

Nov. 8, 1966

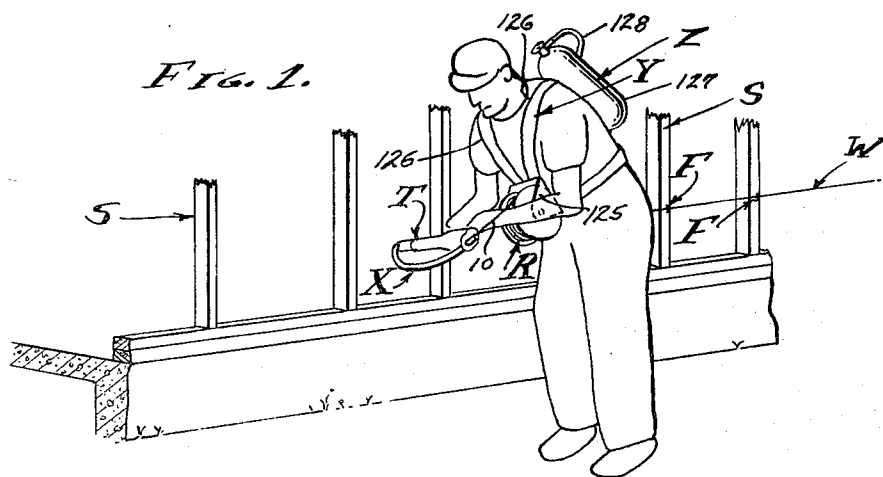
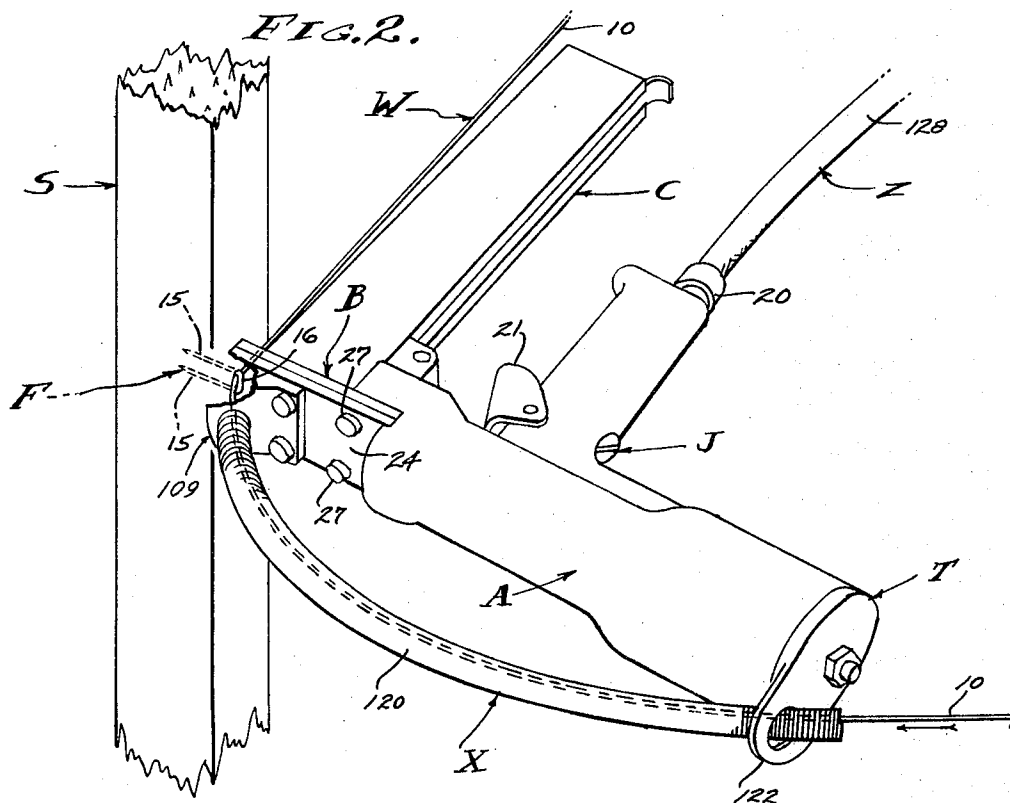
D. P. McKEE

3,283,986

TIE-WIRE INSTALLATION APPARATUS

Filed June 25, 1964

2 Sheets-Sheet 1



INVENTOR  
DALE P. McKEE  
BY  
*W. H. Tammell*  
AGENT

Nov. 8, 1966

D. P. McKEE

3,283,986

TIE-WIRE INSTALLATION APPARATUS

Filed June 25, 1964

2 Sheets-Sheet 2

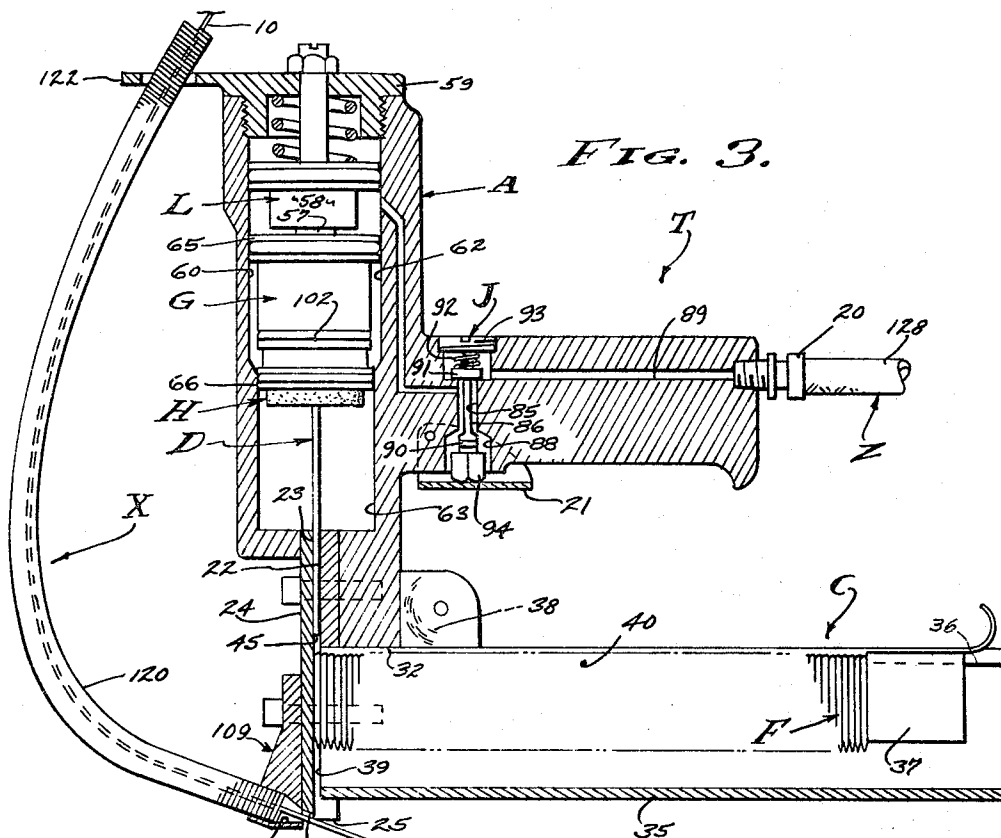


FIG. 3.

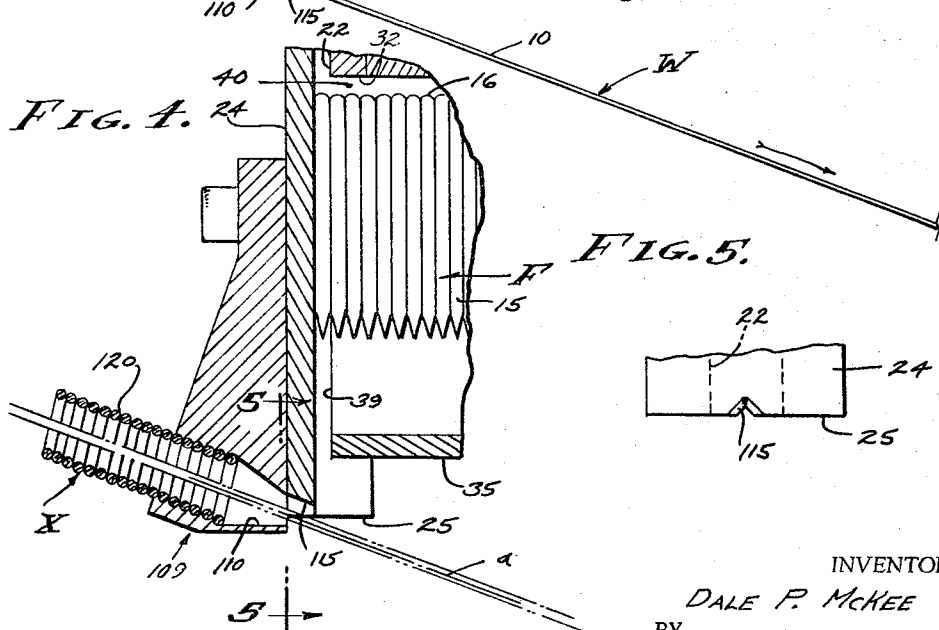
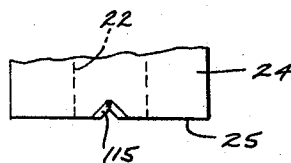


FIG. 4.

FIG. 5.



INVENTOR.

DALE P. McKEE

BY

W. H. Maxwell

AGENT

1

2

3,283,986

## TIE-WIRE INSTALLATION APPARATUS

Dale P. McKee, Woodland Hills, Calif., assignor to Powers Wire Products Company, Inc., El Monte, Calif., a corporation of California

Filed June 25, 1964, Ser. No. 377,821

3 Claims. (Cl. 227-120)

This invention relates to the installation of wire in substantial lengths and is particularly concerned with the fastening of "tie-wire" to the framework of a building, or the like. A general object of this invention is to provide an apparatus that facilitates handling of great lengths of wire, to speed the application thereof to a framework and to deftly apply fasteners for securement of the wire in a properly installed condition.

This invention relates to any situation where lengths of wire are to be fastened to objects by fasteners. One very practical application of the invention is the installation of tie-wire to the framework of a building as part of the underlying foundation structure of plastered walls and the like. Therefore, the present invention will be hereinafter described as it is embodied in the installation of tie-wire as an article to be fastened in place of a framework in a predetermined manner.

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 S that are spaced at predetermined and uniform intervals, of tie-wires W laced horizontally across the outer faces of the studs, of construction paper (not shown) applied to the faces of the studs and over the tie-wires, and of stucco-netting (not shown) 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 lacing and proper tensioning of the tie-wire W as it extends between the studs S to form a backing for the construction paper. In this connection it is very important that sufficient but not excessive tensioning be imposed upon the tie-wire W, so that the tie-wire is taught but so that it does not overly stress the studs to urge them out of place. Upon installation of the stucco-netting over the construction paper as backed by the lacing of tie-wire W the "scratch coat" of cement is applied to which the overlying stucco cement is then applied.

Construction Codes strictly control the procedures of securing proper building construction and the adequacy and tensioning of tie-wire is closely scrutinized. Primarily, however, the installation of tie-wire W is a time consuming step in the erection of a building, and it is a primary object of this invention to provide apparatus in order to carry out this step in a most efficient and expeditious manner.

An object of this invention is to provide an attachment to a fastener driving tool which feeds a tie-wire or the like thereto for the reception of fasteners delivered by said tool and to the end that said tie-wire is secured on a framework or the like in a substantially taught condition.

Another object of this invention is to provide apparatus or gear to be worn by a person and associated with a fastener driving tool in such a manner as to render the automated installation of a fastener onto tie-wire completely mobile.

It is still another object of this invention to provide a fastener driving tool which is maneuverable with the least amount of restriction, so as to be manually positioned as circumstances require, in any attitude. For example, the apparatus is normally employed to lace tie-wire horizontally, but this need not be the strict case, as when tight inside corners are encountered in which case it is an object to easily fasten the tie-wire into such corners and any other like tight places.

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

FIG. 1 is a perspective view showing the apparatus of the present invention and the manner of its manipulation.

FIG. 2 is an enlarged perspective view of the tool of the present invention.

FIG. 3 is a detailed sectional view of the tool of the present invention.

FIG. 4 is an enlarged sectional view of the head portion of the tool shown in FIGS. 1 through 3.

FIG. 5 is a sectional view taken as indicated by line 5-5 on FIG. 4.

The type of structure to which this invention appertains is briefly set forth above and which involves a frame construction comprising studs S upon which the tie-wire W is laced, covered by construction paper, and over which stucco-netting 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 the tie-wire W are that it is an article made of relatively soft wire 10, usually galvanized, and adapted to be stretched taught between studs S. When ordinary fasteners such as nails are employed to fasten the tie-wire W to the studs S difficulty is encountered in the manipulation of the various elements involved. It is not only necessary to hold the tie-wire in proper position and to then hold the nail adjacent thereto, but it is also necessary to pull the tie-wire taught while the nail is manually hammered into place; and all of this is further encumbered by the presence of the tie-wire supply which is normally a roll R of said wire 10. As a result, tie-wire W is often laced loosely, then tightened and then finally fastened, all of which is time consuming.

In accordance with this invention, fasteners F in the form of U-shaped staples are driven by a tool T which I modify with the provision of guide means X at the head thereof to relate the tie-wire W to the tool T in order to be fastened to the studs S by operation of the tool. The fastener F has parallel shanks 15 and is adapted to engage over the article to be fastened. In the drawings I have shown the usual formation of such a fastener F and which comprises the pair of parallel shanks 15 joined by a transverse head 16. The forwardmost ends of the shanks 15 are sharpened, and the head 16 is adapted to be driven into engagement with an article to be fastened, in this case the wire 10 or tie-wire W, and is adapted to be buried at least partially below the surface into which it penetrates. The depth of drive is, of course, dependent upon the capability and adjustment of the tool T.

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 any type or configuration of fastener can be driven thereby, as required. However, the preferred type of fastener F is referred to above and the tool T will be described so as to drive and bury the fastener F into the surface of the studs S with the tie-wire W captured beneath the heads 16 of the fasteners.

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 L 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. 2 of the drawing.

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 flat platelike part 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 front face 23 in which a channel is formed in order to establish the guideway 22, it has a cover plate 24 engaged with the face 23 to close the channel, and it has a lower end face 25. It will be apparent how the guideway 22 can be proportioned so that it will readily pass the staples F with clearance and will act upon the staples to guide them as they are delivered through the head B and from the tool. The guideway 22 also guides the driver blade D of the tool as well as the staples F that are handled thereby. Spaced fasteners 27, one at each side of the head B, secure the head to the body of the tool and secure the plate 24 to the head. It will be apparent that the plate 24 in working position presents a completely flat area 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 of U-shaped staples F 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 F with their looped portions B.

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 toward the head B by the feed spring 38. Means is provided to prevent the follower 37 from entering the guideway 22, for example the curved and upturned part at the back of follower 37 stops against the housing that encloses the feed spring 38. The fasteners or staples F 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 flat 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 to have driving engagement with the piston G. The face 45 is engageable with the top of head 16 of the fastener F.

The latching means L 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 L 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 L may involve suitable mechanism to carry out the function referred to without affecting the present invention. For example, the latching means L 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 L being threadably 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 and piston G is directed to the chamber 60 and is retained in the chamber 60 by action of the valve of

5

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 part 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 be apparent how the "O" ring shaped valve element 102 seals fluid under pressure in the chamber 60.

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. 3 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 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. 3.

In accordance with the invention I provide the guide means X that is associated with and which is cooperatively related with the head B of the fastener driving tool T as hereinabove described. Further, the invention involves a harness Y for the support of both the roll R which comprises the supply of tie-wire W and the power supply Z that I provide for operating the tool T. That is, in the first instance the guide means X is associated with the tool T in order to adapt the tool for reception of the tie-wire W, and in the second instance the harness Y is cooperatively related to the guide X and tool T so as to furnish both a material supply (roll R) and power supply Z, all of which forms an apparatus which is completely mobile.

As shown, the guide means X involves an attachment at or a modification of the cover plate 24, the latter being chosen for illustrative purposes. Thus, the guide means X is shown integral with the cover plate 24 and is posi-

6

tioned at the end face 25 for the purpose of issuing tie-wire W at or below the end face 25 and centered with the guideway 22. Because of the normal attitude and posture of a person using the apparatus and in accordance with the utility and convenience provided by the present invention, the guide means X is disposed to lead tie-wire W to the tool T from the cover plate side of the head B. Therefore, the guide means X involves an eye-shaped element 109 disposed on an axis *a* in the plane of longitudinal extent of the handle or grip, or in a plane normal to the plane of cover plate 24 and coincidental with the center of the guideway 22. Thus, the tie-wire W, which is substantially flexible, is adapted to approach the head portion of the tool T at or beneath the end face 25 thereof.

In the embodiment illustrated, the eye-shaped element 109 is incorporated in the lower portion of the cover plate 24 and presents a depending part below the end face 25. The diameter of the wire 10 is rather small and to this end the eye-shaped element 109 is likewise rather small. Since the tie-wire W is to lie flat against the surface to which it is to be attached the axis *a* is more or less normal to the drive axis of the tool T. However, it has been found to be advantageous to incline the axis *a* at least slightly as shown so as to lead the tie-wire W downwardly at an angle. Further, the eye-shaped element 109 has a tapered bore 110 restricted to a minimum aperture immediately adjacent the guideway 22.

With the guide means X as above described, the tie-wire W is issued at and/or just below the end face 25, in which case an improvement in the head B is the provision of a recess 115 to freely accommodate the tie-wire as it issues from the eye-shaped element. The recess 115 is formed in the head B adjacent to and opening into the guideway 22, and it is advantageously employed to permit freedom of the tie-wire W and to thereby permit free turning of and free manipulation of the tool T without hindrance from the tie-wire W, and without unduly bending said tie-wire.

In accordance with the invention the guide means X involves a conduit or tube 120 for the purpose of delivering the tie-wire W to the eye-shaped element 109 and tapered bore 110. The tube 120 is flexible and is shown in the form of a helical spring that is screw threaded into the large diameter end of bore 110. The flexible tube 120 is trained toward the top of the tool T where a bracket 122 restrains it loosely in position. It is significant that the tube 120 is flexible to an extreme degree as it extends from the eye-shaped element 109 and its bore 110, and the bracket 122 constrains the flexible tube 120 so that it cannot uncontrollably encumber the tool T.

With the guide means X incorporated in the tool T, as hereinabove described, the tie-wire W is fed into the upper open end of tube 120 and is lead to the reduced bore 110 where it issues continuously from the eye-shaped element of guide means X. As a result, the tool T can be advanced forwardly with the handle or grip (and magazine) trailing, all while the tie-wire continues to issue beneath the end face 25. At any interval or point of said advancing movement the tool T can be operated to deliver a fastener F from the guideway 22, whereupon the fastener is applied over the tie-wire 10 with the head portion 16 of the fastener engaged tightly thereon. By adequate driving of the fastener F, that is by burying the fastener to some extent into the surface which it penetrates, the tie-wire W is pulled and thereby tightened. By providing this tightening effect with the application of each fastener F a normal amount of taughtness is established in the tie-wire W, and this taughtness may be increased by the addition of fasteners, at will.

The harness Y can vary widely and a typical harness is shown in FIG. 1 of the drawings. A feature of the particular harness that I provide is the balance of load between the posterior and anterior of the person wearing the apparatus. Since the human form is anteriorly dis-

posed the material supply in the form of the roll R of wire 10 is carried at the front of the harness. Thus, a bracket 125 projects from the harness Y to rotatably support the roll R, said bracket being located at or slightly above the belt line of the person and with its axis transverse and horizontal. The power supply Z is in the form of stored energy, preferably a compressed gas accumulated supply adapted to operate the pneumatic tool T, as it is described above. The harness Y involves shoulder straps 126 that depend at the anterior to support the bracket 125 and that also depend at the posterior to support the supply Z in the form of a pressure tank or reservoir 127. The reservoir stores compressed carbon dioxide or air or the like. As is shown, a flexible hose 128 extends from the reservoir 127 and to the connection 20 at the handle of the tool T.

From the foregoing the utility of the apparatus will be apparent. It is possible for a person to conveniently support and comfortably manipulate the elements that are involved. For instance, a normal supply of tie-wire W will weigh from ten to twenty pounds, a similar weight being usual for a reservoir 127 capable of several thousand operations of the tool T. In practice, the tool T need drive but a small fastener F, in which case the tool is rather light weight. In order to use the apparatus, it is simply necessary to wear the harness Y as illustrated and to feed the tie-wire W through the guide means X so as to issue from the head of the tool T beneath the end face 25. Initial operation of the tool T can be utilized to apply a first fastener F into a stud S, thereby anchoring the end of the tie-wire W. The person then progresses forwardly while the tie-wire withdraws from the roll R and issues from the guide means X. At each stud S, or as may be required, the person simply pauses momentarily and operates the tool T to apply a fastener F over the tie-wire W, fastening the tie-wire tightly to the framework. It will be apparent how the flexible wire 10 and flexible tube 120 is displaced when tight places and corners are encountered. And, as a result the tie-wire W issues continuously without breaks and the fasteners F are applied while the tie-wire is frictionally held taught by virtue of the drag required to withdraw it through the guide means X.

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

Having described my invention I claim:

1. Apparatus for affixing continuous lengths of wire to a supporting surface, and including in combination:

- (a) a means supplying continuous lengths of wire,
- (b) a fastener driving tool with a head having a front and a lower end face and adapted to receive fasteners and with a driver blade operated by the tool to propel a fastener from said lower end face and into engagement with said wire and into said surface,
- (c) and a guide means carried by the tool and comprising, an eye-shaped element adjacent the head, and a curved tubular part leading from behind the head and into said eye-shaped element, said element and part being cooperatively related with the head to re-

ceive and so as to direct the lengths of wire through the tubular part and to issue rearwardly from the eye-shaped element along an axis disposed at the plane of the lower end face of the head and into the path of the fastener as it is propelled by the blade.

2. Apparatus for affixing continuous lengths of wire to a supporting surface, and including in combination:

- (a) a means supplying continuous lengths of wire,
- (b) a fastener driving tool with a head having a front and a lower end face and adapted to receive fasteners and with a driver blade operated by the tool to propel a fastener from said lower end face and into engagement with said wire and into said surface,
- (c) and a guide means carried by the tool and comprising, an eye-shaped element fixed to the front of the head, and a curved and flexible tubular part fixed to and leading from behind the head and into said eye-shaped element from the front of the head, said element and part being cooperatively related with the head to receive and so as to direct the lengths of wire through the tubular part and to issue rearwardly from the eye-shaped element along an axis disposed at the plane of the lower end face of the head and into the path of the fastener as it is propelled by the blade.

3. Apparatus for the manual application of continuous lengths of wire to a supporting surface, and including in combination:

- (a) a harness to be worn by a person,
- (b) a wire supply carried by said harness to issue wire forwardly from said person,
- (c) a fastener driving tool to be manipulated in the hands of said person and with a head having a front and a lower face and adapted to receive fasteners and with a driver blade operated by the tool to propel a fastener from said lower face and into engagement with said wire and into said surface,
- (d) and a guide means carried by the tool and comprising, an eye-shaped element supported at the front of the head, and an arcuately shaped tubular part supported by the tool and leading from behind the head and extended to the eye-shaped element thereof to project the wire rearwardly through the same along an axis disposed at the plane of the lower end face of the head and into the path of the fastener as it is propelled by the blade.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

|           |         |             |           |
|-----------|---------|-------------|-----------|
| 1,370,768 | 3/1921  | Sperling    | 224—5.3   |
| 1,981,076 | 11/1934 | Sells       | 224—5.3   |
| 1,990,135 | 2/1935  | Sato        | 242—96    |
| 2,160,908 | 6/1939  | Robinson    | 227—87    |
| 2,331,509 | 10/1943 | Scheckwitz  | 227—120   |
| 2,519,936 | 8/1950  | Sayre       | 224—5.3   |
| 2,890,005 | 6/1959  | Hoogestraat | 242—96    |
| 2,964,752 | 12/1960 | Kopf        | 227—130 X |
| 3,040,327 | 6/1962  | Michel      | 227—130 X |
| 3,049,712 | 8/1962  | Khan        | 227—130 X |
| 3,105,359 | 10/1963 | Ellis       | 224—5 X   |
| 3,122,749 | 3/1964  | Abrams      | 227—120   |

GRANVILLE Y. CUSTER, JR., *Primary Examiner*.