April 19, 1932. P. R. GLASS 1,854,469

FASTENER INSERTING MACHINE

Filed Dec. 4, 1928

Fig. 3.

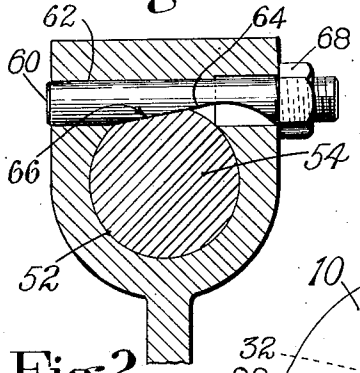


Fig. 7.

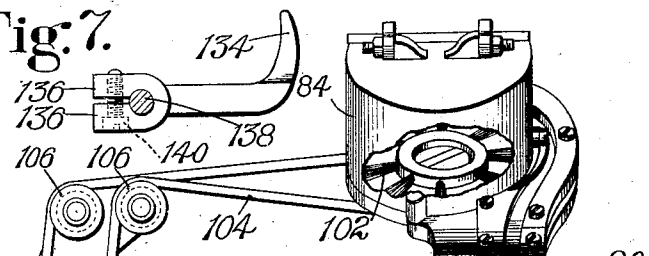


Fig. 1.

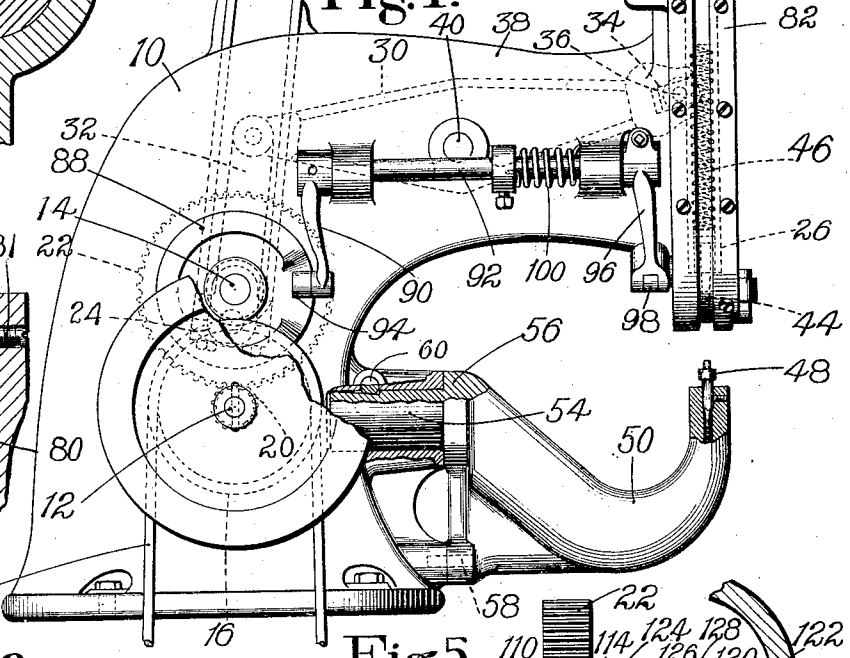


Fig. 2.

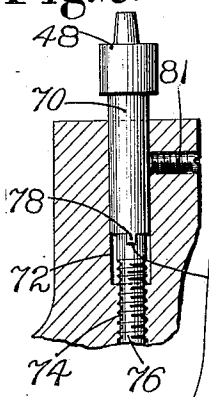


Fig. 6.

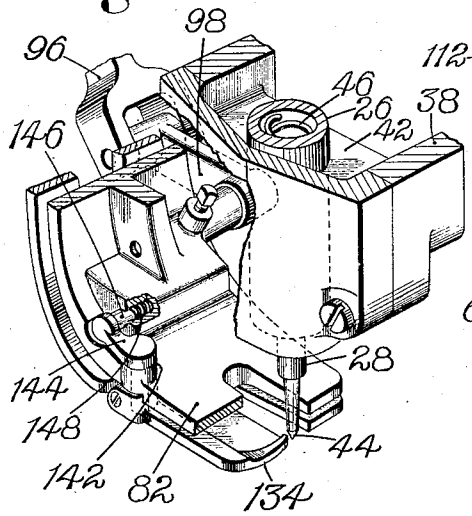


Fig. 5.

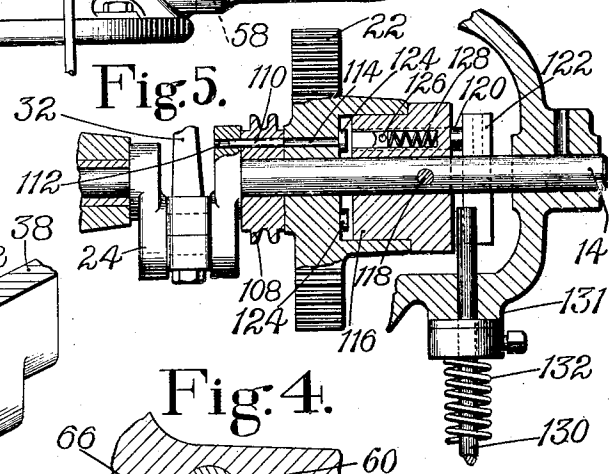
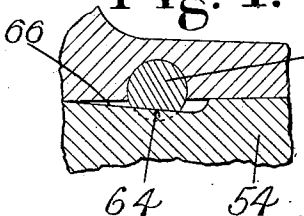


Fig. 4.



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Patented Apr. 19, 1932 1,854,469

UNITED STATES PATENT OFFICE

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FASTENER-INSERTING MACHINE

Application filed December 4, 1928. Serial No. 323,759.

This invention relates to fastener-inserting machines and is herein illustrated as embodied in a machine designed particularly to insert annular fasteners such as eyelets and grommets.

In some types of machines for inserting eyelets or grommets, each fastener-inserting tool of a cooperative couple is moved toward and from the other tool of the couple, while in other types one tool of a couple remains fixed in one position while the other tool of the couple moves toward and from it, but in either case it is common to provide means for adjusting one or the other tool of a couple to regulate the pressure with which the fasteners are to be clenched. To this end an object of the present invention is to provide improved means for effecting axial adjustment of a fastener-inserting tool.

Accordingly, a feature of this invention consists in a novel combination comprising a fastener-setting tool and a backing screw therefor provided with cooperative coupling formations by which the tool may turn the screw, and a support having a socket to receive the screw and a portion of the tool, the socket having an internal screw-thread to cooperate with the screw.

As illustrated, a portion of the tool is readily accessible outside the support so that it may be conveniently manipulated to turn the screw, and the tool may be inserted and withdrawn axially without disturbing the backing screw. The illustrated construction also includes retaining means for engaging the tool to prevent accidental uncoupling of the tool from the backing screw and to prevent accidental turning of the screw.

For certain kinds of work it is common to use a fastener-inserting machine in which the lower setting tool is attached to a stationary horn as distinguished from a plunger. This is generally so when the fastener-receiving articles are not flat and are incapable of being spread out on a flat work-supporting plate. In some cases the horn must have some special shape required by some peculiarity or irregularity in the shape of the articles of work into which the fasteners are to be inserted. Accordingly, it is common to provide machines for this class of work with detachable and interchangeable horns of various shapes to support the fastener-setting tools, but when a horn for this purpose is detachable from the frame of the machine it presents the problem of maintaining a connection so strong and secure as to guard against loosening of the horn as a result of repeated blows or strokes of the movable fastener-inserting tool.

With the latter problem in view another object of the invention is to provide improved means for effecting a powerful and rigid connection between the frame of a machine and a detachable horn. Accordingly, in the illustrated machine, and in accordance with another feature of the invention, the frame is provided with a socket to receive a shank or stem of a detachable horn and with a clamping member arranged to intersect the socket in tangent relation to the shank of the horn, the clamping member being provided with a flat inclined shank-engaging face to produce a radial wedging action on the shank as a result of drawing the member endwise, and the shank of the horn being provided with a complemental flat face inclined in another direction to produce a wedging action by which the tightening of the clamping member will tend to draw the shank of the horn into its socket. As illustrated, the horn and the socket portion of the frame are provided with cooperative faces arranged to abut one against the other to insure accurate register of the stationary fastener-setting tool affixed thereto with a movable fastener-inserting tool, and the inclined face formed on the shank of the horn is so positioned as to maintain the abutting face of the horn positively seated against that of the socket portion of the frame when the clamping member is tightened. Thus, by providing the clamping member with a flat shank-engaging face inclined in one direction and by providing the shank with a cooperative flat face inclined in another direction a compound wedging effect is produced by tightening the clamping member, one component of the wedging effect being applied transversely of the shank of the

horn while the other component is applied longitudinally of the shank.

The illustrated machine is also provided with automatic mechanism for supplying fasteners to the fastener-inserting mechanism, the supplying mechanism including a hopper in which the fasteners are stored, a raceway for conducting the fasteners from the hopper to the fastener-inserting mechanism, and with mechanism for feeding the fasteners from the hopper into the receiving end of the raceway. It is necessary always to maintain a suitable supply of fasteners in the raceway to insure that there will always be not only a fastener at the delivery end of the raceway when a fastener is about to be inserted but also a sufficiently long column of additional fasteners in the raceway to furnish, by their aggregate gravitational tendency, a propelling effect by which the leading fastener of the series will be advanced with certainty, in every case, to the required position in the raceway. On the other hand, it is not desirable to operate the fastener-feeding mechanism at a rate in excess of that required to maintain an adequate supply of fasteners in the raceway, particularly if the fasteners are coated with a finishing substance that would be dulled, scratched or otherwise marred by excessive tumbling of the fasteners in the hopper.

With these considerations in view, still another object of the invention is to provide improved means for driving a fastener-supplying element continuously or periodically, as the case may be, to maintain the required quantity of fasteners in a raceway. To this end a feature of the invention consists in a novel combination comprising a shaft for operating the fastener-inserting mechanism, a controllable clutch mounted on the shaft for driving it, and a transmission member mounted on the shaft for operating a fastener-supplying element, the transmission member being arranged between the driving member of the clutch and a member carried and driven by the shaft and spaced from the driving member of the clutch and the transmission member and each of the spaced members having cooperative coupling elements by which the transmission member may be coupled alternatively to one or the other of the spaced members according to whether the transmission member is positioned to face in one direction or in the opposite direction when it is placed on the shaft.

Referring to the drawings,

Fig. 1 is a side elevation, partly broken away, of a fastener-inserting machine embodying the several features of the present invention;

Fig. 2 is a detail sectional view illustrating means for mounting and adjusting one of the fastener-inserting tools;

Fig. 3 is a cross-section through the clamping means for securing the horn of the machine to the frame;

Fig. 4 is a sectional view on a larger scale of a detail included in Fig. 1;

Fig. 5 is a view, partly in section and partly in elevation, of a clutch mechanism and parts operated thereby;

Fig. 6 is a perspective view including the delivery end of the raceway and parts adjacent thereto; and

Fig. 7 is a top plan view, partly in section, of a detent for controlling the fasteners in the raceway.

The general organization of the illustrated machine is similar, with some exceptions, to that illustrated and described in United States Letters Patent No. 1,369,021 granted February 22, 1921 on an application filed in my name. The frame 10 of the machine is designed to be secured to a supporting column (not shown) and is provided with horizontal bearings for a continuously driven power shaft 12 and with horizontal bearings for a crank shaft 14. A pulley 16 affixed to the shaft 12 receives rotation from a continuously driven belt 18. A pinion 20 also affixed to the shaft 12 drives a spur gear 22 loosely mounted on the crank shaft 14, as shown in Fig. 5. The gear 22 is driven continuously and constitutes the driving member of a controllable clutch for operating the crank shaft 14.

The crank member 24 of the shaft 14 operates a vertically movable plunger 26 (Figs. 1 and 6) by which a fastener-inserting tool 28 is carried. The connections for reciprocating the plunger 26 comprise a lever 30, a link 32 connecting the crank 24 and the lever 30, and a block 34 carried by the plunger 26 and connected thereto by a pivot pin 36. The forward end of the lever 30 is forked to straddle and engage the pivot block 34. The lever 30 is enclosed in a hollow overhanging arm 38 of the frame 10 and is connected thereto by a fulcrum pin 40. The plunger 26 is arranged to slide in bearings formed in the arm 38, one of these bearings being indicated at 42 in Fig. 6.

The fastener-inserting tool 28, Fig. 6, is affixed to the lower end of the plunger 26 and is provided with a spring-pressed spindle 44 of a type commonly used for taking annular fasteners, such as eyelets and grommets, from a raceway, the lower portion of the plunger being bored to provide a socket for a compression spring 46 by which the spindle is normally projected from the body of the tool 28 (Fig. 6) to impale a fastener at the delivery end of the raceway.

A fastener-setting tool 48 is supported in alinement with the tool 28 by a horn 50. The horn is detachably secured to the frame 10 so that it may be readily replaced by a horn of another shape whenever the requirements of the work would be better served by a horn of another shape. For this purpose the

frame 10 is provided with a cylindric socket 52 and the horn is provided with a cylindric shank 54 formed to be inserted axially into the socket, as shown in Fig. 1. A shoulder 56 formed on the horn provides an abutment for engaging the front face of the socket portion of the frame to register the tool 48 with the tool 28. A dowel 58 projecting from the frame 10 enter a hole in the horn to maintain the axis of the tool 48 in parallel relation to the axis of the tool 28.

The shank 54 is positively locked and tightly clamped in the socket 52 by a cylindric clamping member 60 arranged to turn and slide axially in a cylindric bore 62 formed in the frame 10. The bore 62 and the socket 52 cross each other in intersecting relation. A flat inclined face 64 formed on the member 60 is arranged to bear on a flat inclined face 66 formed on the shank 54 so that when the member 60 is shifted endwise to the right as viewed in Fig. 3, as by setting up the nut 68, the face 64 exercises a wedging action by which the shank is clamped against the wall of the socket 52 with pressure transverse to the axis of the shank, and at the same time a component of axial thrust due to the inclination of the face 66 urges the shoulder 56 of the horn against the abutting face of the frame 10. Moreover, when the clamping member 60 is set up tightly, the inclined face 66 maintains the shoulder 56 positively against the abutting portion of the frame. This positive locking of the horn to the frame 10 is particularly desirable to counteract the tendency of the shank 54 to work out of the socket 52 under the force of leverage produced by pressure of the tool 28 against the tool 48. To release the horn 50 so that it may be detached requires merely removing the nut 68 and shifting the clamping member 60 to the left far enough to clear the shank 54.

The tool 48 is provided with a smooth cylindric stem 70 (Fig. 2) formed to turn and slide axially in a socket 72 formed in the horn 50. The lower portion of the socket 72 is provided with an internal screw thread 74 to receive a backing screw 76, but the upper portion of the socket has a cylindric counterbore to provide for smooth engagement with the stem 70. In practice, the screw 76 sustains the inserting and clenching pressure brought to bear against the tool 48 by the tool 28.

To provide for adjusting the screw 76 to regulate the pressure with which the tools will cooperate, the screw and the stem 70 are provided with cooperative coupling formations which, as illustrated in Fig. 2, comprise a tongue 78 and a groove 80. The fastener-engaging portion of the tool 48 projects from the horn 50 and is readily accessible so that it may be grasped and turned with a thumb and finger to adjust the screw 76. The horn 50 is provided with a set-screw 81 arranged to engage and clamp the stem 70 with friction sufficient to prevent accidental turning of the stem and to maintain the stem in coupled relation to the screw 76.

Annular fasteners such as eyelets or grommets are supplied to the tool 28 by a detachable unit comprising a raceway 82 and a hopper 84. This unit is mounted on the overhanging arm 38 by a horizontal pivot pin 86. Suitable mechanism is provided for oscillating the raceway to present the fasteners one by one to the tool 28. This mechanism comprises a crown cam 88 affixed to the crank shaft 14, a cam arm 90 affixed to a rock shaft 92, a cam roll 94, an arm 96 tightly clamped to the rock shaft 92, a link 98 (Fig. 6) connecting the arm 96 and the raceway, and a torsion spring 100 surrounding and connected to the arm 90 to maintain the roll 94 against the cam 88.

A rotary brush 102 is arranged in the hopper 84 to feed the fasteners into the upper end of the raceway 82. This brush is provided with a pulley, as shown in said Letters Patent No. 1,369,021, so that it may be driven by a belt 104 that runs over sheaves 106 and around a transmission pulley 108 mounted on the crank shaft 14 (Fig. 5). The crank member 24 and the continuously driven gear 22 are spaced from each other and the pulley 108 is interposed between them. A coupling pin 110 is inserted tightly into the pulley 108 and projects from one face thereof so that it may be inserted into a hole 112 bored in the crank member 24 or, if preferred, into a hole 114 bored in the gear 22, the choice between the holes 112 and 114 depending upon whether it is desired to drive the brush 102 continuously or only while the crank shaft 14 is in operation. When assembling the mechanism shown in Fig. 5, the pulley 108 may be placed on the crank shaft in either of two positions, that is, with the projecting portion of the pin 110 at the left, as shown, or at the right, according to the direction in which the pulley is faced when it is placed on the shaft.

A controllable clutch of any suitable or preferred type may be provided to form a driving connection between the gear 22 and the crank shaft 14. The construction of the clutch shown in Fig. 5 is essentially the same as that illustrated and described in United States Letters Patent No. 1,351,138 granted August 31, 1920 on an application of R. B. Smith.

The driven member 116 of the clutch is a collar affixed to the shaft by a pin 118. A bolt 120 extends loosely through the collar 116 and is adapted to slide relatively thereto. A segmental wedge member 122 is affixed to the outer end of the bolt 120 and partly encircles the shaft 14. The inner end of the bolt 120 may engage any one of a series of lugs 124 carried by the gear 22, but when the bolt is retracted, as herein illustrated, it clears the

lugs 124. A pin 126 projects laterally from the bolt 120 into engagement with a compression spring 128 nested in the collar 116. When the wedge member 122 is released the spring 128 projects the bolt 120 to the left so that its inner end will stand in the path of one of the lugs 124 and thereby form an operative connection between the driving and driven members of the clutch.

The clutch may be controlled by a vertically movable rod 130 guided by a fixture 131, the rod being normally raised by a compression spring 132 and, if desired, connected to a treadle (not shown) for depressing it to release the wedge member 122. So long as the rod 130 is held depressed the members of the clutch will remain in coupled relation but when the rod is permitted to rise under the influence of the spring 132 its upper end moves into the path of the wedge member 122 and the latter is thereby displaced to the right sufficiently to remove the bolt 120 from the path of the lugs 124.

Referring to Fig. 6, the delivery end of the raceway 82 is provided with a two-part detent for controlling the fasteners in the raceway, one of the parts consisting of a fastener-engaging member 134 and the other part consisting of a spring-stressed member 144. These two parts are provided with cooperative coupling portions comprising resilient clamping jaws 136, 136 (Fig. 7) formed on the member 134 and a cylindric stem 138 formed on the member 144. A clamping screw 140 extends through the jaws 136 to draw them toward each other. The stem 138 extends through a boss 142 of the raceway to form a pivotal conection therewith. When the parts are assembled as shown, with the member 134 clamped to the stem 138, the two parts of the detent are maintained in cooperative relation to the raceway by their coupling portions.

A pin 146 inserted into a socket in the raceway and urged outwardly by a compression spring 148 applies the force of the spring to the member 144 to maintain the tip of the member 134 normally in position to arrest a fastener at the delivery end of the raceway, but when the raceway is retracted by its cam 88 the fastener then engaging the member 134 is held by the spindle 44 so that this fastener is drawn past the tip of the detent and detached from the raceway. The detent, being thus displaced, is immediately returned to its normal position by the spring 148 so that the next succeeding fastener in the raceway will be arrested thereby. The two-part construction of the detent provides for substituting a new member 134 when the one in use becomes worn, but the substitution of a new member 134 does not require replacement or removal of the member 144.

The clutch-controlling mechanism is organized to stop the machine when the plunger 26 is fully raised so that the lower end of the spindle 44 will be above the fastener at the delivery end of the raceway. When the shaft 14 is set in operation the spindle 44 enters the fastener, whereupon the raceway is retracted to clear the tool 28, the impaled fastener being thus detached from the raceway and remaining on the spindle until it is inserted into the work by the downward stroke of the plunger.

The raceway remains retracted until the tool 28 has risen far enough to clear it, but then returns to its initial position so that the next fastener will be placed in register with the spindle 44. In practice, the operator releases the clutch-controlling rod 130 as soon as possible after depressing it, so that the machine will stop at the end of each cycle.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. Fastener-inserting mechanism comprising a fastener-setting tool and a backing screw therefor provided with cooperative coupling formations by which the tool may turn the screw, a support having a socket to receive said screw and a portion of said tool, said socket having an internal screw-thread to cooperate with said backing screw, and means arranged to engage said tool to prevent accidental turning of the tool and the backing screw.

2. Fastener-inserting mechanism comprising a fastener-setting tool and a backing screw therefor provided with cooperative coupling formations by which the tool may turn the screw, a support having a socket to receive said screw and a portion of said tool, said socket having an internal screw-thread to cooperate with said backing screw, and clamping means arranged to engage said tool to maintain it in coupled relation to said backing screw and to prevent accidental turning thereof.

3. Fastener-inserting mechanism comprising a fastener-setting tool and a backing screw therefor provided with cooperative coupling formations by which the tool may turn the screw, a support having a socket to receive said screw and a portion of said tool, said socket having an internal screw-thread to cooperate with said backing screw, and a set-screw arranged in said support to engage said tool and thereby maintain the tool in coupled relation to the backing screw and prevent accidental turning thereof.

4. Fastener-inserting mechanism comprising a fastener-setting tool and a backing screw therefor provided with cooperative tongue-and-groove portions by which the tool may turn the screw, a support having a socket to receive said screw and a portion of said tool, said socket having an internal screw-thread to cooperate with said screw, and means arranged to secure said tool

against accidental turning and against accidental disengagement from said screw.

5. Fastener-inserting mechanism comprising a fastener-setting tool having a smooth cylindric stem, a backing screw for said stem, said screw and said stem having cooperative coupling formations by which the tool may turn the screw, a support having a socket provided with an internal screw-thread for said screw and with a smooth counterbore to receive said stem, and means arranged to engage said stem to maintain it in coupled relation to said screw and to prevent accidental turning thereof.

6. A fastener-inserting machine comprising a frame provided with a socket, a horn for supporting a fastener-setting tool, the horn having a shank formed to be inserted axially into said socket and the shank having an inclined face, a clamping member mounted in said frame and arranged to engage said inclined face of the shank to clamp the horn, and means arranged to tighten said clamping member against said shank, the inclination of said face being such as to produce a component of axial thrust of the shank inwardly as the clamping member is tightened.

7. A fastener-inserting machine comprising a frame provided with a socket and a cylindric bore in intersecting and crossed relation to each other, a horn for supporting a fastener-setting tool, the horn having a shank formed to be inserted axially into said socket, a cylindric clamping member arranged to slide in said bore and engage one side of said shank, said clamping member and the shank having cooperative flat faces inclined to produce a compound wedging action one component of which causes axial thrust of the shank inwardly, and means arranged to tighten said clamping member by moving it lengthwise.

8. A fastener-inserting machine comprising a frame provided with a socket and a cylindric bore in intersecting and crossed relation to each other, a horn for supporting a fastener-setting tool, the horn having a shank formed to be inserted axially into said socket, an abutment arranged to limit the inward movement of the shank, a cylindric clamping member arranged to slide in said bore and engage said shank, said clamping member and the shank having cooperative flat faces, that of the clamping member being inclined to clamp the shank against the wall of said socket and that of the shank being inclined to urge the horn against said abutment, and means arranged to tighten said clamping member by moving it lengthwise.

9. A fastener-inserting machine comprising an operating shaft, a controllable clutch mounted thereon for driving the shaft periodically, the driving member of said clutch being rotatable while the shaft is at rest, a member carried and driven by said shaft and spaced from said driving member, a transmission member arranged on said shaft between said spaced members, said transmission member and each of said spaced members having cooperative coupling elements by which the transmission member may be coupled alternatively to one or the other of the spaced members according to the direction in which the transmission member faces, fastener-inserting mechanism operated by said shaft, and means operated by said transmission member for supplying fasteners to said mechanism.

10. Fastener-inserting mechanism comprising a support provided with a socket, a fastener-setting tool and a backing screw therefor arranged in said socket in abutting end-to-end relation, said socket having an internal screw-thread engaging said screw and the abutting ends of said tool and said screw having cooperative coupling formations for transmitting rotation from the tool to the screw whereby the tool is rendered effective to adjust the screw relatively to said support.

11. Fastener-inserting mechanism comprising a support provided with an internally threaded socket, a screw arranged in said socket and spaced from the mouth of the socket, and a fastener-setting tool having a shank adapted to slide lengthwise into said socket and abut one end of said screw in the socket, said shank and the abutting end of said screw having cooperative coupling formations by which rotation of the tool may be imparted to said screw.

12. A tool for fastener-inserting machines comprising a smooth cylindric shank portion, a fastener-engaging portion at one end of said shank portion, and a coupling formation at the other end of said shank portion to transmit rotation to a backing screw provided with a complemental coupling formation.

13. A tool for fastener-inserting machines comprising a smooth cylindric shank portion, a fastener-engaging portion at one end of said shank portion, and a diametrically extending tongue at the other end of said shank portion to transmit rotation to a backing screw provided with a complemental groove for receiving said tongue.

In testimony whereof I have signed my name to this specification.

PERLEY R. GLASS.