March 8, 1938. L. M. HILE 2,110,150

WIRE HINGE FASTENER

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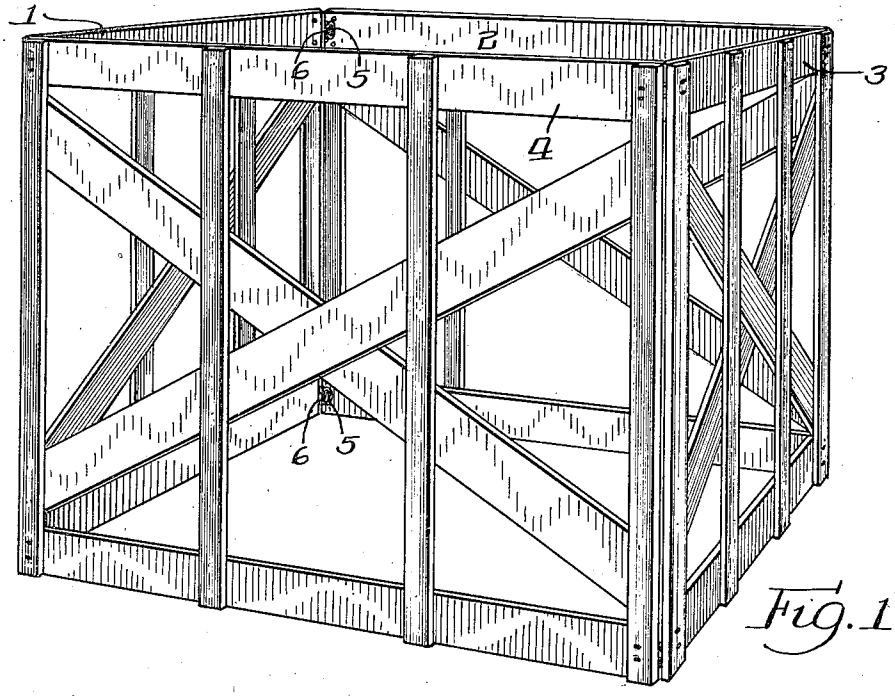

Fig. 1.

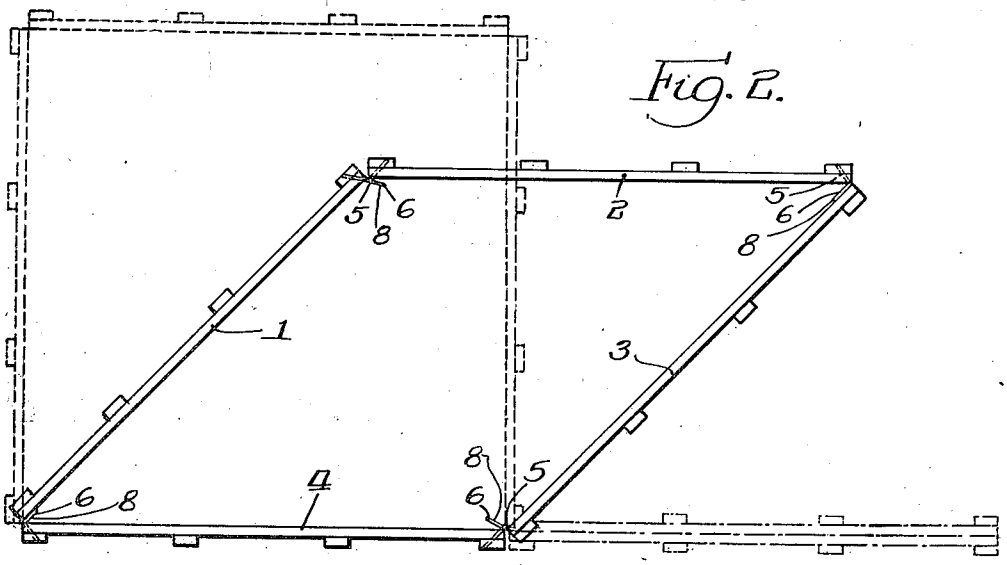

Fig. 2.

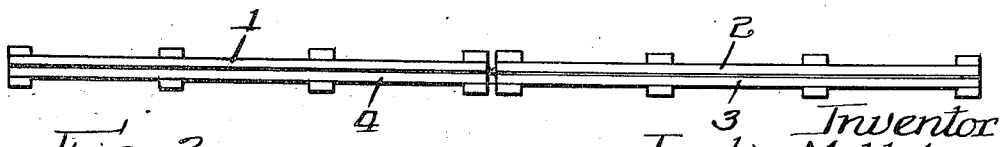

Fig. 3.

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Fig. 4.

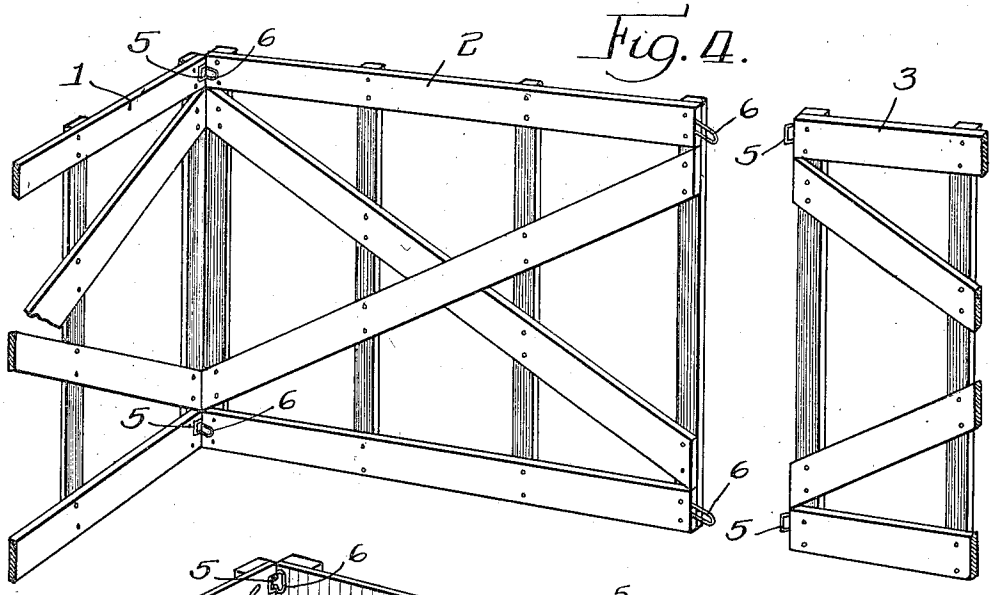
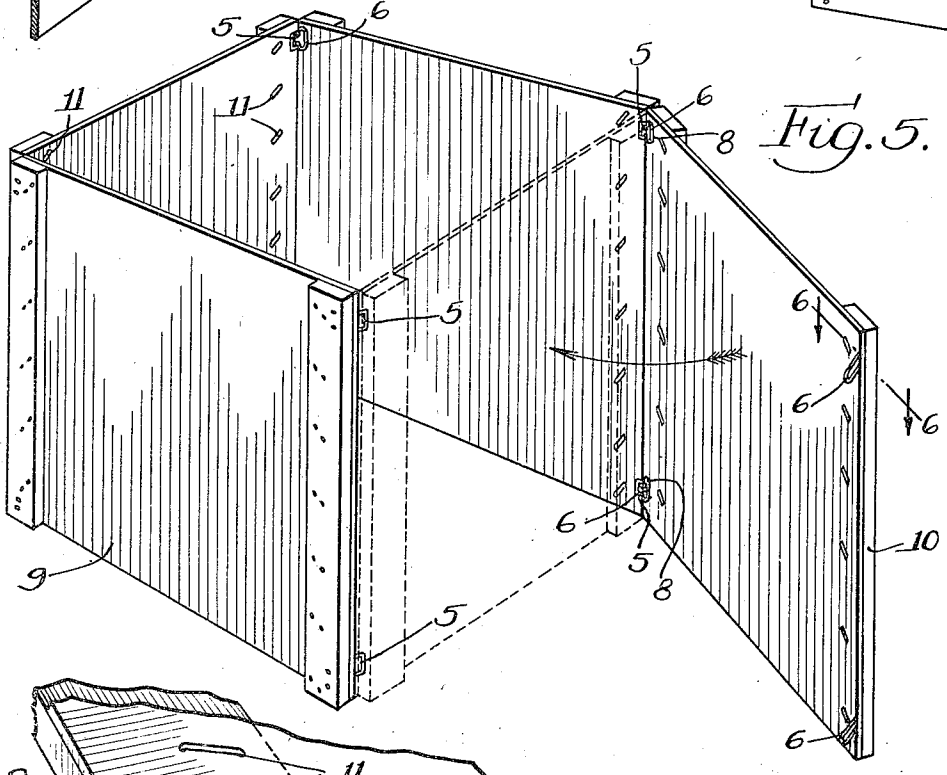


Fig. 5.



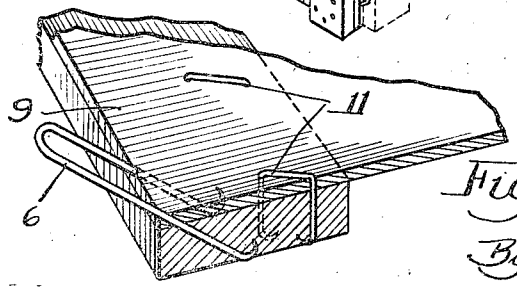


Fig. 6.

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Fig. 7.

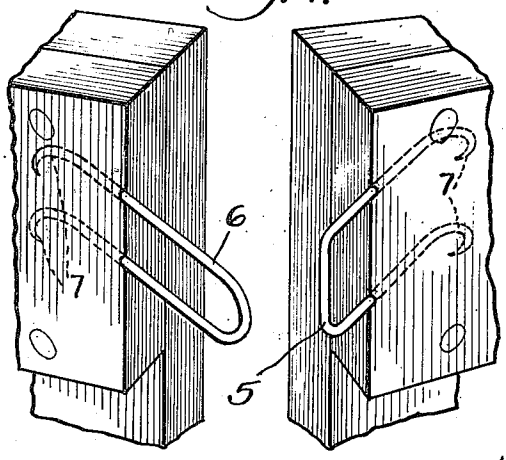


Fig. 8.

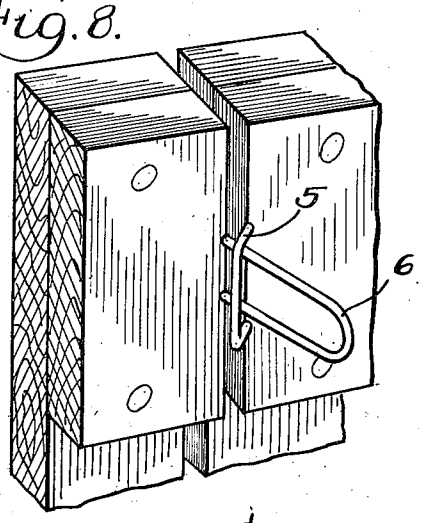


Fig. 9.

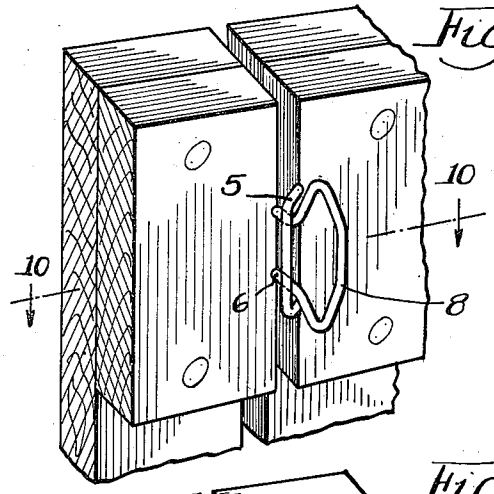


Fig. 10.

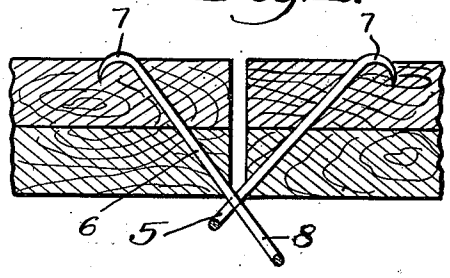


Fig. 12.

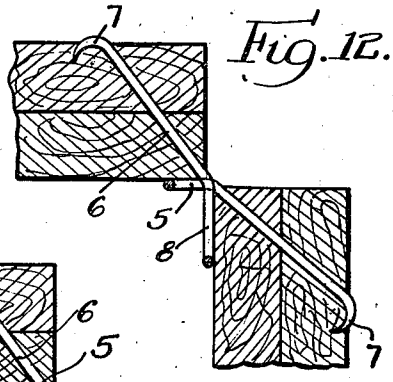
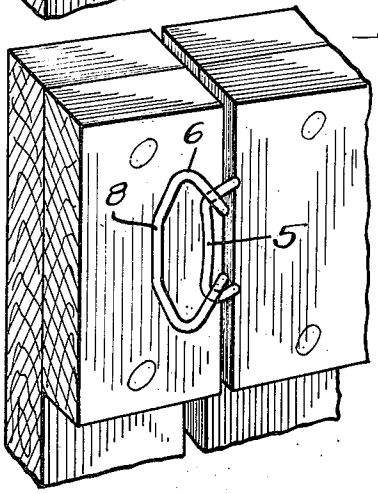


Fig. 11.



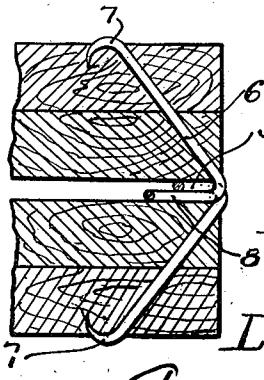


Fig. 13.

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WIRE HINGE FASTENER

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Fig. 14.

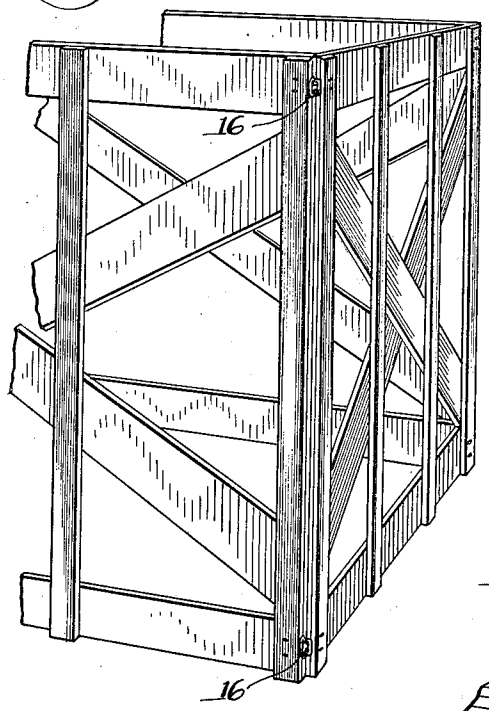


Fig. 15.

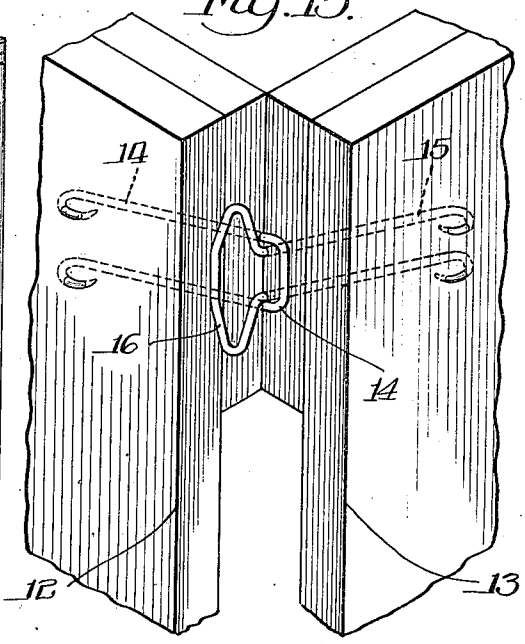


Fig. 16.

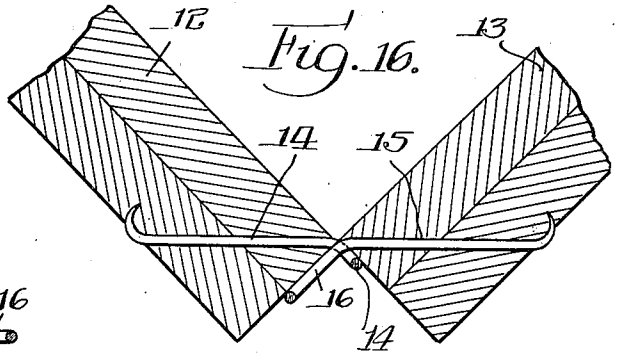


Fig. 17.

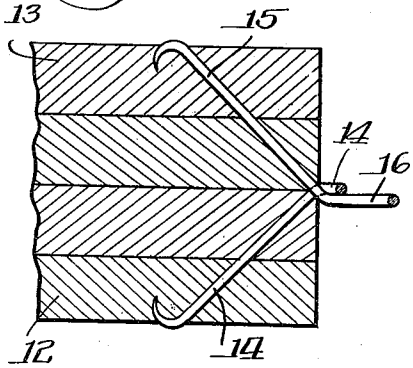
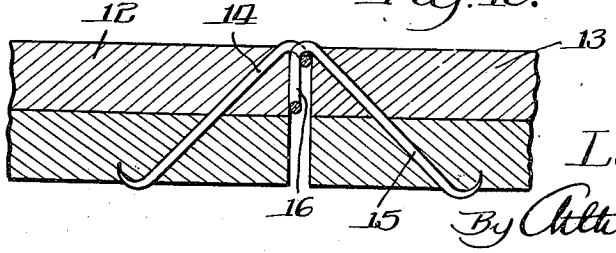


Fig. 18.



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Patented Mar. 8, 1938

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UNITED STATES PATENT OFFICE

2,110,150

WIRE HINGE FASTENER

Leslie M. Hile, Benton Harbor, Mich.

Application September 13, 1935, Serial No. 40,366

20 Claims. (Cl. 217—16)

This invention relates to wire hinges for knock-down or foldable crates or boxes.

Generally stated, the object of the invention is to provide a novel and improved construction and arrangement whereby two inter-engaging wire staple-like members are inserted in the adjacent edges of a folding box or crate, to form a hinge-like connection between the two sections of the box or crate, permitting the latter to be folded flat for shipment or storage, and to then be unfolded for use, the wire hinge thus in effect provided having the inter-engaging portions thereof disposed inside of the box or crate, at the corner thereof, and permitting the two sections of the box or crate to be folded flat together, and to then be unfolded and disposed at right angles to each other.

It is also an object to provide certain details and features of construction tending to increase the general efficiency of a wire box or crate hinge of this particular character.

To the foregoing and other useful ends, the invention consists in matters hereinafter set forth and claimed and shown in the accompanying drawings, in which—

Fig. 1 is a perspective of a folding crate having sections thereof connected together by wire hinges embodying the principles of the invention.

Fig. 2 is a view looking down on the crate shown in Fig. 1, showing the same with the sections thereof at right angles to each other, in dotted lines, and showing the crate partially folded in full lines.

Fig. 3 is a similar view showing the crate folded flatwise for shipping or storage.

Fig. 4 is a perspective of a portion of the crate shown in Fig. 1 of the drawings, showing the interior thereof, and indicating two of the sections unconnected to each other.

Fig. 5 is a perspective of a folding box having wire hinges embodying the principles of the invention.

Fig. 6 is an enlarged detail sectional view on line 6—6 in Fig. 5 of the drawings.

Fig. 7 is an enlarged perspective view showing adjacent portions of the two sections of the box or crate, each with one member of the hinge inserted therein.

Fig. 8 is a similar view showing the two sections brought together and the two wire members inserted one within the other.

Fig. 9 is a similar view showing the longer or inserted wire member bent or distorted to provide it with a head that will keep this member from being pulled out of the other member.

Fig. 10 is a section on line 10—10 in Fig. 9 of the drawings.

Fig. 11 is a view similar to Fig. 9, but showing the inserted wire member bent back against the inner side of the box or crate section.

Fig. 12 is a view similar to Fig. 10, showing the two connected sections of the box or crate at right angles to each other.

Fig. 13 is a similar view, showing the two box or crate sections folded flatwise together.

Fig. 14 is a perspective of a portion of a folding crate, showing a different form of the invention.

Fig. 15 is an enlarged perspective view of a portion of the structure shown in Fig. 14, showing the wire hinge of this form of the invention.

Figs. 16, 17, and 18 are horizontal transverse sections of the parts shown in Fig. 15, showing the adjacent sections of the crate in different positions.

As thus illustrated, and referring to Figs. 1 to 4 inclusive, and Figs. 7 to 13 inclusive, the invention comprises a crate, for packing and shipping different things, comprising four sections 1, 2, 3, 4, each made of slats or boards nailed or otherwise suitably fastened together to form rectangular side sections for the crate. It will be understood, however, that the invention is not limited to an open crate, but may be employed in connection with tight boxes having solid walls, the invention relating more especially to the hinges between the edges of adjacent sections.

As shown in Figs. 7 to 13 inclusive, these hinges are made of wire and each hinge comprises a relatively wide and short staple-shaped member 5, and a relatively narrow and somewhat longer staple-shaped member 6, each member being inserted outwardly through the edge portion of one of the sections, and the points or ends of the two staplelike members being clinched at 7 and turned back into the wood or other material of which the side wall section is made. The relatively narrow member 6 is inserted through the relatively wide member 5, and the end of the member 6 is then bent or distorted to form a head 8 that cannot pull through the member 5, so that an interlocking wire hinge is in effect provided between the two sections of the folding crate or box. When the sections are placed at right angles to each other, as shown in Fig. 12, the two interlocking wire members assume the position shown in this figure of the drawings. If the two sections are folded so that they are in the same plane, then the interlocking wire members 5 and 6 assume the position shown in Fig. 10 of the drawings. When

the two sections are folded flatwise together, then the two wire members assume the positions shown in Fig. 13 of the drawings, the head 8 being bent back against one of the sections, so that when the two sections are then afterward folded into the same plane, the appearance and positions of the two wire members will then be as shown in Fig. 11 of the drawings.

Thus the two wire members, of staplelike form, are inserted outwardly in adjacent edge portions of the two sections to be connected together, so that the interlocking portions of the two members are inside of the crate or box, at the corner thereof, and a cheap but nevertheless strong and effective hinge is provided between the two sections, permitting the latter to be folded and unfolded, in the manner necessary in the use of folding crates or boxes of this character. There are no exposed sharp wire ends to injure the hands of workers.

Obviously, in addition to using the wire fastener or wire hinge shown and described for connecting together the walls or sections of folding crates or boxes, it can also be used to provide hinges for a box cover, for boxes or crates of any suitable or desired character.

As shown in Figs. 5 and 6 of the drawings, the four walls of the folding box are formed of solid material 9, reinforced by means of battens or boards 10 at the edges thereof, the material 9 being preferably secured to the battens or boards 10 by means of staples 11, instead of by nails, and these reinforced edges of the four sections are connected together by the wire hinge members 5 and 6, previously described, as the hinges on this box are exactly the same as they are on the folding crate shown in Figs. 1, 2, 3 and 4 of the drawings.

Thus, in each form of the invention, the wire hinges are formed by one staple-shaped or bail-shaped member which is inserted through a similar member, and the inserted member is then bent or distorted to provide a head that is too wide to pull through the other member, and that will prevent disengagement of one member from the other. In each form of the invention, the wire members are inserted obliquely through the outer corner portions of the adjacent square edges of the box or crate sections, and the points or ends of the wire are clinched and turned back into the outer sides of the sections. Also, in each case, the inter-engaging portions of the members extend between the inner corner portions of the adjacent edges of the walls or sections, and extend a distance into the interior of the box or crate and are subject to flexion by the folding and unfolding of the crate or box. When the two staple-shaped members are first driven into the edge portions of the walls or sections, they remain straight or unbent, as shown, for example, in Fig. 7 of the drawings, but when the two walls or sections are interconnected, by the insertion of one wire member through the other, the two members are then subject to flexion or bending in the manner shown in Figs. 10, 11, 12 and 13 of the drawings, so that the heads of the two staple-shaped members are always within the box or crate, but not in a manner to interfere with the contents of the box or crate. Box or crate sections thus equipped with inter-engaging staple-shaped members are easily assembled and connected together, and are easily folded and unfolded, in the manner desirable for folding boxes and crates of this class.

As shown in Figs. 14 to 18 inclusive, the construction is similar to that previously shown and described, but in this case the two adjacent sections of the crate or container 12 and 13 are connected together by the two wire members 14 and 15, in the manner shown more clearly in Figs. 15 to 18 inclusive. The member 14 is the shorter of the two, and the longer member 15, after being inserted through the loop of the member 14, is then distorted to provide a head 16, which will not pull through the member 14, and the interengaging ends of these two members are outside of the crate or container, when the sections 12 and 13 are at right angles to each other, as shown in Figs. 14 and 16, the two outer end portions of these two wire members being located in the recess formed between the two adjacent edges of the sections 12 and 13, so that these interengaging ends are not inside of the crate or other container, as is true of the construction shown in Figs. 1 to 13 inclusive. When the two container sections are folded flatwise one upon the other, as shown in Fig. 17, the wire members assume the positions shown in this figure of the drawings. When the two sections are folded or moved into the same plane, as shown in Fig. 18, then the two wire members assume the positions shown in this figure of the drawings.

It will be seen, therefore, that the wire members are inserted before the box or crate sections are connected together, and that the wire members are then interengaged with each other in a manner to hinge the sections together, while at the same time permitting separation of one section from the other, if such is desired, as the head 8 or the head 16 can be straightened out again to permit it to pass through the other wire member, if it is desired to disconnect the box or crate sections from each other. But, in any event, it is not the driving or inserting of the wire members that connects the sections together.

Fig. 9 of the drawings, for example, shows how the head 8 of the inserted member 6 can be expanded laterally to an extent that it is too wide to pull through the member 5, as the head of the latter is narrower than the said expanded head 8 of the inserted member. In addition, this head 6 is bendable to rest against one side of the angle formed between adjacent surfaces of the two sections of the box, as in Fig. 12 or in Fig. 16 of the drawings, when the two box sections are at right angles to each other. In each form of the invention, also, the two interengaging heads of the two wire hinge members are disengageable from each other, by restoring the head 8 to its original form or shape, when such is necessary or desirable. In each form of the invention, these disengageable head portions of the two wire hinge members extend between the opposite surfaces of the angle formed, either outside or inside, between adjacent surfaces of the two box sections, as shown in Fig. 12 or as shown in Fig. 16 of the drawings.

Looking at Figs. 7 to 13, for example, it will be seen that what happens to the member 6, when it is given the shape shown in Figs. 9 and 11, is in the nature of an upsetting operation, inasmuch as the outer end of this relatively long member is upset and thereby made shorter, with the result that it is widened to provide the head 8, which latter is considerably shorter than the projecting end portion 6 of this member, as shown, for example, in Figs. 7 and 8 of the drawings. As shown in Fig. 10 of the drawings, the upset head 8 of this member is in the plane of

the legs of the member, and the same thing may be true of the head 16 shown in Figs. 14 to 18 of the drawings, if the upsetting is done, obviously, with the box or crate sections in the position shown in Fig. 17 of the drawings, for in such case the upset head 16 would still be in the plane of the legs of this member, and in such case the upsetting would be done while the outer end of the member 16 is straight and not bent as shown in the drawings. In any event, however, the end of the tongue or longer wire member is subjected to an upsetting operation, in effect, that causes it to become shorter and wider.

As shown in Figs. 10, 11, and 12 of the drawings, the end portions 5 and 6 extend between the sections when the latter are folded flatwise together, as indicated in Figs. 10, 12, and 13 of the drawings. On the other hand, as shown in Figs. 16, 17, and 18 of the drawings, the outer ends of the members 14 and 15 extend between the sections when the latter are folded edge to edge in the same plane, as indicated in Fig. 18 of the drawings. In both forms of the invention, as shown, the two wire members are inserted outwardly in identically the same manner, so that the points of insertion for the legs of each member are at the inner corners of the two box sections.

It will be seen that the two heads of the bale-shaped wire members, in the ultimate structure, as shown for example in Figs. 9, 11, and 15, are so formed or shaped that one head is necessarily distorted after the two members have been separately inserted in the two sections of the box or crate. This means, of course, that the two heads are so formed that they are necessarily interengaged after the two members have both been separately inserted in the sections. First the two members are separately inserted, then the head of one member is inserted through the head of the other member, and then the head of one member is distorted to prevent it from pulling through the other member. Furthermore, it will be seen that the two members are so inserted that their heads may be folded flatwise between the flat opposing edges of the sections, when the latter are in the same plane, or may be inside the box or crate and extend flatwise or flexibly between the two parallel opposing surfaces of the two sections, when the latter are folded flatwise one upon the other. When the two heads extend into the interior of the box, it is more difficult to then separate them from the outside.

What I claim as my invention is:

1. In a knock-down or folding shipping box or crate, a wire hinge fastener for separably connecting together the adjacent edges of two sections of the box or crate, comprising a couple of staple-shaped wire members inserted outwardly in the adjacent edge portions of said walls or sections, with the flexible head of one member inserted through the flexible head of the other, and with the head of the inserted member expanded laterally to provide an enlarged head that is too wide to pull through the other member, but which can be bent back to its original form to permit separation of the sections, whereby the two members may be fully inserted in their respective sections, before the latter are connected together, and thereafter interengaged to separably hinge the two sections together, with the interengaging and separable heads of said members projecting into the angle formed between the edge portions of the sections when the latter are at right angles to each other, and with said enlarged head bendable to rest flatwise against one side of said angle.

2. A structure as specified in claim 1, said wire members being inserted obliquely through the outer corner portions of the adjacent edges of the two walls or sections, and the ends or points of the wire being clinched on the surface and turned back into the outer sides of said walls or sections, and the head portions of the two members extending inwardly between the inner corners of said adjacent edges, a distance within the box or crate.

3. A structure as specified in claim 1, the head portions of said members extending inwardly between the inner corners of said adjacent edges, a distance within the interior of the box or crate.

4. A structure as specified in claim 1, the engageable head portions of said members being internal of the box or crate, when the latter is in use.

5. A structure as specified in claim 1, the interengaging end portions of said members extending outwardly between the adjacent edges of the sections and thereby being exposed on the outer surface of the box or crate, when the latter is in condition for use.

6. A structure as specified in claim 1, the interengaging end portions of said wire members being disposed externally of the box or crate, between the square edges of the sections, at the corner thereof, when the box or crate is in condition for use.

7. In a knock-down or folding shipping box or crate, a wire hinge fastener for separably connecting together the adjacent edges of sections of the box or crate, comprising staple-shaped wire members inserted outwardly through the edge portions of the sections, so that the legs of each member at the points of insertion thereof are spaced apart lengthwise of the edge of the section, with the head of one member insertable through the head of the other member, and with the inserted head upset and thereby widened enough at its end to prevent it from pulling through the other head when the two sections are thus hinged together, and at least one head being also bendable to rest flatwise directly against a section in the relative flexing of the sections.

8. A structure as specified in claim 7, in which the two members are inserted obliquely to the edge portions of the sections, from the inner corners of said edge portions, with both legs of each member intersecting the edge of one of said corners, and with the outer points of said members clinched upon and into the outer surface of the two sections.

9. A structure as specified in claim 7, said interengaging end portions of the two members being disposed in the angle between the inner surfaces of the sections, in position to be bent flatwise against either surface.

10. A structure as specified in claim 7, the interengaging end portions of the two members being disposed in the angle between the outer edges of the sections, in position to be bent flatwise against either edge.

11. In a knock-down or folding shipping box or crate, a wire hinge fastener for separably connecting together the adjacent edges of sections of the box or crate, comprising staple shaped wire members inserted obliquely and outwardly through the adjacent edge portions of the sections, one member being insertable through the other to hinge the sections together, and the outer end of the inserted member being upset and

thereby transversely expanded to form a head that is too wide to pull through the other member, thereby to prevent separation of the sections.

12. A structure as specified in claim 11, said enlarged head being flexible to rest flatwise against a surface of the sections, in the relative flexing of the latter.

13. A structure as specified in claim 11, the legs of each member being spaced apart longitudinally of the edges of the sections.

14. In combination with box or crate sections, interengaging wire members both inserted in identically the same manner in the edge portions of the sections, but with one member longer than the other, and forming a separable flexible hinge between the inner corners of the two edges, in which one member extends through the other and is upset to shorten and widen its end, forming a head that will not pull through said other member.

15. In combination with box or crate sections having square edge portions, means for hingedly and separably connecting together the two inner corners of said edge portions, having points of insertion entirely at said corners.

16. In combination with box or crate sections, interengaging wire members both inserted outwardly in identically the same manner in the edge portions of the sections, but with one member longer than the other, and forming a separable flexible hinge between the inner corners of the two edges, in which one member extends through the other and is upset to shorten and widen its end, forming a head that will not pull through said other member.

17. In combination with box or crate sections, interengaging wire members both inserted outwardly in identically the same manner in the adjacent edges of the sections, so that the inserted portion of each member terminates in a clinch at the outer side surface of the section, but with the projecting head of one member longer than and extending through the other, the two heads being so formed that they are necessarily interengaged after the two members are both separately inserted in the two sections, forming a separable flexible hinge between the inner corners of the two edges.

18. A structure as specified in claim 17, in which one member extends through the other and is upset to shorten and widen its end, forming a head that will not pull through said other member.

19. A structure as specified in claim 17, the interengaging and separable ends of said members being outside the box or crate, so that said ends extend flexibly between the edges of the sections when the latter are folded edge to edge in the same plane.

20. A structure as specified in claim 17, the interengaging and separable ends of said members being both bent to project crosswise of each other a distance inside the box or crate, so that said ends extend flexibly between the opposing inside surfaces of the sections when the latter are folded flatwise together.

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