

Sept. 5, 1967

7 **R. E. POWERS ET AL** 3,
FASTENER DRIVING AND REFORMING TOOL FOR FURRING
STUCCO-NETTING AND THE LIKE

3,339,265

Filed Oct. 22, 1964

4 Sheets-Sheet 1

FIG. 1.

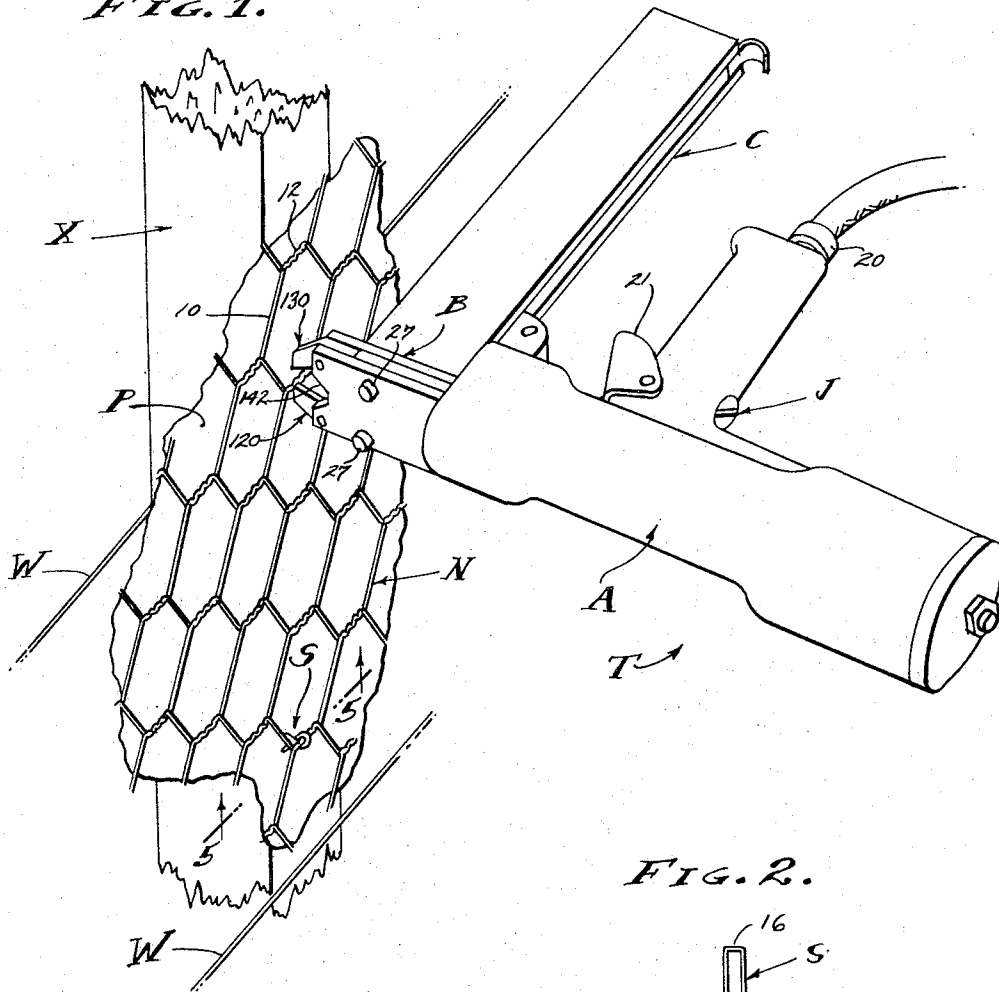


FIG. 2.

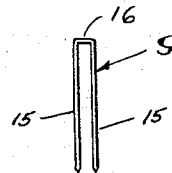


FIG. 3.

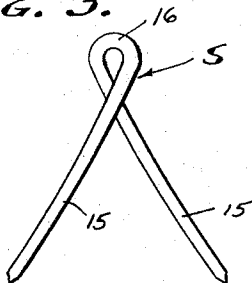
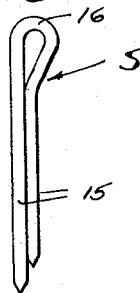


FIG. 3a.



INVENTORS.
RICHARD E. POWERS
& OTTO C. NICK
BY

W. H. G. Russell
AGENT

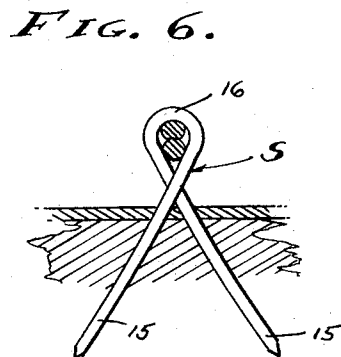
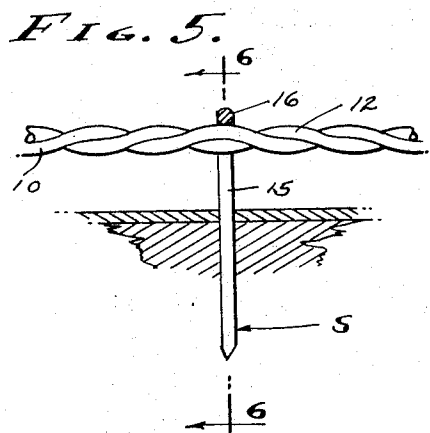
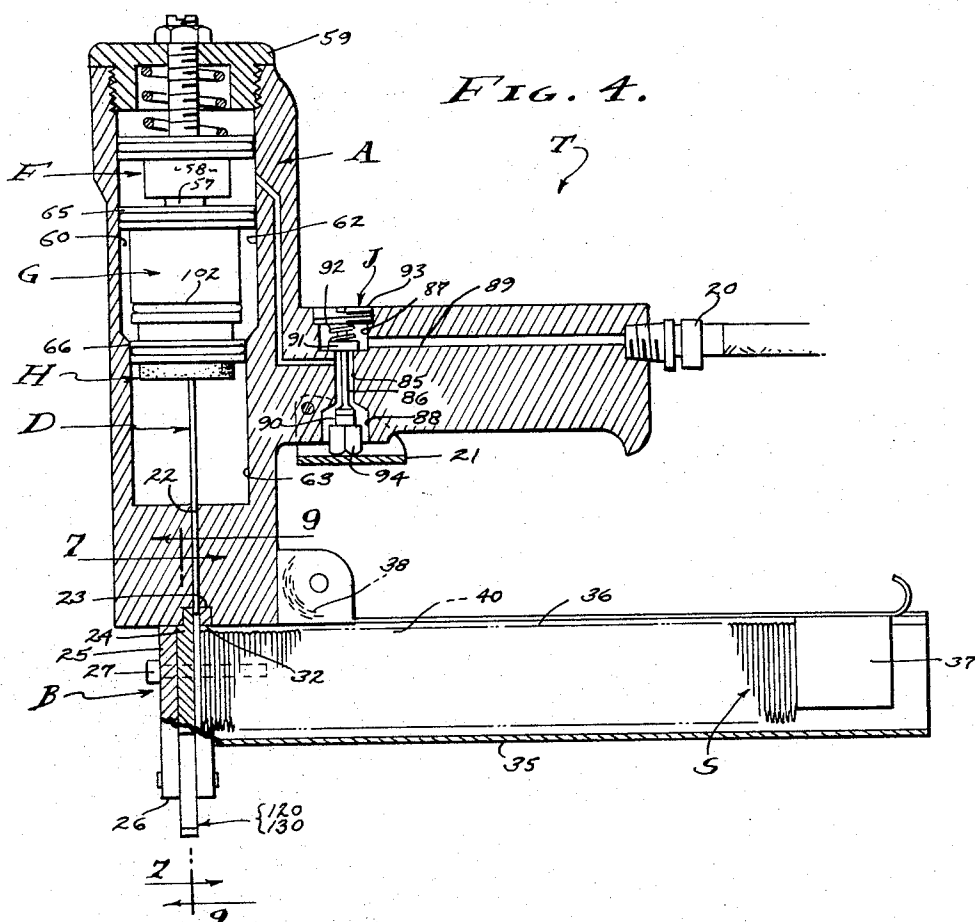
Sept. 5, 1967

R. E. POWERS ET AL
FASTENER DRIVING AND REFORMING TOOL FOR FURRING
STUCCO-NETTING AND THE LIKE

3,339,265

Filed Oct. 22, 1964

4 Sheets-Sheet 2



INVENTORS.
RICHARD E. POWERS
& OTTO C. NICK
BY

W. H. Marshall
AGENT

Sept. 5, 1967

R. E. POWERS ET AL
FASTENER DRIVING AND REFORMING TOOL FOR FURRING
STUCCO-NETTING AND THE LIKE

3,339,265

Filed Oct. 22, 1964

4 Sheets-Sheet 4

FIG. 14.

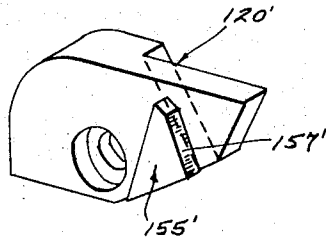


FIG. 15.

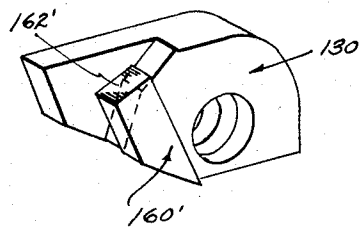


FIG. 16.

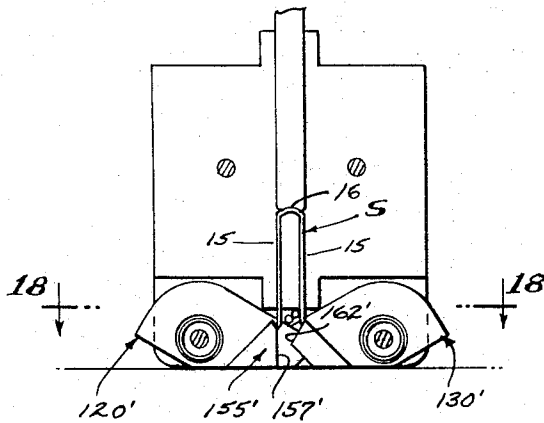


FIG. 17.

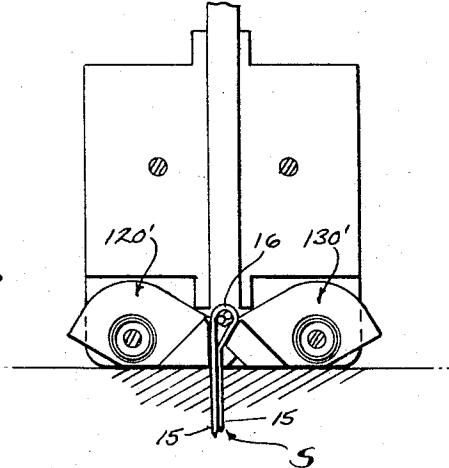
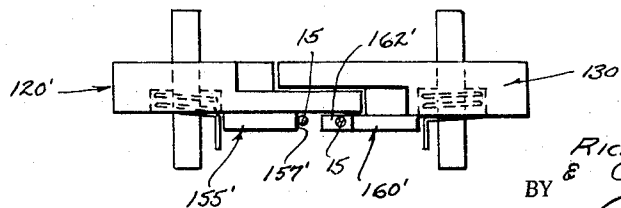


FIG. 18.



INVENTORS.
RICHARD E. POWERS
& OTTO C. NICK
BY

H. Yarnall
AGENT

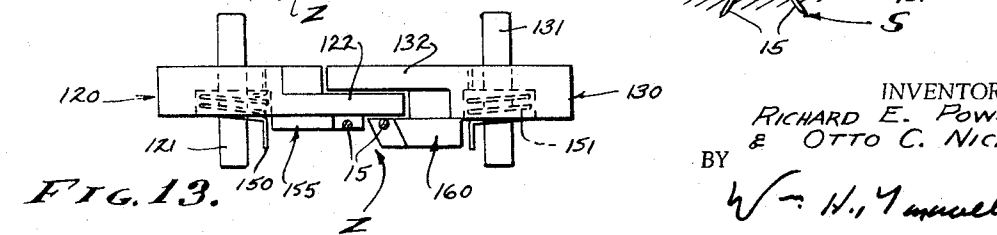
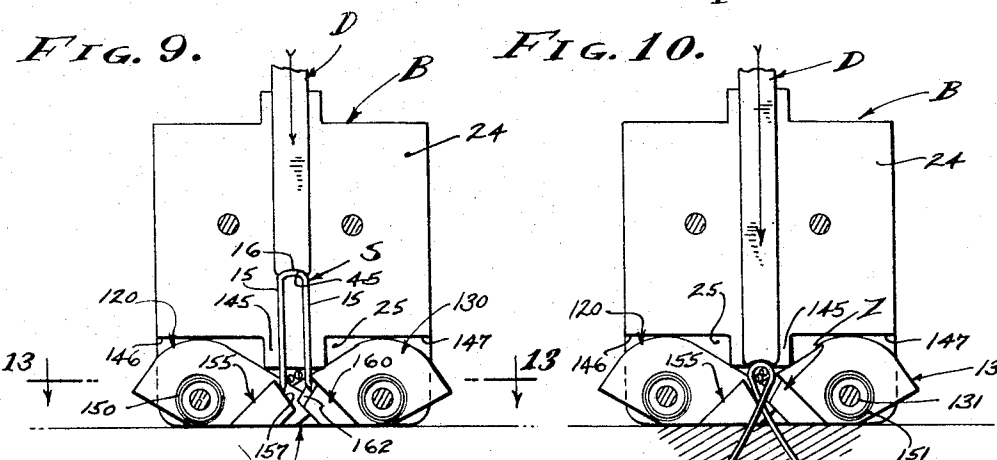
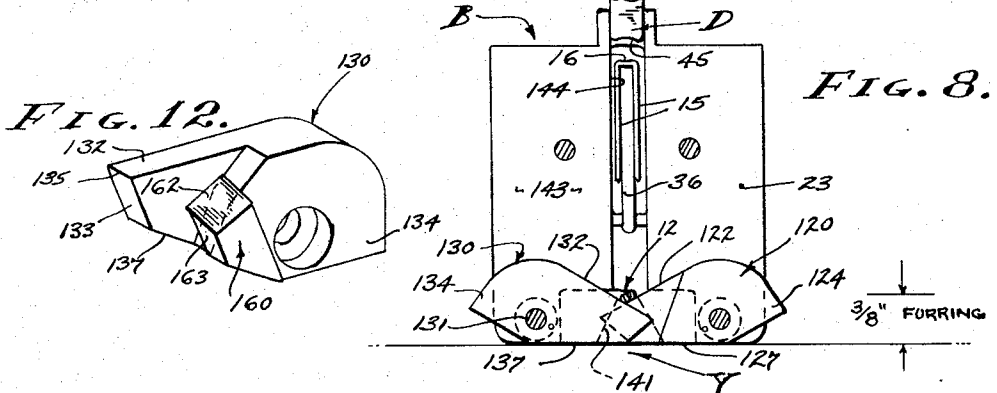
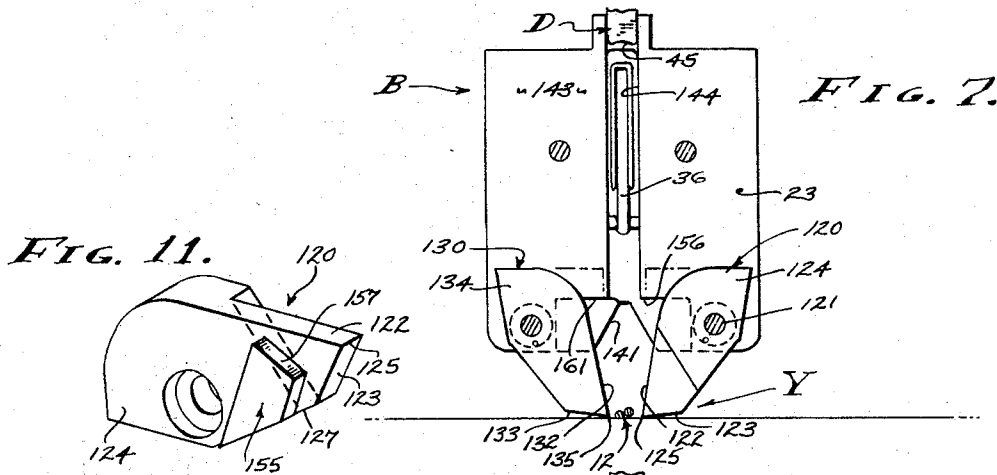
Sept. 5, 1967

R. E. POWERS ET AL
FASTENER DRIVING AND REFORMING TOOL FOR FURRING
STUCCO-NETTING AND THE LIKE

3,339,265

Filed Oct. 22, 1964

4 Sheets-Sheet 3



INVENTORS,
RICHARD E. POWERS
& OTTO C. NICK
BY

H. J. Maxwell
AGENT

1

3,339,265

FASTENER DRIVING AND REFORMING TOOL FOR FURRING STUCCO-NETTING AND THE LIKE

Richard E. Powers, Monterey Park, and Otto C. Nick, Temple City, Calif., assignors to Powers Wire Products Co., Inc., El Monte, Calif., a corporation of California

Filed Oct. 22, 1964, Ser. No. 405,794
18 Claims. (Cl. 29—432.1)

ABSTRACT OF THE DISCLOSURE

A method of forming a U-shaped fastener with parallel legs, lifting an article to space it from a support, and driving the legs into the support, and a fastener driving tool that drives and reforms a fastener and simultaneously furs the article being attached by said fastener, to lift said article to a predetermined level spaced from the surface to which it is to be attached, and further to secure said article in said predetermined leveled position by driving the fastener into the said surface and simultaneously reforming the fastener while establishing engagement with said article.

This invention, in its broad sense, is applicable to many situations where it is desirable to fasten an article on and in spaced relation to a surface. One very practical application of the invention is the furring of "stucco-netting" employed in the underlying foundation structure of plastered walls and the like. Therefore, the present invention will be hereinafter described as it is embodied in installation of stucco-netting as an article to be fastened in place at a predetermined level spaced from the surface to which it is attached by the instant fastener driving tool.

Exterior building walls of frame constructions that are plastered with cement are known as stucco walls. This type of wall involves the erection of a frame which is covered with a membrane of construction paper over which the exterior stucco is applied. This particular construction is to be distinguished from lath and plaster construction, since it has acquired a status of being substantially heavier and more durable as the exterior envelope of a building. Generally, the wall consists of vertically disposed studs X that are spaced at predetermined and uniform intervals, of tie wires W laced horizontally across the outer faces of the studs, of construction paper P applied to the faces of the studs and over the tie wires, and of stucco-netting N fastened on and spaced from the faces of the studs in spaced relation to the said faces and to the said paper. The important feature is the predetermined spacing of the stucco-netting; say for example $\frac{1}{4}$ " or $\frac{3}{8}$ " from the faces of the studs X and an equal spaced distance from the surface of the construction paper P. With this specified spacing of the stucco-netting from the studs and paper, it is permissible to apply the "scratch-coat" of cement, to which the overlying stucco cement is then applied.

Construction codes strictly control the procedure of insuring proper furring and/or spacing as set forth above, and it is this levelling of the stucco-netting which ordinarily involves considerable time and effort and constant concern. Heretofore, this furring has been effected by specially headed nails with the underlying felt blocks, all of which are applied by use of the classic hammer method. However, recently there has been a development in this art whereby a fastener driving tool is employed for furring an article such as stucco-netting, the fastener being applied in such a manner that the stucco-netting is lifted and secured in said lifted position by driving of the fasten-

2

er into supporting engagement with said stucco-netting. Reference is made, therefore, to the copending application of Dale P. McKee, Ser. No. 377,820, filed June 25, 1964, and issued Oct. 18, 1966, as Patent No. 3,279,672, entitled, Fastener Driving and Furring Tool for Stucco-Netting and the Like. It will be observed that in the case of the prior art, the stucco-netting is frictionally engaged and supported by the fastener, and/or that a specially shaped fastener is employed.

Generally, it is an object of the present invention to provide means associated with a fastener driving tool, to simultaneously lift an article a predetermined distance from a surface onto which said article is to be fastened and to reform and apply a common type of fastener in a manner so as to positively fur said article from said surface. When referring to a driving tool, reference is made to a powered device such as a pneumatic gun which forcibly drives a fastener into work, a fastener such as a U-shaped staple or the like. Therefore, a common type fastener is understood to be a U-shaped fastener for purposes of carrying out the present invention.

It is an object of this invention to provide a fastener driving tool that drives and reforms a U-shaped fastener so that it embraces an article and thereby captures said article in a predetermined position established by the depth to which the reformed fastener is driven.

It is an object of this invention to provide a fastener driving tool that drives and places a U-shaped fastener in engagement with an article, that crosses the legs of such a fastener, and thereby positively capturing the article in such a fashion as to hold said article in spaced relation to the surface from which it is supported.

It is another object of this invention to provide a fastener driving tool that twists a U-shaped fastener so that the pair of legs thereof are crossed while being driven into a supporting surface a predetermined distance, thereby reforming the fastener into a fastener having a looped head within which articles can be captured as circumstances require. Thus a U-shaped fastener is reformed into a loop-headed fastener, the head of which remains elevated from the supporting surface into which the fastener is driven.

The various objects and features of this invention will be fully understood from the following detailed description of the typical preferred forms and applications thereof, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is a perspective view showing the furring tool of the present invention as it is related to an article, such as stucco-netting, prior to operation of the tool.

FIG. 2 shows a typical U-shaped fastener that is applied by the tool of the present invention, as it would appear prior to reformation by said tool.

FIGS. 3 and 3a are views similar to FIG. 2 and show the development of the fastener shown in FIG. 1 as it is reformed by two separate forms of the tool shown in FIG. 1.

FIG. 4 is a detailed sectional view of a fastener driving and article furring tool as provided by the present invention.

FIG. 5 is an enlarged sectional view taken as indicated by line 5—5 on FIG. 1.

FIG. 6 is a view taken as indicated by line 6—6 on FIG. 5.

FIG. 7 is an enlarged detailed view of the head portion of the structure and taken substantially as indicated by line 7—7 on FIG. 4, and FIG. 8 is a view similar to FIG. 7 illustrating the operation of parts whereby furring of an article is accomplished.

FIG. 9 is an enlarged detailed view of the head portion of the structure and taken substantially as indicated by line 9—9 on FIG. 4, and FIG. 10 is a view similar to

FIG. 9 illustrating the operation of parts whereby a fastener is reformed so as to embrace an article.

FIGS. 11 and 12 are perspective views of the two cams which are employed in the structure detailed in FIGS. 7 through 10.

FIG. 13 is an enlarged detailed sectional view taken as indicated by line 13—13 on FIG. 9, the parts shown being removed from the remaining structure.

FIGS. 14 and 15 are perspective views of two cams which are employed in the second form of the invention detailed in FIGS. 16, 17 and 18.

FIGS. 16 and 17 are views similar to FIGS. 9 and 10 respectively, and illustrate the second form of the invention.

FIG. 18 is an enlarged detailed sectional view taken as indicated by line 18—18 on FIG. 16, the parts shown being removed from the remaining structure.

The type of structure to which this invention appertains is briefly set forth above and which involves a frame construction comprising studs X upon which the tie wire W is laced, covered by construction paper P, and over which stucco-netting N is applied. This construction is the underlying foundation that is erected for the support of the cement coating or coatings known in the building trades as stucco. The characteristic features of stucco-netting are that it is an article made of relatively soft wire 10, usually galvanized, and arranged to form a mesh that can be applied in flat sheets supplied from rolls. It is common for this article to comprise a plurality of wires 10 extending longitudinally of the sheet of netting, these wires being turned or bent alternately from side to side and roped together as at 12. Thus, the characteristic pattern of the mesh is that adjacent hexagons are established with opposite parallel sides disposed longitudinally of the sheet and roped together, as shown. It is apparent, then, that the roped portions at 12 are stiffened and of increased cross-section. The roping comprises two oppositely pitched, or oppositely twisted, helices that merge at the center of the sides which are roped together.

In accordance with this invention fasteners S in the form of staples or the like are driven by the tool T which we modify with the provision of means at the head thereof to specially drive said staples. The staple or fastener can vary in exact shape and formation, and the fastener has a pair of straight parallel shanks 15 and is U-shaped to engage over the article to be fastened and furred. With the example fastener S shown in FIG. 2 the driving tool T is to be provided with driver blade stop means inherent in the tool design as shown in order to limit the depth to which the fasteners are driven. In FIG. 3 of the drawings we have shown the driven and reformed staple fastener S and which comprises a pair of angularly related shanks 15 integrally joined by a transverse head 16 of loop configuration.

The fastener driving tool T of the present invention is a pneumatic operated tool or fastener driving device adapted to drive U-shaped staples, it being understood that fasteners of varied proportions can be driven thereby, as required and the tool T will be described so as to drive and reform this particular fastener S onto the particular netting as hereinabove described.

The tool T, as illustrated in the drawings, is adapted to be handled manually and involves generally, a frame A having a body portion and a handle or grip portion, a head B carried by the frame A and adapted to direct fasteners into a piece of work, a magazine C for handling a supply of fasteners such as staples and cooperating with the head B so that the staples are received and handled by the head, a driver blade D, a latching means F adapted to cooperate with and control operation of the driver blade D, a piston G operable in a cylinder in the frame A and adapted to drive the blade D, a coupler and snubber H operatively joining the driver blade D and piston G, and valve means J adapted to control the supply

of fluid under pressure to actuate the piston G through a work stroke and a return stroke.

The frame A carries the various elements of the tool, and is shaped to be conveniently handled by a person. The body portion of the frame is a simple elongate part having a cylinder extending longitudinally thereof and having an opening or passage extending longitudinally through the head thereof, at the lower end of the cylinder, and has a recess at the opening for receiving and positioning the head B. The handle or grip portion of the frame is provided to give the person handling the tool a convenient means to hold the tool T and is a simple grip of ordinary construction that projects from the body. In practice, the grip may be substantially normal to the axis of the body and may project therefrom as clearly shown in FIG. 1 of the drawings.

In structures of the type under consideration, it is common practice to provide a fluid pressure supply connection 20 at the grip. It is to be understood that any suitable fluid pressure supply can be provided without affecting the present invention. In the case illustrated the hose of the pressure connection is attached to the grip through a quick disconnect and the valve means J is under control of a finger operated trigger 21.

The head B is, in effect, an extension of the body of the frame A and is provided to receive and deliver fasteners such as staples to the work being acted upon by the tool. The head B is a rectangular assembly of plate-like parts carried by the body in the recess provided therefor and with a longitudinal vertically disposed guideway 22 that extends through and opens at its top and bottom ends.

The head B has a back plate 23 in which a channel is formed in order to establish the guideway 22, a center plate 24 engaged with the back plate 23 to close the channel, and it has a front plate 25 to house the staple reforming means later described. The plates 23, 24 and 25 terminate in a lower end face 26, and it will be apparent how the guideway 22 can be proportioned so that it will readily pass the staples S with clearance and to act upon the staples to guide them as they are delivered to the reforming means. The guideway 22 also guides the driver blade D of the tool as well as the staples S that are handled thereby. Spaced fasteners 27, one at each side of the head B, secure the assembly of plates together and said assembly to the body of the tool. It will be apparent that the head B in working position presents a flat element at the front of the tool and closely adjacent to the guideway 22.

A fastener or staple receiving opening 32 extends laterally through the body A and head B, which opening enters through the head and opens into the guideway 22 so that the staples F fed to the head B are properly guided and aligned with the guideway 22 before they are engaged by the driver blade D of the mechanism. The opening 32 is shaped substantially the same as the staple configuration in order to pass the staples, as shown.

The magazine C is adapted to handle a supply or stack of fasteners or U-shaped staples S and involves, generally, a case 35 carried by the frame A, a guide 36 within the case 35, a follower 37 adapted to advance the fasteners or staples, and a feed spring 38 yieldingly urging the follower toward the head B. The case 35 is carried by the body of the frame A and is an elongate part that projects laterally therefrom. The case is shell-like in form and the guide 36 is a core-like part that is coextensive with the case 35 and is carried between the side walls thereof. A longitudinal passage 40 is formed by the case 35 which passage conforms in general configuration to the U-shaped staples S.

The guide 36 enters the fastener or staple receiving opening 32 and terminates in a flat end 39 that occurs in the plane of the bottom wall of the guideway 22. The follower 37 conforms with the configuration of and is slidably carried in the passage 40 and is yieldingly urged

5

toward the head B by the feed spring 38. Means is provided to prevent the follower 37 from entering the guideway 22. The fasteners or staples S are inserted into the magazine C by simply engaging them over the guide 36 ahead of the follower 37 tensioning the spring 38.

The driver blade D is essentially a slender elongate part rectangular in cross-sectional configuration and terminates at its forward end in a slightly concaved fastener or staple driving face 45. The blade D occupies the guideway 22 of the head B and has an upper driven portion which couples with and has driving engagement with the piston G. The face 45 is engageable with the transverse head 16 of the fastener, the face 45 being disposed normal to direction of movement of said blades.

The latching means F that may be employed in tools of the type under consideration is adapted to cooperate with and control operation of the piston G, later described. The means F is provided to couple with and to hold the piston G at the upper end of the cylinder and to release the piston G when sufficient fluid pressure has been established in the cylinder to effect the desired work stroke. The latching means F may involve suitable mechanism to carry out the function referred to without affecting the present invention. For example, the latching means F may involve means adapted to releasably couple to a head 57 that projects from the top of the piston G, and a pressure responsive release means 58 adapted to release the head 57 from the upper end of the cylinder. The upper end of the cylinder remote from the head B is closed by a cap 59, the latching means F being threadedly engaged through an opening in the cap for adjustment.

The piston G operates in the cylinder and has driving engagement with the driver blade D. The piston G is adapted to drive or move the driver blade D forwardly or downwardly and is adapted to be damped or snubbed. The cylinder is incorporated in the body of the frame A on the longitudinal axis thereof, and is supplied with fluid under pressure by the valve means J, as hereinafter described. The piston G is freely carried in the cylinder and is actuated to retract and to advance in the cylinder. In the particular tool illustrated throughout the drawings the ordinary compression return spring is eliminated which is usually provided within the cylinder ahead of the piston G to return the piston to a retracted position. The tool illustrated is operated entirely by fluid pressure so that when the trigger 21 of the tool is operated the piston G is moved to the bottom of the cylinder, and so that when the trigger 21 is released the piston G is moved to the top of the cylinder.

The piston G is characterized by upper and lower portions 65 and 66 of different diameter establishing a chamber 60 therebetween. The piston G occupies the interior of the cylinder which is also characterized by upper and lower bores 62 and 63 of different diameters. The return means of the tool involves the provision of said differing diameters and further involves the provision of a pressure supply in communication with the cylinder between the upper and lower portions of the piston G. The pressure supply is a valve means that allows fluid to flow in one direction only and checks the flow of fluid in the other direction so that fluid pressure applied to the cylinder above the piston G is directed to the chamber 60 and is retained in the chamber 60 by action of the valve of the pressure supply. In the case illustrated, the valve element 102 is an elastic band of rubber that encircles the piston G and which is constricted onto a seat having a port in communication with the cylinder above the piston (not shown). In practice, the band forming the valve element 102 is circular in cross-section and in the form of an O ring sealing ring, and in which case the said seat is arcuate in form to cooperate with the inner diameter of the element 102. It will then be apparent how the O ring shaped valve element 102 seals fluid under pressure in the chamber 60.

6

The valve means J is a fluid pressure supply and exhaust means that admits and exhausts operating fluid to and from the top end of the cylinder hereinabove described. The valve means J is preferably formed in and carried by the frame A of the tool and, as shown, is housed in the grip. In the case illustrated, the valve means J involves a valve chest 85 and a slide 86 that is shiftably carried in the chest to control flow of fluid. As shown, the chest 85 extends through the grip to open at both the front and back thereof, there being a recess 88 at the front of the chest. The recesses 87 and 88 are in the form of counterbores, the recess 87 handling the inlet of fluid under pressure and the recess 88 handling the exhaust of fluid. A pressure supply passage 89 connects the recess 87 to the connection 20 while the recess 88 simply opens to the outside atmosphere at the exterior of the grip.

The slide 86 of the valve means J is freely shiftable in the chest 85 and involves a plunger 90 that is operable in the recess 88 and a valve disc 91 that is operable in the recess 87. A spring 92 is seated in a cap 93 that confines the spring to the recess 87, the spring engaging and yieldingly urging the disc 91 into contact with a seat in the recess. An extension 94 projects from the plunger 90 and is engaged by and operated by the trigger 21. When the valve means J is depressed by the trigger 21 the disc 91 is lifted from the seat allowing passage of fluid under pressure to a passage that is in communication with the upper end of the cylinder, while the plunger 90 enters the chest 85 to close the exhaust recess 88. When the valve means J is released to the position shown in FIG. 4 the disc 91 is seated to close the recess 87 while the plunger 90 opens the recess 88 to exhaust fluid from the upper end of the cylinder.

When fluid under pressure is applied to the upper end of the cylinder the piston G moves downwardly and the chamber 60 is charged with fluid under pressure. At the end of the work stroke the piston G is arrested by the snubber H in the form of a resilient cushion of rubber or the like. Upon release of fluid from the upper end of the cylinder the valve 102 operates to retain the fluid under pressure in the chamber 60. The fluid that is employed to operate the piston G is air, or the like, which is elastic or compressible. The compressed fluid that is captured in the chamber 60 tends to expand and acts against the larger piston head 65 to move it upwardly to the position shown in FIG. 4.

In accordance with the invention we provide furring means Y at the head B to lift articles from the surface to which they are to be attached and we provide a fastener or staple reforming means Z so that the staples are made to embrace the article and hold the same at a predetermined position. The furring means Y and reforming means Z are cooperatively related and simultaneously operate to perform their respective functions while relying one upon the other. That is, the furring means Y holds the articles in said predetermined elevated position while the reforming means Z affects the fastener S so that it embraces the article in said position when the fastener is driven. In the case of the stucco-netting N, any rod-like wire 10 thereof can be engaged and lifted by the furring means Y and engaged by the fastener S as it is reformed by means Z. However, it has been found to be most practical to lift the roped portion 12. Therefore, the features of the tool to be described in this connection are proportioned to engage and to accommodate the pair of wires 10 which comprise the roped portions 12.

As shown, the furring means Y involves, generally, the back plate 23, center plate 24, front plate 25 and a pair of lifting cams 120 and 130. The plates 23, 24 and 25 are flat elements that are laminated together in forming the head B, to receive the fasteners S and to guide the same as they are issued from the end face 26, to house the furring means Y, and to house the fastener reforming means Z. A necessary feature is that the head B be open and clear of any obstruction that would prevent entry therein

of an article such as the roped portion 12 preceding the engagement of the end face 26 with the surface from which the said article is to be furred. Therefore, the cams 120 and 130 are retractile and retractably carry the elements which comprise the reforming means Z.

The back plate 23 and front plate 25 are of the same general configuration, having a common end face 26 and aligned recesses 141 and 142. The recesses are alike and of inverted V-shape with a vertex of sufficient width to accommodate the two wires of roped portion 12. In practice, the depth of the recesses 141 and 142 and/or placement of the flattened vertices determines the distance to which the article is furred. In the case illustrated the recesses 141 and 142 are of $\frac{3}{8}$ " depth.

The back plate 23 has a front face 143 in a plane substantially coincidental with the front side of the driver blade D, and has a channel 144 cut into or recessed in the front face to slidably receive the driver blade D and continuing toward the end face 26. As above pointed out the staple receiving opening 32 extends through the head B and thus extends through the plate 23 to open into the channel 144. Thus, fasteners S delivered by the magazine C are entered into the channel 144 to be driven by the driver blade D.

The front plate 25 is imperforate for all practical purposes, and it has fastener and bearing openings etc., said plate 25 being held in spaced parallel relation with the first mentioned plate 23 by means of the center plate 24 which is essentially a spacer. In this manner a space is provided between the back plate 23 and front plate 25 for accommodating the cams 120 and 130. As shown, the center plate 24 has a bottom spaced inward from the end face 26 and comprising a stop 145 limiting upward movement of the cams 120 and 130, and a pair of stops 146 and 147 limiting downward movement of the respective cams 120 and 130. Since the cams 120 and 130 are much alike the stops 146 and 147 are in a common plane spaced inward of the recesses 141 and 142, while the stop 145 involves a center lug which projects to the vertices of the recesses 141 and 142.

The cams 120 and 130 are like opposed elements that apply a lifting action to the article to be raised or furred. The two cams are spaced laterally in a chamber established between the plates 23 and 25 and they are pivotally anchored to the head B by means of laterally spaced pivot pins 121 and 131. The pivot pins 121 and 131 are on axes normal to the planes of the plates 23, 24 and 25 and spaced outward from the V-shaped recesses 141 and 142. Each cam has an article engaging inner face 122-132, a surface engaging lower face 123-133, and a stop 124-134, respectively. As shown, the laterally spaced pins 121 and 131 extend between the plates 23 and 25, where the two cams are carried and between which plates the said cams are retractable.

When in a normal distended position as shown in FIG. 7 the cams 120 and 130 depend from the end face 26 and are separated so as to receive the article therebetween. For instance, the roped portion 12 is received between the cams. The cams 120 and 130 are oppositely formed parts, and when in said normal distended position the faces 122-132 and 123-133 converge to points 125-135 spaced downwardly from said end face 26. Thus, depending cam lobes are formed, the points 125-135 being positioned inwardly of the pins 121-131 and spaced, for example, $\frac{1}{4}$ " apart. As a result, the inner faces 122-132 extend upwardly from the points 125-135 and preferably divergently to merge with a convex radius 126-136 that turns outwardly and clears the stops 146-147.

Further, the lower faces 123-133 extend outwardly and upwardly from the points 125-135, each of these faces having a flattened portion 127-137 adapted to engage flat with the surface from which the article is to be furred. As shown, the flattened portion 127-137 is spaced outwardly (and/or downwardly) from the point 125-135, whereby said point is lifted when the flattened portion 127-137 is flatly engaged with said surface. In practice, therefore, the

plane of the flattened portion 127-137 is always spaced outwardly and/or downwardly from the axis of pin 121-131, and the points 125-135 of the two opposite cams overlap so that the inner faces 122-132 also overlap when said cams are revolved to the positions shown in FIGS. 8, 9 and 10.

As clearly illustrated, there is but one space between plate 23 and plate 25 and the cams 120 and 130 are of the same thickness so as to occupy the distance between the said plates. Therefore, the respective point portions of the two cams are offset, one being placed forwardly and the other rearwardly, so that the respective point portions can overlap without interfering one with the other. Further, the points 125 and 135 are relatively sharp so as to assure engagement under the roped portion 12, and when the cams 120 and 130 are urged to revolve inwardly toward each other by downward pressure of the tool T against a supporting surface, the points 125 and 135 pass by each other and the roped portion 12 rides upwardly upon the converging faces 122 and 132. As a result of overlapping of the cams 120 and 130 the recesses 141 and 142 are closed and the article or roped portion 12 is lifted to the vertices of said recesses and thereby centered with the channel 144 and driver blade D.

The stop 145 limits upward movement of the cams 120 and 130 and is preferably in the form of a central lug that depends from plate 24, to be engaged by the upper faces 122 and 132 of the cams 120 and 130 respectively, thereby limiting upward movement of the cams and preventing crushing of the article and also assuring proper positioning of the cams for placement of the elements of the means Z later described. The stops 146 and 147 are engaged by lever-like lobes which form the stops 124 and 134 on the cams 120 and 130 respectively, thereby limiting downward movement of the cams to the distended position shown in FIG. 7. Thus, the cams 120 and 130 are free to revolve between said stopped positions and are yieldingly urged to the said distended position by means of a spring 150-151 carried in a cavity in the cam and wrapped helically around the pin 121-131. The spring 150-151 is anchored to the back plate 23 and has a live end fastened into the cam to revolve the same.

In accordance with the invention, the back sides of the cams 120 and 130 lie in a plane immediately forward of the front face 143 of the back plate 23 and consequently just forward of the front side of the driver blade D. Therefore, the back sides of the cams also lie just forward of the fastener guideway 22 and just forward of the staple or fastener S that is to be driven. With this general relationship of parts as hereinabove established and described the fastener reforming means Z is provided in the form of deflectors 155 and 160 which are movably carried by the cams 120 and 130 respectively. As above described, the said cams are retractile and they have a limited position of retraction as illustrated clearly in FIGS. 8, 9 and 10. Therefore, the deflectors 155 and 160 are disposed upon the cams 120 and 130 to project rearwardly therefrom and into the paths of the fastener S as it is driven from the guideway 22. Therefore, the back plate 23 is provided with suitable depressions 156 and 161 which accommodate the deflectors, and so that said deflectors are free to move without interference from the plate 23. Further, the projecting deflectors are engageable with walls of the depressions in order to stop the cams as desired.

The deflectors 155 and 160 are carried by the cams 120 and 130 so that they are positioned beneath the vertices of the recesses 141 and 142, when the said cams are revolved to the retracted positions as determined by the stop 145. In the first form of the invention as illustrated in FIGS. 7 through 13, the deflectors 155 and 160 obstruct the fasteners driveway 22, and in practice each deflector obstructs one side of the driveway, deflector 155 obstructing the issuance of one fastener leg 15 and the

deflector 160 obstructing the issuance of the other fastener leg 15. As is clearly shown, each deflector extends into the guideway 22 and at least one of said deflectors is adapted to direct a leg 15 away from the longitudinal disposition of the driveway. Or as shown in the second form of the invention as illustrated in FIGS. 14 through 18, at least one of said deflectors is adapted to direct a leg crosswise or transversely of the guideway 22. The amount of deflection is such that the two legs 15 of the fastener S are crossed or brought together to thereby reform the fastener S into one of looped formation. Since the article or roped portion 12 has been furred by retraction into the vertices of recesses 141 and 142, the legs 15 have necessarily straddled the portion 12, whereby formation of the fastener S into a loop embraces the portion 12.

In the first form of the invention shown specifically in FIGS. 7-13 the fastener S is reformed by turning and/or bending both legs transversely and by deflecting one of the legs 15 away from the longitudinal disposition of the driveway 22, whereby the legs 15 are crossed and the head 16 of the fastener is made into loop form. Accordingly, the deflector 155 is provided with an inclined wall 157 extending upwardly and laterally from the center of the guideway 22, to intercept one leg 15. The wall 157 is of limited height substantially equal to the thickness of the fastener S and is normal to the back side of the cam 120 from which it is supported. The deflector 160 is provided with an inclined and bevelled wall 162 extending upwardly and laterally from the center of guideway 22, to intercept the other leg 15. The wall 162 is of extended height substantially greater than the thickness of the fastener S and angles forwardly and downwardly from the back side of cam 130 from which it is supported. In practice, the deflector 160 cantilevers from the cam 130 and overlies the point portion of cam 120 and is provided with a bottom 163 spaced from and substantially parallel with (see FIGS. 9 and 10) the wall 157 of the first mentioned deflector.

In the second form of the invention shown specifically in FIGS. 14-18 the fastener S is reformed by bringing the two legs 15 together and preferably by turning and/or bending one leg 15 transversely so as to engage the other leg 15, whereby a cotter-like structure is formed with a head 16 of loop form. Accordingly, the cam 120' has a deflector 155' that is provided with a wall 157' that is vertically disposed and which forms a continuation of one side wall of guideway 22. Thus, one leg 15 is guided by wall 157' and remains straight. However, deflector 160' is provided with an inclined wall 162' (not bevelled) extending upwardly and laterally from the center of the guideway 22, to intercept the other leg 15. The deflector 160' cantilevers from the supporting cam 130' the same as the deflector previously described, the wall 162' being disposed in a plane normal to the back side of the supporting cam 130'.

With the furring means Y and fastener reforming means Z as described in the foregoing specification and related to the tool T hereinabove described, a stick of U-shaped fasteners is inserted into the magazine C and the tool T is connected to a suitably compressed air supply. One useful purpose of the invention is to fur stucco-netting from the frame of a building structure and to this end it is simply necessary to manipulate the head B of the tool to center with and overlie a strand of wire 10 or preferably a roped portion 12, and thereafter to press the tool T toward the supporting structure. When the tool T is depressed the cams 120 and 130, which are normally distended, are retracted to the stop 145 whereupon the points 125 and 135 pick up the wire 10 or portion 12 and lift the same to the vertices of the recesses 141 and 142. Thereupon the tool T is actuated by depressing the trigger 21, whereupon the driver blade D is advanced with force suitable for driving the U-shaped fastener S into the supporting structure.

Referring to the first form of the invention and as shown in FIG. 10 the deflectors 155 and 160 intercept the two legs 15 and individually redirect the legs, one of them laterally only, and the other both laterally and away from the longitudinal disposition of the guideway 22. The said bending away from the longitudinal disposition of the driveway 22 is effected by the wall 162 which is bevelled and which directs the second leg 15 by or over the first leg 15, which first leg passes along the bottom 163 of the deflector 160. As a result, the fastener S is reformed into a crossed and/or twisted formation characterized by a looped head 16 which embraces the article such as the roped portion 12 of the stucco netting N.

Referring to the second form of the invention and as shown in FIG. 16 the deflector 160' intercepts the one leg 15 and individually directs said leg laterally only and toward the other leg 15. As a result, the first mentioned leg 15 collides with the second mentioned leg 15 (see FIG. 17) whereupon the first mentioned leg 15 is re-straightened so as to follow parallel with the second mentioned leg. Thus, the second mentioned leg which is guided by the wall 157' forms a deflector which restraightens the first mentioned leg and to the end that the two legs are juxtapositioned and issue from the tool in adjacent side by side engagement.

Having described only a typical preferred form and application of our invention, we do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to ourselves any modifications or variations that may appear to those skilled in the art and fall within the scope of the following claims.

Having described our invention, we claim:

1. The method of installing a drivable fastener with a loop-shaped head for embracement of an article furred from a support, and including;
 - (a) initially forming a U-shaped body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
 - (b) lifting the article to a predetermined level spaced from the support,
 - (c) and driving the legs of said body into the support with the said lifted article therebetween by force applied to the head and deflecting one of said legs toward the other of said legs so that the legs converge and form a closed loop with said article embraced therein.
2. The method as set forth in claim 1 and wherein; said deflected leg is restraightened by engaging said deflected leg against the other of said legs while driving said legs into the support.
3. The method as set forth in claim 1 and wherein; one of said legs is guided in its initially straight condition, and said deflected leg is restraightened by engaging said deflected leg against the said guided leg while driving said legs into the support.
4. The method as set forth in claim 1 and wherein; one of the legs is deflected laterally and out of the plane of the other of said legs.
5. The method as set forth in claim 1 and wherein; the said one leg that is deflected laterally toward the other is also deflected out of the initial parallel plane of the legs.
6. The method as set forth in claim 1 and wherein; the said other leg is also deflected laterally toward said one leg and out of the initial parallel plane of the legs.
7. A fastener driving tool for installing a fastener with a loop-shaped head embraced over an article furred from a support, and including;
 - (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
 - (b) a shiftable element distendably supported from the head structure and engageable with the said support and carrying a deflector shifted by said en-

- gagement with said support to obstruct movement of the fastener from said guideway,
- (c) said deflector having a fastener engaging face disposed to deflect one of the fastener legs toward the other of said legs, when driving force is applied to the head of the fastener to issue it from the guideway,
- (d) whereby said legs converge from the head to form a closed loop and are driven into said support.
8. A fastener driving tool for installing a fastener with a loop-shaped head embraced over an article furred from a support, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
- (b) a pair of shiftable elements distendably supported from the head structure and each engageable with said support and each carrying a deflector shifted by said engagement of the element with said support and each deflector obstructing movement of a leg of the fastener from said guideway, respectively,
- (c) one of said deflectors having a face to guide one fastener leg in its initially straight condition, and the other of said deflectors having a face to deflect the other fastener leg toward the straight leg, when driving force is applied to the head of the fastener to issue it from the guideway,
- (d) whereby said legs converge from the head to form a closed loop thereof and are disposed adjacent each other and are driven together into said support.
9. A fastener driving tool for installing a fastener with a loop-shaped head embraced over an article furred from a support, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
- (b) a shiftable element distendably supported from the head structure and engageable with the said support and carrying a deflector shifted by said engagement of the element with said support to obstruct movement of the fastener from said guideway,
- (c) said deflector having a fastener engaging face disposed to deflect one of the fastener legs toward the other of said legs and out of the plane of the initially parallel legs, when driving force is applied to the head of the fastener to issue it from the guideway,
- (d) whereby said legs converge from the head and cross to form a closed loop and are driven into said support.
10. A fastener driving tool for installing a fastener with a loop-shaped head embraced over an article furred from a support, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
- (b) a revolvable cam element distendably supported by and normally depending from the head structure and engageable with the said support and carrying a deflector shifted by said engagement of the element with said support to obstruct movement of the fastener from said guideway,
- (c) said deflector having a fastener engaging face disposed to deflect one of the fastener legs toward the other of said legs, when driving force is applied to the head of the fastener to issue it from the guideway,
- (d) whereby said legs converge from the head to form a closed loop and are driven into said support.
11. A fastener driving tool for installing a fastener with a loop-shaped head embraced over an article furred from a support, and including;
- (a) a head structure having a fastener guideway to

- receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
- (b) a pair of revolvable cam elements distendably supported by and normally depending from opposite sides of the guideway and each engageable with said support and each carrying a deflector shifted by said engagement of the element with said support to engage with and to obstruct movement of one leg of the fastener from said guideway, respectively,
- (c) one of said deflectors having a face to guide one fastener leg in its initially straight condition, and the other of said deflectors having a face to deflect the other fastener leg toward the straight leg, when driving force is applied to the head of the fastener to issue it from the guideway,
- (d) whereby said legs converge from the head to form a closed loop thereof and are disposed adjacent each other and are driven together into said support.
12. A fastener driving tool for installing a fastener with a loop-shaped head embraced over an article furred from a support, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
- (b) a pair of revolvable cam elements distendably supported by and normally depending from opposite sides of the guideway and each engageable with said support and each carrying a deflector shifted by said engagement of the element with said support to engage with and to obstruct movement of one leg of the fastener from said guideway, respectively,
- (c) one of said deflectors having a fastener engaging face disposed to deflect one of the fastener legs toward the other of said legs and out of the plane of the initially parallel legs, when driving force is applied to the head of the fastener to issue it from the guideway,
- (d) whereby said legs converge from the head and cross to form a closed loop and are driven into said support.
13. A fastener driving tool for furring an article from a support and for installing a fastener with a loop-shaped head embracing said article, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
- (b) a recess in the head structure and aligned with the guideway,
- (c) a shiftable element distendably supported from the head structure and engageable with the said support and carrying a deflector shifted by said support with said support to obstruct movement of the fastener from said guideway,
- (d) said shiftable element having an inner face operable toward said recess and to engage beneath said article to lift the same into said recess and to a furred position with respect to said supporting surface;
- (e) said deflector having a fastener engaging face disposed to deflect one of the fastener legs toward the other of said legs, when driving force is applied to the head of the fastener to issue it from the guideway,
- (f) whereby said legs converge from the head to form a closed loop and are driven into the said support.
14. A fastener driving tool for furring an article from a support and for installing a fastener with a loop-shaped head embracing said article, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,

- (b) a recess in the head structure and aligned with the guideway,
 - (c) a pair of shiftable elements distendably supported from the head structure and each engageable with said support and each carrying a deflector shifted by said engagement with said support to engage with and to obstruct one leg of the fastener in said guideway, respectively,
 - (d) each shiftable element having an inner face operable toward said recess and to engage beneath said article to lift the same into said recess and to a furred position with respect to said supporting surface,
 - (e) one of said deflectors having a face to guide one fastener leg in its initially straight condition, and the other of said deflectors having a face to deflect the other fastener leg toward the straight leg, when driving force is applied to the head of the fastener to issue it from the guideway,
 - (f) whereby said legs converge from the head to form a closed loop thereof and are disposed adjacent each other and are driven together into the said support.
15. A fastener driving tool for furring an article from a support and for installing a fastener with a loop-shaped head embracing said article, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
 - (b) a recess in the head structure and aligned with the guideway,
 - (c) a shiftable element supported distendably from the head structure and engageable with said support and carrying a deflector shifted by said engagement with said support to obstruct movement of the fastener from said guideway,
 - (d) said shiftable element having an inner face operable toward said recess and to engage beneath said article to lift the same into said recess and to a furred position with respect to said supporting surface,
 - (e) said deflector having a fastener engaging face disposed to deflect one of the fastener legs toward the other of said legs and out of the plane of the initially parallel legs, when driving force is applied to the head of the fastener to issue it from the guideway,
 - (f) whereby said legs converge from the head and cross to form a closed loop and are driven independently into the said support.
16. A fastener driving tool for furring an article from a support and for installing a fastener with a loop-shaped head embracing said article, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
 - (b) a recess in the head structure and aligned with the guideway,
 - (c) a revolvable cam element supported by and normally distending from the head structure and engageable with the support and carrying a deflector shifted by said engagement with said support to obstruct movement of the fastener from said guideway,
 - (d) said shiftable element having an inner face operable toward said recess and to engage beneath said article to lift the same into said recess and to a furred position with respect to said supporting surface,
 - (e) said deflector having a fastener engaging face disposed to deflect one of the fastener legs toward the

- other of said legs, when driving force is applied to the head of the fastener to issue it from the guideway,
 - (f) whereby said legs converge from the head to form a closed loop and are driven into the said support.
17. A fastener driving tool for furring an article from a support and for installing a fastener with a loop-shaped head embracing said article, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
 - (b) a recess in the head structure and aligned with the guideway,
 - (c) a pair of revolvable cam elements supported by and normally distending from opposite sides of the guideway and each engageable with the support and each carrying a deflector shifted by said engagement with said support to engage with and to obstruct one leg of the fastener in said guideway, respectively,
 - (d) each shiftable element having an inner face operable toward said recess and to engage beneath said article to lift the same into said recess and to a furred position with respect to said supporting surface,
 - (e) one of said deflectors having a face to guide one fastener leg in its initially straight condition, and the other of said deflectors having a face to deflect the other fastener leg toward the straight leg, when driving force is applied to the head of the fastener to issue it from the guideway,
 - (f) whereby said legs converge from the head to form a closed loop thereof and are disposed adjacent each other and are driven together into the said support.
18. A fastener driving tool for furring an article from a support and for installing a fastener with a loop-shaped head embracing said article, and including;
- (a) a head structure having a fastener guideway to receive a U-shaped fastener body with parallel legs of substantially equal length spaced by an integral and transversely disposed head,
 - (b) a recess in the head structure and aligned with the guideway,
 - (c) a pair of revolvable cam elements supported by and normally distending from opposite sides of the guideway and each engageable with the support and each carrying a deflector shifted by said engagement with said support to engage with and to obstruct one leg of the fastener in said guideway, respectively,
 - (d) said shiftable element having an inner face operable toward said recess and to engage beneath said article to lift the same into said recess and to a furred position with respect to said supporting surface,
 - (e) said deflector having a fastener engaging face disposed to deflect one of the fastener legs toward the other of said legs and out of the plane of the initially parallel legs, when driving force is applied to the head of the fastener to issue it from the guideway,
 - (f) whereby said legs converge from the head and cross to form a closed loop and are driven independently into the said support.

References Cited

UNITED STATES PATENTS

3,061,837	11/1962	Kent	29—432.1
3,144,655	8/1964	Kent	227—77

JOHN F. CAMPBELL, *Primary Examiner*.THOMAS H. EAGER, *Examiner*.