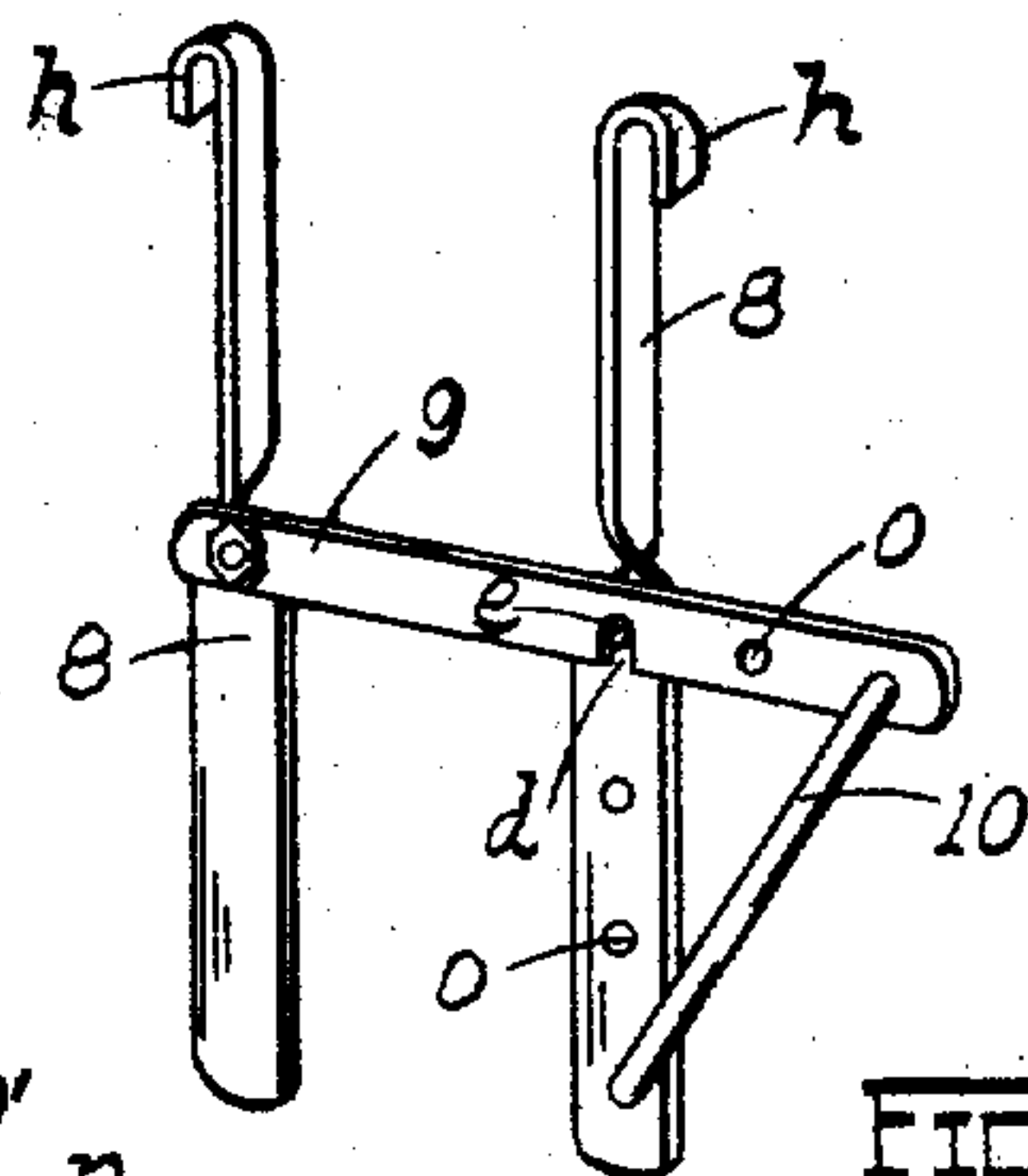


FIG. 10.

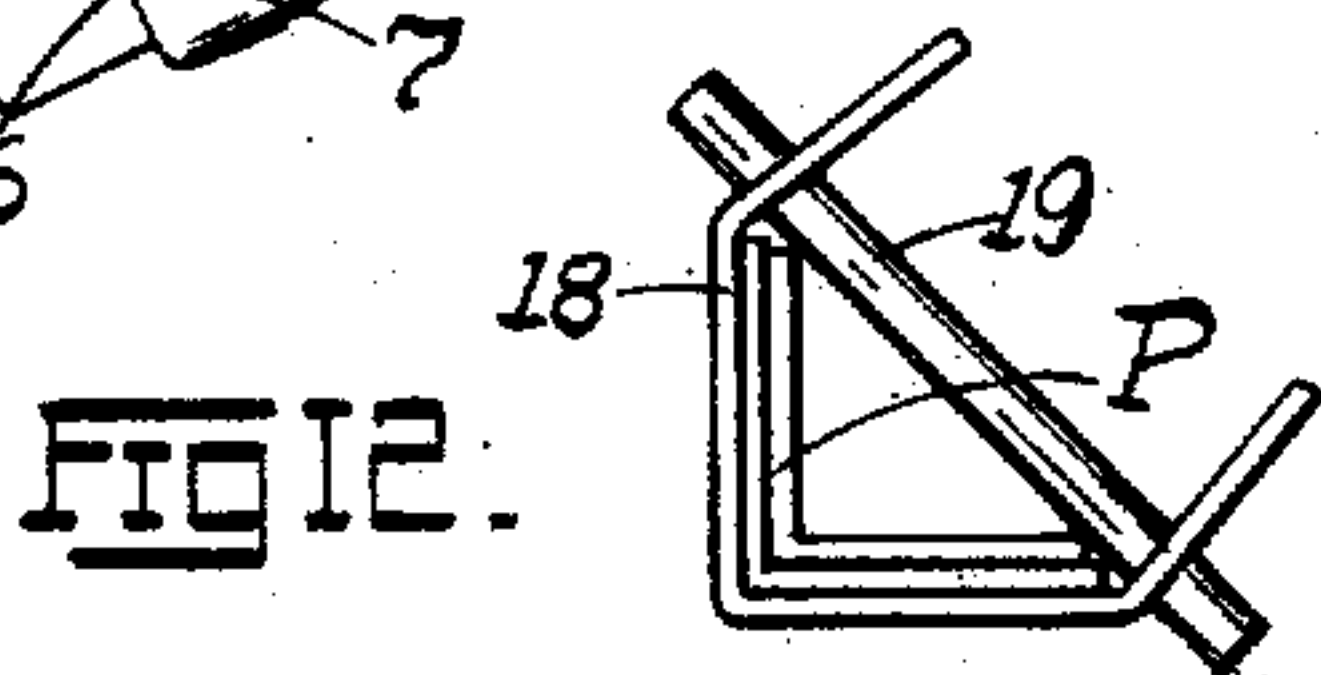


FIG. 12.

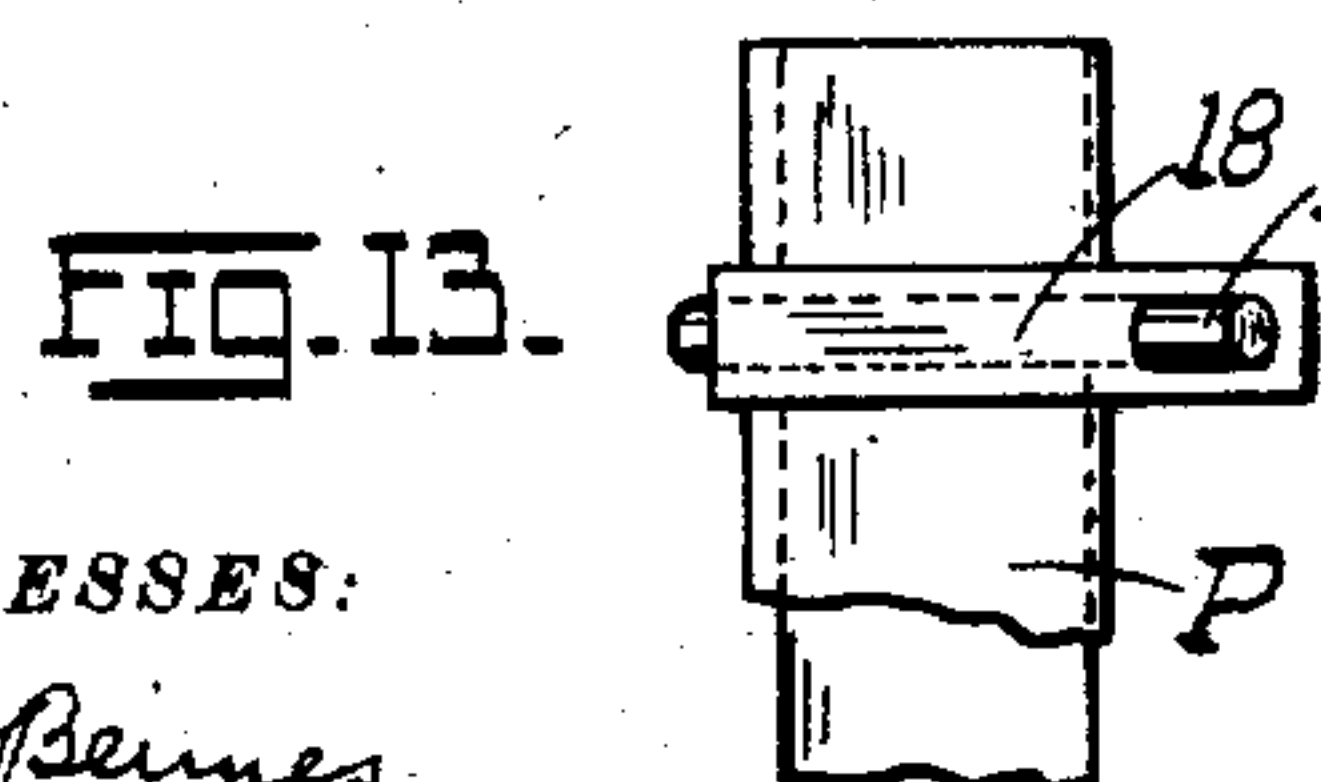


FIG. 13.

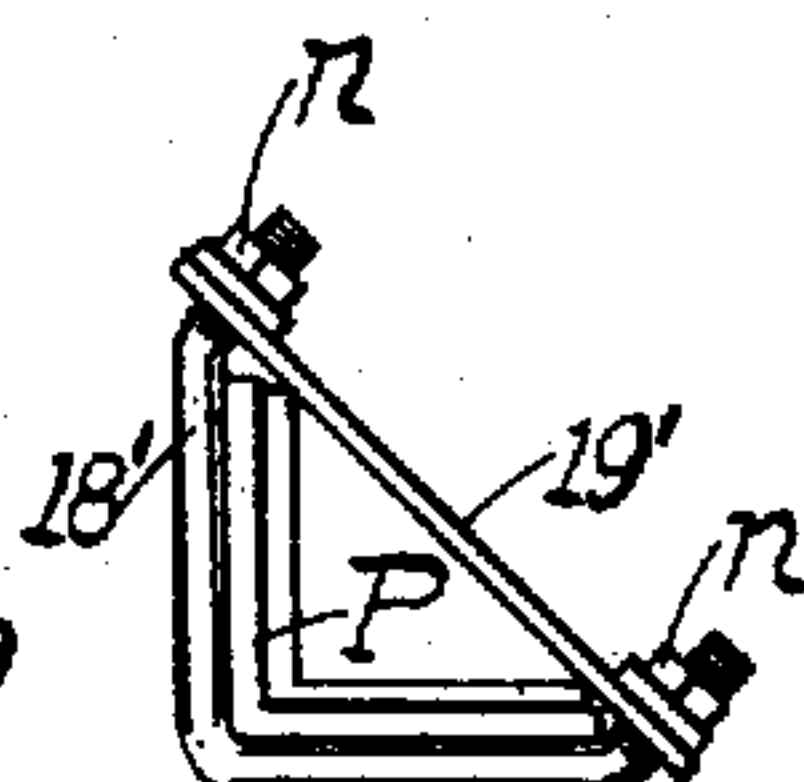


FIG. 14.

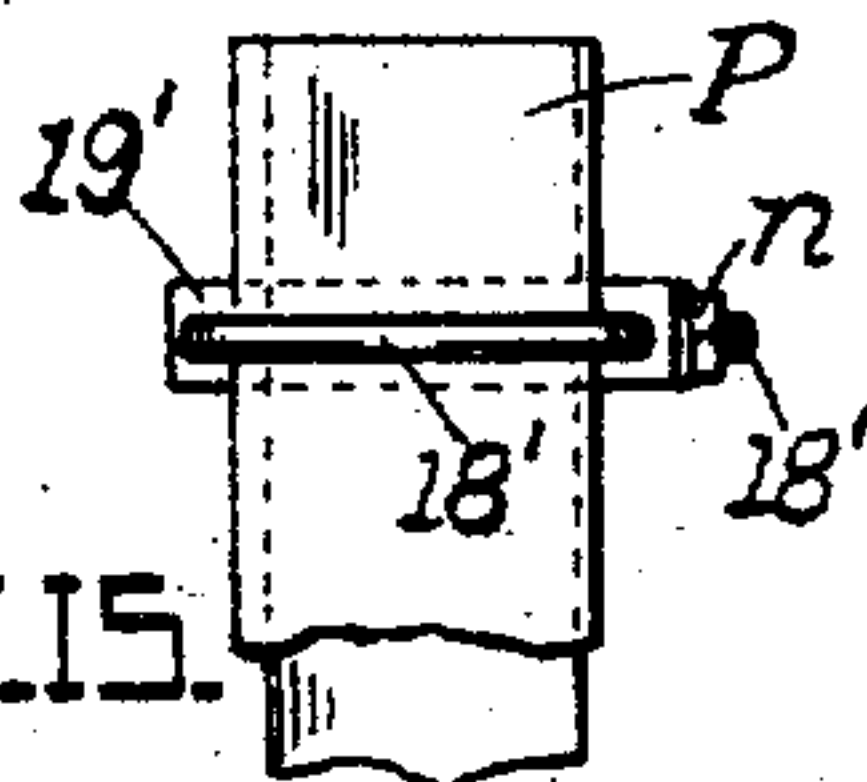


FIG. 15.

WITNESSES:
Harry A. Beimes.
Joa. Amichief

INVENTORS.
Robert B. Higgins
Herman Albers.
BY
E. J. Haren
ATTORNEY.

UNITED STATES PATENT OFFICE.

ROBERT B. HIGGINS AND HERMAN ALBERS, OF ST. LOUIS, MISSOURI.

ADJUSTABLE CONCRETE-FORM.

975,242.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed February 25, 1910. Serial No. 545,993.

To all whom it may concern:

Be it known that we, ROBERT B. HIGGINS and HERMAN ALBERS, citizens of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Adjustable Concrete-Forms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention has relation to improvements in adjustable and knock-down forms for concrete structures, being especially designed for use in the construction of concrete columns, beams and floors of buildings, and it consists in the novel features of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a side elevation of the invention; Fig. 2 is a top plan of Fig. 1, the view showing the main or center frame work for the support of the floor form, the beam-forms on two contiguous sides (only) of such center form, and the column form on one of the corners (only), the like construction (not shown) prevailing about the two remaining sides; Fig. 3 is an end elevation of the structure showing sections of the concrete floor, beam and column; Fig. 4 is a vertical transverse section on the line 4—4 of Fig. 1, showing sections of the concrete floor and beam, which are merely dotted in Fig. 1; Fig. 5 is a detail top plan of the column form and corner posts, and adjustable frame for supporting the column; Fig. 6 is a cross-section on the line 6—6 of Fig. 5; Fig. 7 is a perspective detail of a pair of crossed tie-bars by which the posts are braced; Figs. 8 and 9 are perspectives of the two sizes of clips for supporting the adjustable frames which carry and guide column forms; Fig. 10 is a perspective of one of the hangers supporting the decking which constitutes the beam-form; Fig. 11 is a cross-sectional detail taken through a floor joist too close to the wall of an adjoining building to permit of the placing of the regular outer joist from which the regular hanger is supported, the view showing the manner of supporting the beam-form from below, under the circumstances; and Figs. 12 and 13, 14 and 15, are respectively end views and side elevations of two modified constructions for clamping together the extensible sections or members of the supporting posts.

The object of the present improvement is to provide a form which shall be adjustable both vertically and horizontally; one which will allow for an accurate independent adjustment of the molds or forms receiving the concrete for the vertical supporting columns of the building; one provided with hangers capable of rigid suspension against lateral displacement for the support of the decking on which the horizontal concrete floor beams are to be cast; one provided with extensible members having flat contacting faces, entering into the construction of the vertical posts or columns which support the column molds, and that of the horizontal main and secondary joists respectively supporting the decking on which are formed the horizontal beams and concrete floor; one permitting the construction of a concrete beam or joist close to the wall of an adjoining building; one which shall be rigid when once assembled; one in which the adjustable members entering into the construction of the posts and joists may assume the form of either an angle-bar, channel-bar, flat bar or even a box girder (an angle-bar being herein used as an illustration); one susceptible of a variety of changes without altering its mode of operation; one which will be practically devoid of vibration during the setting operation of the concrete; and one possessing further and other advantages better apparent from a detailed description of the invention which is as follows:—

Referring to the drawings, and for the present to Figs. 1 to 11 inclusive, P represents a series of inner posts made preferably of two angle-bar sections overlapping along their respective legs, and made extensible by means of a slot *s* in the leg of one of the sections and a clamping nut-bolt *b* carried by the contacting leg of the other section. Of course, the slot *s* need not be continuous as shown, and a series of short interrupted slots or holes may be substituted therefor, and in fact, (as subsequently to be referred to) any mechanical means for making the posts extensible may be resorted to. One of the legs of the angle-bar has its upper end turned into an inwardly deflected horizontal supporting bracket or ledge 1, (Fig. 4) said ledges serving to support the ends of the angle-bar floor joists J, one ledge supporting one end

of the transverse joist, whereas the ledge of the next post supports the end of the longitudinal joist, the opposite end of the transverse joist in turn resting on the end of the longitudinal joist supported by the ledge, and the end of the transverse joist directly supported on the ledge 1 in turn carrying the adjacent end of the longitudinal joist (Fig. 2) so that the meeting ends of the joists overlap one another. The overlapped ends are then secured by screws or bolts 2 to the ledges 1. Supported between the horizontal legs of the transverse joists are extensible secondary or supplemental joists J' (only one illustrated) likewise composed of extensible angle-bar sections. Over the several joists J, J', are placed sheets 3 preferably flanged at their outer corner edges, the flanges *a* bearing against the vertical legs of the joists, which legs form the bounding walls of the flooring formed by the superposition of the floor plates or decking 3. The posts are suitably braced on the sides of the frame by double or cross tie-bars 4 composed of extensible sections whose outer ends are secured to the posts by pins or screws 5, the overlapped portions of the sections being fastened by screws 6 carried by clips 7 embracing the overlapped portions; a similar clip 7 and screw 6 is placed at the intersection of the cross-bars (Figs. 1, 7). At the ends of the frame the posts are braced by similar single extensible tie-bars 4.

Disposed around the sides of the structure thus formed (only two sides being herein illustrated) and opposite the posts P, and spaced a suitable distance therefrom, are outer posts P' likewise composed of extensible angle-bar sections similarly constructed and similarly braced, each pair of outer posts P' likewise and in like manner supporting an extensible outer joist J'', disposed parallel to the adjacent joist of the inner frame. The outer series of posts are likewise braced where necessary by tie-bars 4. At the intersection of the vertical planes of disposition of the outer series of posts P' on two contiguous sides of the structure thus formed, is a corner post P'' likewise made of extensible angle-bar sections, so that a cluster or group of four posts are disposed at the corners of the structure (only one corner being here illustrated) said cluster serving as the means for supporting the form in which the vertical concrete column is cast, as subsequently explained. It will be seen that the outer pair of joists J, J'', are so mounted as to bring their vertical legs or walls in parallel and contiguous relation, the horizontal leg of the outer joist J'' pointing outward, and the corresponding leg of the inner joist J pointing inward (Fig. 4). This leaves the space between the vertical legs clear for the suspension of the

hangers which carry the decking or beam-form. These hangers are composed of pairs of flat, twisted vertical suspension bars 8, 9, terminating at the top in hooks *h* which engage the upper edges of the joists, the medial portions of the bars being pivotally connected by a link 9 one end of which projects a suitable distance beyond the adjacent suspension bar. The lower portions of the bars and the extension of the link are provided with openings *o* for the reception of the deflected terminals of a brace-rod 10 which serves to keep the hanger rigid. In practice the hangers are suspended so that the braced ends shall point alternately in opposite directions (Figs. 1, 4). This insures a rigid bracing not only for the hangers, but also against lateral yielding of the joists. The links 9 of the hangers collectively serve to support the sheet angle-plates 11 which are placed in lapped relation on the hangers between the joists, and thus serve to form a mold or form for the concrete beam B, cast therein.

As stated above, the cluster of corner posts P, P', P', P'', serve to support the form for the concrete column C. This form is composed of a series of sheet angle-bars 12 placed in lapped relation (Figs. 2, 5) the several sheets having hooks or bent lips 13 formed at their upper ends, said hooks engaging the sides or members of an upper four-sided jointed frame composed of rods or bars 14, the outer ends of the several members extending beyond their points of connection and hugging the vertical walls of the outer series of posts P', P', P'' (Figs. 2, 5). Two of these frames are generally ample to support a column-form, the lower frame encompassing such column at a convenient point near the bottom thereof (Fig. 1). In order to properly center the column-form relatively to the center line of the beam column B it is desirable to have some means for accurately adjusting the frames 14. This is accomplished as follows:—Engaging the legs of the outer or exposed pair of angle-bar posts P'', P' (Figs. 2, 5) are U-shaped clips 15, the longer arm of the clip having a projecting pin 16 which is inserted through an opening *o* formed in the extensions of the bars 14. At the bend of the clip is an adjusting screw 17 which bears against the edge of the leg of the angle-bar of the post, so that when the screw is turned in proper direction it will draw or exert a pull on the frame 14 thereby shifting it horizontally to bring its center in alignment with the central line of the beam-form. The legs of the inner pair of posts P, P' are engaged by clips 15' of similar design except that the long arm is considerably longer than the long arm of the clip 15, to permit the pin 16' thereof to reach the hole *o* of the same bar 14. Of course, in screwing up

the screws 17 of one pair of clips, the screws 17' of the opposite pair must be correspondingly loosened to allow for the proper adjustment or centering of the frames 14. It may be stated in passing that the holes *o* in the extension of the several bars 14 perform the additional function of permitting the enlarging or contracting of the frame according to the cross-section of column to be cast.

In practice the concrete forming the floor *F* is poured on the form formed by the sheet decking 3, when the concrete beam *B* is poured into the beam-form or mold made by the angle plates 11 (Fig. 3), the column *C* having been at the same time built up to a corresponding level, so that the column, beams, and floor all merge together.

Where the wall *W* of an adjoining building does not admit the erection of the outer posts *P'*, *P'*, and their joist *J''*, resort is had to the following arrangement for supporting the beam form, special reference being had to Fig. 11. In that event bars 8' are hooked over the joist *J*, each bar 8' having a second bar 8'' hinged thereto, and provided with a downwardly turned terminal hook *h* bearing against the wall *W*. Behind the hooks *h* is inserted the edge of the horizontal leg of a sheet angle-plate 11' which at intervals is propped up by posts of angle-bar or similar construction *P'''*. On top of the plates 11' the usual beam form plates 11 are placed when the concrete beam *B* may be poured into the form close to the wall *W*.

Of course, the slot and screw connection is not the only available method of securing the extensible sections of the posts or joists; any equivalent means may be resorted to. For example, in Figs. 12 and 13, we show two post sections *P* clamped by a strap 18 drawn together by a rod 19; in Figs. 14 and 15 we show a strap 18' with screw-threaded terminals held together by a tie-bar 19' held in position by nuts *n* passed over the screw-threaded ends of the strap.

The object of employing angle-bars (or their equivalents such as channel bars, box girders, flat bars) for the extensible members of the posts and joists, as against pipe or tubular sections, is that the flat engaging faces of such angle-bars (or their equivalents) prevent rotation of the section about the axis of the post or joist, an objection inherent with the use of tubular or hollow cylindrical sections or piping. Besides, the flat faces of the angle-bar present enlarged bearing surfaces to the hangers 8, thereby minimizing the danger of lateral oscillation or displacement of said hangers. Referring particularly to Fig. 10 it will be noticed that the link 9 being provided with a bottom notch *d* engaging a pin *e* on the vertical bar 8, the hanger may be instantly removed

from the joists, by simply pulling out one end of the brace 10, when the entire hanger can be folded or collapsed.

Where the supporting ledges 1 bent from one of the angle-bar legs of the posts happen to be on the outside of the structure (Figs. 1, 2, 3, 4), then in lieu of the securing screws 2, we prefer to employ securing means for holding the joists, in the form of clips 7^a provided with screws *b*.

Having described our invention, what we claim is:

1. In combination with an inner series of extensible posts, extensible joists mounted on the same, lapping sheets supported on the joists and forming a floor form, an outer series of extensible posts spaced apart from the inner series, extensible joists connecting the outer series of posts and disposed in the general direction of the adjacent joists supported by the inner series of posts, hangers suspended between each outer joist and inner joist contiguous thereto, and a decking supported on the hangers and forming a beam form.

2. In combination with an inner series of extensible posts, extensible joists mounted on the same, lapping sheets supported on the joists and forming a floor form, an outer series of extensible posts spaced apart from the inner series, extensible joists connecting the outer posts and disposed in the general direction of the adjacent joists supported by the inner series of posts, means for supporting a beam-form decking between the outer joists and joists contiguous thereto, and column-forms supported by the posts at the convergence of two contiguous beam-forms.

3. In combination with an inner series of extensible posts, extensible joists mounted on the same, lapping sheets supported on the joists and forming a floor form, an outer series of extensible posts spaced apart from the inner series, extensible joists connecting the outer posts and disposed parallel to the adjacent joists supported by the inner posts, means for supporting a beam-form decking between the outer joists and inner joists contiguous thereto, column-forms supported by the posts at the convergence of two contiguous beam forms, and means for adjusting the column-forms relatively to the center line of the beam-forms.

4. In combination with a pair of parallel joists having vertical flat members, spaced a suitable distance apart, a series of hangers comprising each a pair of vertical terminally hooked bars supported from the top edges of the members of the respective joists, a cross-bar pivotally connecting the vertical members at points below the lower edges of the joists and having one end extending beyond the vertical bar, a brace coupling the end of the extension to the adjacent vertical

bar, the hangers being disposed with the braces pointing alternately in opposite directions.

5 5. In combination with a group of posts disposed about a fixed point, open frames disposed along said posts, and column-forms held in position by said frames between the posts.

10 6. In combination with a group of joist-supporting posts disposed about a fixed point, open frames disposed along the posts, and column-forms held in position by said frames between the posts.

15 7. In combination with a group of joist-supporting posts disposed about a fixed point, open frames mounted along and between the posts, vertical lapping plates inserted into the forms and forming column-forms, and means for adjusting the frames
20 and the form supported thereby, in a horizontal plane.

25 8. In combination with an inner series of posts composed of extensible angle-bar sections, longitudinal and transverse main joists composed of extensible angle-bar sections carried by the posts, extensible supplemental joists supported by the horizontal legs of the main joists, lapping plates resting on the joists and forming a floor-form, an
30 outer series of corresponding posts and surmounting joists spaced apart from the inner

series and disposed in planes parallel to the joists of the inner series, hangers supported from the outer series of joists and the contiguous joists of the inner series, lapping
35 angle-plates supported on the hangers and forming beam-forms, an outer extensible corner post disposed at the convergence of the vertical planes of two contiguous sides of the structure thus formed, open-frames
40 mounted between the group of posts clustered about said corner, lapping plates inserted into said frames and forming column-forms at the point of convergence of two contiguous beam-forms.

45 9. In combination with a joist located in proximity to an adjoining wall, a hanger having a member suspended from the joist, a second horizontal member terminating in a hook adjacent to the wall, a plate disposed
50 horizontally and having an edge engaged by said hook, posts for propping up said plate, and suitable decking resting on the plate and hangers and forming a beam-form adjacent to the wall aforesaid.

55 In testimony whereof we affix our signatures, in presence of two witnesses.

ROBERT B. HIGGINS.
HERMAN ALBERS.

Witnesses:

EMIL STAREK,
JOS. A. MICHEL.