

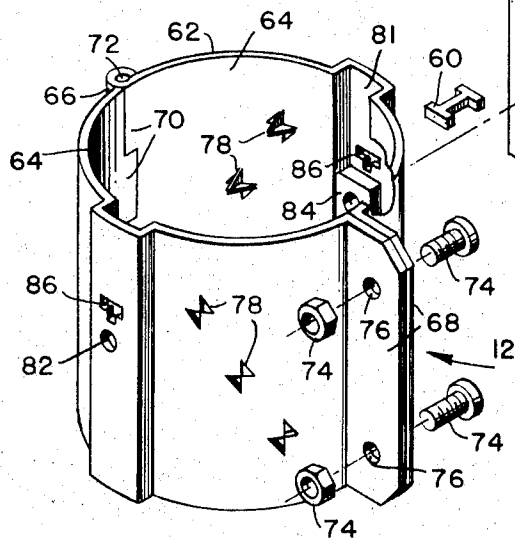
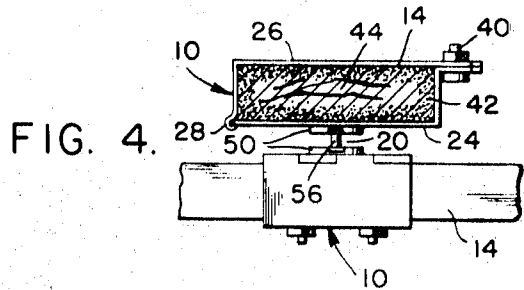
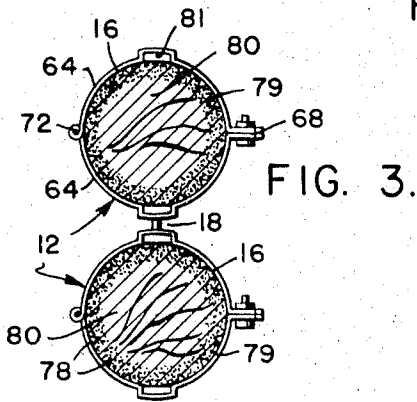
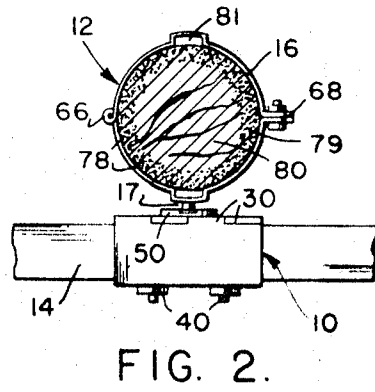
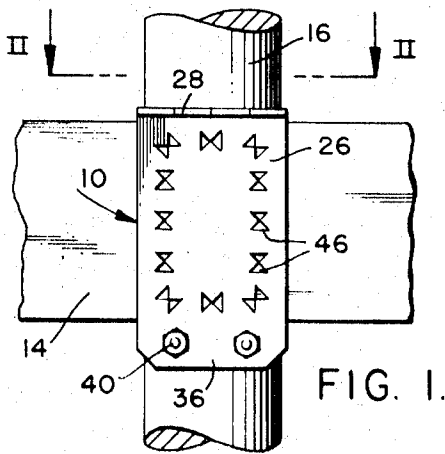
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R. O. HAWES ET AL

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CONNECTOR FOR WOODEN MEMBERS

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INVENTORS.
ROBERT O. HAWES
ROBERT Z. PAGE
BENJAMIN E. REED

BY *Erwin F. Johnston*
ATTORNEY.

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CONNECTOR FOR WOODEN MEMBERS

Robert O. Hawes, 1499 Highwood Drive, McLean, Va. 22101; Robert Z. Page, 7117 Kerr Drive, Springfield, Va. 22150; and Benjamin E. Reed, 4319 Satinwood Drive, Concord, Calif. 94521

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ABSTRACT OF THE DISCLOSURE

The description discloses a pair of connectors for partially treated wooden members. Each connector may include a clamp which is adapted to clamp against a respective structural member. Each clamp is provided with inwardly extending teeth which extend only within the treated zone of the wooden member when the clamp is in position. Each clamp may be provided with a respective external hollow housing so that the housings will receive a bolt-nut combination for joining the clamps together. These housings may be provided with keyways is selected locations so that a key can join the clamps in a desired angular relationship.

The present invention relates to a connector for wooden members and more particularly to a connector for treated wooden members, which can be used without perforating the exterior treated zones of the wooden members.

Wooden members which are employed in the construction of marine structures must be treated with a preservative to protect the wood from marine borers. In some instances wooden members employed for land structures must also be treated to protect the wood against insects and fungi. Treated wooden members normally have only an exterior treated zone which leaves an untreated interior zone which is vulnerable to attack by marine borers, etc. if the integrity of the exterior treated zone is in any way broken. Much of the Navy's marine piling is Douglas fir which is normally impregnated with a preservative only up to one inch in depth. Because of the seriousness of the problem of marine borers to wooden structures, a considerable amount of research has been conducted to come up with highly effective preservative compounds.

In spite of the fact that the preservative compounds are very effective against marine borers, the attack is still made on the interior untreated zones of the wooden members causing their ultimate destruction. So often treated wooden members appear structurally sound from their outside appearance when in actuality the marine borers have hollowed out the entire interior untreated portions of the members. We have found that this undesirable attack has been allowed by present day connectors which provide openings through the treated zones so that the marine borers have a direct passageway to the vulnerable interior untreated wooden zones.

Presently used devices for connecting treated wooden members include bolts or spikes which extend through or deeply into the members which are to be connected. Still other commonly used devices are flat or bent metal sheets which are attached to the wooden members by nails which are driven through holes in the metal or, alternatively, the metal sheets may have struck out long spike portions which are driven into the wooden members. All of these devices necessarily perforate the outer treated zones of the wooden members thereby exposing the untreated interior zones of the wood to destructive

attack by marine borers, termites and fungi. In the marine environment crustacean borers, particularly those of the genus *Limnoria*, enter the spaces between the bolts, spikes, or nails and the wood and hollow out the untreated interior portion of the wooden members. Above the tide zone in a marine environment, or above the ground in land structures insects enter these openings, as does fungus spores which are washed in through the openings by rain water.

The present invention provides a connector for treated wooden members, which does not perforate the exterior treated zones of the wood. This has been accomplished by providing a connector which has the following elements: a clamp for at least partially surrounding the wooden member; the clamp having means for tightening the inner side of the clamp tightly against the exterior surface of the wooden member; a plurality of inwardly extending teeth on the inner side of the clamp for embedment in the wooden member when the clamp is tightened against the member; the length of the teeth being less than the depth of the exterior treated zone of the wooden member, and means on the clamp for fastening the clamp to another similar one of such clamps. The basic principle of the present connector has been adapted for use with round wooden members such as piles, posts, or poles as well as rectangular wooden members which have been sawed to a particular size. The fastening means of the present connector enables round members to be connected to round members, rectangular members to rectangular members, or round members to rectangular members as desired. The connectors are configured in such a manner that a simple means may be provided for fixing a desired angular relationship between the wooden members. Further, the particular arrangement of the present connector makes it very easy for a single workman to install, even when timbers are involved, and enables the connector to be manufactured at a low cost.

An object of the present invention is to provide a connector for treated wooden members, which upon installation will not perforate the exterior treated zones of such members and will yet resist heavy loads.

A further object is to provide a structurally sound connector for treated wooden members, which upon installation does not make any openings through the treated portion of the wood into the interior untreated portion thereof, so that the members maintain their integrity against attack by marine borers, insects and fungi.

Another object is to provide connectors for round and rectangular treated wooden members, which will enable the connection of any combination of such members without perforating the treated zones of such members.

Still another object is to provide a simple connector for wooden members which fixes the members in a desired angular relationship.

Yet another object is to provide a connector for wooden members which is easy to manufacture and can be simply installed by a single workman in the field.

Other objects, advantages and novel features of the invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings wherein:

FIG. 1 is a side view of a horizontally oriented rectangular member which is connected to a vertically oriented round member;

FIG. 2 is a view taken along plane II-II of FIG. 1;

FIG. 3 is a cross sectional view of the connectors connecting a pair of round wooden members;

FIG. 4 illustrates the connectors connecting a pair of rectangular wooden members in a perpendicular relationship; and

FIG. 5 is an isometric exploded view of the connec-

tors of FIGS. 1 and 2 looking from the reverse side of FIG. 1 with the timbers removed.

Referring now to the drawings wherein like reference numerals designate like or similar parts throughout the several views, there is shown in FIGS. 1 and 2 a generally rectangular connector 10 and a generally circular connector 12 which connect a horizontal timber 14 to a round timber 16, such as a pile, post or pole. As shown in FIG. 2, the rectangular connector 10 is fastened to the circular connector 12 by a fastening means at 17 which will be explained in detail hereinafter. There is shown in FIG. 3 a pair of circular connectors 12 which are fastened together at 18 so as to connect the round timbers 16 one to the other. In FIG. 4 there is shown a pair of rectangular connectors 10 which are fastened together at 20 so as to connect the rectangular timbers 14 one to the other.

As shown in FIG. 5, the rectangular connector 10 includes a generally rectangular clamp 22 which is adapted to surround or encompass the rectangular wooden timber 14. The clamp 22 may include a pair of semi-rectangular steel sections 24 and 26, both of which are formed with a 90° angle so that when they are placed in a complementary relationship, as shown in FIG. 5, they will encompass the rectangular wooden member 14.

The clamp 22 includes a means for selectively tightening the inner sides of the steel sections 24 and 26 tightly against the exterior surface of the wooden timber. This tightening means may include a hinge 28 which pivotally connects the steel sections 24 and 26 at their edges so as to form a hinged corner for the clamp, as shown in FIG. 5. In order to form the hinge 28 the edges of the steel sections 24 and 26 may be provided with preformed circular tabs 30 for receiving the hinge pin. The tightening means may further include the steel section 24 having a flange 34 which engages an extended side portion 36 of the other steel section 26 in an adjacent relationship. The extended side portion 36 and the flange 34 may be provided with holes 38 for receiving bolt and nut combinations 40. Accordingly, when the bolt and nut combinations 40 are tightened against the extended side portion 36 and the flange 34 the inner sides of the steel sections 24 and 26 are brought tightly to bear against the exterior surface of the rectangular wooden timber 14.

As shown in FIG. 4, when the wooden timber 14 is treated by a preservative the preservative normally impregnates only an exterior portion 42 thereby leaving an untreated interior portion 44. Should spikes or nails extend through the treated portion 42 into the untreated portion 44, openings between the nails or spikes allow access to the untreated portion 44 by marine borers, insects and fungi. The connector 10 provides good longitudinal support along the timber 14 without destroying the integrity of the treated portion 42 by providing the inner sides of the steel sections 24 and 26 with a series of inwardly extending teeth 46. It is important when the bolt and nut combinations 40 are drawn tight that the teeth 46 extend no further than the treated portion 42 of the wooden timber. Accordingly, the inwardly extending dimension of each tooth 46 should be less than the depth of the treated portion 42 of the wooden timber. The teeth 46 may be triangular struck out portions of the steel sections 24 and 26 and, if desired, each tooth may be formed by striking out a pair of triangular portions at right angles with respect to one another and welded at 48 to provide the tooth with structural integrity. Alternatively, conical shaped spikes (not shown) could be welded on the inner side of the steel sections 24 and 26 to form the teeth 46.

The rectangular connector 10 further includes a means on the clamp 22, for fastening the clamp 22 to another one of such clamps, as shown in FIG. 4. The fastening means may include one of the steel sections such as the steel section 24, having an outwardly extending recess on one of its inner sides. This recess may be formed by

an opening 49 in the wall of the steel section 24 with a nut or bolt end housing 50 secured thereover so that the housing 50 is exteriorly located with respect to the main body of the clamp 22. The housing 50 may be cylindrical in shape and fixed to the section 24 by any suitable means, such as welding. A bolt 56 extends through the bottom of the cylindrical housing 50 with the bolt head (not shown) received within the housing. To make the connection shown in FIG. 4, the bolt 56 extends into the housing of another rectangular connector and a nut 51 within this housing is tightened on the bolt 56 to securely fasten the pair of connectors 10. This in turn connects the rectangular wooden timbers 14. It is to be understood that the head of the bolt 56 and the nut 57 may be disposed in either housing of the connectors 10.

In some instances it may be desirable to fix the timbers 14 in a particular angular relationship. To accomplish this the connector 10 may be provided with a means for fixing the angular relationship between the wooden timbers. The angular fixing means may include the housing 50 being provided with a keyway 58, which may be T-shaped, at a selected position along its bottom or outer circular corner. The keyway 58 is adapted to receive a half portion of an H-shaped key 60, the other half of the key 60 being received by a similar keyway in the housing of another connector. It is to be understood that the keyways 58 can be formed at any desired location about the housing 50 so that the timbers 14 can be fixed in a perpendicular relationship as shown in FIG. 4 or in any other desired angular relationship.

The circular connector 12 includes many of the features of the rectangular connector 10 and is adapted to be fastened to another circular connector, as shown in FIG. 3, or to a rectangular connector 10 as shown in FIG. 2. As shown in FIG. 5, the circular connector 12 includes a clamp 62 which encompasses at least a portion of the round timber 16. The clamp 62 may include a pair of generally semicircular bands 64. The clamp 62 may further include a tightening means by providing a hinge 66 along adjacent vertical edges of the semi-circular bands 64 and providing outwardly extending flanges 68 along opposite vertical edges of the bands. The hinge 66 may be formed by curved tabs 70 at the edges, which receive a hinge pin 72. The tightening means may further include bolt-nut combinations 74 with the bolts adapted to extend through holes 76 in both of the flanges 68. Accordingly, when the bolt-nut combinations 74 are drawn tight the inner sides of the semi-circular bands 64 tightly engage the exterior surface of the round timber 16.

The inner sides of the semi-circular bands 64 are provided with a plurality of teeth 78 which may be constructed in a manner similar to the teeth 48 of the rectangular connector 10. As explained hereinabove, the inwardly extending dimension of the teeth 78 should be less than the depth of a treated zone 79 of the round timbers 16 so that an untreated zone 80 of the round timber is protected from attack by marine borers, insects or fungi.

The circular connector 12 is provided with a fastening means for fastening the circular connector to another circular connector, as shown in FIG. 3, or to a rectangular connector 10 as shown in FIGS. 1 and 2. This fastening means may include at least one of the semicircular bands 64 being provided with an outwardly extending and inwardly facing channel 81, which may be generally rectangular, along its inner side so that the channel 81 is located exteriorly with respect to the main body of the connector 12. The channel 81 is provided with a bolt hole 82 and within the channel adjacent this hole there may be provided a nut 84 for receiving a bolt, such as the bolt 56, shown in FIG. 5. The width of the channel 81 may be such that it just receives the nut 84 so as to prevent rotation of the nut when the bolt is tightened. It is to be understood that the channel 81 could also receive the head of the bolt 56 in lieu of the nut 84, in which case the nut 84 would be received

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within the other connector. It is to be noted that the two channels 81, shown in FIG. 5, enable two timbers to be connected to the round timber 16. If desired, a plurality of channels may be provided in each semicircular band 64 for connecting even more timbers. This may be desirable when constructing a dolphin for a pier.

In a manner similar to that described for the rectangular connector 10 the circular connector 12 may be provided with a means for fixing a desired angular relationship between the wooden timbers. This may be accomplished by providing the channel 81 with a keyway 86, which may be T-shaped, just above the bolt hole 82 for receiving a half portion of the key 60. If it is desired to fix the round timbers in an angular relationship other than the parallel relationship shown in FIG. 3, the channel 81 could be provided with more width so that the keyway 86 may be positioned at any desired location about the bolt hole 82.

To connect a pair of the timbers together the workman will first clamp the connectors on the timbers at the desired locations. It is to be noted that the hinge feature of the connectors enables a single workman to effect the clamping operation. He need merely open the connector and bring it about the timber, after which he can secure it in place by tightening the bolt and nut combinations 40 and 74. In this tightening operation the teeth of the connectors are embedded within the respective timbers only within the treated portion thereof. After the connectors are clamped in place the timbers may be brought together and the bolts 56 and nuts 84 tightened. If it is desired that the timbers be fixed in a particular angular relationship the key 60 may be dropped within respective keyways within the above described fastening means.

It is now readily apparent that the present invention provides connectors for connecting all sizes of treated wooden members, including timbers, without perforating the treated portions of such wooden members. These connectors will maintain the preservative integrity of the wooden members and yet provide the longitudinal resisting force which is necessary for heavy loads. The connectors are constructed in such a manner that any combination of round and rectangular wooden members may be connected together. Further, the connectors are provided with a tightening means which enables a single workman to clamp the connectors to the wooden members.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings.

We claim:

1. In combination with a wooden member which has an exterior treated zone impregnated with a preservative and an interior untreated zone a connector for said wooden member comprising:

- a clamp at least partially encompassing said wooden member;
- said clamp having means for tightening the inner side of the clamp tightly against the exterior surface of the wooden member;
- a plurality of inwardly extending teeth on the inner side of the clamp which are embedded in the wooden member when the clamp is tightened against said member; and
- said clamp being tight against the wooden member and the inwardly extending dimension of the teeth being less than the depth of the treated zone of said wooden member so that the teeth extend only within such treated zone, whereby the integrity of the interior untreated zone of the wooden member is not violated.

2. A connector as claimed in claim 1 including means on said clamp for fastening the clamp to another similar one of said clamps.

3. A connector for a treated wooden member, as claimed in claim 2, wherein the fastening means includes

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a housing which extends outwardly from said clamp and has an opening for receiving a bolt.

4. A connector as claimed in claim 3 wherein the housing has a keyway; and including a key for insertion in said keyway.

5. A connector as claimed in claim 1 wherein the clamp and the tightening means includes:
two sections forming said clamp;
means hinging the clamp sections together; and
means for drawing the two sections together about the hinge means so as to tighten the inner side of the clamp tightly against the exterior surface of the wooden member.

6. A connector as claimed in claim 5 wherein each of the clamp sections is generally semicircular in shape.

7. In combination with round and rectangular wooden members, each of which has an exterior treated zone impregnated with a preservative and an interior untreated zone a pair of connectors for connecting said wooden members comprising:

- each of said connectors including a clamp at least partially encompassing a respective wooden member;
- each clamp being divided into two sections, the clamp sections for the rectangular wooden member being generally semi-rectangular in shape and the clamp sections for the round wooden member being generally semi-circular in shape;

means hinging the sections of each clamp together;
means for drawing the clamp sections together about the respective hinge means so that an inner side of each clamp can be tightened against the exterior surface of a respective wooden member;

a plurality of inwardly extending teeth on the inner side of each clamp for embedment in the respective wooden member when the clamp is tightened;
said clamps being tight against the wooden members;
the inwardly extending dimension of said teeth being less than the depth of the treated zone of the respective wooden member so that the teeth extend only within such treated zone;

a housing which extends outwardly from each respective clamp, each housing having an opening for receiving a bolt;

a bolt extending through the bolt openings of both housings and tightened by a nut with the bolt head disposed in one housing and the nut disposed in the other housing; and

means on the clamps for fixing the wooden members in a desired angular relationship.

8. A pair of connectors for connecting a pair of structural members comprising:

each of said connectors including a clamp which is adapted to at least partially encompass a respective structural member;

each of said clamps having an external hollow housing, the housing of the clamps being adapted to receive a bolt-nut combination for joining the clamps together;

one of said housings being generally cylindrical and having an outer circular corner with respect to the clamp;

the cylindrical housing having a keyway at a preselected location in its outer circular corner;

the other of said housings being provided with a keyway; and a key inserted in the keyways of said housings.

9. A pair of connectors as claimed in claim 8 wherein: each keyway is generally T-shaped; and said key is generally H-shaped.

10. A pair of connectors as claimed in claim 9 wherein said other housing being generally rectangular shaped.

11. A pair of connectors as claimed in claim 10 wherein the clamp having the cylindrical housing is generally rectangular and the clamp having the rectangular housing is generally circular.

12. A pair of connectors as claimed in claim 11 where-

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in each clamp has a plurality of inwardly extending teeth.
 13. A pair of connectors as claimed in claim 12 for connecting wooden members which have an exterior treated zone impregnated with a preservative and an interior untreated zone, including:

said wooden members;
 said clamps being clamped about said wooden members;
 and
 the teeth of said clamps extending into the wooden members only within the treated zones of said wooden members.

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