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Farrell et al.

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[54] **TRUSS PLATE PRESS**

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[52] **U.S. Cl.**..... **100/35,** 100/DIG. 13, 100/100, 100/160, 100/176, 100/210, 100/211, 227/152

[51] **Int. Cl.**..... **B30b 13/00,** B30b 3/00

[58] **Field of Search** ..... 100/176, 41, DIG. 13, 35, 100/153, 160, 172, 173, 210, 100, 177, 211; 227/152; 269/321 F

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Attorney, Agent, or Firm—Biebel, French & Bugg

[57] **ABSTRACT**

A roller press for the attachment of connector plates to a truss member is disclosed in which a pair of rollers are mounted on a carriage and are movable along a truss supporting frame. An upper roller directly engages connector plates to imbed the same into the truss member. A lower roller operates against a series of transversely-extending reaction pads. The pads are moved by the lower roller between a lowered position and a raised position in which the reaction pads serially engage the connector plates and presses them into the joint. The employment of the reaction pads permits the entire roller force to be applied linearly and in incremental amounts so that both the top and the bottom connector plates are attached to a truss member in a single pass of the press.

9 Claims, 7 Drawing Figures

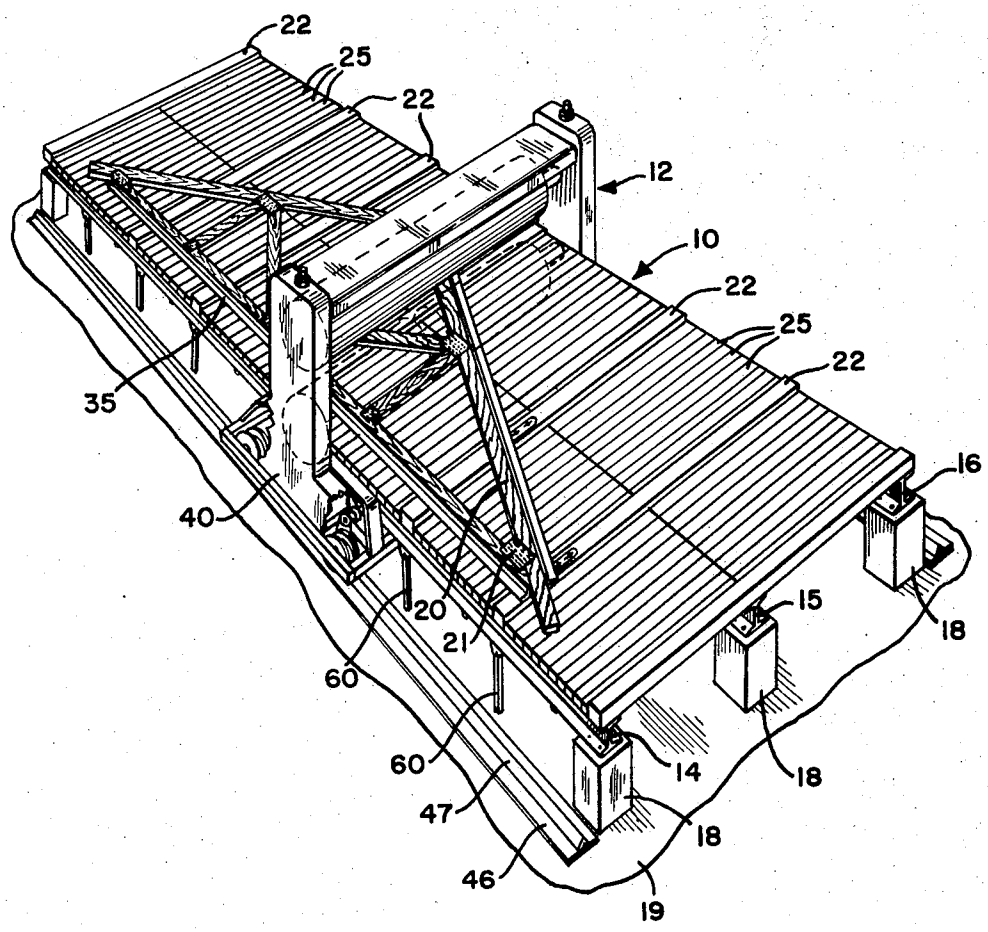


FIG-1

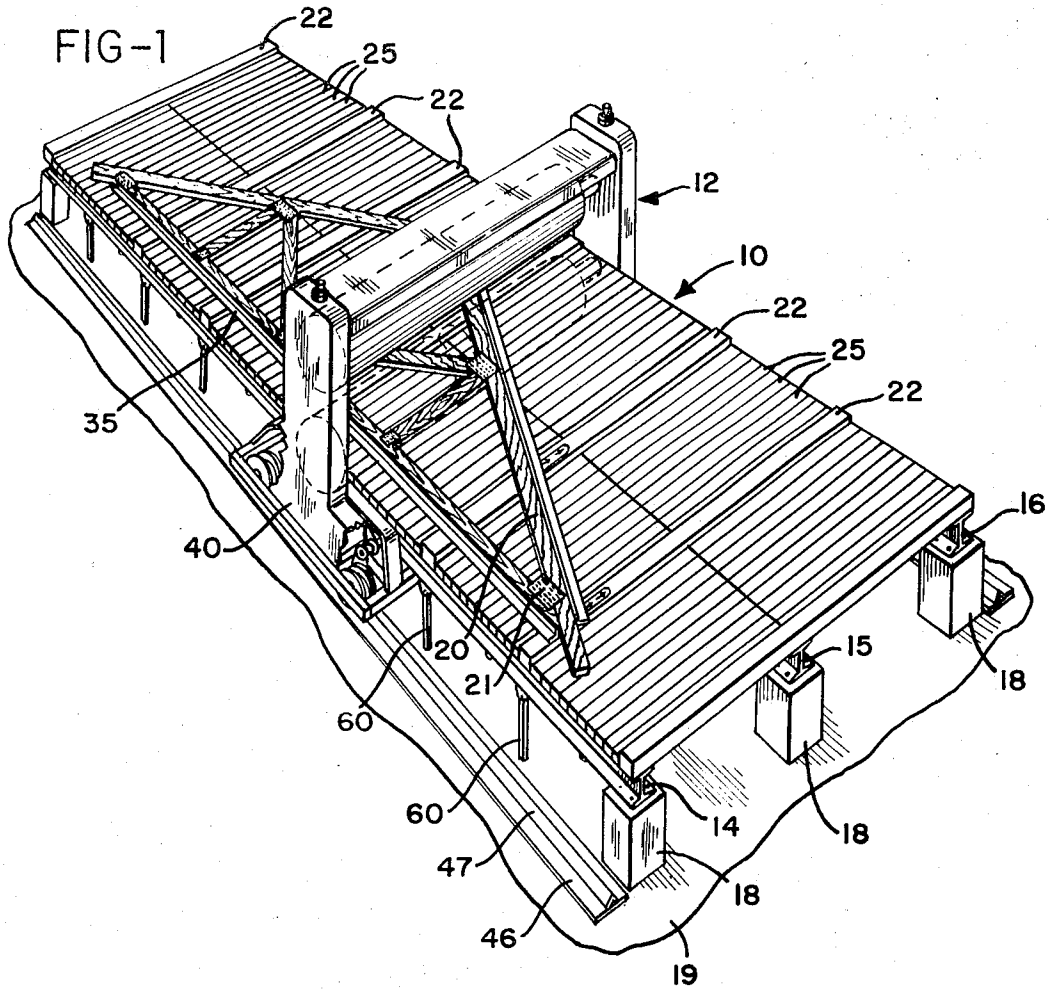

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FIG-2

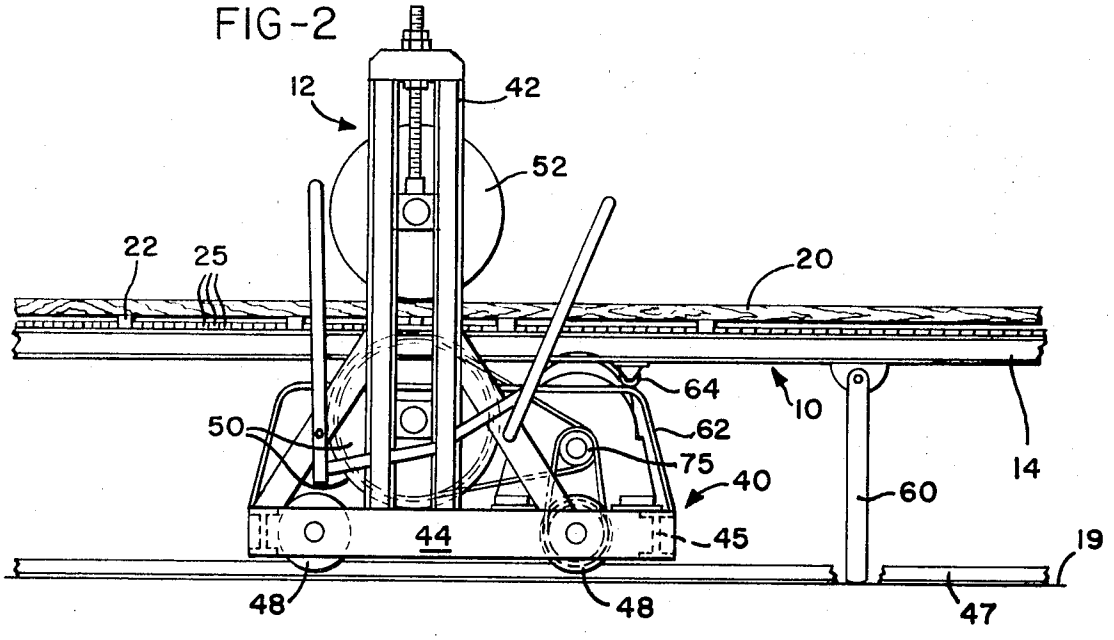

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FIG-3

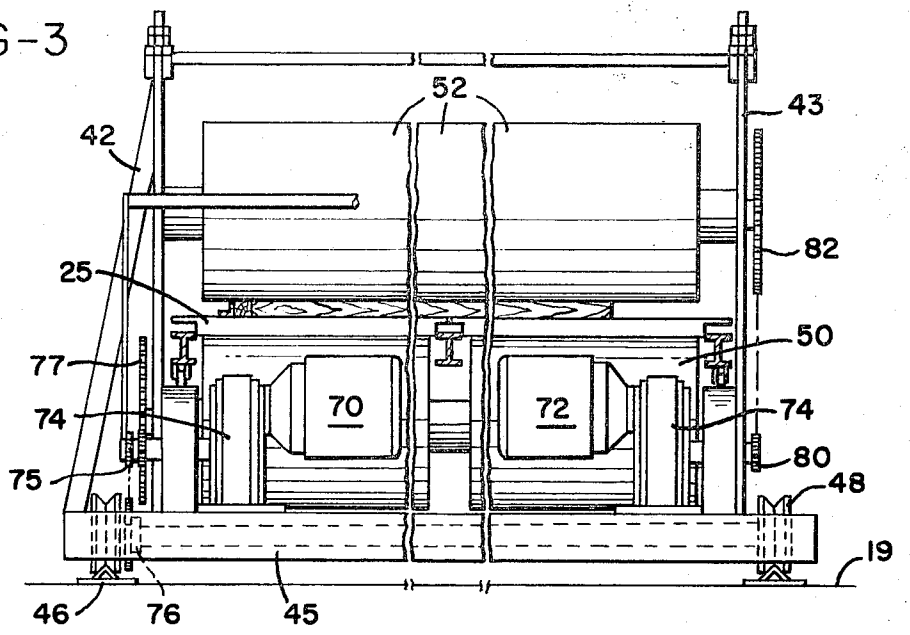

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FIG-4

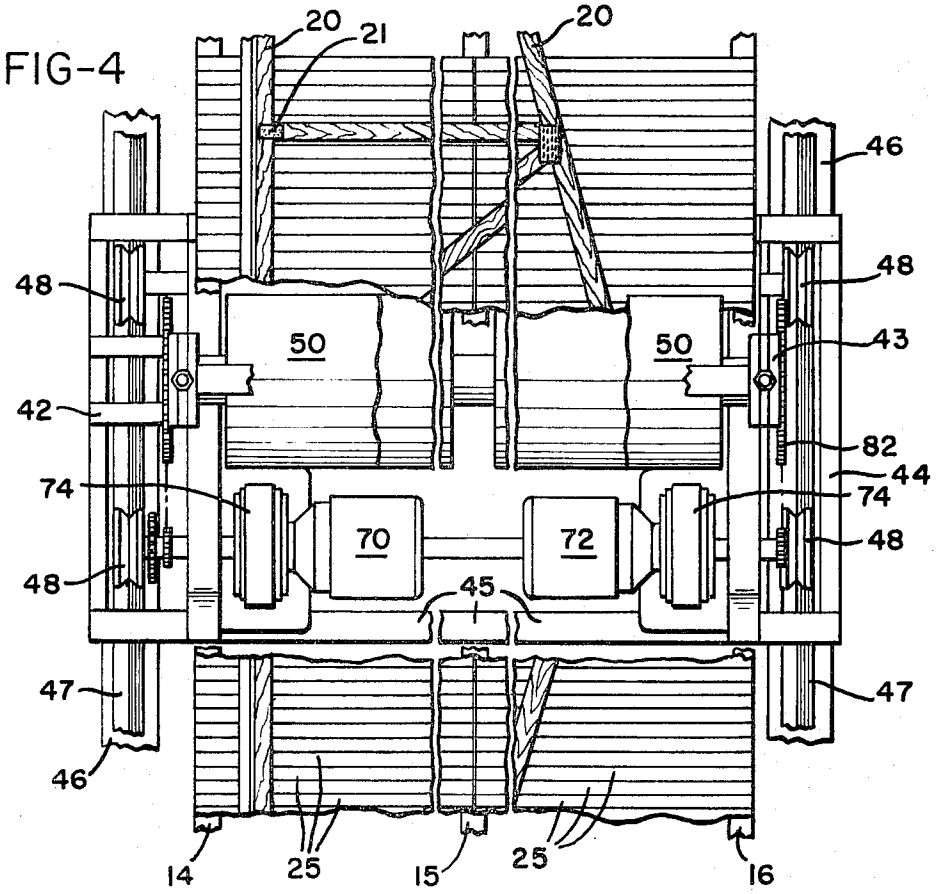

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FIG-5

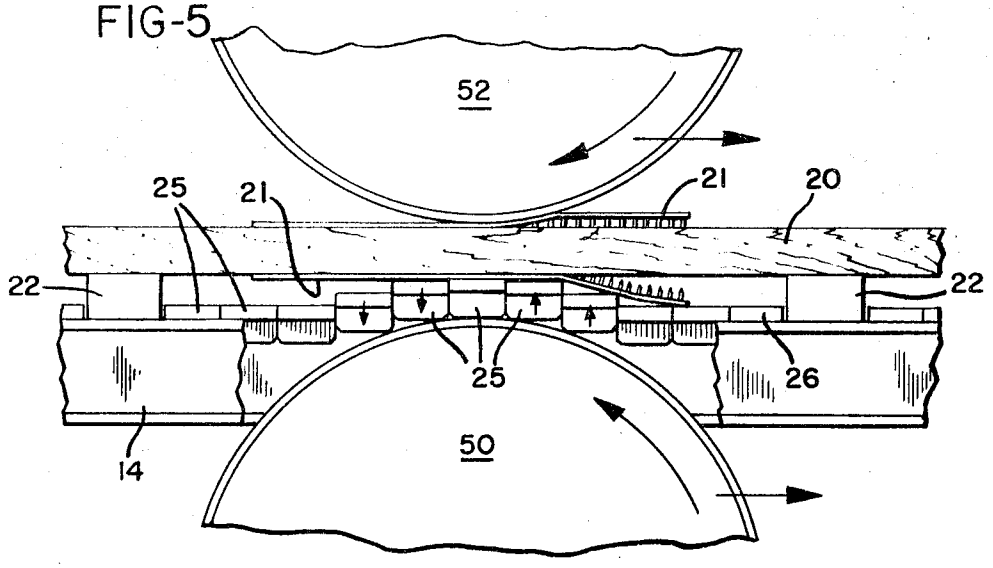


FIG-6A

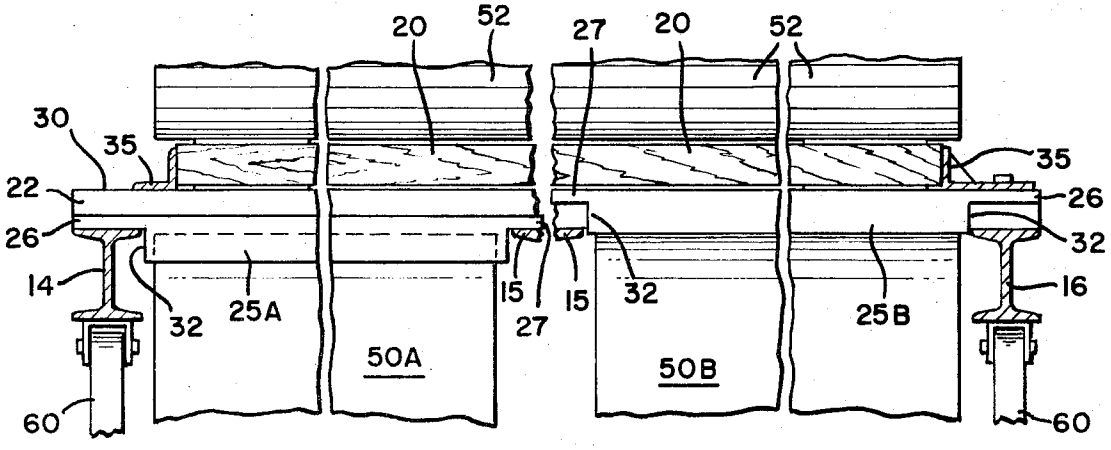


FIG-6B

TRUSS PLATE PRESS

BACKGROUND OF THE INVENTION

Connector plates which have integral teeth formed therein have been known for many years for connecting the joints in pre-jigged wood structural components such as roof trusses, floor trusses, and other truss-like members such as wall panels, modular home components and the like. Typical examples of such plates are shown in U.S. Pat. Nos. 649,761; 1,806,522; 2,827,676; and 3,094,748.

It has been known to apply metal connector plates to truss members employing a roller, and in one instance, the truss is set up on a table and the roller applies the connector plates to one side. Then, the truss is turned over so that the plates can be applied to the back side. After the plates have been applied to both sides it is then common practice to pass the truss through a roller press again for final pressing.

In another known prior system, a single roller is used to partially imbed connector plates into the opposite sides of the joints of a pre-jigged truss. A partially finished structure is then ejected from the jig and carried by a conveyor to a second roller press for final pressing. These prior systems require considerable floor space and entail considerable handling of the truss member. This can be a distinct disadvantage since floor and roof trusses are formed in substantial lengths, up to 100 feet or more long in the case of roof trusses, and the requirements for extra handling and/or extra floor space for additional pressing operations becomes prohibitive.

SUMMARY OF THE INVENTION

The present invention is directed to a roller press for joining connector plates to truss members or the like in which the opposite pairs of plates are fully imbedded or attached in one pass of the roller press, thus eliminating the need for additional presses or additional handling of the truss member.

The principle of the invention is based on the use of a series of reaction pads which are movable by one of the press rollers, in incremental fashion, into pressing engagement with one of the connector plates, while the opposite roller is in direct engagement with the truss and the opposite connector plate. Since the reaction pads can be designed to press only a narrow increment at a time, the desired pressing force can be achieved so that the opposite connector plates can be fully imbedded in a single pass. The reaction pads concept, as applied in the present invention, permits the uses of conventional rollers in a press to join opposite pairs of connector plates, even though the rollers may extend 15 feet or more across the machine. A further advantage is that all of the pressing force is confined between the rollers; none of it is transmitted to the truss-supporting frame. This again is of advantage since the truss frame itself may exceed 15 feet in width and up to 100 feet or more in length. It thus can be designed to support merely its own weight and that of the applied pre-jigged truss member, which can be substantial.

The press of the present invention itself has important advantages over prior systems known to applicants, as identified above. The press requires less space, is flexible in its uses, permits fast setup and removal of the finished truss members, and thus contributes to faster production, and eliminates intermediate handling of the truss prior to its being fully joined by the truss plates.

It is accordingly an important object of the invention to provide apparatus and method for applying the connector plates to a truss member in one pass of a roller press.

A further object of the invention is the provision of pressing apparatus and method which employ a series of reaction pads or bars which are sequentially brought into pressing engagement with one, or a series of, opposite connector plates so that the distribution of pressing forces is limited at any one time substantially to the width of one of the bars.

Another object of the invention is the provision of a truss plate attaching machine which is simple in operation, which is easy to maintain, and which is rugged and dependable for use in an environment of saw dust, wood chips or the like.

These and other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a truss plate press according to this invention, with some of the parts being broken away or removed for the purpose of clarity;

FIG. **2** is a side elevation of a fragment of the machine of FIG. **1** showing the roller press with some of the parts removed for clarity;

FIG. **3** is a partially broken away front elevation of the machine of FIG. **2**;

FIG. **4** is a partially broken away plan view of the machine of FIG. **2**;

FIG. **5** is a fragmentary side elevation, partially broken away, showing the manner in which the rollers engage the truss member and the reaction bars;

FIG. **6A** is a partial transverse view showing a bar in a lowered position and the manner in which it is supported on the frame; and FIG. **6B** shows a reaction bar in its raised position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1** and **2**, a truss plate connector according to this invention is illustrated as including a frame **10** and a roller press **12.** The frame **10** is formed with a plurality of longitudinally-extending table supports in the form of I-beams **14, 15,** and **16,** which are supported at their ends on permanent supports **18** in elevated relation to the floor **19.** The machine which is illustrated for the purpose of this invention is a large one capable of forming and connecting roof trusses, such as shown by the truss **20** supported on the frame **10** in FIG. **1,** and for this purpose, it is preferred to use three transversely spaced I-beams to provide structural support. However, in smaller machines, only the side I-beams **14** and **15** need be used for table support. The several joints of the truss **20** are to be connected by pairs of upper and lower connector plates **21** of the type described in the patents referred to in which protrusions are formed in one side thereof, which imbed into the wood to make a truss joint.

The frame **10** also includes a plurality of transversely extending and longitudinally spaced stationary bars **22.** These bars which may be of metal or wood, are sup-

ported on and attached directly to the upper surfaces of the I-beams. Intermediate the stationary bars **22** there are received a plurality of individual transversely extending reaction pads **25.** The structure of these pads, and the manner in which they are supported on the frame, may best be seen by reference to FIGS. **5** and **6.** When a center I-beam is used, the pads **25** are split into transversely aligned pairs on either side of the center I-beam, as shown by the lowered pad **25A** of FIG. **6A** and the raised pad **25B** of FIG. **6B.** The pads **25** which may be formed of hardwood, plastic, metal, or the like, are formed with upper outwardly extending ledges **26** and **27** at the opposite ends for engagement with the upper surface of the I-beam. The ledges form an offset **32** so that, in the retracted position, the upper surfaces of the pads **25** normally rest below the upper surfaces **30** of the stationary bars **22,** as illustrated by the pad **25A.** The pad offsets **32** formed at the opposite ends of each pad **25,** in combination with the sides of the I-beams, provide means for guiding the movement of the pads from the lowered position to the raised position. The depth of the offset **32** exceeds the amount by which the pads **25** are lifted or raised by the roller press and also exceeds the length of the truss plate projections, so that the pads are at all times restrained by the I-beams against transverse movement. The spaced stationary bars **22,** which include a plurality of the pads **25** therebetween, support the truss **20** in somewhat elevated relation to the pads **25** and restrain the pads against longitudinal movement.

The upper surfaces **30** of the station bars **22** also provide the means by which the truss **20** may be pre-jigged onto the top of the frame **10,** and for this purpose, a jigging fixture which includes adjustable angle braces **35** may be conveniently applied directly to the surfaces **30.**

In the preferred embodiment of the invention the pads **25** simply rest by gravity on the I-beams **14, 15,** and **16.** If one of them becomes damaged it may be simply removed by a lifting bar and replaced.

The roller press **12** is formed with a lower carriage **40,** and a pair of upright end frames **42** and **43** positioned on either side of the table **10.** The carriage **40** is formed with side frame members **44** and cross frame members **45** to form a box-like carriage structure for supporting the drive motors and end frames. The carriage **40** is mounted for movement longitudinally of the frame **10** on floor-tracks **46** which are laid on the floor just outside of the fixed supports **18.** The tracks are formed with an inverted V-shaped section **47,** as shown in FIG. **3,** and the carriage is provided with track engaging wheels **48** which are formed using generally complimentary V-shaped grooves. The track is thus self-cleaning of sawdust and wood shavings. The carriage **40** runs on the tracks **46** in a longitudinal direction from one end of the frame to the other.

The roller press **12** supports the pair of transversely extending, vertically spaced upper and lower rollers, including a first roller **50** between the end frames positioned in generally underlying relation to the frame **10** and an upper roller **52** which is adjustably carried between the end frames **42** and **43** in overlying relation to the frame **10.** When the frame **10** is provided with a central I-beam **15,** as shown, the lower roller **50** is divided into two transversely aligned sections **50A** and **50B** as shown in FIGS. **3** and **4.** Each of these sections respectively are received between the longitudinal I-beams.

The upper roller **52** is adjusted for direct engagement with the connector plates **21** on the upper surface of the truss member **20** and effectively presses the truss plates into the wood, as shown in FIG. **5.**

The lower roller **50,** on the other hand, is supported by the end frames **42** and **43** for direct lifting engagement with the reaction pads **25,** as shown also in FIG. **5.** The reaction pads **25** are thus serially engageable by the lower roller **52** with longitudinal movement thereof and are linearly displaced from their lowered position (FIG. **6A**) to the raised position (FIG. **6B**) and into engagement with the overlying bottom truss plates **21** for imbedding the plates into the truss at its joints simultaneously with the imbedding of the opposite truss plates. The pads **25** are then returned to their lowered position with the passing of the roller **50.** The (pressing) force thus applied through the reaction pads **25** primarily in increments defined by the width of one of the pads, and in this manner the distribution of pressing force between the rollers is confining at any one time to a region corresponding substantially to a width of one of the pads **25.**

In a typical example, the rollers may be formed of a hollow steel skin of three-fourths inch thickness which is internally strengthened or supported by transversely spaced disks at about 3 feet spacing mounted on a 1 ½ inch steel shaft, and may be, for example, 18 inches in diameter. The pads **25** may vary in width and depth and a typical example includes pads formed of one inch square steel bar structure, with the cutout portion **32** having a depth of five-sixteenths inch. This provides for imbedding plates having five-sixteenths inch prongs or teeth, and it is within the scope of the invention to provide rollers of differing diameters and pads of differing widths and retraction distances as required for imbedding the various kinds of connector plates which are available on the market.

It is within the scope of the invention to hold the press **12** in a fixed position and to move the table or frame longitudinally with respect to the press. However, this has the disadvantage of requiring additional floor space.

When the frame **10** is formed with substantial length, as shown in FIG. **1,** it is desirable to provide intermediate temporary supports to eliminate any sag in the I-beams **14, 15,** and **16.** To this end a series of pendulum type legs **60** may be mounted in depending relation from the side beams **14** and **16.** The carriage **40** may be provided with upper saddle-shaped rails **62** on each side, and as the carriage approaches one pair of the legs the rails **62** are proportioned to engage underlying rollers **64** on the I-beams which provide temporary support for the frame onto the carriage, thus permitting the pendulum legs **60** to be swung out of position so that the carriage can pass. The carriage, when contacting the legs **60,** simply moves them out to a horizontal position until the carriage has passed.

Means for driving the carriage in the longitudinal direction includes a pair of drive motors **70** and **72** and reduction gears **74,** as shown in FIGS. **3** and **4.** The drive motor **70** drives a pair of chain sprockets **75.** One of the chain sprockets **75** is connected to drive the forward wheel **48** through a torque limiting clutch **76.** At the same time, the other sprocket **75** is connected to drive the lower roller **50** through a large chain sprocket

77. In this manner the lower roller is driven in the same direction but at a somewhat lower peripheral speed than the wheel. On the other hand, the upper roller **52**, which must be driven in the opposite direction, is driven by the motor **72** through its sprocket **80** and a corresponding large sprocket **82.** When the rollers **50** and **52** engage a truss on the frame **10** they become self-feeding and move under the drive of the motors **70** and **72.** It is convenient to leave the drive wheels **48** engaged through the torque limiting clutch **76** during the pressing operation. When there is no truss on the frame, the carriage will be driven at a somewhat greater speed by the wheels.

The operation of the invention is largely self-evident from the foregoing description. Suitable jigging may be arranged on the stationary bars **22** according to the desired production run, and the truss members laid in place. The lower connector plates **21** may be placed by hand onto the wood and they will remain there as the teeth of these plates are sharp and stick to the wood with little manual pressure. The upper connector plates may be similarly laid in position and they will tend to stay in position without sliding or moving.

The roller press, which has been moved to one or the other end of the frame **10** is started by starting the motors **70** and **72,** and it proceeds forward by driving the front wheels **48** until the upper and lower rollers come into engagement with the truss. At this time the press becomes self-feeding. As a pair of connector plates is approached the top plate is pressed down by the top roller and the bottom plate is pressed by the previously described serial movement of the reaction pads **25.** All of the pressing force is confined between the rollers and none is transmitted to the frame **10.** The use of reaction pads **25** permits sufficient force to be applied so that both the top and bottom connector plates are fully and completely imbedded with one pass of the press.

The pendulum legs may be spaced on approximately **15** feet intervals, and the yoke or rail **62** may be adjusted to provide about a one-eighth inch lifting movement of the table to release the pendulum legs **60** from engagement with the floor so that they can be swung out of position while the press is passing. Camber blocks may be fixed in the chord of the truss so that a finished truss is formed using a predetermined camber.

It is understood that where a smaller version of the roller press is desired the center I-beam **15** may be eliminated and the reaction bars and the lower roller may be made in one piece.

While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention.

What is claimed is:

1. A pressing apparatus for the attachment of connector plates to a truss member comprising a frame for supporting a truss member with pairs of connector plates in aligned position on the upper and lower sides of the truss member, a roller press having a pair of transversely extending, vertically spaced upper and lower rollers, said press supporting said upper roller for direct engagement with the connector plates on the upper side of said truss member, means on said frame supporting a plurality of individual transversely extending reaction pads movable between a normal lowered position in underlying relation to the adjacent plates on the lower side of said truss member to a raised position in pressing engagement with said adjacent plates, said press supporting said lower roller for engagement with said pads to effect movement thereof from said lowered position into said raised position simultaneously with the engagement of the upper roller with the upper plates, and means for moving said press longitudinally relative to said frame to effect the joining of said connector plates with said truss in one pass of said press.

2. In a press for the assembly of connector plates with a truss in which pairs of said plates are positioned at opposite sides of the truss joints, comprising a frame for supporting a truss with said plate pairs positioned at desired locations at opposite sides of the truss joints, a roller press having a vertically spaced, transversely extending, upper and lower roller means, said upper roller means positioned on said press above a truss on said frame and said lower roller means being positioned on said press below such truss, means mounting said press for longitudinal movement with respect to said frame, said press supporting said upper roller means for direct engagement with the upper ones of said plates for forcing the teeth thereof into said truss, with longitudinal movement thereof, a series of transversely extending reaction pads supported on said frame between said lower roller means and the truss and serially engageable by said lower roller means with said longitudinal movement thereof for displacement from a lowered position to a raised position into engagement with the overlying lower plates for imbedding the lower plates into said truss at said joint simultaneously with the imbedding of the opposite truss plates so that the entire pressing force is carried by said roller press, and said plates are fully imbedded into the truss with a single pass of said roller press.

3. The press of claim **2** in which said reaction pads comprise a series of transversely elongated bars supported on said frame, and means guiding said bars for vertical movement between said lowered and raised positions.

4. The press of claim **3** further comprising a series of longitudinally spaced fixed supports on said frame defining groups of said bars therebetween having upper surfaces for supporting a truss member thereon in elevated relation to said bars and restraining said bars against longitudinal movement.

5. The press of claim **2** in which said roller press includes a carriage having a pair of vertical end frames rotatably supporting said rollers, track means extending longitudinally of said table, said carriage having wheels engaging said track means for movement thereon, and drive means on said carriage connected to drive said wheels to move said carriage along said track, said drive means also being connected to drive said rollers so that said carriage is self-feeding during the time that the rollers are in engagement with a truss on said frame.

6. The press of claim **5** in which said track means further comprises a pair of inverted V-shaped tracks, and said wheels are formed with a generally complimentary V-shaped groove received on said track.

7. The press of claim **5** in which said table is supported at its ends on fixed legs, a series of intermediate

pivotally supported depending legs on said frame engaging the floor and means on said press engageable with said legs to pivot the same providing for the passage of said press thereby.

8. A press for the attachment of connector plates to a truss member, comprising a frame for supporting the truss member with pairs of the connector plates aligned at opposite sides of the truss member, a series of individual reaction pads on said frame positioned adjacent at one side of said truss member and movable into engagement with incremental portions of an adjacent connector plate, roller press means having one roller engageable serially with said pads to move said pads into pressing engagement with said plates and having a second roller in opposed relation to said first roller for engagement with the opposite side of the truss member, and means for moving said roller press means in a direction transverse to the pads to effect said serial movement of said pads to press the connector plates into the truss member.

9. The method of applying pairs of connector plates into opposite sides of a truss joint comprising the steps of passing a roller over one plate of said pairs forcing the same into the truss and simultaneously with the movement of said roller sequentially bringing a series of bars into pressing engagement with the opposite plate by moving said bars with a second and opposite roller, so that the distribution of pressing forces between said rollers is substantially confined at any one time to the width of one of said bars.

* * * * *