Oct. 29, 1940. A. F. HOWARD 2,219,284

MECHANISM FOR FABRICATING TOY STRUCTURAL MATERIAL

Filed Nov. 23, 1936 5 Sheets-Sheet 1

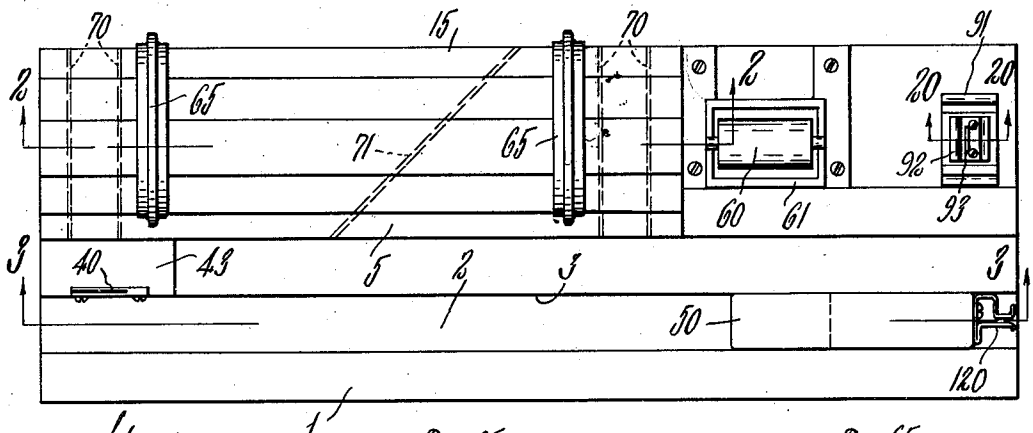


Fig. 1.

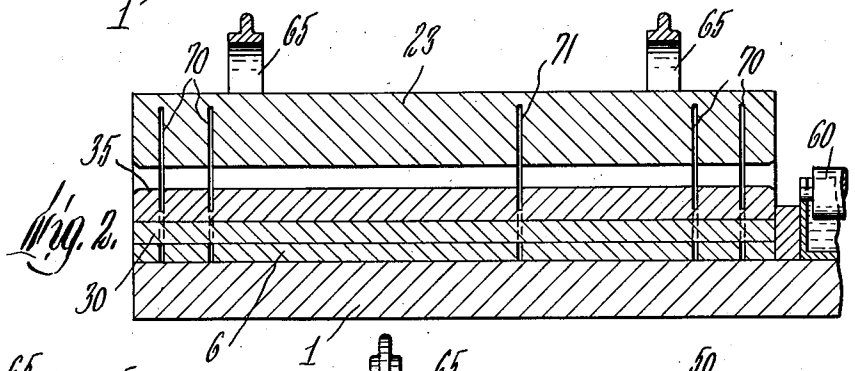


Fig. 2.

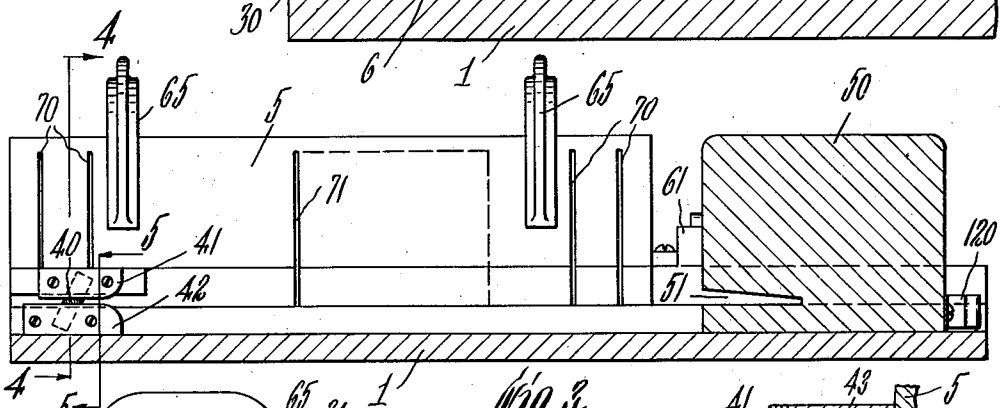


Fig. 3.

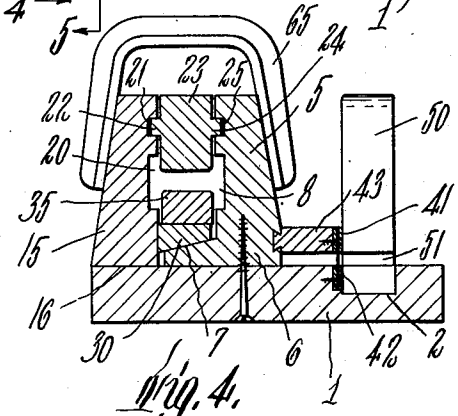


Fig. 4.

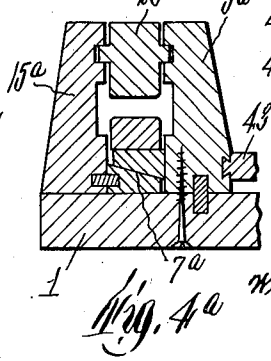


Fig. 4a

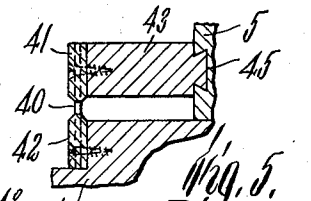


Fig. 5.

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MECHANISM FOR FABRICATING TOY STRUCTURAL MATERIAL

Filed Nov. 23, 1936 5 Sheets-Sheet 2

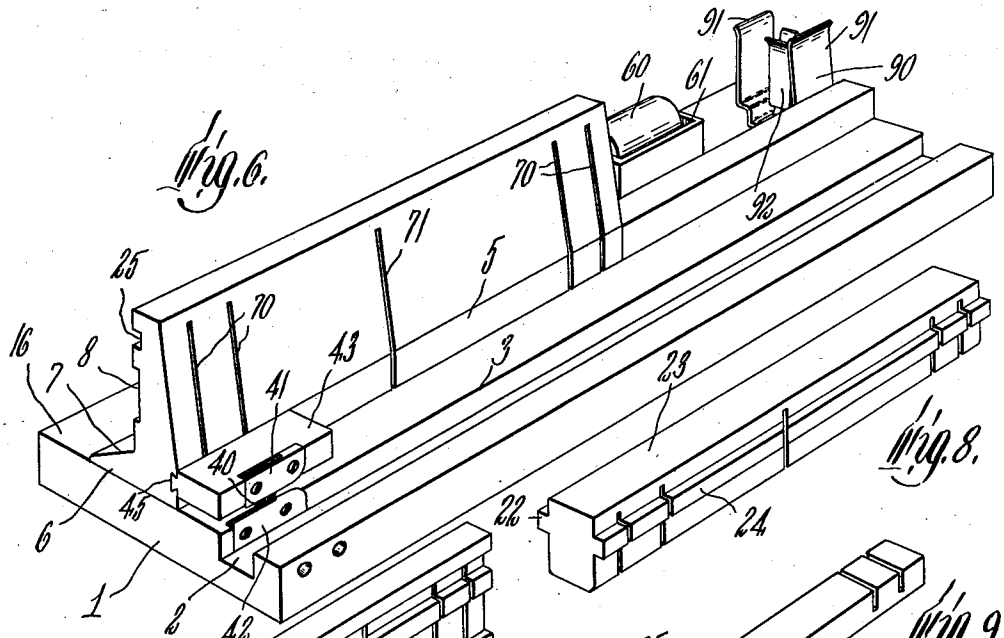


Fig. 6.

Fig. 8.

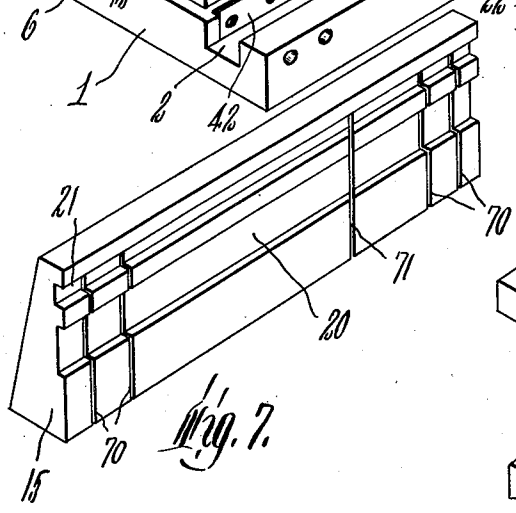


Fig. 7.

Fig. 9.

Fig. 10.

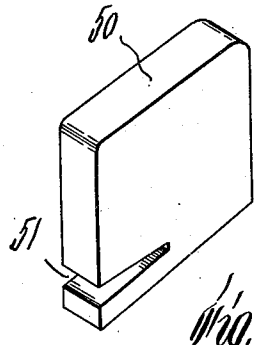


Fig. 12.

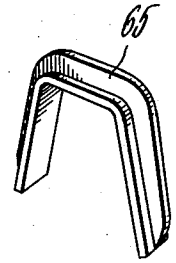


Fig. 11.

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MECHANISM FOR FABRICATING TOY STRUCTURAL MATERIAL

Filed Nov. 23, 1936 5 Sheets-Sheet 3

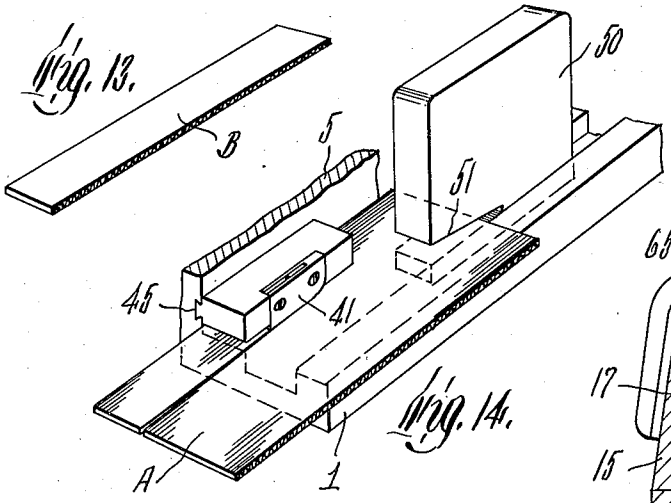


Fig. 13.

Fig. 14.

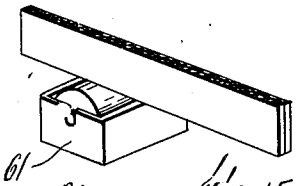


Fig. 15.

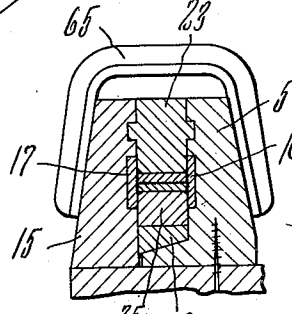


Fig. 16.

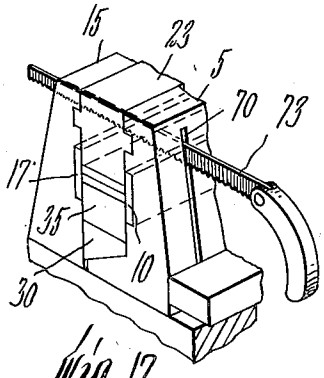


Fig. 17.

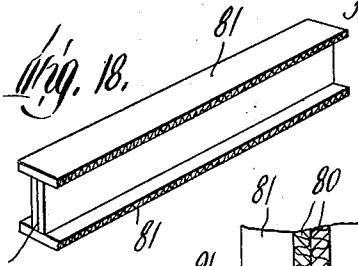


Fig. 18.

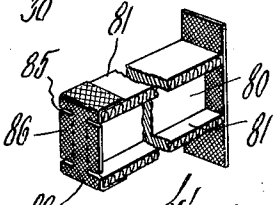


Fig. 19.

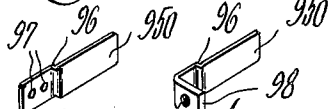


Fig. 21.

Fig. 22.

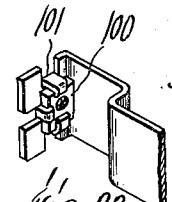


Fig. 23.

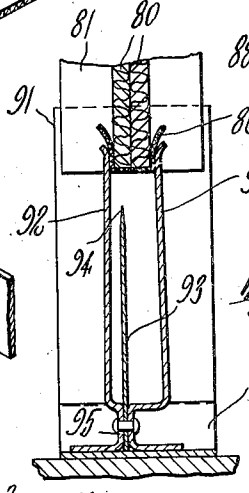


Fig. 20.

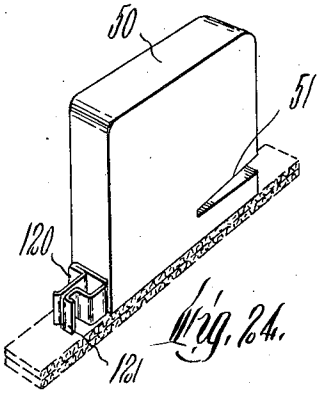


Fig. 24.

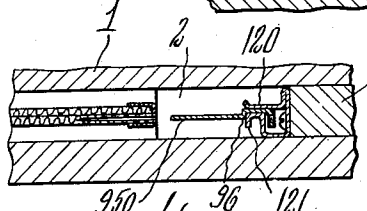


Fig. 25.

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MECHANISM FOR FABRICATING TOY STRUCTURAL MATERIAL

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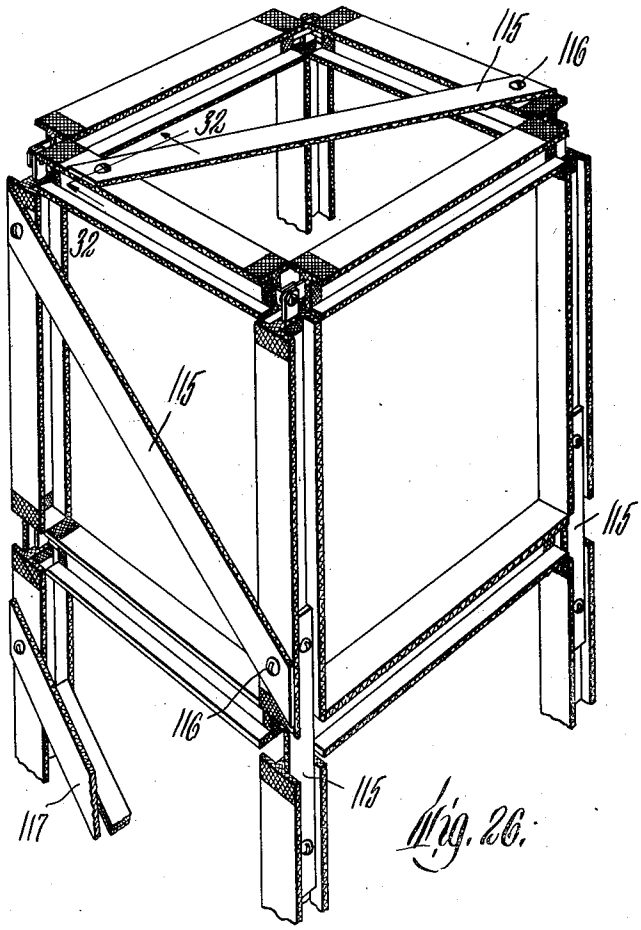


Fig. 26.

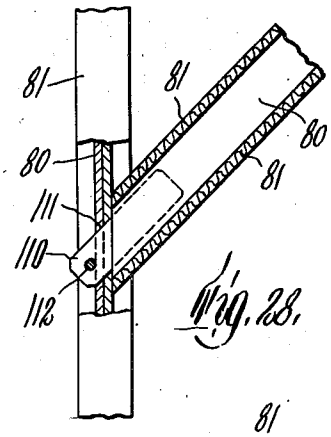


Fig. 28.

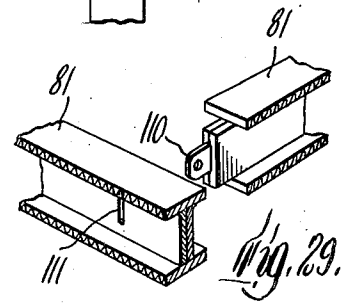


Fig. 29.

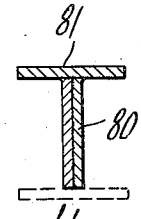


Fig. 30.

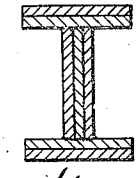


Fig. 31.

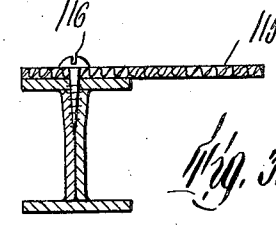


Fig. 32.

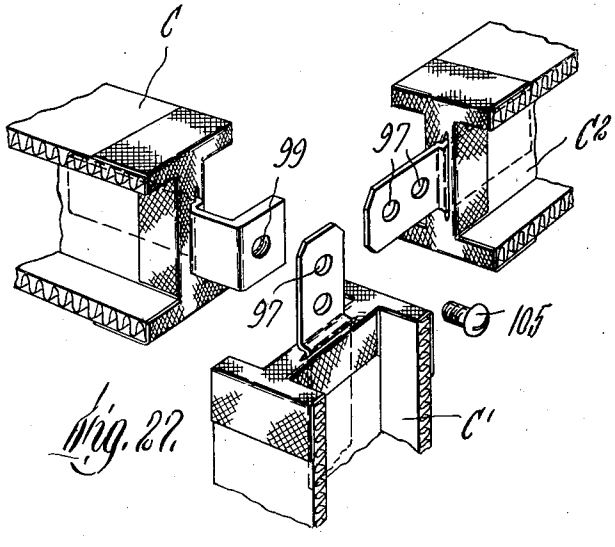


Fig. 27.

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Filed Nov. 23, 1936 5 Sheets-Sheet 5

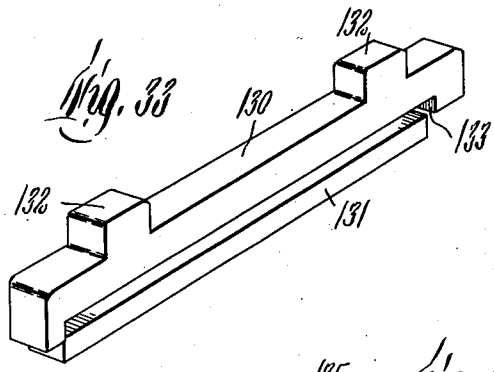


Fig. 33.

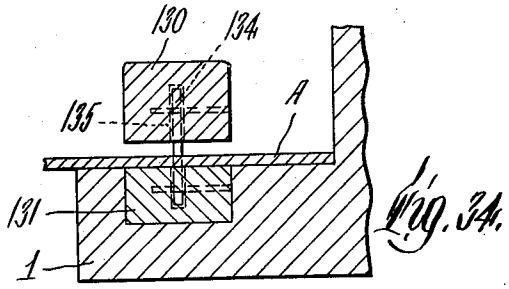


Fig. 34.

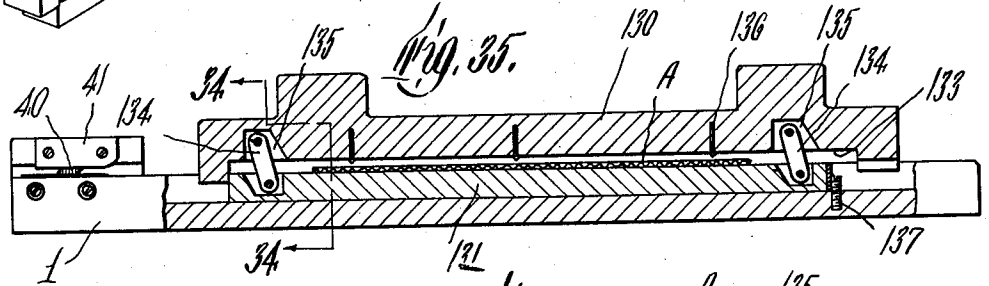


Fig. 35.

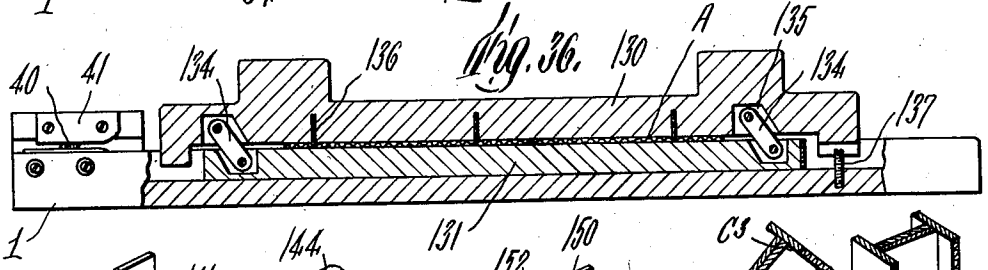


Fig. 36.

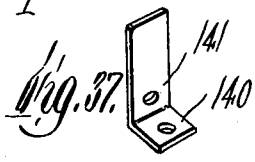


Fig. 37.

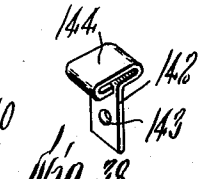


Fig. 38.

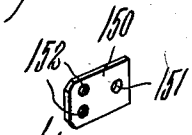


Fig. 40.

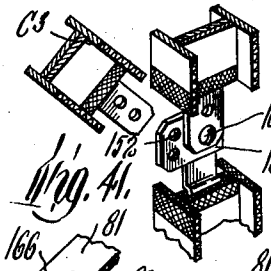


Fig. 41.

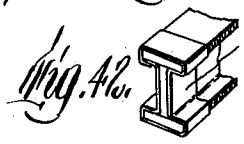


Fig. 42.

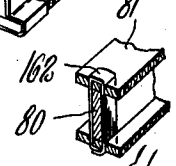


Fig. 43.

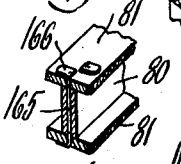


Fig. 44.

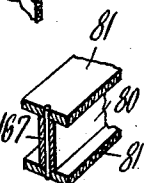


Fig. 45.

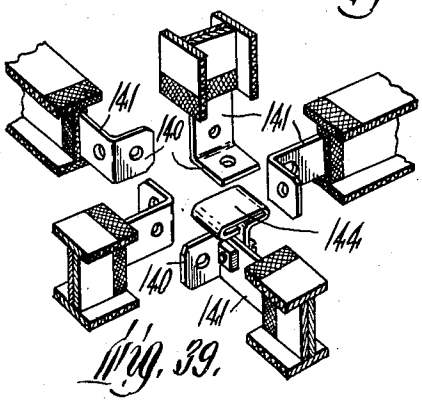


Fig. 39.

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Patented Oct. 29, 1940

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UNITED STATES PATENT OFFICE

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MECHANISM FOR FABRICATING TOY STRUCTURAL MATERIAL

Alan F. Howard, Winchester, Mass.

Application November 23, 1936, Serial No. 112,202

15 Claims. (Cl. 93—1)

This invention relates to the manufacture of toy structural material. One of the objects of this invention is to produce toy structural material in a simple and expeditious manner from plentiful and inexpensive stock, such, for example, as corrugated cardboard, so that a child may make his own structural material and then assemble it as he may desire.

Another object is to produce jigs and fixtures by which the toy structural shapes may be made up as desired from relatively cheap, or even waste sheet stock. Excellent material for the purpose is corrugated cardboard stock which may, if desired, be derived from cartons in which goods have been shipped and which are ordinarily thrown away or destroyed.

For a more complete understanding of this invention, reference may be had to the accompanying drawings in which—

Figure 1 is a top plan view of apparatus for facilitating the rapid fabrication of the structural material.

Figures 2 and 3 are detail sections on lines 2—2 and 3—3, respectively, of Figure 1.

Figures 4 and 5 are detail sections on lines 4—4 and 5—5, respectively, of Figure 3.

Figure 4*a* is a view similar to Figure 4, but showing a modified construction.

Figures 6 to 12, inclusive, are detail perspective views of various parts of the apparatus.

Figure 13 is a perspective view of one of the strips from which the structural material is built up.

Figure 14 is a fragmentary perspective view showing the manner in which the stock is manipulated to form the strip of Figure 3.

Figure 15 is a perspective view showing the manner of applying adhesive to the edges of two of the strips such as shown in Figure 13, in the building up of a toy structural member of I or T section.

Figure 16 is a detail section similar to a part of Figure 4, but showing four elements, such as are shown in Figure 13, assembled in I beam formation.

Figure 17 is a fragmentary perspective view showing the manner in which the beam may be cut to length while under pressure.

Figure 18 is a perspective view of the I beam after it has been removed from the pressing fixture.

Figure 19 is a perspective view of the beam of Figure 18, showing the application to its ends of a fabric reinforcement.

Figure 20 is a detail section on line 20—20 of Figure 1, but to a larger scale and showing the application of the fabric reinforcing.

Figures 21 to 23, inclusive, are perspective views of securing elements.

Figure 24 is a perspective view of the member shown in Figure 12, but arranged to support any of the securing elements of Figures 21 to 23, inclusive, for insertion into the beams.

Figure 25 is a detail horizontal section showing the member of Figure 24 supporting the element of Figure 22 in position for insertion into a beam.

Figure 26 is a perspective view of a structure built up from a plurality of I beam members and reinforcing and bracing strips.

Figure 27 is a fragmentary perspective showing the mating end portions of a plurality of I beams with their securing means.

Figures 28 and 29 are fragmentary perspective views illustrating other types of joints between structural members.

Figure 30 is a cross section illustrating a T beam construction.

Figure 31 is a cross section of an I beam of a modified construction.

Figure 32 is a detail section showing the attachment of a reinforcing strip to an I beam.

Figure 33 is a perspective view of a modified construction of stock gripper and pusher.

Figure 34 is a detail section crosswise of the pusher of Figure 33 on lines 34—34 of Figure 35, and showing it in position on the fixture with stock in position to be gripped and cut.

Figures 35 and 36 are views partly in side elevation and partly in longitudinal section of the pusher of Figure 33 in stock-released and stock-gripping positions, respectively.

Figures 37 to 41, inclusive, are perspective views showing various forms of junction pieces to facilitate securement of the structural elements in various relations.

Figures 42 to 45, inclusive, are detail perspective views showing various ways of securing the strips together to form the structural members.

In Figures 1 to 12, inclusive, there is illustrated a fixture for facilitating the cutting and building up from sheet material strips of toy elements simulating in appearance structural metallic shapes. While these strips may be secured, if desired, in many ways, a particularly advantageous method of securement is by the use of an adhesive. Where the stock used is fibrous material, and more particularly where it comprises corrugated cardboard, an adhesive in the nature of sodium silicate is preferred, although ordinary glue may be used, if desired.

Referring first to Figures 1 to 6, the apparatus or fixture, as shown, comprises a base 1, the top of which may constitute a work table, having a guide groove 2 in its upper face adjacent to one side, this being for a purpose which will later appear. Spaced from the inner edge of this groove, as 3, by an amount equal to the desired width of the strip elements which are to be built up into the desired shapes, is an upstanding side wall member 5, which is secured to the base member 1. This side wall member has a base extension portion 6 having an inclined or wedge upper face 7, and above this it is provided with a longitudinally extending side recess 8 of a width sufficient to receive one of the strips to be used in making the structural material, such a strip being shown in position therein at 10 in Figures 16 and 17. Cooperating with this side member 8 is an opposite side member 15 shown detached in Figure 7. This side member 15 is provided with a flat lower face which may ride on the upper face 16 of the base member 1 toward and from the side wall member 5. Its side face which faces the side member 5 is provided with a longitudinal oppositely disposed recess 20 similar to the recess 8 of the member 5, so that it may receive a strip 17 similar to that received in the recess 8.

Above the recess 20, the member 15 is provided with a groove 21 within which may slidably extend a rib 22 on a top member 23 shown detached in Figure 8. This top member 23 also has a correspondingly shaped rib 24 on its opposite side face which may be engaged in a corresponding groove 25 in the side wall member 5. The side members thus support the top member throughout a range of relative movement between the side members. Adapted to rest on the wedge face 7 of the member 5 is a wedge strip 30 having an inclined lower face 31 and a flat upper face 32. On this upper face 32 may rest a bottom member 35, shown detached in Figure 9.

When the parts are assembled, as illustrated in Figures 4 and 16, the upper face of the bottom member 35 extends above the lower edges of the side recesses 8 and 20 of the side members 5 and 15 and the lower face of the top member 23 extends below the upper edges of these recesses so that the side and top and bottom members together define a longitudinal opening of generally I cross section.

As the side members 5 and 15 are brought toward each other from the position shown in Figure 4 to that shown in Figure 16, the cooperating wedge faces on the side member 5, and the wedge member 30 raise the bottom member 35 so that the cross sectional area of the opening between these members is decreased while maintaining substantially the same cross sectional shape. It will be noted that this decrease in area is transverse to the faces of the flanges and web of the I cross section and is widthwise of the web, while the widths of the flanges defined by the widths of the recesses 8 remain unchanged. This results in the application of pressure in a most advantageous manner, as will later be apparent.

In order to cut the strips which are to be fabricated into the toy structural member, a cutting knife shown at 40, upstanding from the top face of the member 1, may be employed. This knife may well be a safety razor blade and it may be clamped, preferably in an inclined position so that it may have a shearing cut, between metal face plates 41 and 42, the plate 41 being screwed to the edge of a block 43 secured in any suitable manner as by the rabbeted connection at 45 with the outer face of the wall member 5. The other plate 42 may be secured to the base 1 so as to form a portion of the inner face of the guideway 2. Thus, as the material to be stripped is brought up against the outer face of the side member 5, using this as an edge gage, and is pressed against the knife edge, the material will be cut into strips of uniform widths. The forward edges of the plates 41 and 42 may be curved as shown to facilitate the entry of the sheet material therebetween, and, particularly when corrugated cardboard is to be cut, they may be spaced sufficiently close as to cause indentations in the faces of the material, particularly in that face at the leading side of the knife edge, in advance of the cutting knife, this being found in practice to facilitate the cutting.

In order to facilitate the feeding of the strip material, a stock gripper may be provided for engaging this material, this gripper being arranged to travel in the guide slot 2. One stock gripper which may be employed is shown detached in Figure 12, and comprises a block 50 of a thickness for sliding engagement in the guideway 2 and provided with a tapered slot 51 in its forward face into which the rear edge of the stock, shown at A in Figure 14, may be engaged, so that the stock, resting on the top face of the base or work table 1, having been brought up against the side wall of the gage may be pressed against the slitting knife and cut into strips, such as shown at B in Figure 13.

While various sheet materials may be used, one which is very cheap and easily procurable and which is admirable for the purpose is corrugated cardboard, such board having a pair of flat face plies between which is adhesively secured a corrugated ply. Preferably, also, the strips are so cut that the corrugations extend more or less crosswise of the length of the strip. This corrugated board is commonly employed as material for cartons for shipping goods and is ordinarily thrown out as waste material after the goods have been removed.

A plurality of such strips having been prepared, the building elements may be made up therefrom. Preferably one of such strips is coated with the desired adhesive, as, for example, by rolling it over an adhesive-applying roller 60 mounted to dip beneath the level of adhesion in an adhesive-containing receptacle 61. This receptacle 61 may be secured to any convenient portion of the base 1. One face only of a strip being thus coated with adhesive, another strip is brought into face to face relation therewith with its edges co-terminous and then either one or both edge faces may be again pased over the adhesive-applying roll 60, as shown in Figure 15.

The composite strip thus formed is then laid on the bottom member 35, side strips having been previously inserted in the recesses 8 and 20 of the side members, and the side and top and bottom members are then brought in together to firmly press the strips into engagement in the manner shown in Figure 16. A convenient method of thus bringing them together is illustrated in Figures 4 and 16, the outer faces of the side members being tapered so that they may be engaged by a plurality of matingly internally tapered yoke clamps 65. The built up structural beam is then maintained under pressure until the adhesive has set. Where the adhesive has

been applied to both side edges of the central composite strip, shown in Figure 15, the resulting structural member will be of generally I cross section, but should adhesive be omitted on one of these side edges so that one of the strips retained in one of the recesses 8 or 20 is not adhesively secured, a T beam section will result, as illustrated in Figure 30.

In Figure 4a is shown a construction wherein the wedge block 30 is supported on the inclined top face 7a of an extension carried by the movable side member 15a rather than by the fixed side member 5 as shown in Figure 4. This not only provides a broader supporting base for the slidable side member, but when this member is moved away from the fixed side member, it removes the support for the bottom member 35, thus facilitating removal of the structural beam from the fixture. This figure also shows a key strip 26 for definitely locating the fixed side member 5a relative to the base member 1, it being important to fix the member 5a in parallel relation to the groove 2 since the side of the member 5a constitutes the edge gage for the material when it is cut into strips. The extension for the movable member 15a is also shown as a separate piece similarly keyed in position.

Provision may be made for cutting the built up unit or element into lengths as desired, and if desired, to bevel the ends, and it is preferable to do this while the component parts are held in the fixture under pressure, although after the adhesive has been thoroughly dried this may be done afterwards. In order that this cutting may be effected while the parts are under pressure, the side members 5 and 20 may be provided with slots such as 70 or 71, and the top and bottom members may be provided with mating slots. The upper ends of these slots extend above the lower edge of the top member 23 and below the top face of the bottom member 35 to a sufficient extent above the strips in the fixtures to permit a saw, such as 73, to be inserted above the strip elements, which may then be sawed through as shown at Figure 17. The slots 70 may be spaced variously to permit the elements to be cut off in any desired of a plurality of definite lengths. The slot 71 may be arranged at an angle, as shown best in Figure 1, so that an end of each of the elements may be cut off at the desired bevel. These wall members with their slots therethrough thus constitute a miter box to facilitate accurate end cutting of the elements as desired.

When the adhesive has sufficiently hardened or set, the clamps 65 may be removed and the free side top and bottom members may be separated so as to permit the removal of the beam therefrom, which, when an I beam is made, appears as illustrated in Figure 18, comprising a central web 80 of at least two thicknesses, and end flanges 81 secured centrally thereto.

In order to reinforce the end portions of these elements, so that they may be more rugged in service, reinforcing tape or cloth may be applied thereto, as illustrated in Figure 19. A roll of tape of the desired width may be cut off into desired lengths, adhesive applied thereto, as by passing it over the adhesive roll 60, and the length may then be brought across the end of the beam as shown at the right hand of Figure 19. The ends of the strip are folded over and secured to the side faces of the flange members 81, and slits such as 85 may be made inwardly of the flange members 81 to provide flaps 86 which may be turned inwardly and secured to the side faces of the web portion 80.

To facilitate this engagement of the reinforcing cloth or tape, a fixture shown at 90 and which may be secured to a suitable portion of the base 1, may be employed. This fixture, as shown, comprises a pair of spaced spring fingers 91 between which the flange members 81 may be inserted and a pair of spring fingers 92 positioned between the fingers 91 for engagement with opposite sides and the end of the web 80. Also, for a purpose which will later appear, means may be provided for cutting a slit through the reinforcing tape or cloth and into the web portion 80 of the beam and preferably at one side of the center in order to leave the cement bond between the strips constituting this web intact.

As shown in Figure 20, this slitting means comprises a blade 93 having its cutting edge 94 somewhat back of the upper edges of the spring portions 92 so that it will be out of the way of the fingers of the operator. The lower end of this blade 93 may be secured, as by riveting, to the sides of the spring fingers 92 as shown at 95, and preferably, also, the spring fingers 92 are shorter than the fingers 91, so that as the beam with the tape applied to its end face is presented and thrust between the spring arms, the ends of the tape are first engaged with the outer faces of the flange members 81 and then the flaps 86 are brought down against the side faces of the web 80 each with a wiping pressure. Further motion of the beam between the spring fingers then acts to force the knife edge 94 through the cloth reinforcing and into the body portion of the structural member.

This slitting of the end of the beam is for the purpose of securing therein an element which will facilitate the securement of a plurality of these structural elements in any desired relation. These securing elements may be of various forms, as shown, for example, in Figures 21, 22, 23, 28, 29 and 37, but preferably, each, as shown, is formed as a strip, such as metal, narrower than the end of the beam, and having a shank portion 950 which may be thrust into the end of the beam through the slot up to a shoulder 96 thereon. This shoulder 96 provides a stop to limit the extent of the insertion of the element into the beam, and it also serves to bring the outer portion of the fastening element into axial alinement with the beam.

As shown in Figures 21 and 22 these fastening elements in general may comprise two types. One of these, as shown in Figure 21, is provided with a flat extremity having a plurality of holes 97 therethrough, while the other is provided with a right angled end flange 98, provided with an aperture 99 which is preferably threaded. Instead of having a threaded opening, this flange may be provided with means for holding a nut as 100, as shown in Figure 23, the end flange being cut to form integral tabs 101 which may be bent over the edges of the nut to hold it in position. It is preferred to employ a threaded portion for certain of these fastening elements in order to avoid the necessity of using separate nuts where the elements are secured together by screws, since it is difficult to maintain such nuts tight and the fixing of the parts under such conditions is less secure than where one of the fastening elements itself is threaded for the reception of the securing screw.

In Figure 27 is illustrated the manner in which three of the toy structural elements or beams

may be secured together, one of these, C, having the fastening element of Figure 22, and the others, C′ and C^2, having the fastening element of Figure 21. Where the beams or structural elements come together in the relationship shown in Figure 27, the screw 105 is passed through the more remote opening 97, the beam C′, and the inner opening 97 of the beam C^2, and threaded into the opening 99 of the beam C. The provision of the two holes 97 is necessary because the structural beams are wider lengthwise of the web 80 than laterally of the flanges 81 for the reason that the flanges 81 are attached to the outer edges of the web 80, and all of these members are of the same width.

In Figures 28 and 29 are shown arrangements for fastening beams together where the end of one is attached at an angle to the other. As shown in Figure 29 the flange strip 81 of one is cut away so that the web portion 80 may extend between the flange members 81 of the other beam and the cut away flange ends engage the flange sides of the mating beam. A narrower strip element 110, projecting from the adjacent end of the extended web portion 80, passes through a slot 111 in the web of the other beam where it may be secured as by passing a suitable fastening element such as a paper fastener, match stick, or the like, through a hole near its end. In Figure 28 the slot 111 is arranged longitudinally, while in Figure 29 it is arranged laterally of the beam web, and in Figure 28 the webs 81 are cut off diagonally at their ends so that the beams are secured to each at other than a right angle. In Figure 28, also, the beams are shown as secured in position by a match stick or the like, as at 112, which passes through the strip element 110.

There are various commercial weights or thicknesses of corrugated board commercially employed, and in some cases with the thinner materials, it is desirable to build up the beam with more than two layers for the web portion and more than one layer for each flange portion. In Figure 31 is illustrated a construction in which three strips are employed for the web portion and two strips for each of the flange portions. Considerable latitude of the thickness of the material is permissible, since the fixture in which the strips are assembled may compress and thin the stock to a considerable degree, particularly where corrugated board is employed, so that where normally three thicknesses in the web and two in the flange would seem somewhat too great, the parts are compressed together in the fixture to bring them down to uniform dimensions with material which initially was of a different thickness.

One of the particular advantages of the use of fibrous material such as corrugated cardboard is the capability of this material to take fastening elements, such as screws, directly. For example, as is shown in Figure 26 and in detail in Figure 32, reinforcing strips may be secured to the structure wherever desired, being secured directly by screws which are engaged directly with the material of the structural beams. For example, in Figure 26 such reinforcing strips, each in the form of single thickness of strip material are shown at 115, screws such as 116 being driven directly through the reinforcing strip and into the structural beam, as shown in Figure 32. Reinforcing members of T cross section, as shown in Figure 30 at 117, are particularly suitable for this purpose.

In order to facilitate insertion of the fastening strip elements into the ends of the beam, means may be provided for engaging these fastening elements and centering them with relation to the beam ends. As shown in Figures 24 and 25, the pusher block 50 may be employed in this connection, being provided on one edge with a clip 120 so formed as to receive therein any of the securing elements such as shown in Figures 21 to 23, with a portion 121 engaging the outer face of the shoulder 96. The guideway 2 may be of the same width as the strip elements so that the beam may be placed therein, as shown in Figure 25, and the desired attaching strip engaged in the strip 120 may then be pushed toward the end of the beam by movement of the block 50. In order that the edgewise height of this strip may be adjusted to the proper point, the necessary number of strips may be led flatwise in the guide groove to raise the pusher 50 to the proper height.

In Figures 33 to 36 is illustrated a preferred form of stock-gripping device to facilitate the cutting of the stock into the desired strips. Particularly when corrugated cardboard is employed, there is some tendency to buckle the stock where it is not supported lengthwise of the cutting for a substantial length, particularly if some degree of care is not employed. In order to avoid any opportunity for this buckling, the stock gripper and pusher shown in these figures is provided with upper and lower stock-clamping strips 130 and 131. The upper of these strips may be provided with upwardly projecting portions 132 to facilitate grasping by the operator. The lower face of this upper strip is recessed, as at 133, throughout a length somewhat greater than that of the length of the strip 131, and the two strips are secured together as by a plurality of links 134, each pivoted at one end to the strip 130 and at the other end to the strip 131, the ends of these links being extended into recesses as 135 in each of these strips. When the strips are in the relative lengthwise positions shown in Figure 35, with the forward end of the strip 131 engaging against the forward edge of the recessed portion 133, the links hold the strips somewhat separated to permit the insertion of the stock A therebetween, but by pushing forwardly on the strip 130, this strip is brought downwardly into contact with the stock, by the action of the links 134, into the position shown in Figure 36, where the stock is gripped between the strips, this gripping being further increased by the provision of suitable stock-engaging points 136 carried by the strip 130. By exerting continued forward pressure on the projections 132, the stock gripper rides forwardly in the guideway 2, and the stock is brought against the knife edge and the slitting of the stock into the strips is effected.

On retraction of the stock gripper, the lower strip 131 is brought up against a stop 137 extending up from the base of the guideway 2, so that continued retracting pressure exerted on the upper strip 130 causes this upper strip to be moved backwardly and upwardly into the position shown in Figure 35, thus releasing the stock so that it may be moved laterally into engagement with the gaging portion of the wall member 5 for another cutting stroke.

In Figures 37 and 38 are shown other types of securing strips for the ends of the structural beams, in Figure 37 the strip being shown as having an end flange 140 and a shank portion 141, each provided with a screw-receiving per-

foration. In Figure 38 a strip 142, likewise perforated at 143, is provided with a flattened looped end 144. This looped end permits the insertion therein of the end portion 140 of the element shown in Figure 37. The shank portion of the member shown in Figure 38 may be secured to an element such as shown in Figure 37 by a screw passing through the perforations 143 and 141, respectively, and this provides not only the end flange for securement to another similar attaching element, but also the loop into which the end of such another attaching element may be engaged.

Figure 39 shows various arrangements of the mating end portions of the beams which may be secured together by such an arrangement.

Figure 40 shows a gusset plate which may be employed to advantage where certain of the beams are to be secured at other than in alinement or at right angles. This gusset, as shown, comprises a flat plate 150 provided with holes 151 and 152. The holes 152 are preferably threaded. The hole 151 permits the passage therethrough of the securing screw 105, which may be used to secure together the ends of two beams in alinement, as shown in Figure 41, while the laterally extended portion of the gusset plate which presents the threaded openings 152, facilitates securement thereto of a fastening element on a third beam C^3 at an angle to the perpendicular to the others.

While adhesive securement of the strip members together to form the structural elements is preferred, other means may be employed, as shown, for example, in Figures 42 to 45. In Figure 42 a metallic strip 160 bent to surround the assembled fibrous strips is employed, this metallic strip being engaged about the outer faces of the other strips and holding them in proper assembled relation. In Figure 43 the flange elements 81 are shown as perforated for the reception of a securing metallic band 162 which passes down on each side of the central web 80, its ends being bent into overlapping relation. In Figure 44 a single strip 165 having split ends 166 is employed, this strip passing through both the flange members 81 and the web member 80, and its ends being bent downwardly against the outer faces of the flange members 81. In Figure 45 a wooden dowel pin, such as 167, is shown as passed through both the web member 80 and the flange members 81, and secured in position as by glue.

While the structures produced in accordance with this invention are particularly intended as toys, the parts are so sturdy and light that they might be found useful, also, in the manufacture of crates as for shipping or other purposes.

The structural product hereinbefore described is not claimed herein, but forms the subject matter of a divisional application Serial No. 140,806, filed May 5, 1937, for Toy structural material, now Patent No. 2,156,155 dated April 25, 1939.

From the foregoing description of certain embodiments of this invention, it should be evident to those skilled in the art that various other changes and modifications may be made, those shown being merely illustrative, without departing from the spirit or scope of this invention as defined by the appended claims.

I claim:

1. A fixture comprising a plurality of elongated members cooperating when assembled to define between them an elongated opening of a cross sectional contour simulating that of a flanged structural beam, said members having cooperating wedge connections formed to contract said opening transverse to the side faces of the flanges when a pair of said members are closed toward each other.

2. A fixture comprising a plurality of elongated members cooperating when assembled to define between them an elongated opening of a cross sectional contour simulating that of a metallic structural beam, said members having cooperating wedge connections formed to contract said opening in a plurality of directions when a pair of said members are closed toward each other, and means for clamping said pair of members together to compress stock in said opening into such cross sectional contour, certain of said members having slots therethrough which a cutting element may be inserted and actuated, while said stock is under pressure, to cut said stock.

3. A fixture comprising a side member, a bottom member, an opposite side member, and a top member, the confronting faces of said members when in closely assembled relation defining an opening therebetween simulating in cross section that of a flanged structural shape, certain of said members having mutually engaging inclined faces causing relative motion of said side members toward and from each other to correspondingly move said top and bottom parts relatively and to contract said opening transverse to the faces of said flanges.

4. A fixture comprising a plurality of elongated members cooperating when assembled to define between them an elongated opening of a cross sectional contour simulating that of a structural beam having a web and flanges, said members having cooperating connections formed to contract said opening transverse to the side faces of said flanges and web when a pair of said members are moved toward each other.

5. A fixture comprising a plurality of elongated members cooperating when assembled to define between them an elongated opening of a cross sectional contour simulating that of a structural beam having a web and flanges, said members having cooperating connections formed to contract said opening transverse to the side faces of said flanges and web when a pair of said members are moved toward each other, while the widths of said flanges remain unchanged.

6. A fixture comprising a plurality of elongated members cooperating when assembled to define between them an elongated opening of I cross section, said members having cooperating connections formed to contract said opening in directions transverse to the side faces of the flanges and webs of the I cross section while the widths of said flanges remain unchanged, when a pair of said members are moved otward each other.

7. A fixture comprising a plurality of elongated members cooperating when assembled to define between them an elongated opening of I cross section, said members having cooperating connections formed to contract said opening in directions transverse to the side faces of the flanges and webs of the I cross section and transverse to the width of said web while the widths of said flanges remain unchanged, when a pair of said members are moved toward each other.

8. A fixture comprising a side member, a bottom member, an opposite side member, and a top member, the confronting faces of said members when in closely assembled relation defining an opening therebetween simulating in cross section that of a metallic structural shape, certain of said

members having mutually engaging inclined faces causing relative motion of said side members toward and from each other to correspondingly move said top and bottom parts relatively, said side members having oppositely disposed slots therethrough through which a cutting tool may be passed to cut material within said opening.

9. A fixture comprising a base, a pair of side members relatively movable toward and from each other on said base, said side members having oppositely disposed confronting longitudinal recesses shaped to support a pair of oppositely disposed strips of sheet material, and top and bottom members presenting portions extending below and above the top and bottom margins of said recesses, respectively, to define with said recesses a space of I cross section, said bottom member having wedge connections with one of said side members such that as said side members are brought toward each other said bottom member is raised.

10. A fixture comprising a base, a pair of side members relatively movable toward and from each other on said base, said side members having oppositely disposed confronting longitudinal recesses shaped to support a pair of oppositely disposed strips of sheet material, and top and bottom members presenting portions extending below and above the top and bottom margins of said recesses, respectively, to define with said recesses a space of I cross section, said bottom member having wedge connections with one of said side members such that as said side members are brought toward each other said bottom member is raised, said top member and side members having cooperating parts for supporting said top member from said side members throughout a range of relative motion of said side members.

11. A fixture comprising a plurality of elongated members including a pair of opposed members having confronting recesses, and a pair of members between said opposed members projecting toward each other inwardly of the side edges of said recesses to define with said recesses an opening extending longitudinally of said members and of substantially I cross section, and means for closing the members of each pair toward each other to decrease the cross sectional area of said opening.

12. A fixture comprising a plurality of elongated members including a pair of opposed side members and top and bottom members between said side members forming an opening therebetween extending lengthwise of said members, said side and top members having parts interengaging to support said top member from said side members through a range of motion of said side members from and toward each other, one of said side members having a laterally extending wedge face, a wedge block supported on said wedge face and supporting said bottom member, and means for forcing said side members toward each other as far as permitted by said top and bottom members to decrease cross sectional dimensions of said opening both horizontally and vertically.

13. A fixture comprising a plurality of elongated members including a pair of opposed members having confronting recesses and a pair of members between said opposed members projecting toward each other inwardly of the side edges of said recesses to define with said recesses an opening extending longitudinally of said members of substantially I cross section, means for moving said opposed members toward each other, and wedge connections between one of said opposed members and one of said between members causing motion of said between members toward each other as said opposed members are moved toward each other to thereby contract the opening between said members in two directions.

14. A fixture comprising a plurality of elongated members including a pair of opposed side members having confronting recesses and top and bottom members between said side members projecting toward each other beyond the side edges of said recesses to define with said recesses an opening extending lengthwise of said members of substantially I cross section, said side and top members having parts interengaging to support said top member from said side members through a range of motion of said side members from and toward each other, one of said side members having a laterally extending wedge face, a wedge block supported on said wedge face and supporting said bottom member, and means for forcing said side members toward each other as far as permitted by said top and bottom member to decrease the cross sectional dimensions of said opening both horizontally and vertically.

15. A fixture comprising a plurality of elongated members including a pair of opposed side members having confronting recesses and top and bottom members between said side members projecting toward each other beyond the side edges of said recesses to define with said recesses an opening extending lengthwise of said members of substantially I cross section, said side and top members having parts interengaging to support said top member from said side members through a range of motion of said side members from and toward each other, one of said side members having a laterally extending wedge face, a wedge block supported on said wedge face and supporting said bottom member, the outer faces of said side members being inclined downwardly away from each other, and an internally tapered yoke clamp engageable with said outer faces of said opposed members for forcing said opposed members toward each other as said yoke is pressed downwardly thereover thus to descrease the cross sectional dimensions of said opening both horizontally and vertically.

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