F. LACKNER.

NUT MACHINE.

APPLICATION FILED MAR. 5, 1910.

1,039,145.

Patented Sept. 24, 1912.

3 SHEETS—SHEET 1.

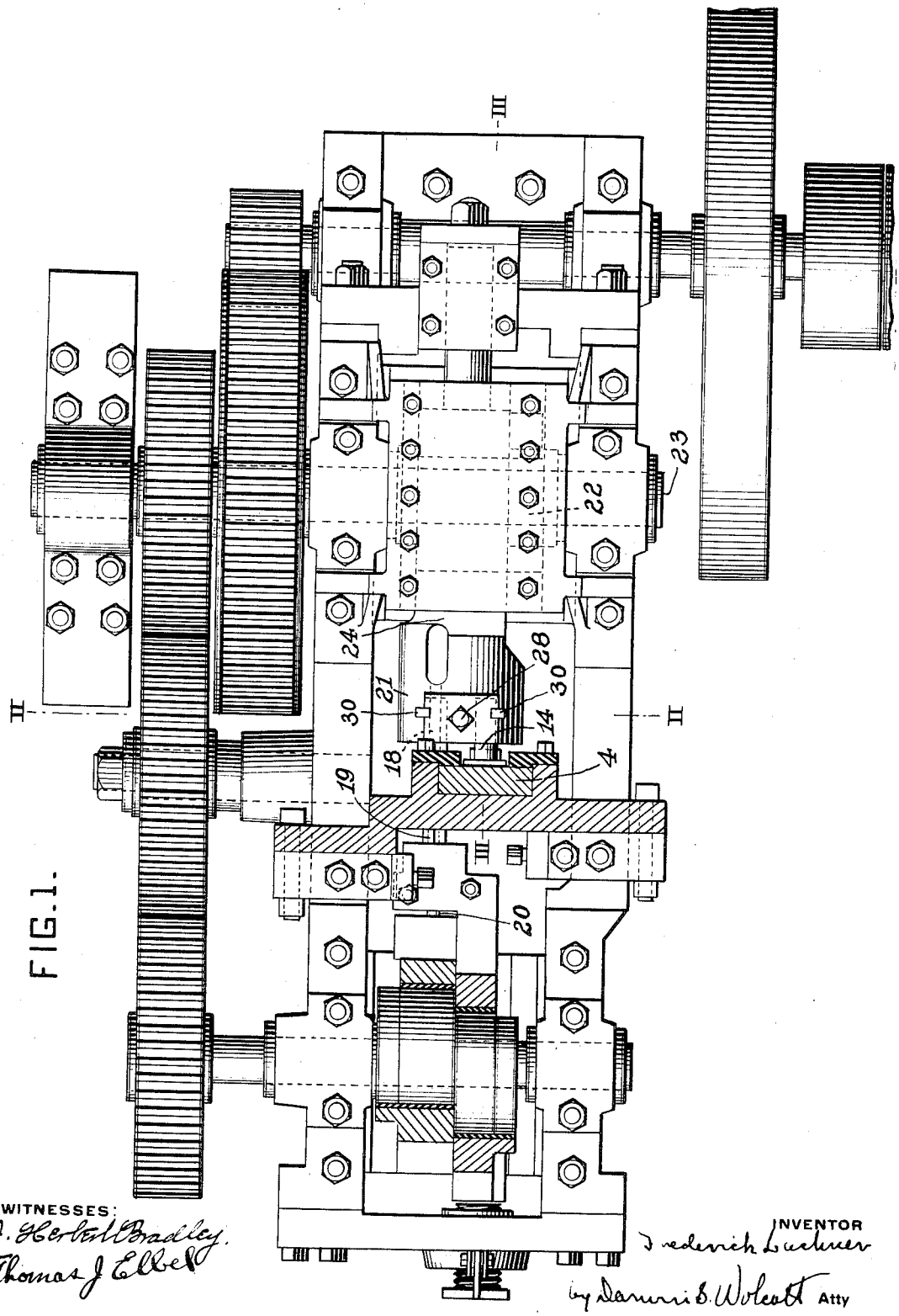

FIG. 1.

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3 SHEETS—SHEET 2.

FIG. 2.

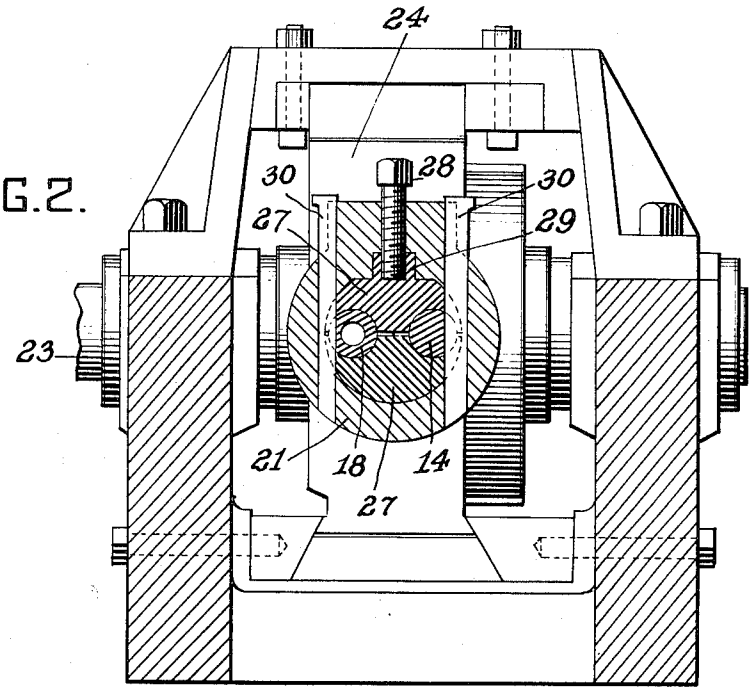
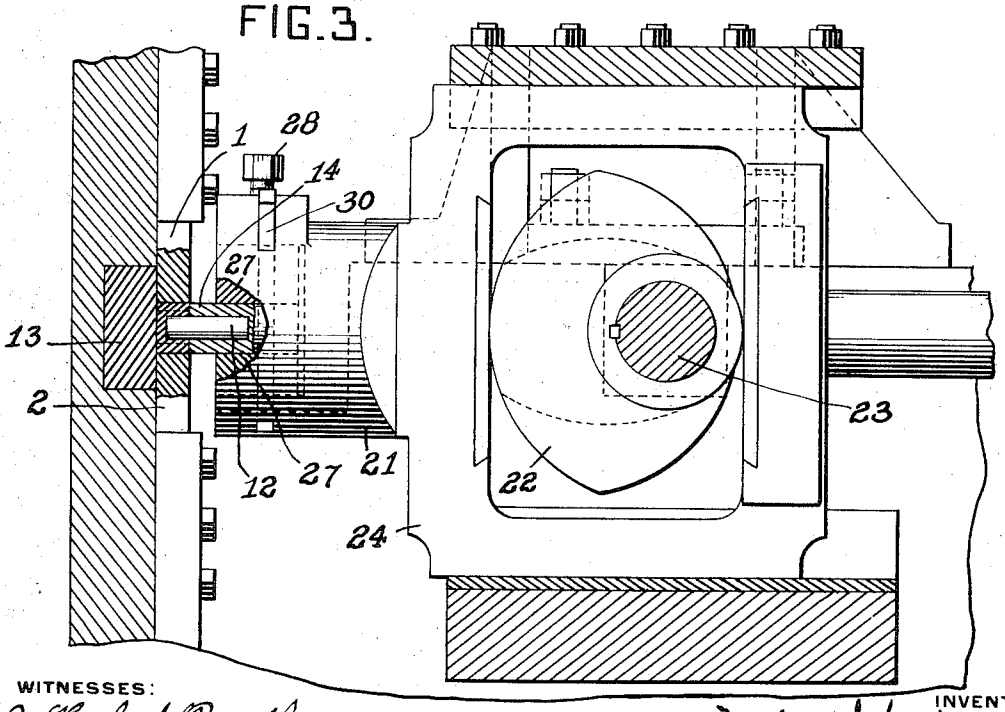


FIG. 3.



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3 SHEETS—SHEET 3.

FIG. 4.

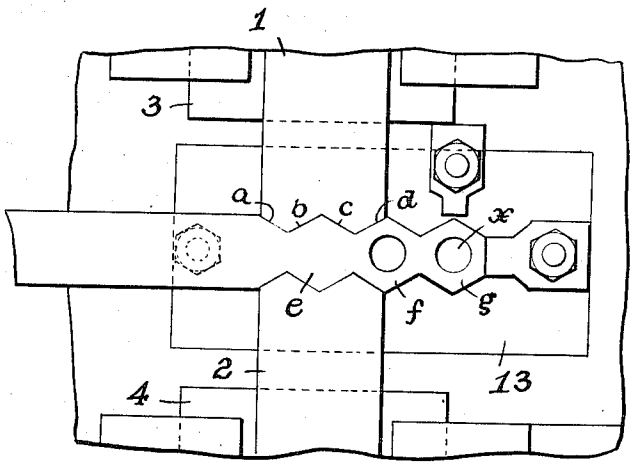
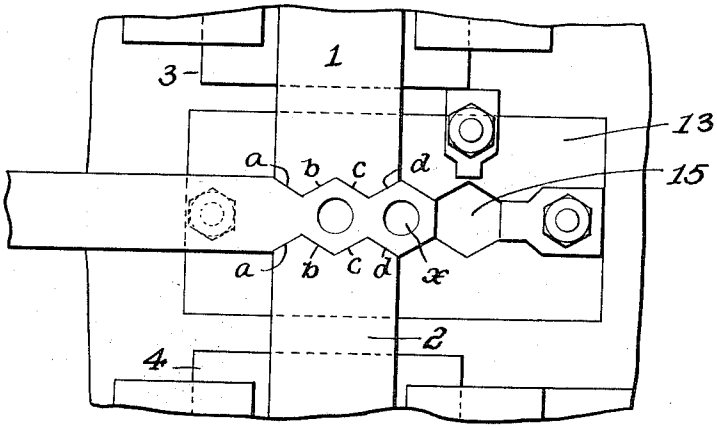


FIG. 5.



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UNITED STATES PATENT OFFICE.

FREDERICK LACKNER, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO NEELY NUT AND BOLT COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

NUT-MACHINE.

1,039,145. Specification of Letters Patent. Patented Sept. 24, 1912.

Application filed March 5, 1910. Serial No. 547,584.

To all whom it may concern:

Be it known that I, FREDERICK LACKNER, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Nut-Machines, of which improvement the following is a specification.

The invention described herein relates to certain improvements in the type of nut machine forming the subject matter of Letters Patent No. 911599 dated February 9th, 1909, and is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this specification Figure 1 is a top plan view partly in section of my improved machine; Fig. 2 is a transverse section on a plane indicated by the line I—I Fig. 1 and Fig. 3 is a vertical section on a plane indicated by the line III—III Fig. 1. Figs. 4 and 5 are elevations of the shaping jaws and adjacent parts of the machine and illustrate steps in the formation of nuts.

Except as hereinafter specified the improved machine is constructed and operated as shown and described in said Letters Patent. As shown in the patent, the jaws 1 and 2 which are secured to the vertically operating slides 3 and 4 are so constructed, that when the jaws are closed together practically the whole of three sides of a hexagon nut are formed in each jaw the two jaws then forming a practically closed die box. In such a construction the connection of a blank with the stock and with an adjacent blank is formed by a light web extending from a corner or corners of the blank. The blanks are partially shaped by the jaws and partially punched while in the grip of the jaws, the final shaping and complete perforation being effected in a die box. This die box is necessarily located to one side of the path of movement of the jaws and hence the web connecting corners of adjacent blanks must have sufficient length to span this dividing space, and being surplus metal must be removed. If care be exercised by the operator to keep the blanks at the proper temperature no trouble will be encountered in the removal of these webs when forcing the blank into the final shaping die box, but if the metal be too hot this web is torn rather than cut from the corners leaving slivers of metal attached to the blank when forced into the die box, the movement into the box wiping these slivers along the side of the nut rendering the same unmarketable. And further as these webs are quite thin, they will not have sufficient rigidity to hold the blanks in proper alinement when the jaws are withdrawn and the blank moved to position in front of the die box. Hence a supporting block is necessary to insure the alinement of the blank with the finishing die box. In order to overcome these difficulties the jaws 1 and 2 are so shaped in my improved machine, that the shaping edges thereof will form only four sides (two in each jaw) of the shaping matrix, the other and opposite sides being united to the stock and the previously formed blank. When so constructed blanks are connected to the stock and to adjacent blanks along side portions and when severing a blank by forcing it into the finishing die box there will not be any surplus metal to be removed.

By reference to Figs. 4 and 5 it will be seen that the jaws 4 and 5 are provided each with a series of similar edges *a*, *b*, *c* and *d*. The edges *a* and *b* form V shaped notches in the stock thereby preliminarily forming four faces of the blank. After being thus notched the stock is moved a distance equal to the width of one blank thereby bringing the walls of the notches formed by *a* and *b* to such a position that on the next inward movement of the jaws the edges *c* and *d* will press upon said walls. By this second inward movement of the jaws the edges *a* and *b* will form new notches, in proper relation to those previously formed, thus preliminarily completing four faces of a blank, which is firmly gripped by faces *b* and *c*. While thus gripped by the faces *b* and *c* which in this position form what is for convenience hereinafter termed the primary or punching matrix, the blank is partially perforated and compressed as hereinafter described. The stock is fed forward between each inward movement of the jaws and on the fourth inward stroke the partial formation of three blanks will have been effected, as shown in Fig. 4, the first partially formed blank *i. e.* with four sides formed and partially perforated will be in line with the finishing matrix 15. At the same time there will be a blank *e* in the matrix formed by the edges *b* and *c* ready to be partially punched and compressed, and a compressed

and partially perforated blank *f* connecting the blanks *e* and *g*. The edges *d* of the jaws serve to retain the intermediate blank and the one in line with the finishing matrix in proper position and will support the blank *f* as against thrusts due to the shearing off of the blank *g* as it is forced into the finishing matrix as hereinafter described.

It will be observed that in the operation described all of the sides but two of the blank are formed by the jaws 3 and 4, and that each is integral with adjacent blanks along these unfinished or unformed sides and that the completion of the blanks is effected by the shearing of the end blank from the intermediate blank. To this end the finishing matrix is located with reference to the primary matrix formed by edges *b* and *c*, such a distance that when the end blank is forced into the finishing matrix its last side will be formed and also one of the unfinished sides of the next blank. In other words the distance between the axes of the finishing matrix and the primary or punching matrix should not be less than the width of two blanks so that there will be at least one blank intermediate the blanks held in said matrices. By this method it is possible to effect simultaneously the preliminary shaping and punching of one blank and the completion of another blank without any loss of material. And further as a side of an adjacent blank is simultaneously formed in separation of the end blank, there is no liability of the formation of slivers, which in the finishing operation would be spread over the surface of the nut.

As shown and described in said patent the stock is fed along a back wall or die block 13 and the jaws 1 and 2 move across the front face of the same, the block being solid or imperforate in line with the partially shaped blank. After the peripheral shaping, the blank while held in the jaws and resting against the back plate 13, is acted on by the punch 12 which partially perforates the blank, the metal thus displaced flowing either laterally to fill the matrix formed by the jaws or outwardly causing an increase of thickness in the blank. When it is desired to crown the nuts a recess is formed in the back wall for the reception of metal displaced by the punch as fully shown and described in the patent referred to.

As will be readily understood the action of the jaws on the stock and the displacement of metal by the punch will produce irregularities of thickness in the blank. This is removed by a plunger 14 having its axis coincident with the axis of the punch 12 and acting subsequent thereto on the blank. In the present combination the punch which is carried by the plunger and not operative through it as shown in the patent, has an operative length beyond the end of the plunger somewhat less than the thickness of the stock. As the punch is subject to greater wear than the plunger and requires more frequent dressing and renewal, it is preferred that the punch should be made independent of the plunger but removably held in a socket in the plunger.

After the preliminary shaping and partial perforation the blank on the second forward movement of the stock, is carried in front of the die box or finishing matrix 15 formed through the back plate 13. A hollow plunger 18 now moves forward pushing the blank into the die box, the edges of the plunger and die box operating as shears to sever the blank from the next succeeding one. After the blank has been forced into the die-box or finishing matrix and is still pressed upon by the plunger 18, a second hollow plunger 19 moves forward through the rear end of the die-box and compresses the blank between it and the plunger 18. While thus gripped between these plungers, a punch 20 moves forward through the plunger 19 and the nut blank, removing the thin web *x* left in the partial punching effected by the punch 12, and through the plunger 18, pushing through the latter the web *x* of metal removed from the blank. The plunger 19 and punch 20 are arranged and operated as shown and described in the patent referred to.

In lieu of operating the plunger 14, punch 12 and plunger 18 by independent cams, the punch 12 is carried by the plunger 14 and the latter and punch 18 are secured in a head 21 mounted in suitable guide ways in the main frame of the machine and provided at its rear end with a suitable yoke 24 surrounding a cam 22 on the driver shaft 23. This cam operates to move the slide or head 21 only during the forward or working stroke and is constructed to move the head slowly up to work to avoid jars or blows and to hold it in its forward position during the operation of the plunger 18 and punch 20 heretofore described. The return or backward movement of the head is effected by a cam 26 on the shaft 23 which engages a lateral extension to the yoke 24. This cam is constructed to impart a rapid backward movement to the head.

While the plungers 14 and 18 may be secured in the head 21 in any suitable manner it is preferred to employ the means shown in Fig. 2 consisting of two semi-cylindrical blocks 27 fitting into a suitable socket in the head 21. In the inner adjacent faces of these blocks are formed grooves for the reception of the inner ends of the plungers. When the plungers have been inserted into the grooves the blocks are forced together by a set screw 28 thus securely clamping the plungers in position. In order to insure

the proper alinement of the plungers, one of the blocks is provided with a fin 29 fitting in a groove in the wall of the socket as shown in Fig. 2. If desired keys 30 may be employed as an additional means for securing the plungers in the heads.

It is characteristic of my improvement that a complete blank partially perforated intervenes between a blank while being finished and a blank undergoing the preliminary shaping. To attain these ends the finishing die and the jaws for the preliminary shaping are so arranged relative to each other that the distance between the axis of the finishing die and the axis of the matrix formed by the jaws is equal or approximately equal to the width of two blanks as shown in Figs. 4 and 5. It will be understood that the axis of the punch 12 and plunger 14 which operate on a blank held by the jaws 1 and 2 and the axis of the plunger 18, which is in line with the finishing matrix, are separated a similar distance *i. e.* the combined widths of two blanks. By reason of this construction and relative arrangement of the matrices, and by properly timing the operations of the punch and plungers, the stock is so gripped and held by the jaws during the punching of one blank that there will not be any such movement of the metal by reason of the punching as will affect the position of a previously formed blank relative to the finishing matrix and plunger.

I claim herein as my patent.

1. In a nut machine the combination of a finishing matrix, a reciprocating plunger in line with said matrix, a primary matrix formed by jaws having V-shaped notches oppositely disposed in the respective jaws and having faces adapted to bear against the adjacent previously formed blank and arranged on the feed side of the finishing matrix in such relation to the latter that the distance between the axes of the matrices is not less than the combined widths of two of the blanks being formed, a punch in line with the axis of the primary matrix and adapted to reciprocate in a direction at right angles to the direction of feed of the stock and means for operating the jaws of the primary matrix to grip the stock during the operation of the plunger and punch.

2. In a nut machine the combination of jaws having a primary matrix formed by jaws having V-shaped notches oppositely disposed in the respective jaws and having faces adapted to bear against the adjacent previously formed blank, a head, a punch carried by the head and operative on a blank while inclosed in the primary matrix thereby preventing a material movement of the metal longitudinally of the stock during such punching, a plunger so mounted in the head that the distance between the axis of the punch and plunger is not less than the combined widths of two blanks, and a finishing matrix similarly spaced from the primary matrix and in line with the plunger.

3. In a nut machine, the combination of a punch, a compressing plunger concentric with the punch, a finishing plunger, the distance between the axes of the finishing plunger and the punch being not less than the combined width of two blanks, a finishing matrix in line with the finishing plunger, means for partially shaping a blank, means for maintaining such shape during the operation of the punch and compressing plunger, and means intermediate the finishing matrix and the shape maintaining means for supporting a blank as against the thrust of the finishing plunger when forcing a blank into the finishing matrix.

4. In a nut machine, the combination of a reciprocating head provided with a socket, two blocks provided with grooves in adjacent faces for the reception of tools, means for forcing said blocks toward each other to grip the tools and means for positively locking the tools from longitudinal movement on the head.

5. As an improvement in the art of making nuts etc., the method herein described, which consists in partially shaping a blank, partially perforating such blank, simultaneously finishing a partially shaped and perforated blank, preventing any material movement of metal longitudinally of the stock during the perforating and finishing operations, and supporting the partially formed blank in position for the finishing operation by a partially formed blank integral with the stock and the blank being finished.

6. In a nut machine, the combination of a matrix having an imperforated back wall, a reciprocating head, a plunger corresponding peripherally to the matrix secured to the head and provided with a coaxial punch extending beyond the plunger a distance less than the depth of the matrix.

7. In a nut machine, the combination of a matrix having an imperforated back wall, a head, a plunger corresponding peripherally to the matrix, and a coaxial punch detachably secured to the plunger and extending beyond the plunger a distance less than the depth of the matrix.

In testimony whereof, I have hereunto set my hand.

FREDERICK LACKNER.

Witnesses:
ALICE A. TRILL,
DARWIN S. WOLCOTT.