

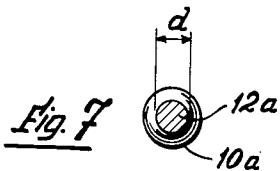
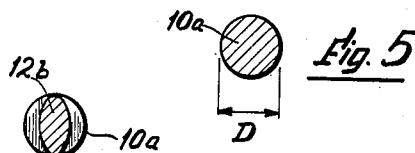
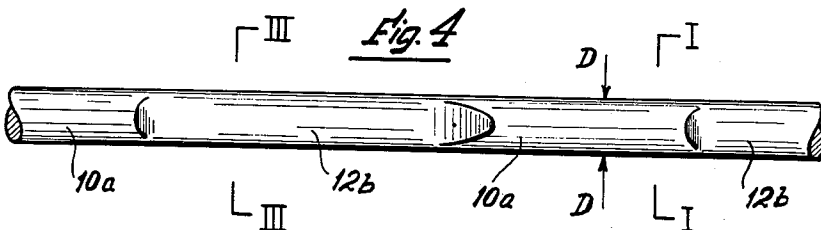
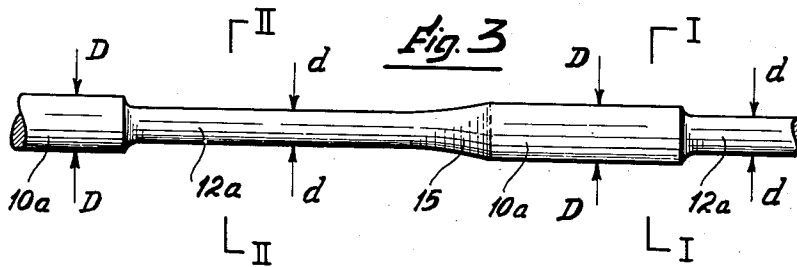
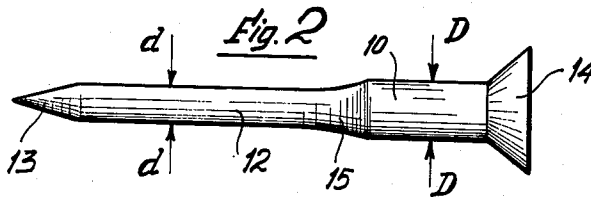
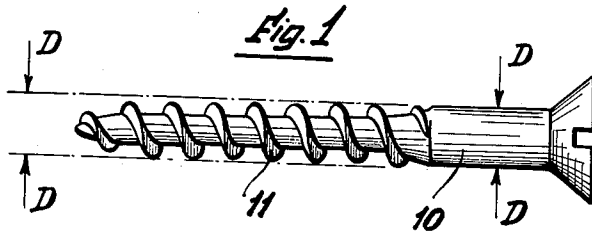
April 3, 1956

S. CHIABERTA ET AL
METHOD OF PRODUCING BLANKS FOR ROLL THREADED
SCREWS AND THE LIKE BY A COMBINED
FORGING AND DRAWING ACTION

2,740,136

Filed Feb. 24, 1951

4 Sheets-Sheet 1



INVENTORS
Serafino Chiaberta and
Rico Chiaberta
BY

[Signature]

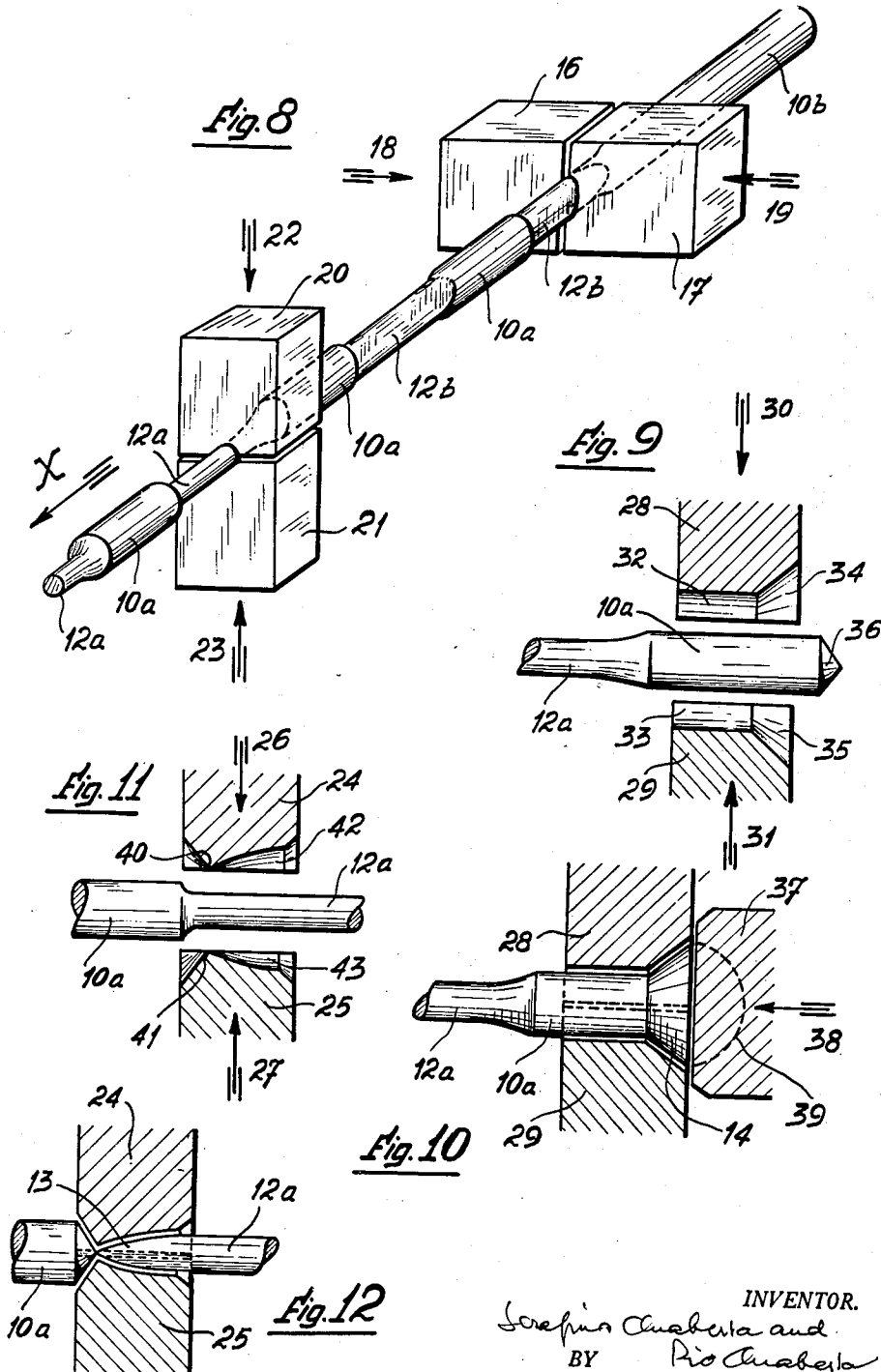
April 3, 1956

S. CHIABERTA ET AL
METHOD OF PRODUCING BLANKS FOR ROLL THREADED
SCREWS AND THE LIKE BY A COMBINED
FORGING AND DRAWING ACTION

2,740,136

Filed Feb. 24, 1951

4 Sheets-Sheet 2



INVENTOR.
S. Chiaberta and
BY P. Chiaberta
Undersigned

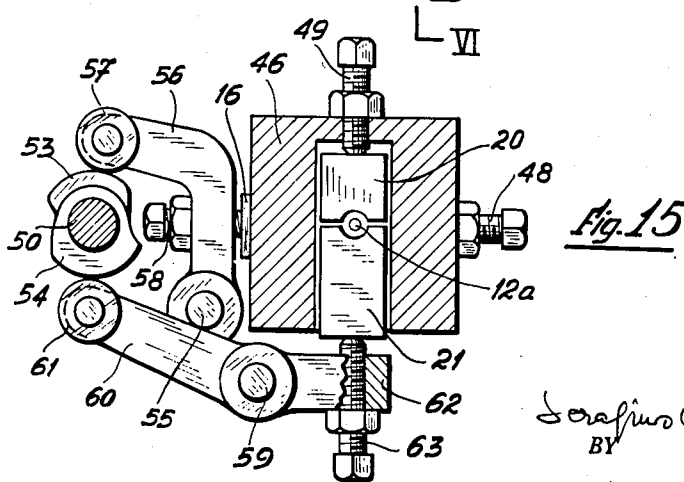
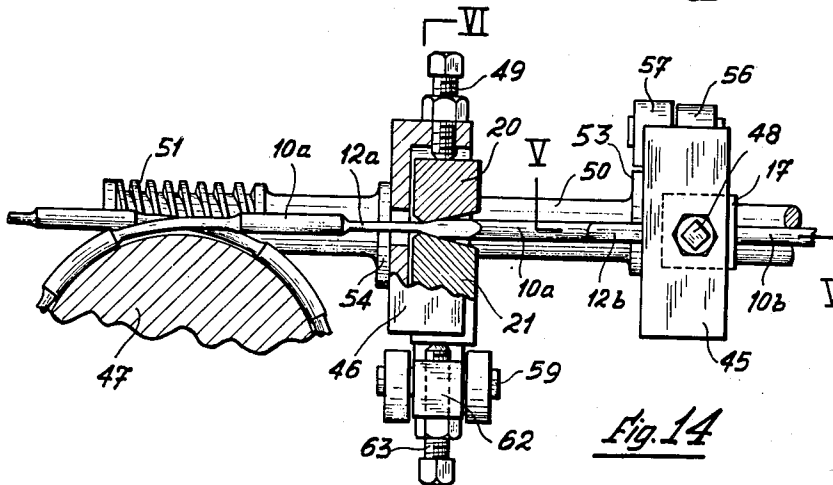
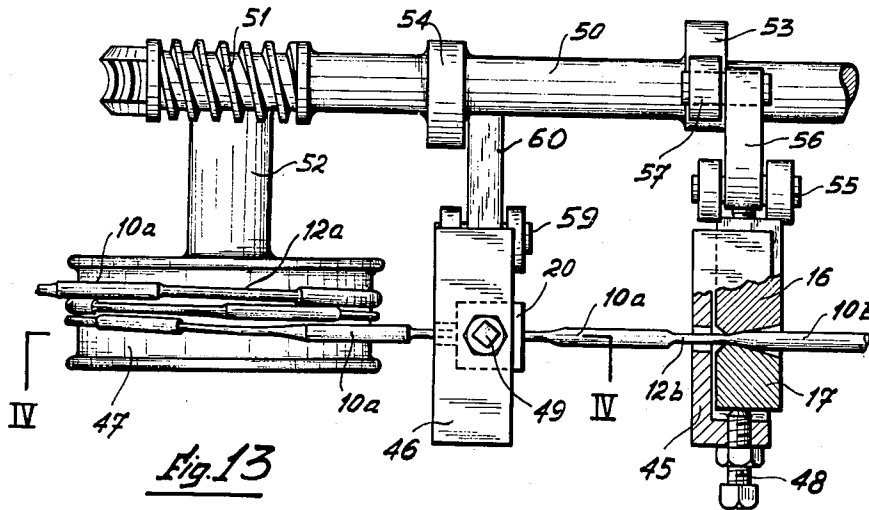
April 3, 1956

S. CHIABERTA ET AL
METHOD OF PRODUCING BLANKS FOR ROLL THREADED
SCREWS AND THE LIKE BY A COMBINED
FORGING AND DRAWING ACTION

2,740,136

Filed Feb. 24, 1951

4 Sheets-Sheet 3



INVENTOR.

Serafino Chiaberta and
Reto Chiaberta

Widnell [Signature]

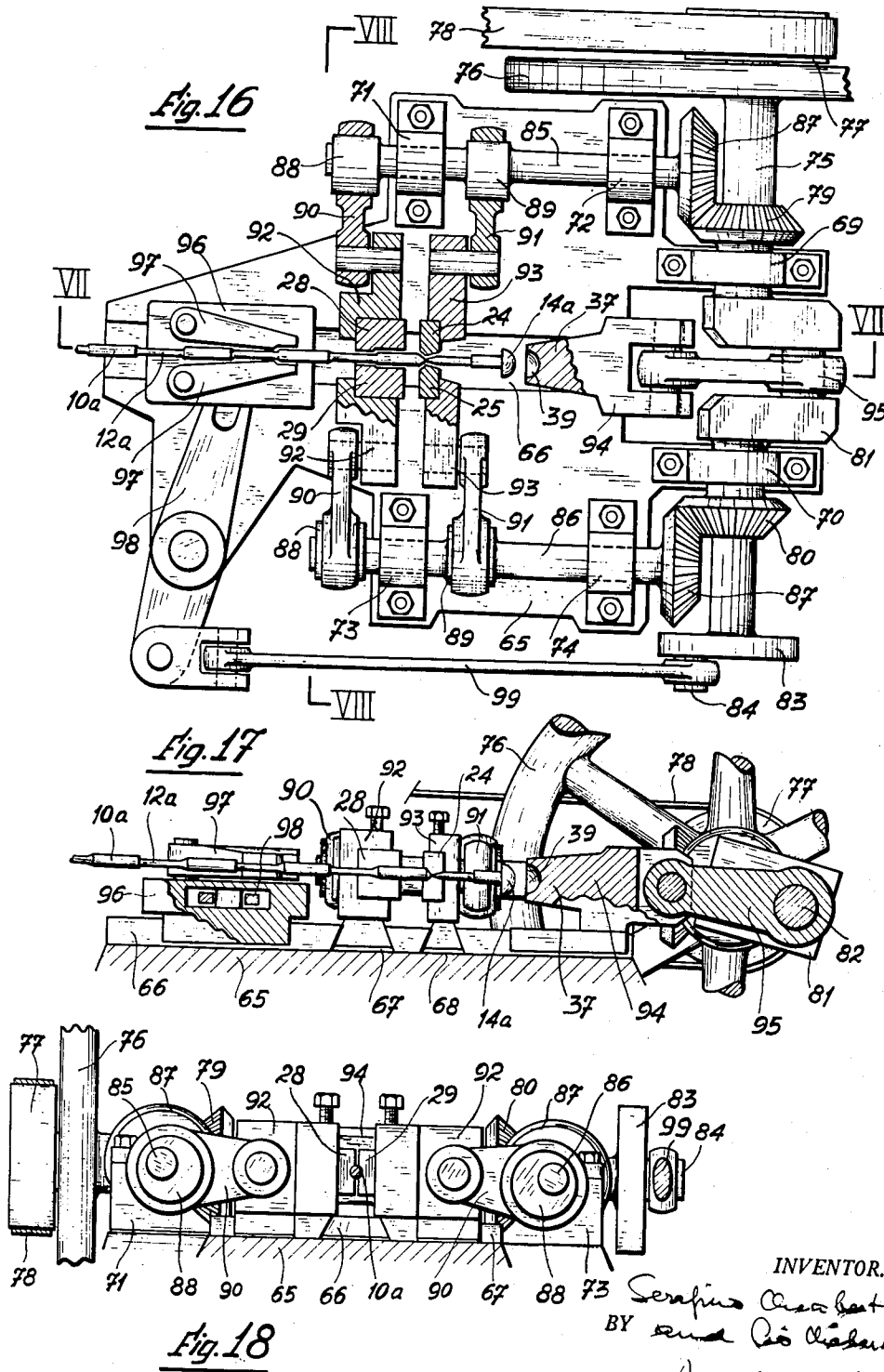
April 3, 1956

S. CHIABERTA ET AL
METHOD OF PRODUCING BLANKS FOR ROLL THREADED
SCREWS AND THE LIKE BY A COMBINED
FORGING AND DRAWING ACTION

2,740,136

Filed Feb. 24, 1951

4 Sheets-Sheet 4



INVENTOR.

Serafino Chiaberta
BY *[Signature]*
[Signature]

1

2,740,136

METHOD OF PRODUCING BLANKS FOR ROLL THREADED SCREWS AND THE LIKE BY A COMBINED FORGING AND DRAWING ACTION

Serafino Chiaberta and Pio Chiaberta, Milan, Italy, assignors to Bulloneria E Viterie Italiana E. E. V. I., Milan, Italy

Application February 24, 1951, Serial No. 212,558

Claims priority, application Italy February 27, 1950

8 Claims. (Cl. 10—10)

This invention relates to a new and useful method and means for producing blanks to be used in mass production manufacturing of screws, wood screws, bolts and the like, and more particularly this invention relates to a method and means for producing blanks for such screws and bolts the threaded section of which is formed by means of a screw-thread-rolling machine.

Generally speaking, in the commercial production of such screws and bolts in large quantities the roll threading of the threaded section is increasing in popularity as a manufacturing method the only difficulty being that roll threading tends to raise the major diameter of the thread above the diameter of the shank of the screw, which is objectionable. The threaded section of the screw should not be larger in diameter than the shank section which is not threaded. Because of the above said tendency of rolling to increase the diameter, the section of the blank which is to be thus threaded is reduced to less diameter than the shank section so that when the thread is rolled it will have the desired diameter.

According to current knowledge in the art, several methods are employed to reduce the diameter of the shank previous to roll threading, so that the major diameter of the thread will finally be equal to the diameter of the shank portion. One method is to reduce the diameter of a portion of a cylindrical blank by the extrusion process, which consists in pushing the blank in a die having a shoulder and then a reduced diameter in the die block, so that in being forced through the hole in the die the stock must extrude or become reduced in diameter. Another method is to reduce the diameter by the swaging process, and still other methods comprise steps in which a cylindrical blank is subject to hammering, or to compression between movable dies, or other diameter reducing means and treatments.

All known diameter reducing methods substantially of the type above said are subject to common objection that the volume of production is lowered by the fact that the diameter reducing step must necessarily be actuated by an action exerted on any single cylindrical blank. Any diameter reducing machine either working according to the extrusion process or according to the swaging or any other known process must necessarily be provided with a large number of movable and reciprocating parts and members, and the operation of same machine cannot attain the desirable high production speed. However, any known diameter reducing process is satisfactory for making roll threaded screws and bolts of short lengths only, i. e. under actual manufacturing conditions reduction of diameter of a quite long shank portion is not practical in view of the fact that the material easily cracks or becomes otherwise spoiled under such treatment.

We are aware that it has been proposed to manufacture stud-bolts from cylindrical metallic bar stock comprising diametrically reduced portions spaced apart along the length of the bar, the roll threading being actuated on the said reduced portions upon parting off stud-bolts

2

blanks from said bars, and said diameter reduction being actuated by cold swaging the bar at points correspondingly spaced apart. Said manufacturing method is subject to the objection that the cold swaging process for reducing of the diameter of spaced portions of a cylindrical bar is not convenient for high speed mass production and more particularly a continuous production flow is not attainable, while such condition is desirable when a fast operating screw-rolling machine is to be fed.

The main object of the present invention is to provide a mass production manufacturing method which will rapidly produce pointed and headed screw and bolt blanks of accurate size and condition to be immediately threaded by a thread rolling machine.

A further object of the present invention is to provide a means for continuous flow production of a cylindrical metallic bar stock comprising portions of reduced diameter, said portions being so dimensioned and spaced apart along the length of said bar that blanks having a cylindrical shank portion and a portion of reduced diameter may be cut off from said bars.

A still further object of the present invention is to provide a means for cutting off blanks from a metallic bar stock comprising portions of reduced diameter, and for having the cut off blanks properly pointed and headed.

With the above objects in view, our present invention mainly consists of the method of producing a metal article of the type having a shank with a portion reduced in diameter which method consists in subjecting a cylindrical metallic bar stock to a diameter reducing drawing action at points spaced apart along the length of the bar so as to form on the bar spaced portions of less diameter than the original diameter of the bar and adjacent to portions of same bar in which portions said bar is left of its original diameter, and then in cutting off from the bar pieces comprising one portion reduced in diameter and one adjacent portion of original diameter.

More particularly, with the above objects in view, our present invention consists of the method of subjecting a metallic bar stock to a diameter reducing drawing operation at spaced points in which operation two drawing steps are comprised, in the first of said drawing steps a drawing action is exerted at points spaced apart along the length of the bar as to form on said bar spaced portion of substantially flattened cross-sectional shape and adjacent to portions of same bar in which the latter has its original diameter and shape, in the second of said drawing steps a second drawing action is exerted at same spaced points at which said first drawing action was previously exerted, so as to reduce said flattened spaced portion to a substantially circular cross-sectional shape of less diameter than the original diameter of the bar.

According to our present invention, the diameter reducing drawing action is performed by the use of at least one drawing die the drawing nozzle of which is formed by the combinations of two opposite die blocks, means being provided for moving said die blocks one against the other so as to form the drawing nozzle and for spacing apart said die blocks so that the metallic bar stock may freely pass between the die blocks, the said movements of said die blocks being so timed to the axial movement of the metallic bar that alternate portions along the length of said bar are subjected to the drawing action of said die blocks and respectively free from same.

More particularly, the diameter reducing drawing means according to the present invention comprises, in combination, a first pair of die blocks so shaped that when said blocks abut against each other a drawing nozzle of substantially elliptical cross-section is formed, means to reciprocate said die blocks in a direction normal to the axis of the bar, a second pair of die blocks so shaped that when said blocks abut against each other a drawing

nozzle of substantially circular cross-section is formed, said cross-section being of diameter less than the original diameter of the bar, mean to reciprocate said die blocks in a direction normal to the axis of the bar and in a direction comprising the major axis of the elliptical cross-section of the bar previously subjected to the drawing and flattening action by said first pair of die blocks, and means for coordination of the axial movement of the bar with the reciprocating movements of the first pair of die blocks and with the reciprocating movements of the second pair of die blocks so that the said second pair of die blocks acts on same portions previously subjected to action by the said first pair, said drawn portions being spaced apart along the length of the bar and adjacent to portions in which said bar is left of original diameter and shape.

With the above objects in view, in a preferred embodiment of our invention the cutting off of pieces from the metallic bar stock drawn at portions spaced along its length is performed by means of cutting dies shaped to form the bar portion near to cut into a substantially pointed shape, so that the stock is cut off into properly pointed wood screw blanks.

With the above objects in view, in a most preferred embodiment of our invention the step of cutting off the stock drawn at portions spaced along its length is performed by a machine comprising, in combination, a pair of cutting dies so shaped that the bar portion near to cut is shaped into a substantially conical point while the cutting is performed, a pair of gripping dies arranged to squeeze the shank portion of the bar near the point from which the preceding piece was previously cut off, the hollow of said gripping dies being provided with a recess in which the screw head may be formed by axial hammering, an axial hammer arranged to punch on the end of the bar located in said recess, means being provided for reciprocating and timing said cutting dies, said gripping dies and said axial hammer with the feeding motion of the metallic bar stock in the machine.

The abovesaid and other novel features which we consider as characteristic of our invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and combination of parts and to certain steps in the method of operation, together with additional objects and advantages which will appear as the description proceeds, will be best understood from the following description when read in connection with the accompanying drawings, in which one preferred form of embodiment of the invention has been shown.

In said drawings:

Figure 1 is a side view of a specific wood screw as produced by roll threading a blank.

Figure 2 is a side view of said blank, as attainable by applying the method and by using the means according to our invention.

Figures 3 and 4 are side views of lengths of stock during various stages of operation.

Figures 5, 6 and 7 are cross-sectional views of the stock shown in elevation in Figs. 3 and 4.

Figure 8 is a perspective view diagrammatically showing the arrangement and the action of drawing dies on the metallic bar stock.

Figures 9 and 10 are diagrammatic side views of the end of the stock adapted to be acted on by the gripping dies and by the heading axial hammer, and of the action of said dies and hammer respectively, said dies and hammer being shown in cross-sectional view.

Figures 11 and 12 are likewise diagrammatic side views of a length of stock adapted to be acted on by the cutting dies and of the action of said dies respectively, the latter being shown in cross-section.

Figure 13 is a plan view of the assembly comprising the operative parts of the machine actuating the drawing steps of the method, said machine being in part

shown in sectional plan view taken on the line V—V of Fig. 14.

Figure 14 is a side view of same assembly, shown partly in section taken on the line IV—IV of Fig. 13.

Figure 15 is a cross-sectional view of same, taken on the line VI—VI of Fig. 14.

Figure 16 is a partly sectioned plan view of the machine actuating cut-off from the drawn stock, and the pointing and heading of wood screw blanks.

Figure 17 is a partly sectioned side view of same machine, the section being taken on the line VII—VII of Fig. 16.

Figure 18 is a cross sectional view of same machine, taken on the line VIII—VIII of Fig. 16.

Like reference characters refer to like or equivalent parts throughout the several figures. Change of reference letters coupled to reference numeral indicates change of shape or of position of like or equivalent parts.

Referring first to Figs. 1 to 7 inclusive:

According to present knowledge in the art, when a conventional wood screw is produced in the shape as substantially shown in Fig. 1, which wood screw comprises a cylindrical shank portion 10 of a certain diameter D and a screw threaded portion 11 of substantially the same diameter D, the thread can only be formed by the roll threading manufacturing method if a blank as substantially shown in Fig. 2 is provided, namely if a blank is provided with a cylindrical shank portion 10 of diameter D and with a portion 12 of reduced diameter *d* and of circular cross-sectional shape. For reason of cheap mass production and for the sake of the article's quality it is deemed preferable that the blank be provided with a substantially conical end 13, with an enlarged head 14 and with an intermediate substantially frusto-conical portion 15 in which the major diameter D of the shank portion is progressively decreased up to the minor diameter *d* of the portion 12 which is to be subjected to roll threading. The main object of the present invention is to provide a method and means for rapidly and cheaply mass-producing such a blank.

The method according to our invention may be roughly divided into two major steps: by means of the first of said major steps, a metallic bar or wire stock of cylindrical cross-sectional shape and of uniform diameter D is transformed into a stock substantially having the shape as shown in Fig. 3, said stock comprising portions 10a of original diameter D and portions 12a of reduced diameter *d*, any portion 10a being connected to the adjacent next portion 12a by a frusto-conical portion 15 and all said portions being regularly spaced apart along the stock length. By means of the second of said major steps, a plurality of wood screw blanks are cut off from said stock and made in the shape substantially shown in Fig. 2.

According to one characteristic of this invention, the first major step is performed by a drawing process, which process itself is divided into two minor drawing steps, during the first of which the cylindrical metallic bar or wire of uniform diameter D is reduced into a stock (substantially shown in Fig. 4) comprising untouched cylindrical portions 10a of diameter D and portions 12b of flattened cross-sectional shape is shown in Fig. 6, in which said stock is shown in cross-section. During the second of said minor drawing steps all flattened portions 12b of the stock are reduced into portions 12a of reduced diameter *d* and of circular cross-sectional shape, as shown in Fig. 7, in which said stock is shown in cross-section, while portions 10a are left untouched in their original circular cross-sectional shape and original diameter D, as shown in Fig. 5, in which both stocks of Figs. 3 and 4 respectively are shown in cross-section.

The drawing steps for reducing a cylindrical metallic bar or wire stock in a stock provided with a plurality of portions of reduced diameter spaced apart along its length are diagrammatically shown in Fig. 8, which shows the

5

originally cylindrical stock 10b of uniform diameter D fed in axial direction by any conventional feeding device with a uniform feeding movement X through a drawing unit comprising a first pair of die blocks 16 and 17 pressed against the stock in opposite directions 18 and 19 respectively, the operative surfaces of said die blocks being so shaped that a substantially elliptical drawing nozzle is formed for reduction of cylindrical bar 10b in a bar 12b of flattened cross-sectional shape, means being provided for spacing apart said die blocks from time to time so that spaced portions 10a of bar are left untouched. Said drawing unit comprises further a second pair of die blocks 20 and 21 pressed against the stock in opposite direction 22 and 23 respectively, the operative surfaces of said die blocks 20 and 21 being so shaped that a substantially circular drawing nozzle of diameter d is formed for reduction of flattened portions 12a into portions 12a of reduced diameter d, means being provided for timing the action of said die blocks 20 and 21 so that they will engage only the portions 12b, leaving the said portions 10a untouched.

The drawing nozzles formed by the combination of opposite die blocks of both the said pairs of die blocks are shaped according to current knowledge in making dies for wire drawing, namely the said nozzles comprise an inlet portion of substantially conical shape, through which the material is forced and thereby progressively reduced to its desired final cross sectional shape. The frusto-conical portion 15 is formed as the die blocks move apart, since said portion 15 being the last portion on which the die blocks acted before the separation movement of the die blocks operation started. Any desirable proper shaping of said portion 15 is attainable by the use of correspondingly shaped drawing die blocks.

One important characteristic of this invention is the relative arrangement of the said two pairs of die blocks, the die blocks 20 and 21 of the second acting pair of die blocks being so arranged in the drawing assembly that the directions 22 and 23 of their movement towards the stock are in a plane forming an angle of 90° with the plane in which the die blocks 16 and 17 of the first acting pair of die blocks move respectively in the direction 18 and 19.

As result of the above said arrangement, the die blocks 20, 21 of the second pair of dies act by pressing the edges of the flattened sides of portions 12b of the stock, the cross-sectional shape of which was previously reduced into elliptical shape by the action of the first acting pair of dies, and by changing the thus pressed section of elliptical cross-section into a section of circular cross-section by pressing together the narrow opposite edge portions of said section of elliptical cross-section.

It will be easily understood how a metallic bar stock drawn as above said and provided with portions of reduced diameter spaced apart along its length of the stock may be reduced into a plurality of wood screw blanks provided with a shank portion, with a portion of reduced diameter, with a substantially conical point and with an enlarged head, by means of simple and fast working machines, said operation being substantially equivalent to the operations which constitute the steps of current and conventional manufacturing methods of making pointed and headed nails from a metallic wire stock.

The following description when read with reference to the accompanying Figs. 9 to 12 inclusive will demonstrate what was said above: as diagrammatically shown in Figs. 11 and 12, a plurality of pointed wood screw blanks may be successively cut off from the drawn stock by action of a pair of cutting dies 24 and 25 moving in opposite directions 26 and 27 respectively towards the end portion of portion 12a of reduced diameter, said cutting dies being provided with opposite cutting edges 40 and 41 respectively, adjacent to semi-conical recesses 42 and 43 respectively, in which recesses the pressed portion of the stock is reduced into a substantially conical point 13,

6

while the blank comprising the pressed portion 12a is cut off from the next adjacent portion 10a of greater diameter.

The heading of blanks is made by the action of a device, the construction and operation of which is diagrammatically shown in Figs. 9 and 10. This device comprises a pair of gripping dies 28 and 29, and means for moving said dies in the direction 30 and 31, respectively, toward the end portion of the shank portion 10a of the stock, said dies being provided with substantially semi-cylindrical recesses 32 and 33, respectively, said recesses being so dimensioned that a tight grip of portion 10a may be attained, and with adjacent substantially frusto-conical recesses 34 and 35, respectively, said dies being arranged in the machine so as an end portion 36 of suitable length will protrude from said gripping dies when in closed, or gripping position. The heading is made by the axial blow of a hammer 37 moved in the direction 38 against the end portion 36 of the stock, said axial blow changing said end portion into the frusto-conical head 14 of the blank.

Of course, the shape of the gripping dies and of the hammer may be modified according to the desired shape of the blank's enlarged head; for example, if a rounded head is required, the gripping dies are not provided with frusto-conical recesses 34 and 35 while the hammer 37 is provided with a rounded recess 39, as shown in dotted line in Fig. 10, in which recess a rounded head will be formed. If heads are required with an external rounded surface and a middle frusto-conical part, both frusto-conical recesses in the gripping dies and a rounded recess in the hammer will be provided.

In Figs. 13 to 15 inclusive the construction of a machine by which the drawing steps are performed is shown, the frame, the merely structural and bearing parts, and some other members being omitted for sake of clearness, the omitted parts and members might be easily constructed by any skilled person by applying current knowledge. Said machine is constructed to operate according to the steps above described with reference to Figs. 3 to 8 inclusive and it comprises a first drawing unit comprising the first acting die blocks 16 and 17 slidably arranged in a block member 45, a second drawing unit comprising the second acting die blocks 20 and 21 slidably arranged in a block member 46, a winding drum 47 around which the drawn metallic wire or bar is wound and by which the necessary tractive pull may be imparted to said metallic wire for its passage through the drawing nozzles formed by the die blocks in closed position, and means for driving said winding drum and for alternately pressing one die block of any pair of die blocks towards the second die block of the same pair, said pressing means being in timed connection with said driving means. In particular, since the necessary magnitude of movement of die block is very little, only means for movement of the die block 16 of the first drawing unit and of the die block 21 of the second drawing unit are provided, the other die blocks 17 and 20 of the first and second drawing units, respectively, being fixedly connected to the respective blocks members 45 and 46 by abutment against adjustable bolts 48 and 49, respectively.

The driving mechanism of the apparatus comprises a driving shaft 50, which is connected to a suitable source of rotative power (not shown) by which it may be driven. Said shaft 50 is connected to the shaft 52 of the winding drum 47 by means of any suitable positive transmission 51, and it is provided with two cams 53 and 54 respectively.

Pivotaly supported at 55 on the machine frame (not shown) there is an elbow shaped lever 56, the free end portion of which is provided with a roller 57 rolling on said cam 53 and the middle portion of which is provided with an adjustable bolt 58 abutting on the external face of the movable die block 16 of the first drawing unit. The machine is provided also with a second lever pivotaly supported at 59 on the machine frame, one side portion 60 of said lever being provided with a roller 61 rolling on

the second cam 54 of shaft 50, and the second side portion 62 of this lever being provided with an adjustable bolt 63 abutting on the external face of the movable die block 21 of the second drawing unit.

The machine above described operates as follows: assuming that a length of the metallic bar stock to be drawn is properly arranged through both drawing units and wound around the winding drum 47, the driving of the shaft 50 will actuate the drawing steps according to the above described method; by means of the transmission 51, the winding drum 47 receives an uniform rotative motion thus pulling stock with uniform speed through both drawing units. The rotation of the shaft 50 to which the cams 53 and 54, described above, are fixedly attached causes the levers 56 and 60, 62 to be oscillated, through the interaction of the rollers 57 and 61 and the cams 53 and 54 respectively, and the movement of the levers presses the movable die blocks 16 and 21 towards the opposite die blocks 17 and 20, i. e. it makes the drawing nozzles of both drawing units operative. As the rollers 57 and 61 are lowering because of rotation of the, respectively, co-acting cams, the movable die blocks 16 and 21 respectively are made free to move rearwardly spacing themselves apart from the opposite die blocks 17 and 20, so that no drawing action will be exerted on the stock, which thus may freely pass between the pairs of die blocks. At any full revolution of the shaft 50 a drawing cycle will be performed, namely a portion of the metallic bar stock will be subjected to the drawing action and an adjacent portion of same stock will be left having the original diameter and cross-sectional shape, the length of the drawn and of the undrawn portions being dependent on the transmission ratio of transmission 51 and on the shape of the cams.

For proper operation of the described machine, attention is to be paid to some working conditions, and chiefly to the exact arrangement of parts so that the second drawing unit will be acting exactly on the stock's portions previously subjected to the action by the first drawing unit. The provision of adjustable bolts 48 and 49 for connection of die blocks 17 and 20 to block members 45 and 46, respectively, and the provision of adjustable bolts 58 and 63 as transmitting means between levers 56 and 62, respectively, and the movable die blocks 16 and 21 allows proper adjustment of the described machine to metallic bar stocks of different diameter.

Assuming that a metallic bar stock provided with portions of reduced diameter spaced apart along its length is formed by means of the first major step of the method according to this invention and by using a drawing apparatus substantially as above described, wood screw blanks may be cut off from said stock by using a machine as shown in Figs. 16 to 18 inclusive of the accompanying drawings.

The machine on which the dies and the hammer above described with reference to the preceding Figs. 9 to 12 inclusive are adapted to be mounted comprises, a substantially horizontal table 65 having a longitudinal dovetailed groove 66 and two parallel transversal dovetailed grooves 67 and 68. The table is provided with a rear set of bearings 69 and 70 and with two side sets of bearings 71 and 72 and respectively 73 and 74, and mounted in these bearings 69 and 70 is an operating shaft 75 upon which are mounted a flywheel 76 and a pulley 77, by which it may be driven by a belt 78.

The shaft 75 is provided with a symmetrically arranged pair of bevel gears 79 and 80, with a central crank 81 having a crank pin 82, and it is further provided with an end crank wheel 83 having a crank pin 84. Mounted on the sets of bearings 71 and 72 and respectively 73 and 74 are two parallel and symmetrically placed shafts 85 and respectively 86, each of which shafts is provided with one bevel gear 87 in meshing connection with bevel gears 79 and 80, respectively, mounted on said operating shaft 75, and with two eccentric pulleys 88 and 89, em-

braced by the heads of connecting rods 90 and 91, respectively, said connecting rods being pivotally connected to block members 92 and 93, respectively, slidably mounted, by means of suitable dovetail tongues, into said transversal grooves 67 and 68 of the table, respectively. All above described parts and members 87 to 93 inclusive mounted on or connected to the shafts 85 and 86 are symmetrically repeated and arranged on both sides of the apparatus.

The actual gripping dies 23 and 29 and cutting dies 24 and 25 are detachably mounted in the sliding block members 92 and 93, respectively, by any suitable means.

Slidably mounted on the rear portion of longitudinal groove 66 of the table is mounted a sliding block 94 the front portion of which actuates the axial hammer 37. In the form of embodiment shown in Figs. 16 and 17, said hammer 37 is provided with the above described rounded recess 39 in view of the production of wood screw blanks provided with a rounded head 14a. Said sliding block 94 is reciprocated by said crank 81 of the shaft 75 by means of a connecting rod 95 pivotally connected at one end to said sliding block and at the other end to said crank pin 82.

On the fore portion of the longitudinal groove 66 a conventional feeding device 96 is slidably mounted, said feeding device being provided with conventional movable gripping members 97 which may grip the stock when said feeding device is moved towards the axial hammer and release the stock when moving backwardly. Said feeding device 96 is reciprocated by an oscillating lever 98 connected to said crank wheel 83 by means of a connecting rod 99 pivotally coupled at its opposite ends to the outer end of said lever 98 and respectively to crank pin 84 of crank wheel 83.

The operation of the machine described with reference to Figs. 16 to 18 inclusive is as follows:

A motor drives the pulley 77 and thereby continually rotates the operating shaft 75 and, by means of the above described gearing and linking connections, all movable parts of the machine are kept in continuous rotating or reciprocating motion. Assuming that a length of metallic bar stock previously provided with portions of reduced diameter spaced apart along its length is properly inserted into the machine, namely arranged into the feeding device 96, the movements and the operation of the several operative parts and members of the described machine automatically perform the cutting off from the stock of pointed and headed screw blanks, by an operative cycle comprising three subsequent steps:

When the various parts of the machine are set in the position as shown in the figures, one blank is already finished and ready to be dropped down, i. e. the blank provided with its rounded head 14a is free from the gripping dies and from the axial hammer, and fully severed from the preceding portion 10a of the stock by the action of cutting and pointing dies 24 and 25. As the finished wood screw blank is dropped down, the continuous rotation of shafts 75, 85 and 86 causes the cutting dies 24 and 25 to be spaced apart, while the gripping dies are still kept in gripping position for a brief lapse of time, during which time the sliding block 94 is pushed forward, causing the punching of the previously truncated end of the stock by the axial hammer 37, and the consequent making of the head on the next adjacent portion of the stock, i. e. actuating the first step of the operative cycle; during said first step, the feeding device moves in retreat- ing direction.

After the gripping dies start to separate, while the cutting dies are still kept in spaced position, thus making the stock free from all dies, and in the meantime the operation of the connection means comprising crank 83, connecting rod 99 and lever 98 causes the feeding devices to be brought forward, thus causing the advance of the stock in the machine for a length equal to the length of a portion of stock comprising one portion 10a of large diam-

eter and the adjacent portion 12a of reduced diameter. Said advancing or feeding movement brings the subsequent and still untouched portion 10a of the stock in a position in which said portion is adapted to be acted on by the gripping dies and the rear end of the adjacent portion 12a adapted to be acted on by the cutting dies. The second step of the operative cycle ends as the stock is brought in position adapted to have a blank severed from the stock by the action of cutting dies.

The third step of the said operating cycle comprises the operative movement of the cutting dies and the consequent cutting off of one blank from the stock, and the dropping down of said blank (the head of which being already made during the first step, while the blank was still attached to the stock) makes the truncated end of the stock ready to be punched by the axial hammer. At this time, the cycle of operations has been complete, and the hammer and then the dies come again into action as described above. The full cycle of operations takes place during one revolution of shafts 75, 85 and 86.

It will be understood that the elements of the machine or means described above or parts thereof, and that one or more step of the described manufacturing method may find useful application in making devices and in producing goods of other types than those described.

While we have illustrated and described the invention as embodied in a method and means for producing blanks for roll threaded screws and the like, we do not intend to be limited to the detail shown, since various modifications and structural changes may be made and alterations in the number, order and arrangement of the steps of the manufacturing cycles and methods may be done without departing from the spirit and the scope of our invention.

Without further analysis the foregoing will so fully reveal the gist of our invention that other can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of the prior art, fairly constitute the essential characteristic of the generic or specific aspects of this invention, and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalents of the following claims.

What we claim as new and desire to secure by Letters Patent is:

1. A process for reducing the diameter of spaced portions of a continuously moving length of stock of circular cross-section, comprising the steps of first reducing each spaced portion to an elliptical cross-section of a minor diameter less than the original cross-sectional diameter of the stock by engagement with a first stationary drawing die means; and reducing the thus formed elliptical portions to a circular cross-section of less diameter than the original cross-section of the stock by engagement with a second stationary drawing die means, said second die means engaging only those portions of the stock which have been reduced by the first die means, whereby the parts of the stock located between said spaced portions remains substantially the same as the original cross-section of the stock.

2. A process for reducing the diameter of spaced portions of a continuously moving length of stock of circular cross-section, comprising the steps of first reducing each spaced portion to an elliptical cross-section of a minor diameter less than the original cross-sectional diameter of the stock by engagement with a first stationary drawing die means acting in the direction of said minor diameter; and reducing the thus formed elliptical portions to a circular cross-section of less diameter than the original cross-section of the stock by engagement with a second stationary drawing die means acting in a direction substantially normal to the direction of said first drawing die means, said second die means engaging only those portions of the stock which have been reduced by the first die means, whereby the parts of the stock located

between said spaced portions remains substantially the same as the original cross-section of the stock.

3. A process for reducing the diameter of spaced portions of a continuously moving length of stock of circular cross-section, comprising the steps of first reducing each spaced portion to an elliptical cross-section of a minor diameter less than the original cross-sectional diameter of the stock by engagement with a first stationary drawing die means; and reducing the thus formed elliptical portions to a circular cross-section of less diameter than the original cross-section of the stock by engagement with a second stationary drawing die means, said first and second die means acting simultaneously on two of said spaced portions, and said second die means engaging only those portions of the stock which have been reduced by the first die means, whereby the parts of the stock located between said spaced portions remains substantially the same as the original cross-section of the stock.

4. A process for reducing the diameter of spaced portions of a continuously moving length of stock of circular cross-section, comprising the steps of first reducing each spaced portion to an elliptical cross-section of a minor diameter less than the original cross-sectional diameter of the stock by engagement with a first stationary drawing die means acting in the direction of said minor diameter; and reducing the thus formed elliptical portions to a circular cross-section of less diameter than the original cross-section of the stock by engagement with a second stationary drawing die means acting in a direction substantially normal to the direction of said first drawing die means, said first and second die means acting simultaneously on two of said spaced portions, and said second die means engaging only those portions of the stock which have been reduced by the first die means, whereby the parts of the stock located between said spaced portions remains substantially the same as the original cross-section of the stock.

5. A process for reducing the diameter of spaced portions of a continuously moving length of stock of circular cross-section, comprising the steps of first reducing each spaced portion to an elliptical cross-section of a minor diameter less than the original cross-sectional diameter of the stock by engagement with a first stationary drawing die means; reducing the thus formed elliptical portions to a circular cross-section of less diameter than the original cross-section of the stock by engagement with a second stationary drawing die means, said second die means engaging only those portions of the stock which have been reduced by the first die means, whereby the parts of the stock located between said spaced portions remains substantially the same as the original cross-section of the stock; and severing from the stock pieces each of which is composed of one of said spaced portions of the stock and a part of the stock located between a pair of spaced portions thereof.

6. A process for reducing the diameter of spaced portions of a continuously moving length of stock of circular cross-section, comprising the steps of first reducing each spaced portion to an elliptical cross-section of a minor diameter less than the original cross-sectional diameter of the stock by engagement with a first stationary drawing die means; reducing the thus formed elliptical portions to a circular cross-section of less diameter than the original cross-section of the stock by engagement with a second stationary drawing die means, said second die means engaging only those portions of the stock which have been reduced by the first die means, whereby the parts of the stock located between said spaced portions remain substantially the same as the original cross-section of the stock; severing from the stock pieces each of which is composed of one of said spaced portions of the stock and a part of the stock located between a pair of spaced portions thereof, so that said pieces have opposite end portions one of which has a smaller cross-section than the other; and pressing said

11

one end portion of each piece, simultaneously with the severing thereof from the stock into a substantially pointed shape.

7. A process for reducing the diameter of spaced portions of a continuously moving length of stock of circular cross-section, comprising the steps of first reducing each spaced portion to an elliptical cross-section of a minor diameter less than the original cross-sectional diameter of the stock by engagement with a first stationary drawing die means; reducing the thus formed elliptical portions to a circular cross-section of less diameter than the original cross-section of the stock by engagement with a second stationary drawing die means, said second die means engaging only those portions of the stock which have been reduced by the first die means, whereby the parts of the stock located between said spaced portions remains substantially the same as the original cross-section of the stock; upsetting a free end of a part of the stock having the original diameter thereof to form a head on the free end of said part of the stock; and severing from the stock a piece thereof including the upset part of the stock and the spaced portions thereof located next to said upset part.

8. A process for reducing the diameter of spaced portions of a continuously moving length of stock of circular cross-section, comprising the steps of first reducing each spaced portion to an elliptical cross-section of a minor diameter less than the original cross-sectional diameter of the stock by engagement with a first stationary drawing die means; reducing the thus formed elliptical portions to a circular cross-section of less diameter than the original cross-section of the stock by

12

engagement with a second stationary drawing die means, said second die means engaging only those portions of the stock which have been reduced by the first die means, whereby the parts of the stock located between said spaced portions remain substantially the same as the original cross-section of the stock; upsetting a free end of a part of the stock having the original diameter thereof to form a head on the free end of said part of the stock; severing from the stock a piece thereof including the upset part of the stock and the spaced portions thereof located next to said upset part; and pressing the free end of said spaced portion of said piece of stock into a substantially pointed shape simultaneously with the severing of said piece of stock from the latter.

References Cited in the file of this patent

UNITED STATES PATENTS

194,103	Munson	Aug. 14, 1877
225,277	Greenleaf	Mar. 9, 1880
996,840	Deeds	July 4, 1911
1,163,961	Warwick	Dec. 14, 1915
1,205,173	Dodds	Nov. 21, 1916
1,205,174	Dodds	Nov. 21, 1916
1,316,509	Rose	Sept. 16, 1919
1,319,837	Brinkman	Oct. 28, 1919
1,622,144	Humphries	Mar. 22, 1927
1,652,073	Vontobel	Dec. 6, 1927
2,228,301	Ditzel et al.	Jan. 14, 1941

FOREIGN PATENTS

143,547	Great Britain	Nov. 21, 1921
557,960	Great Britain	Dec. 13, 1943