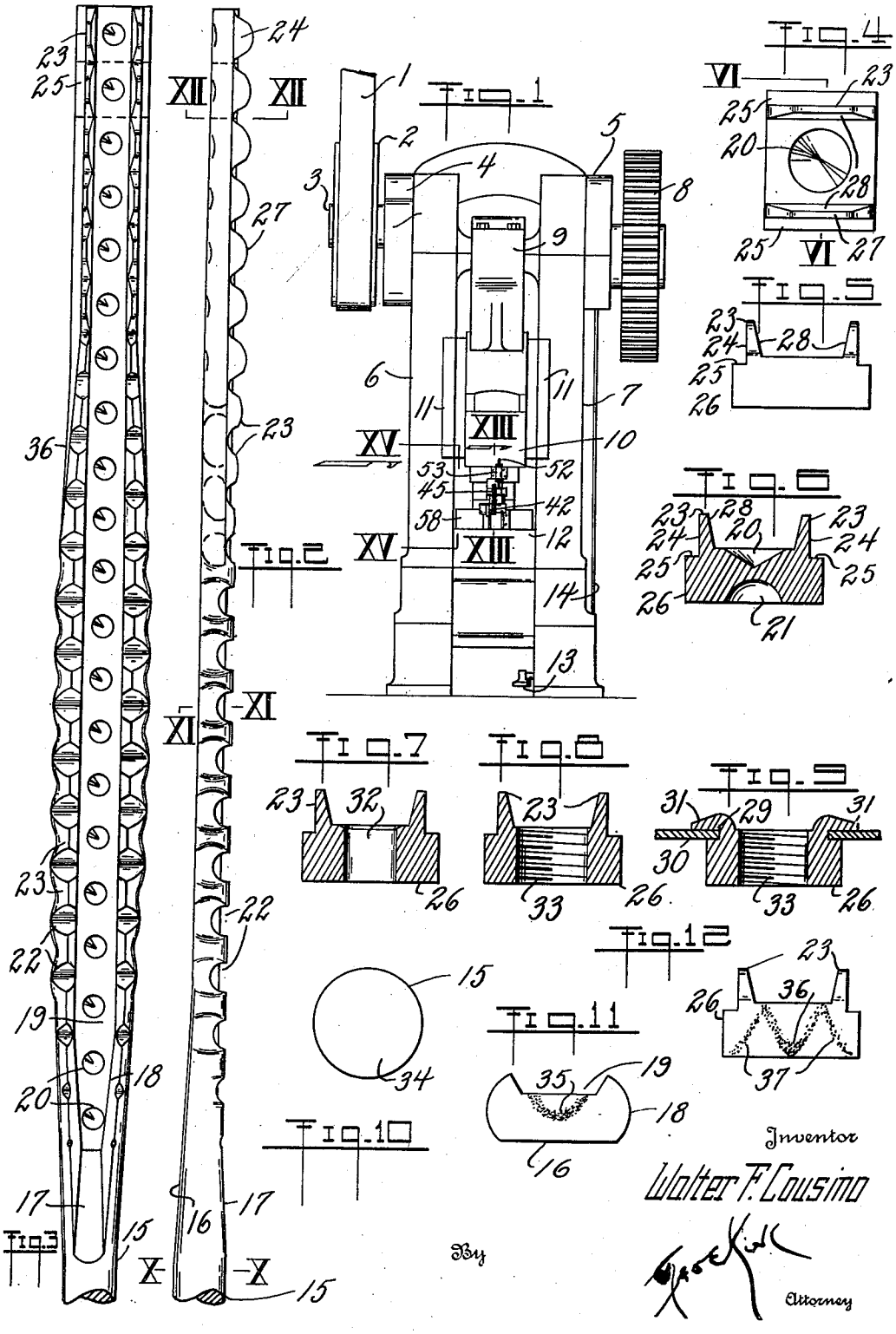
Sept. 2, 1941. W. F. COUSINO 2,254,644

CLINCH NUT PRODUCTION

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CLINCH NUT PRODUCTION

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Fig. 13

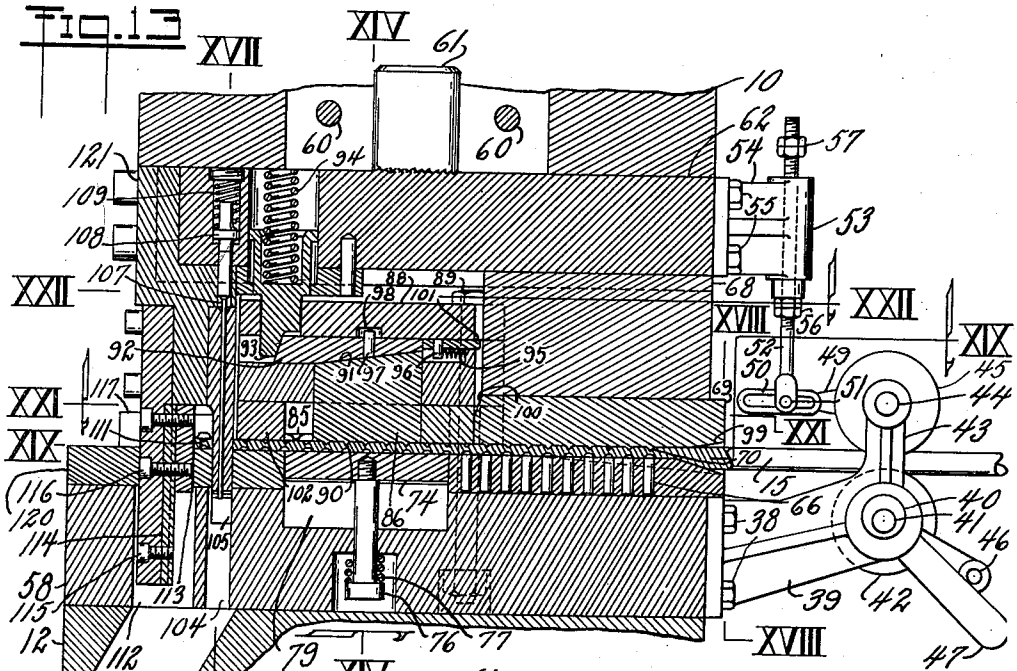
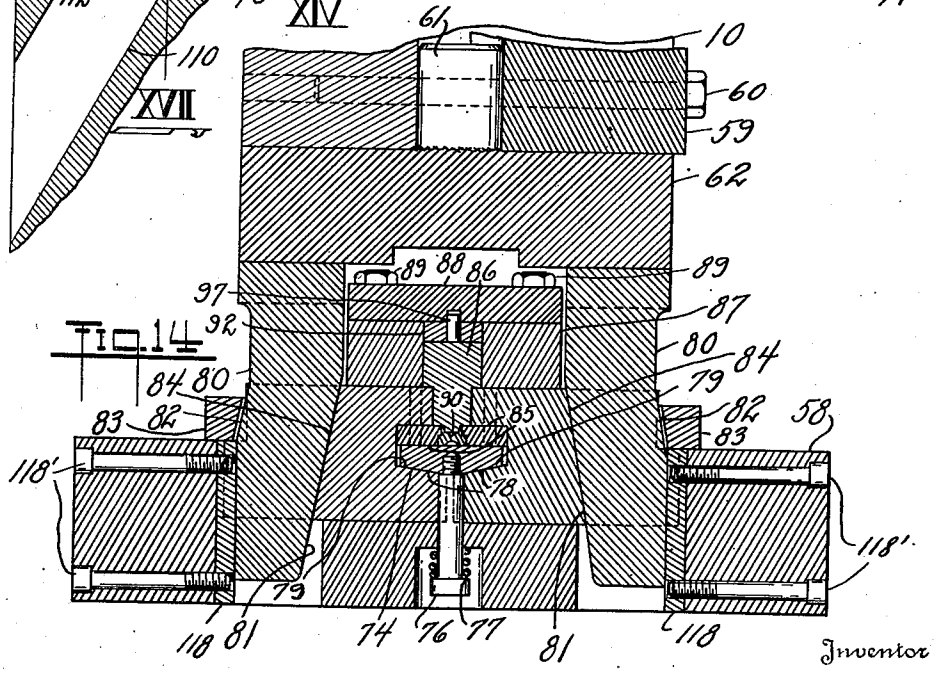


Fig. 14



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CLINCH NUT PRODUCTION

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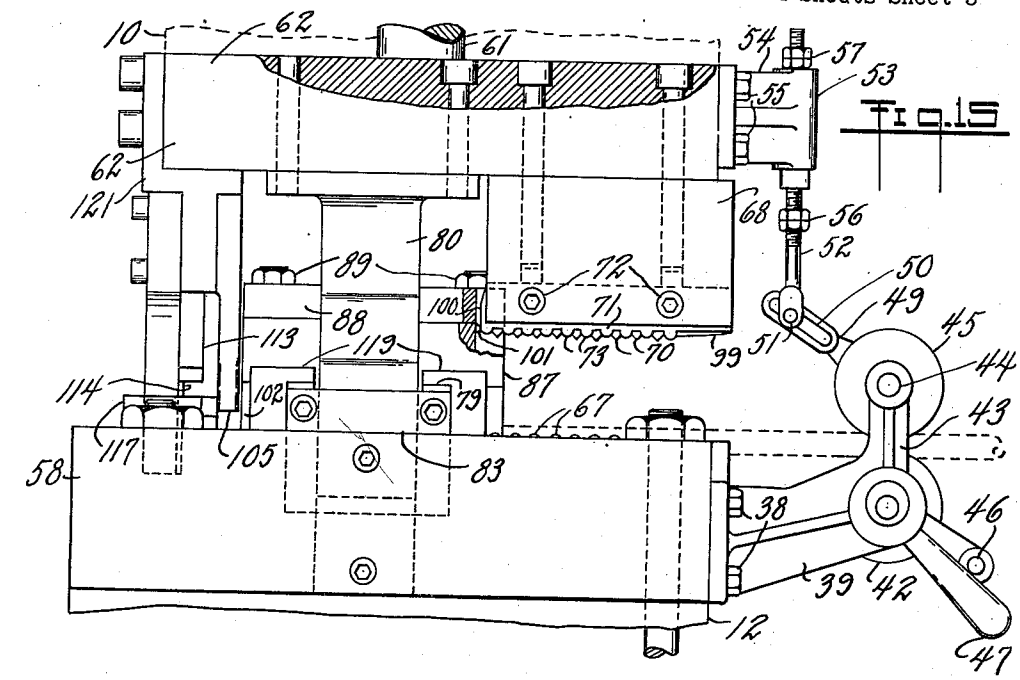


FIG. 15

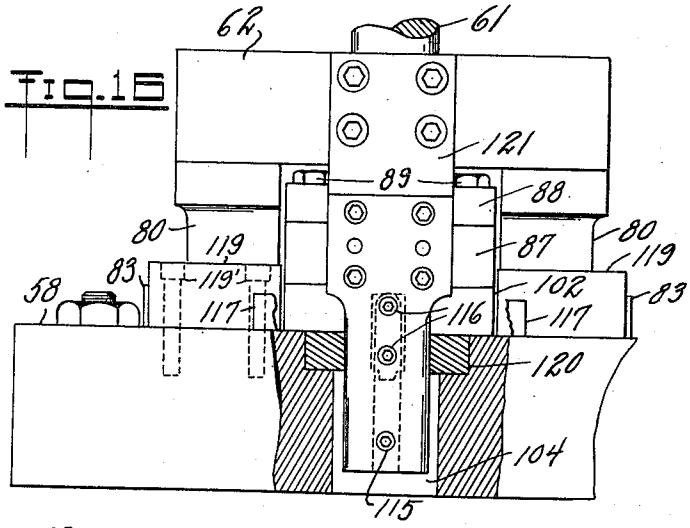


FIG. 16

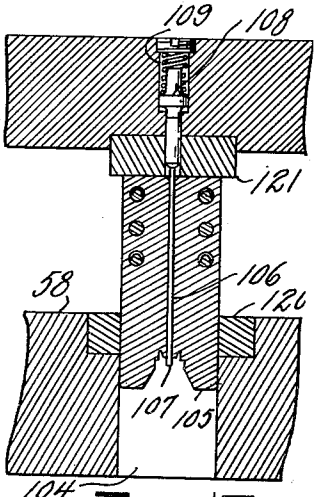


FIG. 17

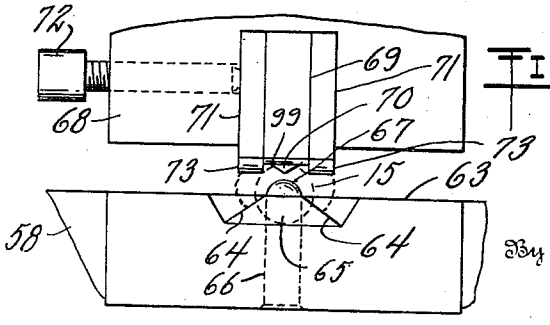


FIG. 18

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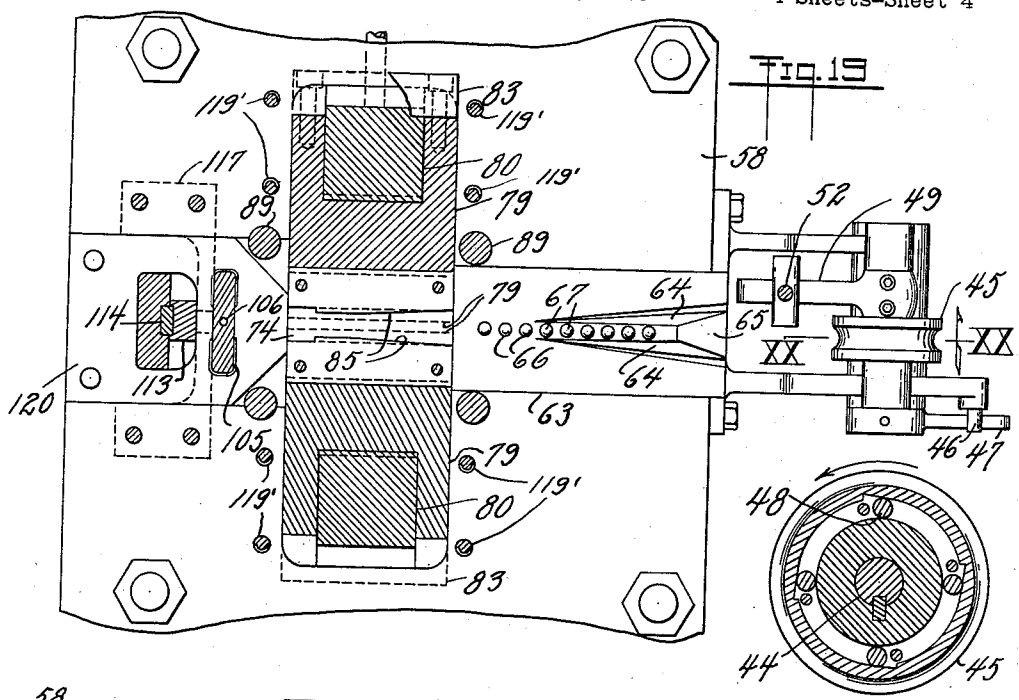


Fig. 19

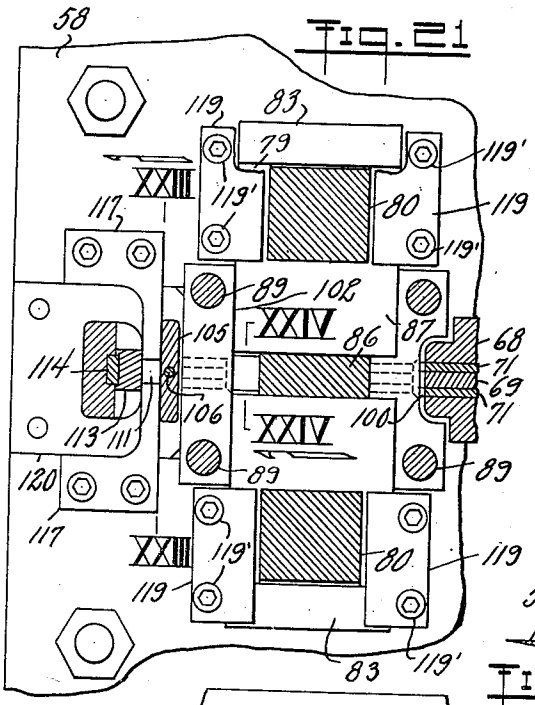


Fig. 21

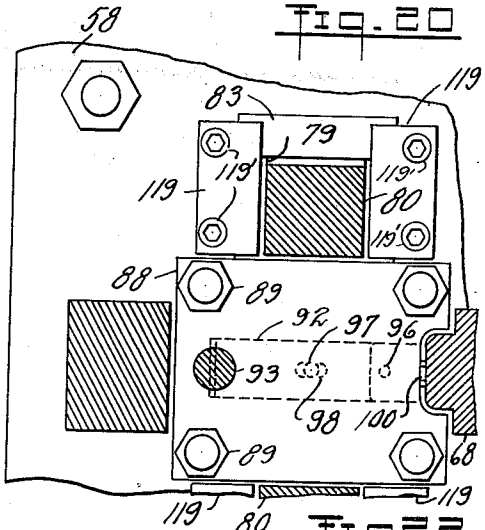


Fig. 20

Fig. 22

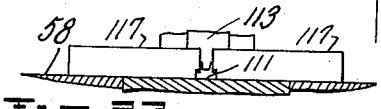


Fig. 23

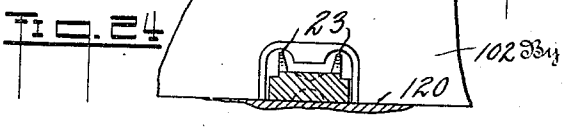


Fig. 24

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UNITED STATES PATENT OFFICE

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CLINCH NUT PRODUCTION

Walter F. Cousino, Toledo, Ohio, assignor of one-half to Albert A. Leclerc, Detroit, Mich.

Application December 11, 1939, Serial No. 308,598

10 Claims. (Cl. 10—76)

This invention relates to reworking lengths of material into specially formed units or blanks.

This invention has utility when incorporated in method and apparatus for handling commercial rod stock as open hearth steel, and developing therealong a different cross-section, even into symmetrical succession and severing therefrom as units fin-carrying clinch nut blanks.

Referring to the drawings:

Fig. 1 is a side elevation of a punch press for carrying out the operation and producing the product hereunder;

Fig. 2 is a side view on an enlarged scale of the development of a clinch nut succession from a piece of commercial rod stock as progressed through the punch press of Fig. 1;

Fig. 3 is a plan view of the reworked stock of Fig. 2, from the right of Fig. 2;

Fig. 4 is a plan view of a unit severed from the stock of Fig. 2;

Fig. 5 is a view from the left of the unit of Fig. 4;

Fig. 6 is a section on the line VI—VI, Fig. 4, through the unit or blank as in the form severed from the stock as reworked;

Fig. 7 is a section of the blank of Fig. 6 as punched at a succeeding step, in the event the blank is to be used for a nut;

Fig. 8 is a section of the blank of Fig. 7 as tapped to receive the screw or bolt;

Fig. 9 is a section of the tapped blank of Fig. 8 with its fins spread into anchoring position with thin sheet stock and thus clinched for holding therewith and, by its polygonal form, keyed against relative rotation;

Fig. 10 is a view on an enlarged scale, showing the general undisturbed crystalline structure commercial stock, say at the region X—X, Fig. 2, wherein such texture approximates uniformity throughout;

Fig. 11 is a view showing the region of internal distortion from the initial squeezings or reworking of the commercial stock for crowdings to depart from the general symmetry as uniform;

Fig. 12 is a view of the further disturbance in the region XII—XII, Fig. 2, showing the distortion away from or clear of the root of the fin and all in the more thick body instead of creating any weakening cold working or strain hardening in the region local to the root of the fin, to leave undisturbed the crystalline structure at the juncture of the fin with the body of the nut blank;

Fig. 13 is a section on the line XIII—XIII, Fig. 1, showing the position of the dies in the punch press at the working or impacting position;

Fig. 14 is a section on the line XIV—XIV, Fig. 13, showing the cross squeeze or the squeeze transversely of impact direction for the press;

Fig. 15 is a view of the dies from the side XV—XV, Fig. 1, showing the press as lifted from impacting position but short of full stroke of the lifting, parts being broken away;

Fig. 16 is a view from the left of Fig. 15, parts being broken away;

Fig. 17 is a view of the cutter or knife on the line XVII—XVII, Fig. 13;

Fig. 18 is a view on the line XVIII—XVIII, Fig. 13, at the supply end for the dies into which the stock is fed;

Fig. 19 is a section on the line XIX—XIX, Fig. 13, showing the lower die of the punch press and features of the control for the squeeze transversely of the impact action;

Fig. 20 is a section on the line XX—XX, Fig. 19, showing the one-way clutch drive for the stock feed into the press;

Fig. 21 is a section on the line XXI—XXI, Fig. 13, showing features of the upper die member and the actuating parts for the squeeze as crosswise of the impact stroke of the press;

Fig. 22 is a section on the line XXII—XXII, Fig. 13, showing portions of the upper die members as adjacent the mounting therefor in the movable head of the press;

Fig. 23 is a fragmentary detail view on the line XXIII—XXIII, Fig. 21, showing the holding clip for one of the severed blanks to be retained for trimming or sizing; and

Fig. 24 is a section on the line XXIV—XXIV, Fig. 21, showing the guide for the blank from the press to the shear.

Drive

Belt 1 may pass about pulley 2 and drive shaft 3 in bearings 4, 5, of a frame having uprights 6, 7. This shaft 3 has gearing 8 therefrom to operate crank 9 in reciprocating head 10 on guides 11, toward and from major anvil or deck 12 as mounted between the standards 6, 7, of this punch press. Treadle 13 may operate through connection 14 to control operation of this punch press as continuous or intermittent.

Stock reworking

In carrying out the invention herein, cylindrical rod stock 15 may be introduced into the punch press and there acted upon at a succession of feeding operations (Figs. 2, 3), say to the

extent of a pair of blanks. In this handling of the stock 15, major extent slant 16 is desirably from the lower side against minor slant 17 from the upper side and developing outward through graduated portion 18 to upper way 19. In this squeezing progress in the direction of impact of the plunger 10 toward the table 12 there are developed in the stock, supplemental to the uniform cross-section squeezings, departures therefrom by forming seats 20 at the center regions of the blanks to be. These indented regions 20 may be of conical form, while the complementary or opposite regions 21 may be of semi-spherical form and approximate the regions 20 for registry in ultimate punching of the blank, say for clinch nut production. By this economy means there is reduced the amount of stock to be punched out and there is also created transverse disturbance of the internal structure of the body, while leaving the blank toughened in the region of the juncture of the fin with such body.

In the formation of these blanks, say for clinch nuts, sides to the way 19 may have interruptions or depressions 22 therein, thereby to develop alternately with the openings 20, 21. These regions of identity in succession of severing of the blanks leave between the portions 22, fin portions 23 (Fig. 6) upwardly extending, which fin portions 23 have outer edges 24 approximately perpendicular to ledges 25 of body 26 of the blank. The outline of these fins 23 as to the sides of the regions 22 is of curved contour 27. Inner sides 28 of these fins thin out toward the free ends, while the straight side 24 of the polygon of the blank body 26 insures sufficient anchoring in rectangular hole 29 (Fig. 9) of sheet stock 30 as the fins 23 are deformed thereover to form clinch 31. The curved portions 27 are efficient for readily guiding such portions into the opening and means a speed-up in assembly.

In the instance the blank is to be beyond the matter of merely reinforcing a port or opening, the portions 20, 21, may be connected by punching to form opening 32 (Fig. 7). If this keying for the fitting or tube is to go beyond that of a chamfered port for rivet operation, say as threading with a bolt or nut, this punched out portion 32 may be tapped or have threading 33 (Fig. 8).

This commercial stock, say wrought rod 15, as originally worked, has texture symmetry 34 (Fig. 10) generally undisturbed. The squeezes for developing initially the ways 16, 17, 18, 19, 20, 21, 22, are in the direction of the impact of the punch press and distort the texture direction to have such disturbance line 35 (Fig. 11) at an angle to that of the impact direction 34 (Fig. 10). Lateral squeeze 36 (Fig. 3) has shown disturbance lines to reside in the blank body 26 remote from the fins 23. There is also developed region of additional lines of disturbance 37 (Fig. 12). There seems to remain the normal structure at the root for the fin 23. This normal region retains strength against rupture from the body as the clinch or bend 31 deformation occurs when anchoring the blank in position with the sheet stock 30.

Stock feeding

The bed 12 of the punch press has anchored thereon by screws 38 (Fig. 13) brackets 39 carrying eccentrics 40 mounting shaft 41 carrying roller 42. These brackets 39 additionally have upper arms 43 carrying shaft 44 mounting opposing grooved roller 45 (Fig. 19) as to the roller 42. Fixed with one of the brackets 39 is stop 46. Handle 47 is fixed with one of the eccentrics 40. Swinging of this handle 47 toward the stop 46 shifts the shaft 41 and roller 42 into clamping position toward the grooved roller 45 as to the stock or rod 15. As this handle 47 is swung downward toward the bed 12, this roller 42 has space increased as to the roller 45 so that the stock 15 may be thrust thereinto and, as the handle 47 is swung back to the stop 46, there is a frictional firm clamping anchorage therebetween.

The shaft 44 has a one-way clutch 48 (Fig. 20) connecting such with the grooved roller 45. Fixed with this shaft 44 is arm 49 (Fig. 13) having slot 50 therein, with which engages pin 51 of rod 52 directed by guide 53 in bracket 54 anchored by screws 55 in fixed position as to the head 10 operable in the slide. On this rod 52 are nuts 56 adjustable to determine the descent stroke in rocking the arm 49 at the unclutching position as to the roller 45. In the reverse or upward stroke of this head 10, there is a provision for adjusting the feed distance due to the adjustable nuts 57, which, in the elevation or rise of the head 10, in striking these nuts causes the arm 49 to act through the one-way clutch 48 as an intermittent grip device in cooperation with the roller 45 to grip the stock 15 therebetween and feed such stock toward the punch press during this upward lift of the punch press at the interval of release, which, as there is spacing between the guide 53 and the nuts 57, permits release of the stock by the dies before the feeding operation occurs.

Spreading

On the bed 12 and engaged by the screws 38 is block or lower die member 58 (Fig. 14) as the lower member of this special unit to be assembled with the punch press. Clamp member 59 as secured by bolts 60 of the head 10 anchors projection 61 to special upper die member 62 of this unit to be installed in the punch press. This unit 62 mounts the screws 55 of the feed device as the base member of this unit 58 carries the screws 38 on the brackets for the rollers of the feed device.

This lower member 58 (Fig. 18) mounts auxiliary lower die member 63 having spread inclines 64, the angle of which may vary according to the hardness of the stock and the degree of deformation which it is desired to effect. Along this way having approach face 65 for the form 16 of the stock, there is a succession of hardened steel pins 66 having spheric heads 67 effective to determine the socket portions 21 of the blanks.

Complemental to and opposing this lower die member 63 is upper die member 68 comprising auxiliary medial member 69 having oppositely in register with the pins 66, conical portions 70 to form the sockets 20. On opposite sides of this mid-die portion 69 are die portions 71 clamped with the die portions 69 by bolts 72. These die portions 71 have semi-circular nubs 73 (Fig. 15) in crosswise register with each other but alternating or staggered as to the pins 66 and points or cone portions 70. These die elements in the block 68 are approximately horizontal and determine a deformation of the stock as progressing therealong in a straight line. However, the lower die block 63, toward which the stock 15 is fed, desirably to have its mid-portion more theretoward than toward the block 68, has as to this block 63 a gradual working upward of these faces 64 (Fig. 19). In the instance of the feed

adjustment, say for a pair of blanks at each impact of the press, this means that the feed is past, say two of these nubs 73 as a feed distance.

Squeeze—Narrowing

In this progressive deformation as passing the region completing this transformation or flow in reworking of the stock in the direction of the impact of the press on the stock, the stock passes to holder block 74 (Figs. 13, 14). Bolt 76 anchored with the block 74 has spring 77 tending normally to pull this block downward clear of the stock as being fed therepast. However, this block 74 has inclined faces 78 on its under side adapted to be engaged by wedge blocks 79. As the head 10 descends, the block 62 has therefrom depending portions 80 with wedge sides 81, 82. In the lift or upward travel, the sides 82 engage the portions 83 of the blocks 79 to slide these blocks apart and thereby allow the spring 77 to release the stock on the block 74. In the descent of the head 10, the wedge faces 81 by the impacting on the wedge faces 84 of the blocks 79 thrust such blocks toward each other and thus act at the faces 78 of the portion 74 to thrust such upward into holding position so that the blocks engage the stock as being reworked. These blocks 79 also carry side squeeze die members 85 acting oppositely or 90° from the direction of press impact and thereby operate the side squeeze 36 on the stock in narrowing up the initial widening in the reworking thereof.

As the head has made its full descent in completing this squeezing operation and recover is started, there is slight upward movement to release the blocks 79 as to the wedge action of the side 81 with the side 84 before the side 82, 83, engages in the outward-movement-travel-effecting operation. As this ascent continues, the depending portions 80 clear the lower portion of the die and leave therewith not only these wedge blocks 79 but the supplemental parts thereover including top clamp die member 86 housed in block 87, with which it is held by top block 88 having assembly bolts 89 therefor. This block 86 has projections 90 to register with the sockets 20 in the stock and thereby cooperate in efficient feed relation. The block 86 has upper cam surface 91 (Fig. 13) with which may cooperate wedge 92 as thrust by projection 93, yieldably thrown by spring 94 in descent with the block 62 and the head 10. Accordingly, as the head 10 descends this wedge projection 93 through the wedge 92 throws the block 86 into holding position with the stock as the projections 90 enter the seats 20. As the head 10 ascends and the projection 93 is clear of the wedge 92, compression spring 95 acts on pin 96 and thrusts the wedge block 92 to clear the wedge surface 91 as limited by pin 97 in way 98 of the block 88. This clears the block 86 so that, as the succeeding feed operation occurs, the conic sides of the seats 20 in the feed operation may readily lift this block 82 for the successive feed position. Entire dependence is not placed on this spring 95 for thrusting this wedge 92, for the die member 69 has remote from its stock entrance portion 99 a cam face 100 which, as the block 62 ascends with the head 10, strikes extension 101 of the wedge 92 and thrusts such clear of the wedge face 91 of the block 86 so that this block 86 may surely rise clear of the incoming feed distance for the stock.

Blank severing

The stock as passing this side squeeze passes through channel of guide block 102 (Fig. 24) to way 104, in which is operable shear 105 (Figs. 13, 17). This shear 105 has way 106 therein for stem 107 having head 108 against which acts compression spring 109 as a plunger so that the stem 107 readily recedes as the stock is contacted thereunder, but as the impact operation of the press through the head 10 is effective for shearing action on the opposite sides of this shear 105, this plunger recedes into the shear. After the stock is severed, then the plunger is sufficiently effective through the spring 109 to thrust the severed blank clear of the shear 105 into the way 104 to pass by chute 110 in the block 12 clear of the punching operations.

This thrusting operation occurs when the shear 105 is clear of the way provided by the block 102. This means that the severed blank on ledge 111 is then thrust into way 112 to descend in the chute 110. The timing of the feed is such that descent of the head 10 as bringing down the shear 105 also brings down supplemental shear or shaver 113 as adjusted by shims 114 as to the ledge 111. This means that any out-of-dimension relation for the stock may not occur, for the shear 105 definitely determines two sides of the next to the last blank, while the third side or free end of the stock has its dimension determined by this shaver 113. These shims 114 are adjusted by screws 115 and the mounting of the shaver is further effected by screws 116.

Operation

In the operation hereunder, there is handled commercial uniform cross-section stock such as open hearth steel. Such stock is reworked, in this instance more specifically in two directions; first, to thin the stock by a squeeze in the direction of press impact; and, second, a squeeze at right angles thereto. The first squeeze defines symmetry for successive sections. Following the second squeeze, there is the severing of these sections into units for the blanks herein, more specifically clinch nut blanks. The press may operate in its synchronism continuously as a series of punching operations, or the operator may delay the operations by the foot control. The rod, accordingly, may be a continuous length of wire more or less coarse, or be longitudinal sections of relatively shorter lengths of rods. In this operation, the squeeze or deformation, say at a distance of a plurality of the blanks to be formed per feed, may mean, as herein brought out, a succession of these feedings for developing the squeeze or reforming operations. The reforming operations as effected by the press impact are definite in the direct impact squeeze from the press.

Following this in the sequence herein are the transverse squeeze or wedge operations wherein the wedges release the stock for the feeding and then in the direction of the impact hold the stock for the transverse squeezing at the horizontal plane relatively to the vertical plane of squeezing of impact of the press. As the squeezing operations occur simultaneously on successive portions of the stock there is likewise the shearing of the sized plurality of blanks. The recovery of the press is the release for the feeding for a succeeding repetition of this cycle of operation.

It is to be noted that as to the advance of the severed blank on the ledge 111, such blank is retained on such ledge against lifting upon the ascent of the shear 105 and the shaver 113. This

is effected by claws 117 (Figs. 13, 21, 23) holding the blank in the alignment as to which it was originally deposited.

The wedge members, from the head 10 and block 62 having the inner wedge faces 81 and the outer wedge faces 82, have wear plates 118 (Fig. 14) anchored in the block 58 by screws 118'.

The wedge faces 83 fixed with the respective blocks 79 are held from lifting away from the block 58 by overhanging members 119 (Figs. 21, 22) anchored by screws 119' with the plate 58.

Mounted on the lower or fixed block 58 of the dies is plate 120 (Figs. 13, 19, 21, 24) providing a guide for the shear 105 as well as the shaver 113. The shear 105 and the shaver 113 are fixed in position with the block 62 through the medium of a holder 121 (Figs. 13, 15, 16).

The purpose herein has importance to hold the root portion for the fins against internal disturbance, say such as might depart from the normal structure as solidifying or crystallizing after heat. Helpful to such end is adopting configuration for the block 86 so to fit in between the fins 23 that when the lateral squeeze develops from the die members 85 such squeeze is not a shear near the body. This means that the distortion or disturbance of the set or crystalline structure, which may take on disturbance approaching slip plane structure as disclosed in the body 35, 36, has these structures short of rupture, while leaving the fin root approximately undisturbed as to crystal formation of its setting.

What is claimed and it is desired to secure by United States Letters Patent is:

1. In clinch nut production, a formed stock reworking machine embodying a press for delivering a succession of impacts, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a transmission connection from the press for feeding the stock between the dies between the impact operations of the press, and a die section movable by press impact transversely of said impact.

2. In clinch nut production, a formed stock reworking machine embodying a press for delivering a succession of impacts, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a release for the stock in the press as the press recovers from impact, a transmission connection from the press for feeding the stock across the dies between impact operations of the press, a clamp for re-engaging the stock as the feed operation is effected, and die sections movable by press impact transversely of said impact.

3. A formed stock reworking machine embodying a press for delivering a succession of impacts, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a release for the stock in the press as the press recovers from impact, a transmission connection from the press for feeding the stock across the dies between impact operations of the press, a stop for limiting the feed extent of the stock, a clamp for re-engaging the stock as the feed operation is effected, die sections movable by press impact transversely of said impact, and a cut-off for units from the stock in pairs.

4. A formed stock reworking machine embodying a press for delivering a succession of impacts, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a release for the stock in the press as the press recovers from impact, a transmission connection from the press for feeding the stock across the dies between impact operations of the press, a stop for limiting the feed extent of the stock, a clamp for re-engaging the stock as the feed operation is effected, die sections movable by press impact transversely of said impact, a cut-off for units from the stock in pairs, and a trim for holding the units to dimensions.

5. A formed stock reworking machine embodying a press for delivering a succession of impacts, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a transmission connection from the press for feeding the stock between the dies between the impact operations of the press, and a die section movable by press impact transversely of said impact; and in the adaptation of said machine for re-forming rod stock into blanks of the character of clinch nuts or the like, said opposing dies including a pair of die members for preliminary thinning and spreading process, there being an auxiliary die member mounted in the lower die member of said pair, said auxiliary die member having spread inclines, and hardened steel pins also mounted in said auxiliary die members, said pins being provided with spherical heads adapted to form sockets in the under side of the blank in the process of formation from the stock directed by the ways in progress determined by said transmission connection.

6. A formed stock reworking machine embodying a press for delivering a succession of impacts, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a transmission connection from the press for feeding the stock between the dies between the impact operations of the press, and a die section movable by press impact transversely of said impact; and in the adaptation of said machine for re-forming rod stock into blanks of the character of clinch nuts or the like, said opposing dies including a pair of die members for preliminary thinning and spreading process, an auxiliary medial die member assembled with the upper die member of said pair, said medial die member having conical portions adapted to form sockets on the upper surface of the blank, and said auxiliary die member additionally being provided with portions having semi-circular nubs adapted to form depressions in and transversely of the blank in the process of formation from the stock directed by the ways in progress determined by said transmission connection.

7. A formed stock reworking machine embodying a press for delivering a succession of impacts, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a transmission connection from the press for feeding the stock between the dies between the impact operations of the press, and a die section movable by press impact transversely of said impact; and in the adaptation of said machine for re-forming rod stock into blanks of the character of clinch nuts or the like, said opposing dies including a first pair of die members for preliminary thinning and spreading process, there being an auxiliary die member mounted in the lower die member of said pair, said auxiliary die member having spread inclines, and hardened steel pins also mounted in said auxiliary die members, said pins being provided with spherical heads adapted to form sockets in the under side of the blank, and in opposition to and in complementary relation and opposing said lower die member an upper die member, an

auxiliary medial die member assembled with said upper die member, said medial die member having conical portions adapted to form sockets on the upper surface of the blank, and said auxiliary die member additionally being provided with portions having semi-circular nubs adapted to form depressions alternating with the sockets of the blank in the process of formation from the stock directed by the ways in progress determined by said transmission connection.

8. A formed stock reworking machine embodying a press for delivering a succession of impacts, there being a movable head for the press, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a transmission connection from the press for feeding the stock between the dies between the impact operations of the press, and a die section movable by press impact transversely of said impact; and in the adaptation of said machine for re-forming rod stock into blanks of the character of clinch nuts or the like, said opposing dies including a pair of die members for narrowing and flattening the stock, and comprising a holder block having inclined faces actuable during descent of the head, wedge blocks engaged by said faces, block means having depending wedge sides for engaging with the wedge blocks to slide these wedge blocks toward the blank in descending travel and to recede from the blocks in ascending travel, and a spring for releasing the blocks as the blocks and wedge sides clear in the upward travel of the head and thereby free the stock for progress determined by the transmission connection in the intermission between the impacts.

9. A formed stock reworking machine embodying a press for delivering a succession of impacts, there being a movable head for the press, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a transmission connection from the press for feeding the stock between the dies between the impact operations of the press, and a die section movable by press impact transversely of said impact; and in the adaptation of said machine for re-forming rod stock into blanks of the character of clinch nuts or the like, said opposing dies including a pair of die members for narrowing and flattening the stock, and comprising a holder block having inclined faces actuable during descent of the head, wedge blocks engaged by said faces, block means having depending wedge sides for engaging with the wedge blocks to slide the wedge blocks toward the blank in descending travel and to recede from the blocks in ascending travel, and a spring for releasing the blocks as the blocks and wedge sides clear in the upward travel of the head, said transversely movable die section embodying squeeze members adjacent said holder block, said squeeze members acting at 90° from the direction of the head impact in thereby effecting side squeeze of the stock on the holder block in the process of progressively forming the blank.

10. A formed stock reworking machine embodying a press for delivering a succession of impacts, there being a movable head for the press, opposing dies in said press having complemental ways for receiving and directing a strip of stock, a transmission connection from the press for feeding the stock between the dies between the impact operations of the press, and a die section movable by press impact transversely of said impact; and in the adaptation of said machine for re-forming rod stock into blanks of the character of clinch nuts or the like, wherein said press head in its ascent clears the die and said transmission connection is then operable for intermittently progressing the stock, the provision of severing means for the rod stock into elements of the blank, said severing means including a shear element, and a supplemental shear, there being guide means therefor holding the supplemental shear in position to act on the stock, said transmission connection being effective through the way in progressing the stock during the head ascent and for holding the stock against progress during the head descent and for simultaneous operation of the shear during the descent, whereby the severing of the blank from the stock leaves the blank clear for ejection.

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