D. E. VANVACTOR.

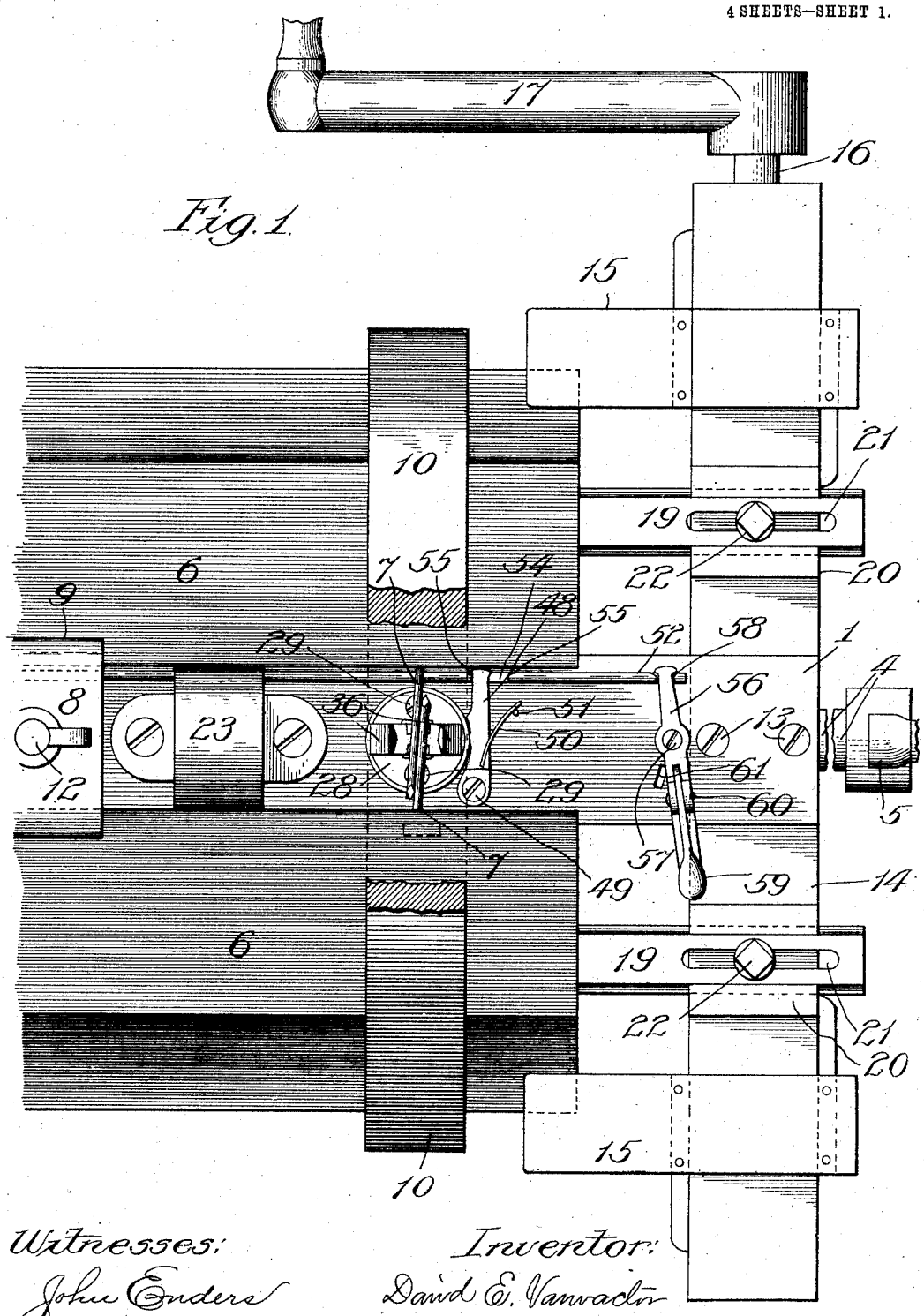
MACHINE FOR TYING BANDS IN STAVE FORMED STRUCTURES.

APPLICATION FILED JULY 18, 1908.

928,290. Patented July 20, 1909.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
John Enders
Chas. H. Buell.

Inventor:
David E. Vanvactor
By David H. Fletcher.
Atty.

ANDREW B. GRAHAM CO. PHOTO-LITHOGRAPHERS. WASHINGTON, D. C.

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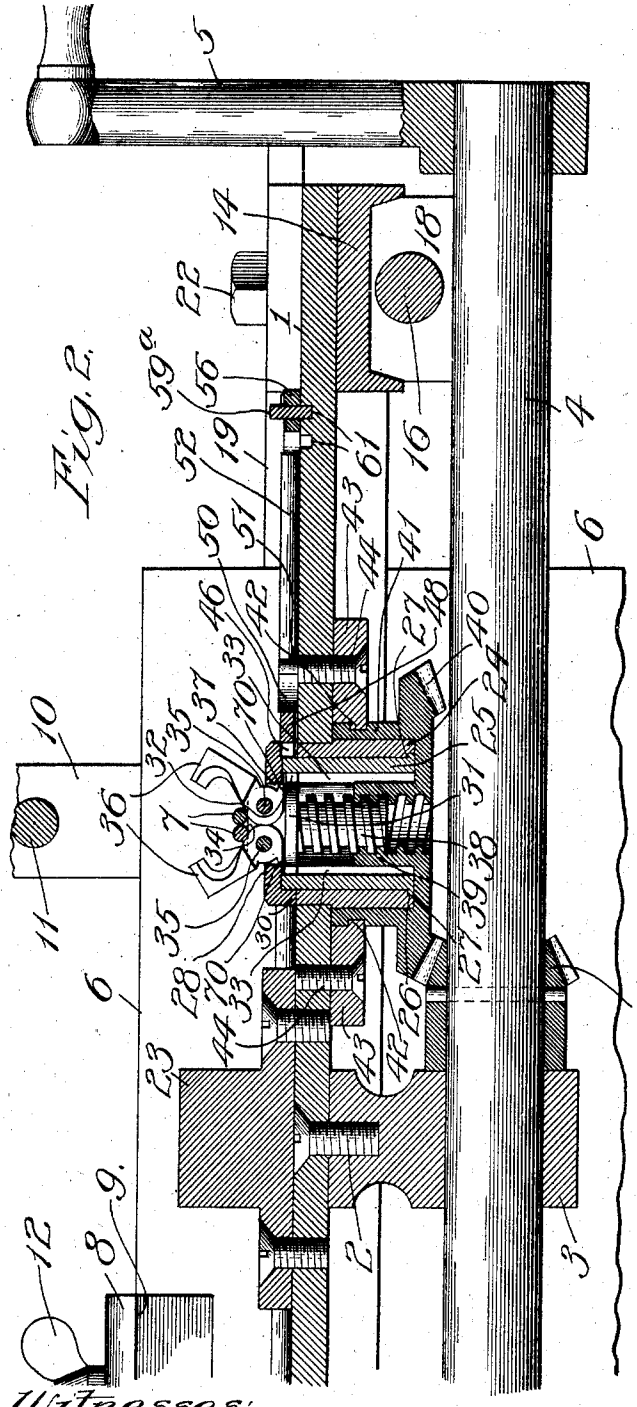


Fig. 2.

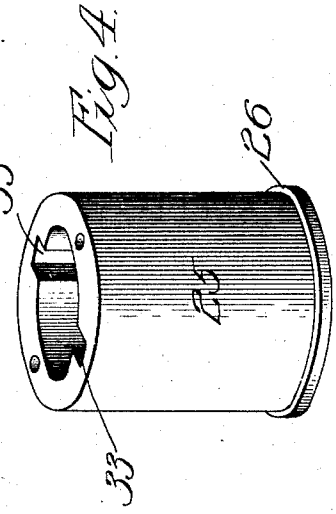


Fig. 4.

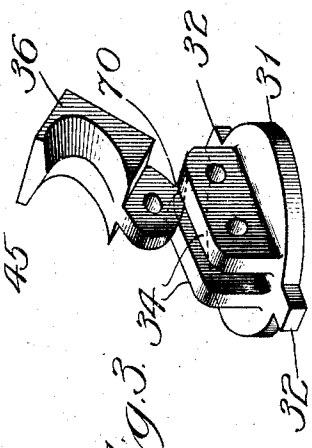


Fig. 3.

Witnesses:
John Enders
Chas. H. Buell

Inventor:
David E. Vanvactor
By David A. Fletcher,
Atty.

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

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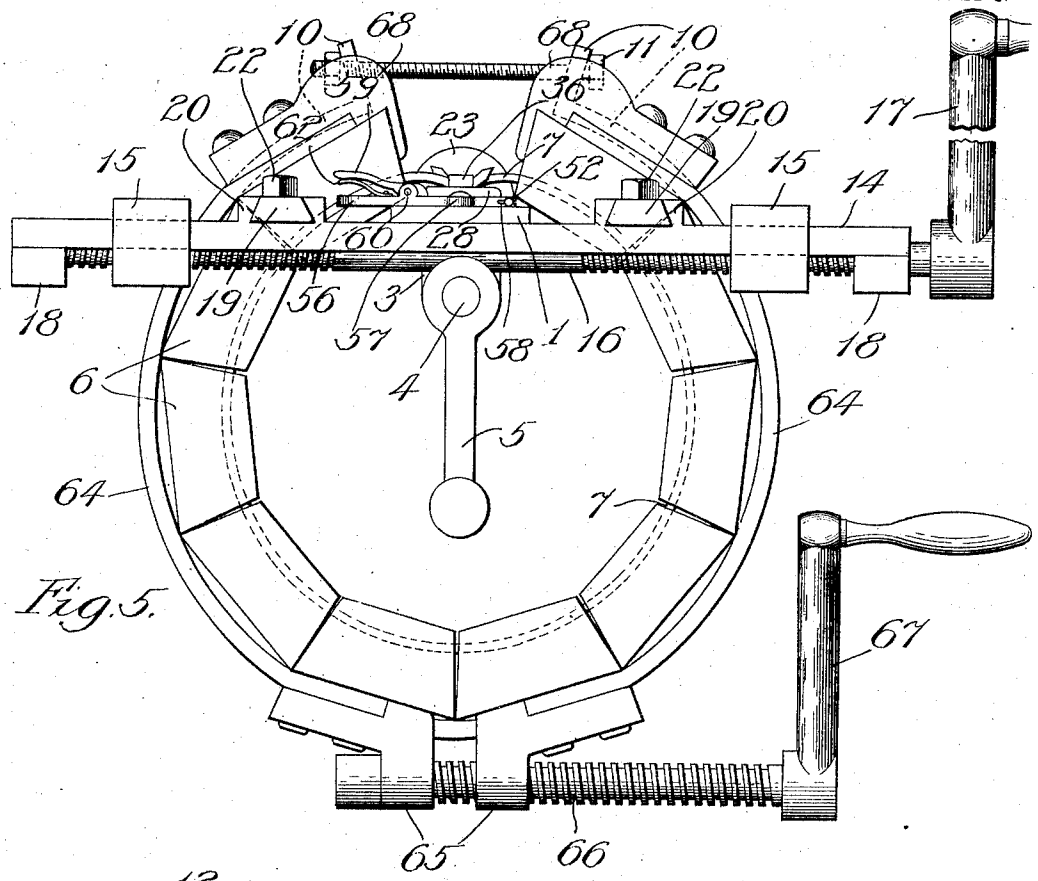


Fig. 5.

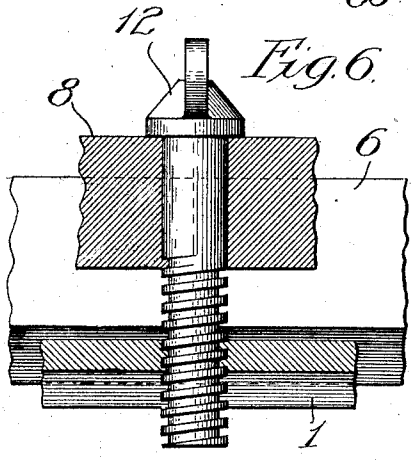


Fig. 6.

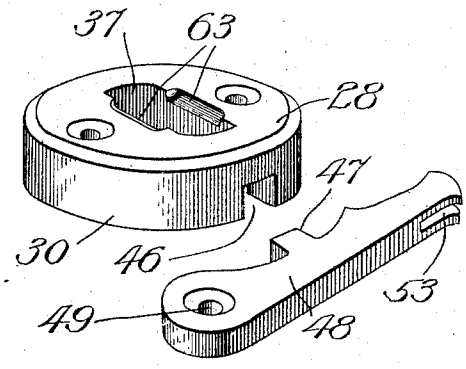


Fig. 7.

Witnesses:
John Enders
Chas. A. Bull

Inventor:
David E. Vanvactor.
By David H. Fletcher,
Atty.

ANDREW B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C

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Fig. 8.

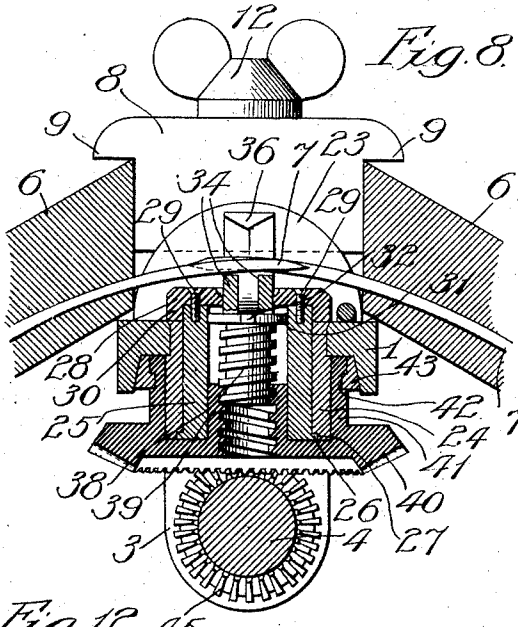


Fig. 9.

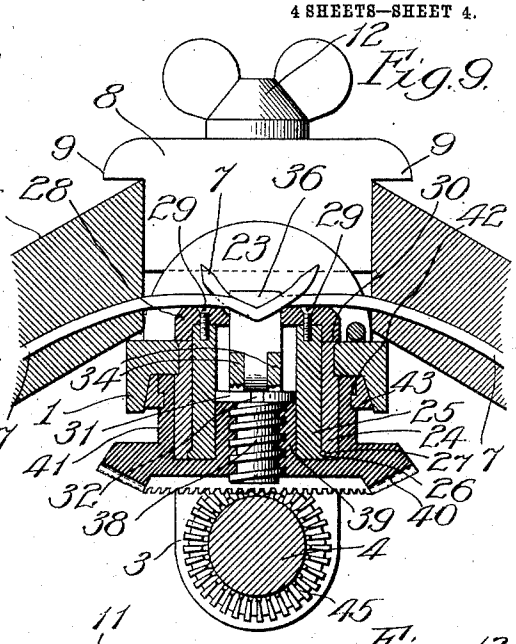


Fig. 12.

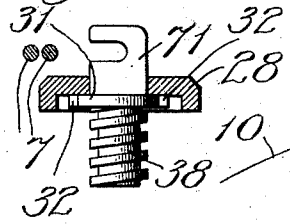


Fig. 10.

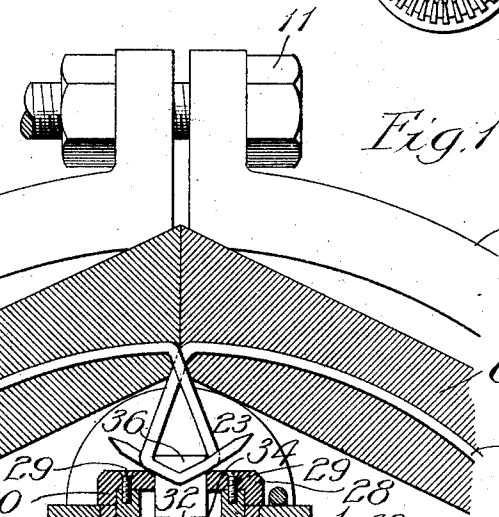


Fig. 13.

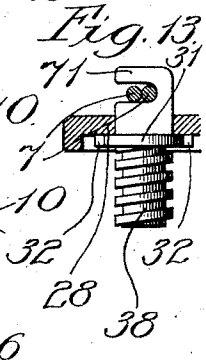


Fig. 11.

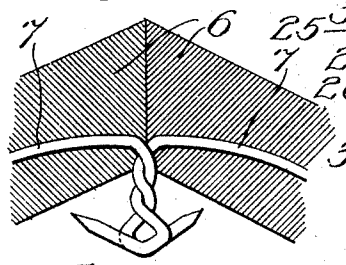
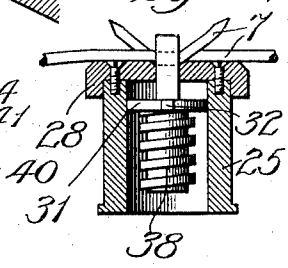


Fig. 14.



Witnesses:

John Enders

Chas. H. Buell.

Inventor:

David E. Vanvactor

By David N. Fletcher.

Atty.

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

DAVID E. VANVACTOR, OF ARGOS, INDIANA.

MACHINE FOR TYING BANDS IN STAVE-FORMED STRUCTURES.

No. 928,290. Specification of Letters Patent. Patented July 20, 1909.

Application filed July 18, 1908. Serial No. 444,286.

To all whom it may concern:

Be it known that I, DAVID E. VANVACTOR, a citizen of the United States, residing at Argos, in the county of Marshall and State of Indiana, have invented certain new and useful Improvements in Machines for Tying Bands in Stave-Formed Structures, of which the following is a description, reference being had to the accompanying drawings, forming a part of this specification, in which corresponding characters of reference in the different figures indicate like parts.

My invention relates to the manufacture of posts, columns or other analogous structures which are intended to be built up from staves connected by means of wire or other bands projected through holes formed in staves from edge to edge; and the object of my invention is to provide means whereby the projecting ends of the bands previously threaded through said holes, may be severally and simultaneously tied or twisted together, preferably upon the interior of the structure, so as to firmly and permanently secure said staves in place. I accomplish said object by means of the several combinations of elements hereinaftter more particularly described and definitely specified in the claims.

In the drawings, Figure 1, is a plan view of a portion of one end of my improved machine, showing adjustable clamping mechanism, for holding the first and last staves in predetermined relation with respect to the other, for adjusting the machine to register with the bands, and also showing one of a plurality of twisters together with means for actuating and otherwise controlling it, Fig. 2, is a central, vertical, longitudinal sectional view thereof, Fig. 3, is a perspective view of one of the band clamping jaws of the twisting mechanism, together with the head to which it is jointedly connected. Fig. 4, is a like view of the cylindrical shell in which the head is movably fitted, Fig. 5, is an end elevation of the adjustable clamping mechanism as it would appear when connected with the assembled staves, as well as the temporary retaining clamp, Fig. 6, is a central vertical, longitudinal sectional view, showing means for temporarily holding the machine in position to be operated, Fig. 7, is a perspective view of the cap through which the twisting jaws are projected, together with the locking dog for engaging the shell, Fig. 8, is a transverse vertical sectional view taken through one of the twisting heads showing the wire bands as they would appear in connection therewith as well as with the staves, the jaws being shown in position to grasp the bands, the first and last staves being separated by means of a spacing block. Fig. 9, is a like view showing the twisting jaws as they would appear upon grasping the ends of the bands, before the faces of the separated staves are brought together, Fig. 10, is a like view showing the parts as they would appear when said staves are forced together by means of clamps and the bands drawn inwardly by the jaws ready to impart the final twist for binding the staves together, the bands being shown as they would appear after the twister has been given half a turn, Fig. 11, is a view showing the wire as it would appear when the action is completed and the instrument withdrawn, Fig. 12, is a side view in detail of a modified form of gripping mechanism; the same being shown as it would appear when the machine is first inserted in the column. Fig. 13, is a like view showing the hook in position to engage the wires and bend them downwardly, and Fig. 14, is a view of the same device taken at right angles to the others and showing the parts as they would appear after the wires are gripped.

Referring to the drawings, 1, Figs. 1, 2, 5, 6 and 8 to 10 inclusive, represents a straight metal bar which extends throughout the length of the machine and constitutes its main supporting frame. Attached to said bar by means of screws 2, or otherwise, are a series of hangers 3, which serve as bearings for a shaft 4, also shown in Figs. 1 and 5, and 8 to 10 inclusive. Said shaft corresponds substantially in length with that of the frame bar, is parallel therewith and is adapted to be actuated by means of a crank 5, or other well known source of power.

The staves 6, which are intended to form the column, are previously bored from edge to edge, and the holes therein threaded with wire or other suitable metal bands 7, the ends of which project from the meeting faces of the first and last staves, so as to overlap each other as shown. Said staves are arranged substantially in the relation shown in Fig. 5, with the meeting faces of the first

and last staves separated from each other by means of a series of spacing-blocks, 8, Figs. 1, 2, 6, 8 and 9, which are provided with shoulders 9 adapted to rest upon the outer edges of the separated staves. The staves are held securely in position as described and shown, by means of truss-hoops 10, Figs. 1, 2 and 10, which are adjusted and tightened by means of bolts 11; the number of truss-hoops corresponding preferably to that of the bands. They, however, may be decreased in number, provided there are enough of them to hold the staves firmly in place. When the staves are thus clamped by the truss-hoops, which are preferably placed in the several cross-sectional planes of the bands, the machine is projected endwise into the hollow structure formed by the staves and rigidly supported in place by means of thumb-screws 12, which are passed through bores in said separating blocks and enter threaded holes in the frame-bar 1.

In order to enable the twisting devices to register with the stave-bands, I provide the following described clamping and adjusting mechanism: To the end of the frame bar at the crank end of the machine, I attach by means of screws 13, Fig. 1, or otherwise, a cross-bar 14, also shown in Figs. 2 and 5, having clamping blocks 15, slidably fitted thereon. A right and left-hand screw 16, having a crank 17, is journaled in bearings 18, attached to the under face of the bar 14, at its respective ends. By means of said screw, the blocks 15 may be adjusted so as to bear against the faces of the staves 6, at the proper points to accurately center the frame bar and temporarily support it at the proper height. Gages 19 are arranged at right angles to the bar 14 and are dovetailed into bearing blocks 20 rigidly attached to said bar, so as to slide therein. Said gages are provided with slots 21, through which set-screws 22 are projected and tapped into the bar 14 for rigidly securing the gages in place. Said gages are intended to abut against the ends of the staves 6, and should be so adjusted that when so abutting, the several twisting devices hereinafter described, will be caused to register with the corresponding stave-bands to be acted upon thereby.

A series of upwardly projecting guards 23, Figs. 1, 2, 5 and 8 to 10 inclusive, are rigidly attached to the top face of the frame bar and are intended to extend upwardly into the space between the meeting faces of the two separated staves, with the lower parts thereof resting against the lower corners of said staves as shown. This construction not only provides a means for centering the machine throughout its length, but also serves another and important purpose as hereinafter stated, in connection with the initial bending of the overlapped bands preparatory to twisting them. The guards 23 are located near to the bands and I prefer in practice to provide one for each band.

The several wire twisting devices are identical in construction, and hence it follows that but one need be described. Rigidly secured in bores in the frame plate 1, are a series of annular studs 24, so spaced that the axis of each will lie in the plane of the band to be twisted. The upper face of each stud is flush with that of the frame bar, while the body extends below and serves as a bearing for the twisting mechanism. Fitted loosely within the stud is a hollow cylindrical shell 25, Figs. 2, 4, 8, 9 and 10, provided with a flange 26, adapted to rest in a corresponding recess 27, at the lower end of the annular stud. A cup 28, also shown in Fig. 7, is attached to the top of the shell 25 by means of screws 29. Said cap is provided with a depending annular flange 30, which encircles the upper end of the shell. Said shell, therefore, is adapted to rotate within the stud. Fitted loosely within the shell 25 is a circular head 31, which I term the twister head, said head having lugs 32 which are fitted loosely within guide-grooves 33 extending lengthwise of the shell as shown in Figs. 2 and 4. Said twister-head is provided with lugs 34, between which, at 35, better shown in Figs. 2 and 3, is pivoted opposing counterpart jaws 36, which are arranged to project through a slot 37, Fig. 7, in the cap 28. Each twister-head is provided with a screw 38, integral therewith, which is formed to enter a central screw-threaded bore in the hub 39, formed upon a beveled gear 40, said hub being loosely projected within the shell 25. The gear 40 is also provided with a second annular hub or flange 41 which encircles the stud 24, and abuts against the under face of the frame bar 1. The part 41 is provided with a peripheral groove into which is fitted tongues 42 upon supporting plates 43, better shown in Fig. 2, which are attached to the bottom face of the plate 1 by means of screws 44. It will thus be seen that the hub is free to rotate while secured against endwise movement, and also secures the shell 25 in place by bearing against its lower end. The gears 40 are engaged by pinions 45, keyed or otherwise rigidly mounted upon the shaft 4, by which they are intended to be driven.

In the operation of the machine, presently to be described, it is essential that the shell 25, which primarily controls the rotation of the jaws 36, be held against rotation until the jaws are actuated for the purpose of first grasping the overlapping ends of the bands 7, and then bending and drawing them into the hollow of the post preparatory to twisting them at the proper time. This temporary locking may be accomplished as follows: Formed in the flange 30 of the cap 28,

is a notch 46, Figs. 2 and 7, adapted to be engaged by a detent 47, upon a locking lever 48, also shown in Fig. 1, pivoted at 49, to the bar 1. Said detent is adapted to be held in normal engagement with the notch by means of a spring 50 in engagement with a pin 51, upon said bar. A connecting rod 52, shown also in Fig. 5, is arranged to extend along the bar 1, for the purpose of connecting with the several levers 48, to enable them to be actuated simultaneously, as hereinafter described. A slot 53, Fig. 7, is formed in the end of the lever 48, which is adapted to receive the rod 52, the latter being reduced as shown at 54, Fig. 1, to permit such entry and to form shoulders 55 upon opposite sides of said lever to engage the latter when the rod is moved longitudinally. An actuating lever 56, Figs. 1, 2 and 5, is pivoted at 57, to the frame-bar. The short end of said lever is jointedly connected at 58 to the rod 52. A short hand-lever 59 is pivoted at 60, to the lever 56, said lever having a locking dog 59^a, of well known construction upon its short end, adapted to enter recesses 61, in the bar 1. A spring 62, acts to press the dog against the bar, thereby causing it to enter the recesses when in registration therewith.

The operation of the machine is as follows:—The staves for a given column, having been clamped in position by means of the truss-hoops with the meeting faces of the first and last staves resting against the separating blocks 8, as described, the machine is projected into the hollow of the post, the gages 19, are adjusted to cause registration of the jaws 36 with the band wires 7, as shown in Figs. 1, 5 and 8. The jaws are assumed to be open. The clamping blocks 15, are then adjusted by turning the crank 17, until the blocks rest against the outer faces of the staves, so as to hold the machine in the position shown in Fig. 5. The thumb-screws 12 are then screwed into the bar 1, thereby holding the latter firmly in place. The clamping blocks 15 not only aid in the initial adjustment of the machine, but assist in steadying it when operated, inasmuch as they serve to brace the bar 1 against lateral movement when the crank is turned. Upon turning the crank, the gears 40 are actuated in unison by the pinions 45, thereby causing the internally threaded hubs 39 to act upon the screws 38,—the latter being prevented from rotation by means of the lugs 32, being held in the guide ways 33, while, at the same time, the shells 25 are locked against rotation by the detents 47, which are in normal engagement with the notches 46 in the caps 28. The result of this action is to force the screws 38 downwardly, thereby bringing the outer faces of the jaws 36 into impingement, respectively, with the ends of the slot 37 in the caps 28, and closing the jaws around the wires 7; the initial position of said jaws when open, being indicated in Figs. 1, 2 and 8. A further action, serves to close the jaws over the overlapped wires and bend the latter as shown in Figs. 5 and 9;—the tendency being to draw them downwardly into the slot 37, of the cap 30, which is provided with rounded portions or lips 63, Fig. 7, against which the wires are bent and firmly gripped by the jaws. The relative length of the screw 38 to that of the hub 39, is such that the end of the hub abuts against the head 31, thereby preventing further movement, and establishing such a relation between the parts as may enable the heads to be rotated for twisting the bands when the shells 25 are released. After thus gripping the wires, it is obvious that in order to continue the operation, provision should be made for bringing the separated staves together while maintaining intact their relation to the others. In order to accomplish this result so that the wires may first be bent downwardly from the edges of the staves, it is essential that the spacing blocks 8, should be removed, thereby leaving the machine suspended from the wires which are grasped by the twisting jaws. In the meantime, it is necessary to provide a temporary support for the separated staves; otherwise, the required downward pull upon the bands to get them in the proper relation for twisting, would place an excessive stress upon the first joint of each stave and bend the bands in the wrong places. I overcome this difficulty by means of a temporary clamp consisting of two hoop members 64, Fig. 5, provided with lugs 65, connected by means of an adjusting screw 66, which is swiveled in one, and tapped into the other, said screw being provided with a crank 67, by which it is operated.

Hooks 68, are attached to the opposite ends of the parts 64, which hooks are arranged to grasp the opposite faces of the two separated staves as shown. Two of these clamps, one at or near each end of the post, would ordinarily be sufficient, but it is obvious that more may be employed. After placing the clamps in position and tightening the screws 66, the spacing blocks should be removed, when the device would appear as shown in Fig. 5. The clamping jaws 15 are then opened when the truss-hoops 10 are tightened, thereby causing the inner faces of the approaching staves to impinge upon the curved guards 23, and force them downwardly into the hollow of the post. The supporting clamps are removed just before the space between the staves is closed. The continued and final tightening of the truss-hoops closes all the joints between the staves tightly and securely, and holds the staves rigidly ready for and during the tying of the bands. At this stage of the operation, the overlapping ends of the bands will, by

reason of the corresponding downward movement of the jaws, be bent downwardly. In Fig. 10 they are shown as they would appear when the jaws 36 have been given a half revolution. When it becomes necessary to rotate the head to twist the wires, the lever 59 is operated, thereby releasing the lever 56, which is moved until the locking dog 59[a] is in engagement with the left-hand recess 61, thereby, through the action of the rod 52, actuating the levers 48, and releasing the shells 25, which are then free to be rotated. The operator then grasps the handle of the crank 5, and turns it until, through the action of the shaft 4, and gears 45, 40, the requisite number of twists are given to the bands to hold the joints of the staves in close contact after the removal of the truss-hoops and to secure them permanently in place. When the parts are in the relative positions shown in Fig. 9, it is obvious that any further turn of the crank 5, would cause the rotation of the shell, assuming the latter to be released as stated. In Fig. 11, the bands are shown as they would appear with the final twist 69 imparted thereto.

Upon the completion of the twisting operation, the jaws 36 remain in engagement with the bent ends of the wire, and, in order to release them, it becomes necessary to separate the jaws. This is accomplished by first releasing the lever 56, when the spring 50 actuates the lever 48, thereby locking the shells 25 against rotation. The movement of the crank is then reversed, thereby forcing the screws 38 downwardly, as shown in Fig. 1. When this position is reached, spurs 70, Figs. 2 and 3, engage the inner faces of the cap 28 and force the jaws open; thereby disconnecting the machine throughout its length from the bands and leaving it free to be withdrawn from the post.

I do not wish to be confined to the hinged jaws hereinbefore described for gripping and twisting the overlapping ends of the bands, inasmuch as the same result may be accomplished by varying means. In Figs. 12, 13 and 14, I have shown a modification of said invention, in which, in place of said hinged jaws, I have provided a single rigid hook 71 which is integral with the twister-head 31. The body of the hook is intended to stand in the vertical plane of the axis of the shaft 4, so that when the machine is first inserted and suspended in the post, before fully tightening the truss-hoops, the several hooks 71 will stand with respect to the wires 7 in the relation indicated in Fig. 12. Upon pushing the machine in the post until the stops 19 abut against the ends of the staves, the wires will stand within the hook, as shown in Fig. 13. Upon rotating the hub, the hook 71 will be drawn downwardly into the slot in the cap, thereby bending and gripping the wires, as shown in Fig. 14. In the modification described, it is unnecessary to change any of the parts except the hook. It follows, therefore, that the operation of the coacting parts would be the same as that with the hinged jaws except as to the manner of connecting and disconnecting the hooks from the bands. After completing the twist, the latter may be accomplished by reversing the crank as described, and moving the frame longitudinally to withdraw it from the post.

Having thus described my invention, I claim:—

1. A machine for connecting and securing the meeting ends of retaining bands in staved structures, in which is combined means for clamping the staves with the counterpart edges of the first and last staves separated, means in operative connection with a source of power for gripping the overlapping ends of the bands, means for actuating said gripping mechanism to bend the bands at an angle to the surface of the structure when said counterpart edges are brought together, and means for rotating said gripping elements after said bands are so bent.

2. A machine for tying a band in a staved structure, in which are combined means for clamping the staves in position, means for temporarily separating the meeting edges of the first and last staves, means for gripping the overlapping ends of the stave-holding band, means for closing the opening between the separated staves, means for forcing said gripping means away from said opening to bend the band out of the plane of the meeting staves, and means for rotating said gripping means to twist said overlapping ends.

3. The combination, in a machine of the class described, of stave clamping means, removable spacing means between the first and last staves, gripping means for engaging the overlapping ends of the bands, means for rotating said gripping means to tighten and fasten the bands when the edges of the staves are forced together, and means for automatically releasing said gripping means.

4. In a machine of the class described, the combination of stave clamping means, removable spacing means between the first and last staves, gripping means for engaging the overlapping ends of stave connecting bands, means for temporarily supporting said gripping means in registration with said overlapping ends, and means for rotating said gripping means to tighten and fasten the bands when the edges of the staves are forced together.

5. In a machine of the class described, the combination of stave-clamping means, means for temporarily separating the meeting faces of the first and last staves, gripping means for simultaneously gripping the opposite ends of a plurality of bands, means for bending the ends of said bands out of the plane of

the meeting staves, means for forcing the edges of said staves together, and means for simultaneously rotating said gripping means to twist together the opposite ends of said bands.

6. In a machine of the class described, the combination of stave clamping means, means for temporarily separating the first and last staves, gripping means for simultaneously gripping the opposite ends of a plurality of bands, means for causing the registration of said gripping means with said bands, means for bending the ends of said bands out of the plane of the meeting staves, means for forcing the edges of said staves together, and means for simultaneously rotating said gripping means to twist together the opposite ends of said bands.

7. In a machine of the class described, the combination with means for supporting the staves with the meeting faces of the first and last staves temporarily separated from each other, of band gripping jaws jointedly mounted upon a revoluble support, means for opening said jaws to grasp the opposite ends of a band, means for closing said jaws to grip said ends, and means for rotating said support.

8. In a machine of the class described, the combination with means for supporting a number of staves with the meeting faces of the first and last of the series temporarily separated from each other, of gripping jaws jointedly mounted upon a head slidably supported within a revoluble shell, means for moving said support longitudinally within said shell to open and close said jaws, means for locking said shell against rotation when said jaws are being opened and closed, and means for rotating said shells when said jaws are closed.

9. In a machine of the class described, the combination with a driving element, of a plurality of revoluble shells in operative connection therewith, means for temporarily locking said shells against rotation, a sliding element within each of said shells, gripping jaws jointedly mounted upon said sliding element, means for moving said sliding element longitudinally to open and close the jaws when said shell is locked against rotation, means for releasing said shells, and means for rotating said shells when released.

10. In a machine of the class described, the combination with a driving element of a plurality of revoluble shells in operative connection therewith, means for temporarily locking said shells against rotation, a screw-threaded sliding element within each of said shells arranged to move lengthwise of the axis of the shell, a counterpart revoluble screw for moving said sliding element lengthwise of the axis of the shell when the latter is locked against rotation, gripping jaws jointedly mounted upon said sliding element, rigid means for engaging said jaws when moved out of or into the shell to cause them to open and close, means for limiting the movement in both directions of said sliding element, means for releasing said shell, and means for rotating the same.

11. In a machine of the class described, the combination with a revoluble element having a longitudinally slidable element supported therein, gripping jaws jointedly connected to said slidable element, an abutment for engaging said jaws to open and close them when said slidable element is moved out and in, means for temporarily locking said revoluble element against rotation, means for releasing the same, and means in operative connection with both said revoluble and sliding elements to actuate the one when the other is at rest.

12. In a machine of the class described, the combination with means for clamping a predetermined number of staves in position to form a hollow structure with the counterpart faces of the first and last staves separated from each other, of removable spacing means for positively maintaining said separation, means for gripping and drawing the ends of the bands inwardly when said spacing means is removed, and supplemental means for temporarily supporting the adjacent edges of said staves and preventing collapse when stress is applied to said bands to draw them inwardly pending the bringing together of said adjacent edges.

13. In a machine of the class described, the combination with means for clamping staves in position to form a hollow structure, and removable spacing means for separating the adjacent faces of the first and last staves, of a supporting frame arranged to be projected within the structure, said frame being detachably supported from said spacing means, a driving shaft having beveled pinions thereon for actuating a plurality of beveled gears, beveled gears, revoluble elements having longitudinally slidable elements supported therein, gripping jaws connected with said slidable elements, abutments for engaging said jaws to open and close them when said slidable element is moved in and out, means for locking said revoluble element against rotation, means for releasing the same, and means for forcing the device into the hollow of the structure when the space between said staves is closed.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses this 16th day of July, 1908.

DAVID E. VANVACTOR.

Witnesses:

D. H. FLETCHER,

CARRIE E. JORDAN.