

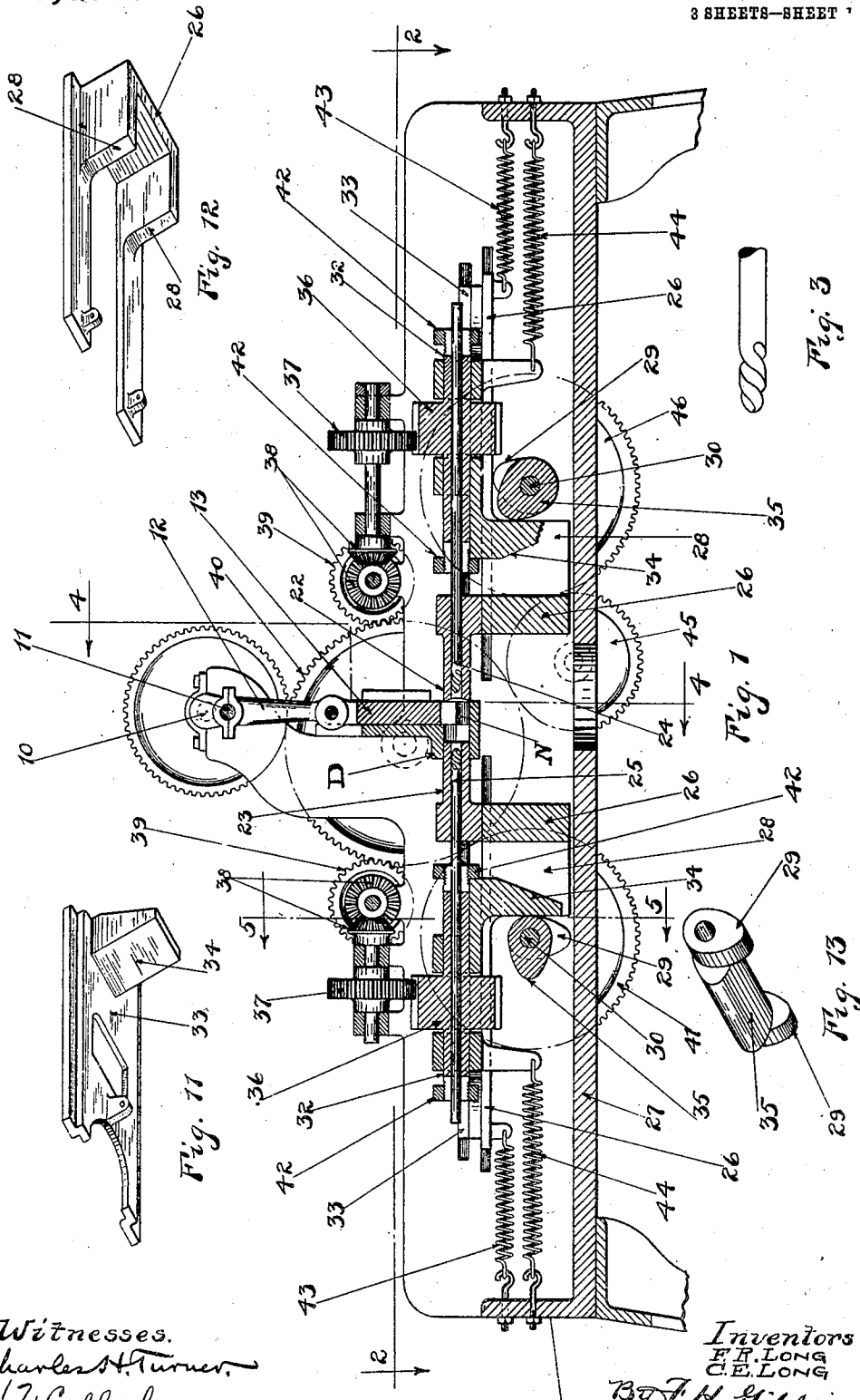
F. R. & C. E. LONG.
NUT MAKING MACHINE.

APPLICATION FILED JUNE 2, 1906.

Patented Nov. 2, 1909.

3 SHEETS—SHEET 1

938,598.



Witnesses.
Charles H. Turner.
H. V. Callahan.

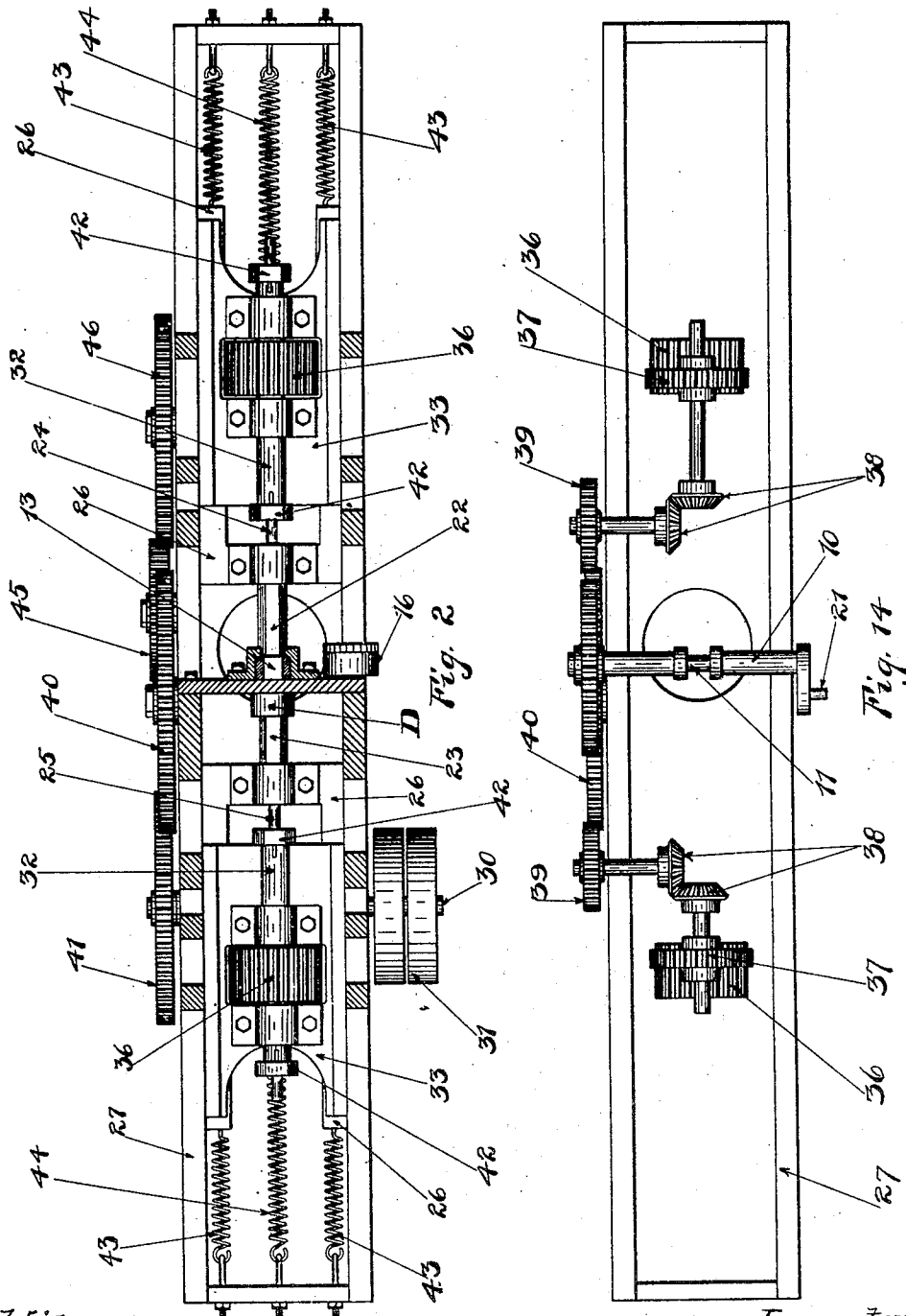
Inventors
F. R. LONG
C. E. LONG
By J. H. Gibbs
Attorney.

F. R. & C. E. LONG.
NUT MAKING MACHINE.
APPLICATION FILED JUNE 2, 1906.

938,598.

Patented Nov 2, 1909.

3 SHEETS—SHEET 2.



Witnesses
Charles H. Turner.
J. V. Callahan.

Inventors
F. R. LONG
C. E. LONG
By F. H. Gibbs
Attorney

F. R. & C. E. LONG.
NUT MAKING MACHINE.
APPLICATION FILED JUNE 2, 1906.

938,598.

Patented Nov. 2, 1909.

3 SHEETS—SHEET 3.

Fig. 4.

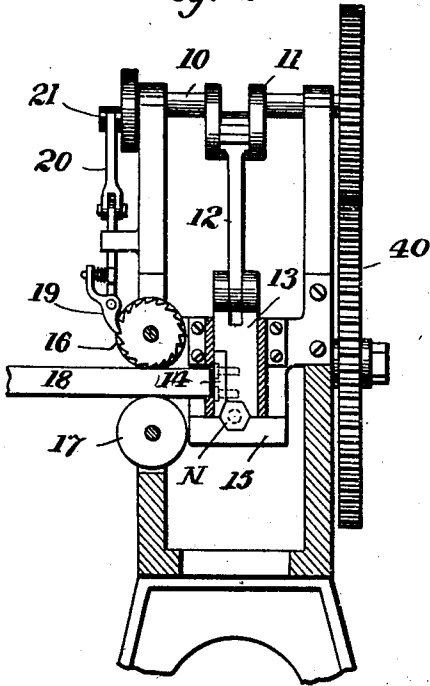


Fig. 5.

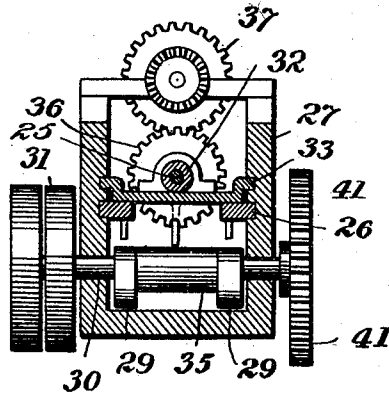


Fig. 6.

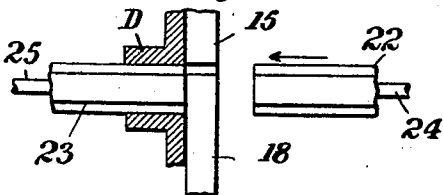


Fig. 9.

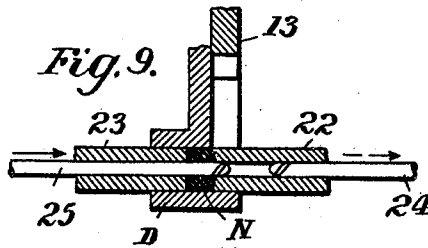


Fig. 7.

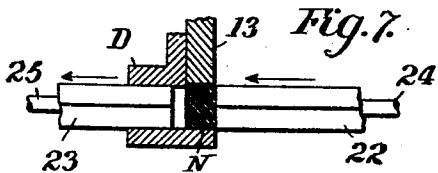


Fig. 10.

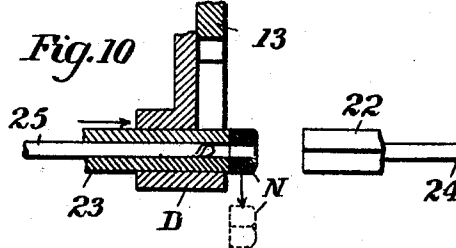
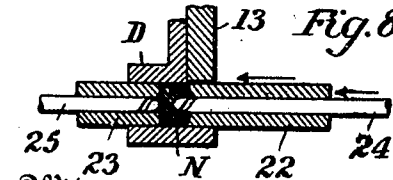


Fig. 8.



Witnesses
J. F. Smith
J. F. Smith

Inventors
F. R. Long & C. E. Long
Foote, Freeman & Watson

Attorneys

UNITED STATES PATENT OFFICE.

FREDERICK R. LONG, OF MILTON, AND CLINTON E. LONG, OF WILLIAMSPORT, PENNSYLVANIA, ASSIGNORS TO AMERICAN FORGED NUT COMPANY, OF BLOOMSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

NUT-MAKING MACHINE.

938,598.

Specification of Letters Patent.

Patented Nov. 2, 1909.

Application filed June 2, 1906. Serial No. 319,925.

To all whom it may concern:

Be it known that we, FREDERICK R. LONG and CLINTON E. LONG, citizens of the United States, and residents of Milton, Northumberland county, State of Pennsylvania, and Williamsport, Lycoming county, State of Pennsylvania, respectively, have invented certain new and useful Improvements in Nut-Making Machines, of which the following is a specification.

This invention relates to the manufacture of nuts and more particularly to the manufacture of hexagon nuts.

Nuts of hexagonal section have usually been made by punching hexagonal blanks from a plate or bar and then punching the round openings in the nuts, which are afterward threaded.

According to the present invention we feed into the machine step by step a bar of suitable cross-section, which is properly heated, and cut from the end of it sections which are roughly formed into hexagonal shape during the cutting operation, then pressed into a hexagonal die, then pierced by tools which spread or expand the metal so as to fill the die, and then ejected from the die. The forming and piercing operations are performed without severing any substantial quantity of metal from the blank, practically the entire amount cut off from the rod being transformed into the finished nut, partly by the compression in the die and partly by the expanding action of the piercers. The large percentage of waste which occurs in the present mode of manufacturing hexagonal nuts by trimming the outside and punching the hole is thus avoided.

The invention will be described in detail in connection with the accompanying drawings, in which,

Figure 1 is a longitudinal vertical section, taken through the forming dies, of a machine embodying the invention; Fig. 2 is a plan view partly in section on the line 2—2 of Fig. 1; Fig. 3 is a detail of one of the piercing tools; Fig. 4 is a section on the line 4—4 of Fig. 1; Fig. 5 is a section on the line 5—5 of Fig. 1; and Figs. 6 to 10 inclusive, are sectional views illustrating the operation of the machine, Fig. 6 being a plan view, and Figs. 7 to 10 vertical sections through the die and forming tools. Fig. 11 is a perspective view of one of the piercer slides. Fig.

12 is a similar view of one of the former slides. Fig. 13 is a similar detail of the actuating cams for said slides. Fig. 14 is a plan view illustrating the cooperative relation of certain gearing hereinafter referred to.

Referring to the drawings, 10 indicates a shaft which is rotated constantly by suitable means, as hereinafter described, during the operation of the machine. By means of a crank 11 on this shaft, and a pitman 12, a cutting and forming die 13 is reciprocated in suitable guides. The lower end of this die has a recess conforming to three sides of a hexagon. On one side of the die is a cutting tool 14 which is removably connected with the die so that it may be removed for sharpening and readily replaced when worn out. Below the die 13 is a fixed die 15 having a recess conforming to three sides of a hexagon, the dies 13 and 15 when brought together having thus a hexagonal opening between them.

At one side of the dies 13, 15, are a pair of feed rolls 16, 17, adapted to feed the bar 18 into position to have a piece cut from its inner end equal in bulk or weight to the finished nut desired. The feed rolls operate while the cutting and forming die is above the bar 18, the end of the bar being fed under said die. This intermittent feed may be accomplished in any suitable manner. As shown there is a ratchet wheel connected with the roll 16 and a spring pawl 19 reciprocated by a pitman 20, and a crank 21 on the shaft 10 drives the ratchet wheel intermittently. The rolls 16, 17, may be geared together as is customary with feed rolls.

The piece cut off by the knife 14 is carried down and roughly formed into a hexagonal nut N by the dies 13 and 15, as shown in Fig. 4. The bar 18 is not fed entirely across the opening in the dies 13, 15, as that would result in the cutting off of more metal than is required to fill the dies. The bar is fed only sufficiently to permit the right amount of metal to be cut off, as indicated in Fig. 6, which shows the bar 18 in cutting position under the die 13. While the die 13 is in its lowest position a hexagonal former 22, which is in alinement with the opening between the fixed die 15 and movable die 13 as shown in Figs. 1 and 6, advances and forces the blank N into a stationary die D, which is integral with the fixed die 15 before referred to and

is of hexagonal section, the blanks being forced into contact with an opposing former 23. While the two formers are in position to confine the blank N in the die D, a piercer 24 which reciprocates centrally in the former 22, advances and forms a hole centrally in the nut blank extending part way through the same. The metal displaced by the piercer is forced radially outward and to assist in this operation the piercer has spiral grooves and ribs at its forward end, and is somewhat sharpened, as shown in Fig. 3. The piercer thus resembles somewhat a boring tool, but it is rotated in a direction reverse to that of a boring tool to assist in spreading the metal and prevent cutting it.

In Fig. 8 the blank is shown in the die D and the formers are shown in the position which they occupy when the former 22 is at its extreme inner position and the piercer 24 advanced to complete the first part of the opening through the nut blank. A piercer 25 in the former 23 is at this time withdrawn so that its end is about flush with the former in which it reciprocates. While the two formers remain in this position the piercer 24 is withdrawn and the piercer 25 is advanced, as shown in Fig. 9, the piercer 25 passing entirely through the nut blank. This operation completes the nut, with the exception of threading it which forms no part of the present invention. As the second piercer 25 passes through the nut the metal is spread or expanded so that it entirely fills the space surrounding the piercer within the die D and between the formers 22 and 23. The former 22 is then withdrawn from the die D and the former 23 advances pushing the nut out of the die and beyond the cutter so that it may be dropped into a suitable receptacle. Immediately afterward the bar 18 is fed forward under the cutter and a new blank severed from the bar by the cutter 14.

Any suitable means may be used to reciprocate the formers and the piercing tools and to rotate the latter. As shown the former 23 is carried by a slide 26 running in guides in the main frame 27. The slide 26 has arms 28 which cooperate with cams 29 on a cam shaft 30, which shaft is suitably driven, as by the pulley 31. The piercer 25 is rigidly connected with a rotatable shaft 32 carried in bearings upon a slide 33 having an arm 34 which cooperates with a cam 35 on the shaft 30. The piercer shaft 32 carries an elongated gear 36 which is always in mesh with a gear 37 which is constantly driven while the machine is in operation. As shown the gear 37 is driven by beveled gears 38 and a spur gear 39 meshing with a gear 40, which is in turn driven by a gear 41 on the driving shaft 30. The piercer is rigidly clamped by suitable means in the hollow

shaft 32. As shown, this shaft has its ends split and threaded and provided with clamping nuts 42. The slides 26 and 33, as shown, are respectively held in contact with their cams by springs 43 and 44.

The mechanism described in detail for operating the former 23 and the piercer 25 is duplicated at the opposite end of the machine for operating the former 22 and the piercer 24 and like reference letters and numerals are used to designate the corresponding parts, it being unnecessary to repeat the description in detail. Power is transmitted to the devices for operating the former 22 and the piercer 24 by means of an idle pinion 45 and a gear 46 on the cam shaft 30 which operates said former and piercer.

It will be evident that various changes in the details of our invention may be made without departing from the spirit thereof and hence we desire it to be understood that we do not limit ourselves to the precise construction and arrangement of parts illustrated and described.

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

1. A machine of the nature disclosed comprising in combination, a die having a die recess, an apertured member adapted to compress a blank in said die recess, a piercer having a tapered end arranged in the aperture of said member, and means for rotatably advancing the tapered end of said piercer into the compressed blank in said die recess.

2. A machine of the nature disclosed comprising in combination, a die having an elongated polygonal-shaped die recess, two oppositely acting formers adapted to compress an interposed blank in said recess, one of said formers being apertured, a piercer arranged in the aperture of said apertured former, and means for rotatably advancing the end of said piercer into the compressed blank in said die recess.

3. A machine of the nature disclosed comprising in combination, a die, two oppositely acting tubular formers adapted to compress an interposed blank in said recess, a piercer arranged in the bore of each former, means for rotatably advancing one of said piercers into said blank and then withdrawing the same, and means for following the withdrawal of said piercer with an advance of the opposite piercer through said blank.

4. A machine of the nature disclosed comprising in combination, a die, two oppositely acting tubular formers adapted to compress an interposed blank in said recess, a piercer having a spirally fluted end arranged in the bore of each former, means for advancing one of said piercers into said blank while rotating the same reversely to the direction

of said spirally fluted end and for withdrawing said piercer, means for following the withdrawal of said reversely rotating piercer with an advance through said blank of said other piercer, and means for rotating said other piercer reversely to the direction of the spiral flutes on its end.

5. A machine of the nature disclosed comprising in combination, a die, two oppositely acting tubular formers adapted to compress an interposed blank in said recess, a piercer arranged in the bore of each former, means for advancing one of said piercers into said blank and then withdrawing the same, means for following the withdrawal of said piercer with an advance through said blank of said other piercer, one of said piercers having a spirally fluted end, and means for rotating said piercer during its advance in a direction reverse to that of the spiral flutes on its end.

6. A machine of the nature disclosed comprising in combination, a die, two oppositely acting tubular formers adapted to compress an interposed blank in said recess, a piercer arranged in the bore of each former, one of said piercers having a spirally fluted end, means for rotatably advancing said fluted piercer into said blank with a rotation reverse to the spiral flutes on its end and for withdrawing said piercer, and means for following the withdrawal of said piercer with an advance of the opposite piercer.

7. A machine of the nature disclosed comprising in combination, a die, two oppositely acting formers adapted to compress an interposed blank in said recess, one of said formers being apertured, a piercer having a spirally fluted end arranged in the aperture of said apertured member, means for rotating said piercer in a direction reverse to the direction of the spiral flutes on its end, and means for advancing said piercer into said blank during its rotation.

8. A machine of the nature disclosed comprising in combination, a die having an apertured die recess, an apertured member adapted to compress a blank in said die recess, a piercer having a spirally fluted tapered end arranged in said aperture of said apertured member, means for advancing the fluted end of said piercer into the compressed blank in said die recess, and means for simultaneously rotating said piercer in a direction reverse to that of its spiral flutes.

9. A machine of the nature disclosed comprising in combination, means for holding a blank, a piercer having a spirally fluted end, means for advancing the spirally fluted end of said piercer into said blank, and means for simultaneously rotating said piercer in a direction reverse to that of its spiral flutes and means for compressing said blank in the holding means.

10. A machine adapted to form expanded nut blanks, comprising in combination a die adapted to contain a nut blank, a piercer having a spirally fluted end, means for advancing said piercer into said blank, means for simultaneously rotating said piercer in a direction reverse to that of its spiral flutes, and longitudinally movable formers for compressing said blank in the die.

11. A machine adapted to form expanded nut blanks, comprising in combination means for holding an imperforate blank, a piercer having a tapered end, means for advancing the tapered end through said blank, means for simultaneously rotating said piercer, and longitudinally movable formers for compressing said blank in said holding means during the penetration of the blank by the piercer.

12. A machine adapted to form expanded nut blanks, comprising in combination a die having a die recess adapted to receive an imperforate nut blank, longitudinally movable apertured formers adapted to compress said blank while in said recess, a piercer arranged in the aperture of one of said formers and having a spirally tapered end, said tapered end being adapted to expand said blank while in said die recess when advanced into the blank, and means for advancing the tapered end of said piercer into the compressed blank in said die to pierce and expand said blank.

13. A machine adapted to form expanded nut blanks, comprising in combination, a die having a die recess, two reciprocating tubular formers, one adapted to compress an imperforate nut blank within the die recess, against the other, a piercer having a spirally fluted end arranged in each former, means for advancing one of said piercers into said blank and then withdrawing the same while the blank is held under compression by said former, means for following such withdrawal with an advance of the other piercer into said blank, and means for rotating each of said piercers during its respective advance.

14. A machine adapted to form expanded nut blanks, comprising in combination a die having a die recess, reciprocatory apertured members adapted to compress a blank in said die recess, a piercer having a spirally fluted tapered end arranged in the aperture of one of said members, means for advancing the fluted end of said piercer into the compressed blank in said die recess, and means for simultaneously rotating said piercer in a direction reverse to that of its spiral flutes.

15. A machine adapted to form expanded nut blanks, comprising in combination a die having a die recess, two tubular reciprocatory formers adapted to compress an interposed blank in said recess, a piercer arranged

in the bore of each former, means for advancing one of said piercers into said blank and then withdrawing the said piercer from the blank while under compression between
 5 said formers, and means for subsequently advancing the other piercer entirely through said blank.

16. In a nut blank forming machine, the combination comprising a die having a die
 10 recess, reciprocatory apertured formers adapted to compress a blank in said die recess, a piercer arranged in the aperture of each former, and means for advancing the end of each of said piercers into the com-
 15 pressed blank in said die recess while said blank is held under compression between said formers.

17. In a nut blank forming machine, the combination comprising a die having a die
 20 recess, two oppositely acting tubular formers adapted to compress an interposed blank in said recess, a piercer arranged in the bore of each former, means for advancing one of
 25 said piercers into said blank while the blank is being compressed by the formers, means for withdrawing said piercer, and means for following the withdrawal of said piercer
 with an advance through said blank of said other piercer.

30 18. In a machine adapted to form an expanded nut blank, the combination comprising a die having a die recess, two oppositely acting tubular formers adapted to compress
 35 an imperforate blank in said recess, a piercer arranged in the bore of each former, means for advancing one of said piercers into said blank, means for withdrawing said piercer,
 and means for following the withdrawal of said piercer with an advance of the opposite
 40 piercer entirely through said nut blank while said blank is compressed between the formers.

19. A machine adapted to form an expanded nut blank, comprising in combination,
 45 a die having a die recess, reciprocatory tubular formers, one former being adapted to insert said blank into said die recess and compress the blank against the other former,
 a piercer arranged in the bore of each former,
 50 means for advancing one of said piercers into said blank while the blank is held compressed between said formers and then withdrawing the same, and means for following the withdrawal of said piercer with an advance
 55 of the opposite piercer through said blank.

20. A machine adapted to form an expanded nut blank, comprising in combination,
 60 a die having a die recess, two oppositely acting tubular formers, the one former being adapted to insert a nut blank into said die recess and to compress the blank therein against the other former, a piercer arranged in the bore of each former, means for ad-

vancing one of said piercers partway into
 65 said blank during the compression of the blank, thereby causing a lateral expansion of the blank, and then withdrawing the said piercer, and means for following the withdrawal of said piercer with an advance of
 70 said other piercer through said blank.

21. A machine adapted to form an expanded nut blank, comprising in combination, a die having a die recess, two oppositely
 75 acting tubular formers, the one being adapted to insert an initially swaged severed nut blank into said die recess and compress the same therein against the other former, a piercer arranged in the bore of each former, one of said piercers being rotatable, means
 80 for rotatably advancing said rotatable piercer into said blank while the blank is under compression and for retracting said piercer, and means for following the retraction of said piercer with an advance of
 85 the opposite piercer.

22. A machine adapted to form an expanded nut blank, comprising in combination, a die having a die recess, reciprocatory
 90 formers, one former being adapted to insert an initially swaged severed blank into said die recess and compress the same therein against the other, one of said formers being apertured, a piercer arranged in an aperture
 95 of said apertured former, means for rotating said piercer, and means for advancing said piercer into said blank during its rotation while said blank is under compression between
 said formers.

23. In a nut blank machine, a finishing
 100 die, oppositely acting formers adapted to compress a nut blank in said die, a piercer adapted to indent one side of said blank while under compression, means for advancing and for retracting said piercer, a
 105 second piercer adapted to perforate and expand said blank, and means for actuating the second mentioned piercer.

24. In a machine for forming expanded nut blanks, the combination of a die, adapted
 110 to contain a nut blank, a pair of formers disposed co-axially on opposite sides of and adapted to compress the nut blank, a pair of piercers arranged similarly to the formers, means for thrusting one piercer in the nut
 115 blank while the blank is under compression, and means for subsequently thrusting the other piercer through the blank.

25. In a machine adapted to form expanded nut blanks, the combination of a die
 120 adapted to contain an imperforate nut blank, means for compressing said blank, means for indenting the blank from one side only while said blank is under compression, and means for completing the penetration
 125 through the blank from the opposite side.

26. In a machine adapted to form expanded nut blanks, the combination of a die

adapted to contain an imperforate nut blank,
means for compressing a blank therein,
means for indenting one side of said blank,
means for backing the other side of the
5 blank during such indentation, and means
for completing the perforation of the blank
from the opposite side thereof.

In testimony whereof we affix our signatures in presence of two witnesses.

FREDERICK R. LONG.
CLINTON E. LONG.

Witnesses:

EDWIN PAUL,
WILLIAM M. PHILIPS.