Aug. 2, 1938. H. C. ERDMAN 2,125,272

MANUFACTURE OF SCREWS

Filed June 24, 1937

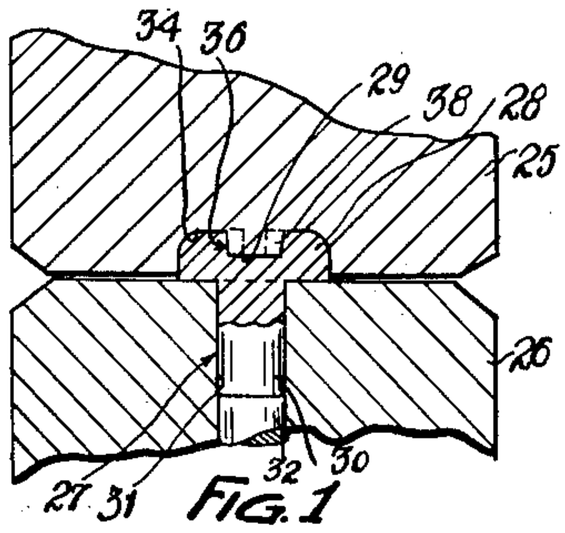

FIG. 1

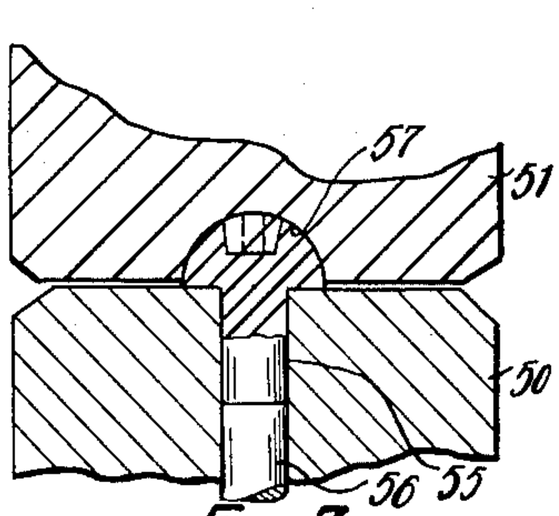

FIG. 7

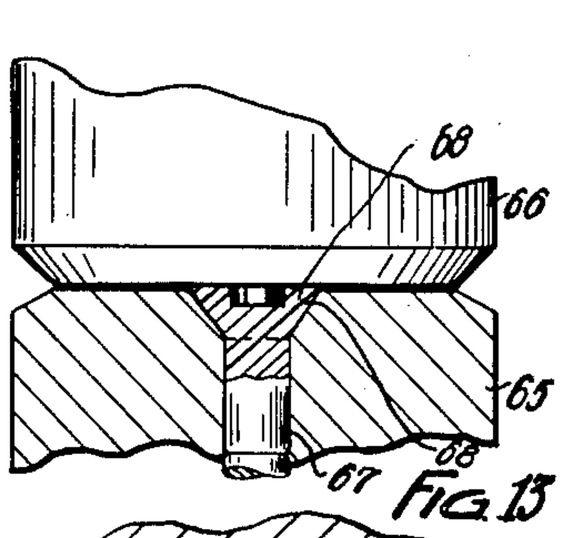

FIG. 13

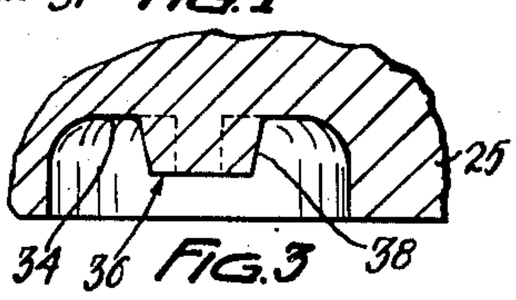

FIG. 3

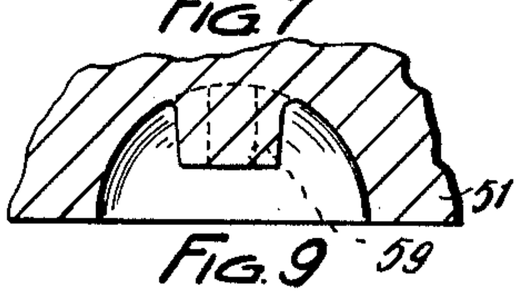

FIG. 9

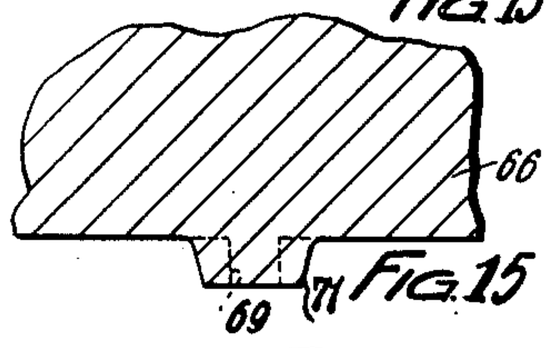

FIG. 15

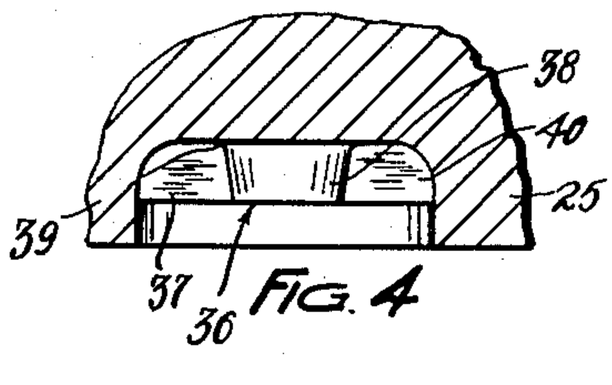

FIG. 4

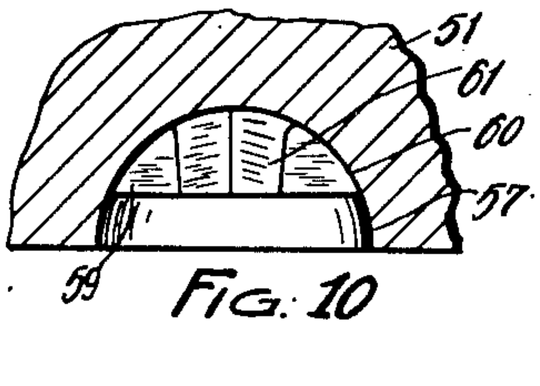

FIG. 10

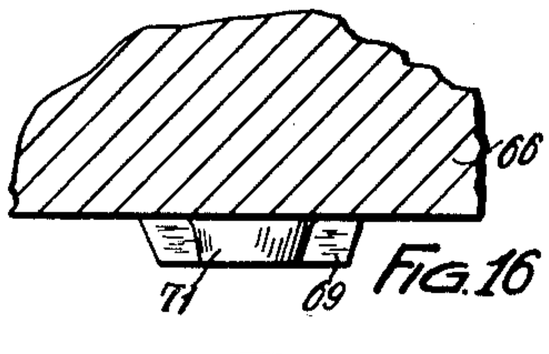

FIG. 16

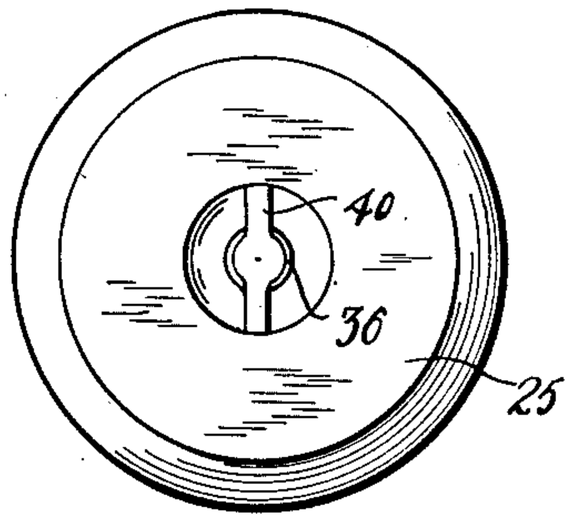

FIG. 2

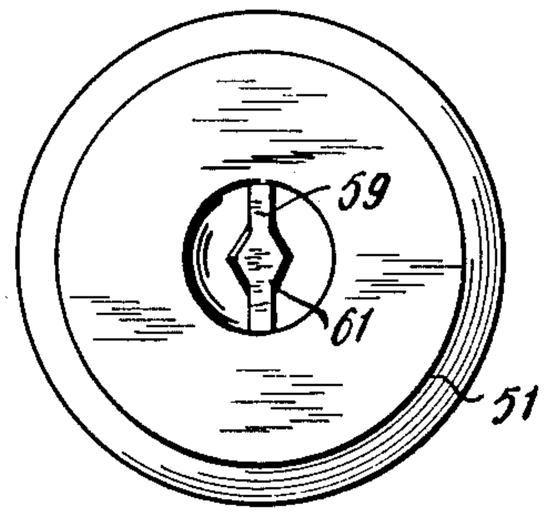

FIG. 8

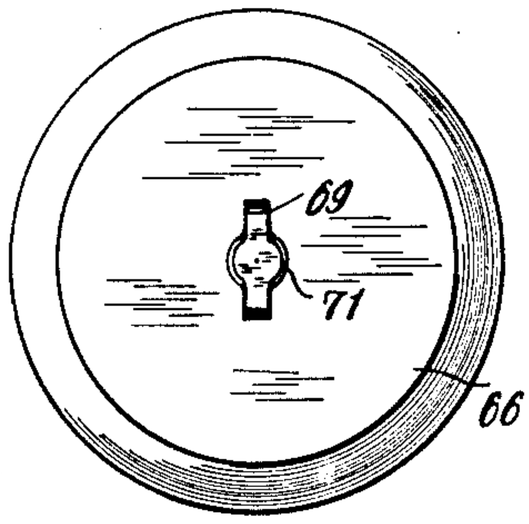

FIG. 14

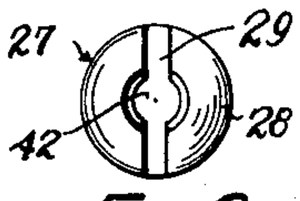

FIG. 6

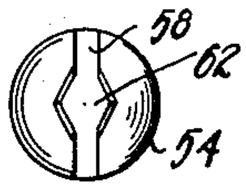

FIG. 12

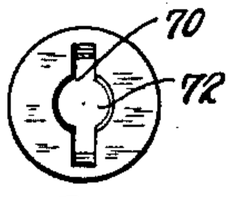

FIG. 18

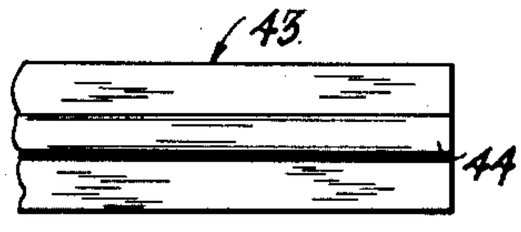

FIG. 20

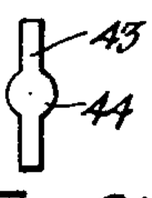

FIG. 21

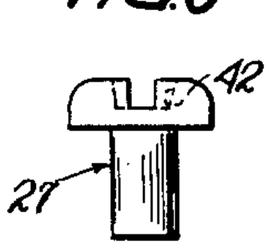

FIG. 5

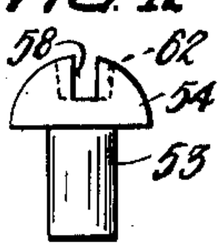

FIG. 11

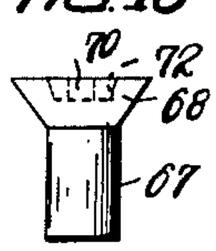

FIG. 17

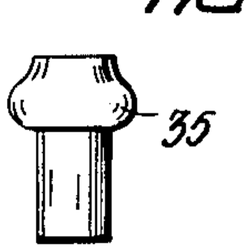

FIG. 19

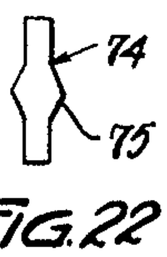

FIG. 22

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ATTORNEYS

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UNITED STATES PATENT OFFICE

2,125,272

MANUFACTURE OF SCREWS

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Application June 24, 1937, Serial No. 150,092

3 Claims. (Cl. 10—7)

This invention relates to the manufacture of screws, and as its principal object, aims to provide improved apparatus for the production of screws of the type having a tool-receiving recess in the head thereof.

An object of my invention is to provide a novel form of punch or hammer for forming the tool-receiving recess in the heads of screws being produced whereby die breakage and the percentage of scrap or imperfect screws is reduced to a minimum.

Still another object of my invention is to provide improved screw forming apparatus embodying a hammer having a web-like projection for forming a screw-driver slot in the screw head being shaped and also having novel means for reinforcing the web-like projection.

Other objects and advantages of my invention will be apparent from the following description when taken in conjunction with the accompanying sheet of drawings in which

Fig. 1 is a longitudinal sectional view showing a pair of dies acting on a screw blank;

Fig. 2 is an end view of the punch or hammer;

Fig. 3 is a longitudinal sectional view taken through the hammer;

Fig. 4 is a longitudinal sectional view taken through the hammer at approximately right angles to the sectional view of Fig. 3;

Fig. 5 is a side elevation of a screw blank produced by the dies and forming operation illustrated in Fig. 1;

Fig. 6 is a plan view of the blank;

Fig. 7 is a longitudinal sectional view showing another pair of cooperating dies acting on a blank for another type of screw;

Fig. 8 is an end view of the hammer;

Fig. 9 is a longitudinal sectional view taken through the hammer;

Fig. 10 is another longitudinal sectional view of the hammer taken at approximately right angles to the view of Fig. 9;

Fig. 11 is a side elevation of a screw blank produced by the dies and forming operation illustrated in Fig. 7;

Fig. 12 is a plan view of the blank;

Fig. 13 is an elevational view, partly in section, illustrating cooperating dies and a forming operation for another type of screw blank;

Fig. 14 is an end view of the hammer;

Fig. 15 is a longitudinal sectional view taken through the hammer;

Fig. 16 is a longitudinal sectional view taken through the hammer at substantially right angles to the view of Fig. 15;

Fig. 17 is a side elevation of a screw blank produced by the dies and forming operation of Fig. 13;

Fig. 18 is a plan view of the blank;

Fig. 19 is a side elevation of a rough screw blank from which the completed screw blanks may be formed;

Fig. 20 is a partial side elevation of a tool which may be used for driving certain of the screws produced by my novel apparatus;

Fig. 21 is an end view of the tool, and

Fig. 22 is an end view of a similar tool of a cross-sectional shape to fit the tool-receiving recess of the screw blank of Figs. 11 and 12.

More detailed reference will now be made to the accompanying drawing in which I show the novel screw-forming apparatus of my invention adapted to the production of different types of screws. It should be understood however that the drawing is to be regarded as illustrative and that the invention may be embodied in various other similar devices and apparatus.

In Fig. 1 of the drawing I show a pair of cooperating die members 25 and 26 acting on a screw blank 27 to form the head 28 thereof to the desired shape, and to provide the head with a tool-receiving recess or slot 29. The die 26 serves as an anvil for supporting the blank 27 during the forming operation and has an axially extending opening 30 which shapes and sizes the stem 31 of the blank during the forming operation. The anvil 26 may also include a knock-out pin 32 which forms the bottom of the opening 30 and acts to eject the screw blank from the die after the forming operation has been completed.

The die member 25 is a hammer or punch which acts on the screw blank to form the head thereof to the desired shape and also to form the tool-receiving recess 29 therein. For shaping or forming the screw head I provide the hammer with a recess 34 in the end thereof in coaxial relation to the stem forming opening 30 of the anvil 26. The recess 34 is of the desired depth and shape to properly form the rough blank 35 of Fig. 19 to the shape and form of the finished blank 27 of Figs. 5 and 6. During this forming operation the metal of the rough blank 35 is squeezed and distributed to form a head of the "binding" type on the screw blank shown in Figs. 5 and 6.

Screws of this type are usually provided with a tool-receiving slot or recess in the head thereof

and heretofore this recess has been formed during the head-shaping operation by a projection on the hammer. Considerable difficulty has been experienced with apparatus of this kind by reason of the hammer projection becoming broken during the repeated blows which it must strike during the production of screw blanks in rapid succession. There has also been a high percentage of scrap or imperfect screw blanks resulting from the blanks sticking to the hammer and causing jamming.

In my improved screw-forming apparatus I provide the hammer **25** with an axial projection **36** for forming the tool-receiving recess in the head of the screw and this projection embodies novel characteristics which eliminate the difficulties just mentioned. The hammer projection **36** comprises a web-like body or rib of metal **37** formed integral with the hammer and extending axially into the die recess **34** and transversely thereof. The web-projection **37** extends into the recess a distance corresponding with the desired depth which the tool-receiving recess is to have in the completed screw blank. To prevent breakage of this web-projection and to secure certain other important advantages, I provide a reinforcing boss or enlargement **38** which is located intermediate the lateral ends of the web projection **37** and extends coaxially of the hammer for substantially the same distance or depth as the web-projection. By making the enlargement **38** of tapered form as indicated in the drawing, I find that it greatly strengthens the web-projection **37**, and also assists in preventing the screw blanks from sticking to the hammer and producing jams which would result in delay in production, damaging or breaking the dies, and in a large percentage of scrap screws. The upper end of the tapered enlargement **38** is formed to merge smoothly with the wall of the die recess **34** as by providing an annular fillet **39** of appropriate radius at the base of the projection.

I find that the strength of the web projection **37** and its resistance to breakage can be further increased by connecting the outer or lateral ends **40** of this projection with the side wall of the recess **34** so that the metal of the web projection is integrally united with the metal of the hammer at these points. I also find that in the manufacture of screws with die members of the form just described, the metal of the screw blank is worked and thereby hardened which results in finished screws of greater strength and superior quality.

In the forming operation illustrated in Fig. 1 the enlargement **38** of the hammer projection is forced into the metal of the screw blank and displaces some of the metal thereof laterally which assists in causing the outer or marginal portions of the screw head to be completely filled out and formed to the desired size and shape. During this operation the enlargement **38** forms an enlargement or pocket **42** in the tool-receiving recess of the screw blank being produced but this enlargement or pocket in the head of the completed screw is an advantage rather than a disadvantage because when a screw driving tool **43**, such as that illustrated in Figs. 20 and 21, engages in the screw recess the rib-like enlargement **44** of the tool will fit the corresponding enlargement or pocket **42** of the screw recess and will center the tool on the screw axis and also prevent lateral slipping or accidental disengagement of the tool from the slot of the screw. The interlocking thus provided between the tool and the screw head may also be very useful for retaining the screw on the end of the tool in instances where the screw must be moved into an otherwise inaccessible place by means of the tool. Furthermore since the enlargement or pocket **42** is located on the axis of the screw where the torque for driving purposes is almost negligible, it will be apparent that the presence of the enlargement or pocket will not materially reduce the effective area presented by the faces of the wing portions of the screw slot to the corresponding portion of the driving tool.

In Fig. 7 of the drawing I have shown another pair of die members comprising cooperating anvil and hammer members **50** and **51** which act on a rough screw blank to produce a screw blank **53** having a round head **54** as illustrated in Figs. 11 and 12.

The anvil **50** is provided with a stem-forming recess **55** and with a knock-out pin **56** similar to the corresponding parts of the anvil of Fig. 1. The hammer member **51** is provided with a die recess **57** of a rounded shape to form the round head **54** of the screw blank **53**.

To form a tool-receiving recess or slot **58** in the head of the screw blank **53** I provide the hammer with a web-like projection **59** which extends axially into the recess **57** and transversely thereof as illustrated in Figs. 9 and 10. This web-like projection has its outer or lateral ends **60** united with the wall of the die recess and has an axially extending tapered enlargement **61** intermediate its ends. Instead of being of round cross-section as illustrated in Fig. 2, the enlargement **61** may be of non-circular cross-section, for example of diamond-shape, and forms a corresponding diamond-shaped enlargement or pocket **62** in the head of the screw blank **53**.

In Fig. 13 of the drawing I show cooperating anvil and hammer members **65** and **66** for forming the screw blank **67** which is of the type having a flat head **68**. When a screw blank of this form is to be produced the hammer **66** need not be provided with a recess but does have an axially extending web-like projection **69** which forms the transversely extending tool-receiving slot or recess **70** in the head of the screw blank. This slot may have its ends lying inwardly of the outer wall of the screw head, as is shown in this instance, or if desired may extend entirely across the head. In this embodiment of my invention the web-projection **69** of the hammer has a tapered axially extending enlargement **71** intermediate its ends and which is of substantially the same depth or length as the web-projection itself. During the forming of the screw blank **67** this enlargement forms the pocket or enlargement **72** in the head **68** of the screw blank. The outer or lateral ends of the web-projection **69** may be inclined or tapered, as shown in Fig. 16, to form correspondingly inclined faces at the ends of the slot **70**.

For use with screw blanks in which the tool-receiving recess of the head has a diamond-shaped pocket or enlargement as illustrated in Fig. 12, I provide a driving tool **74** having a corresponding diamond-shaped central rib portion **75**. Although I have illustrated and described two different forms of driving tools which may be used to advantage with the screw blanks formed by my novel apparatus, it should be understood however that the use of tools of the particular form here illustrated is not necessary and that a conventional form of screw driver may be used if desired.

From the foregoing description and the accompanying drawing it will now be readily understood that I have provided improved screw-forming apparatus in which the hammer or punch of the die members is provided with a slot-forming projection capable of withstanding the repeated blows required to be struck during the production of screw blanks in rapid succession. It will be understood furthermore that by providing the hammer projection with a tapered enlargement, I secure not only a reinforcement and strengthening of the projection but also secure the advantage of preventing sticking of the screw blanks to the hammer and thus minimize jamming and the percentage of scrap screws.

While I have illustrated and described my improved screw forming apparatus in a somewhat detailed manner, it should be understood that I do not wish to be limited to the details of construction and arrangements of parts herein described, but regard my invention as including such changes and modifications as do not constitute a departure from the spirit of the invention and the scope of the appended claims.

Having thus described my invention, I claim:

1. In apparatus of the character described, a hammer having a working surface adapted to act on a screw blank to shape the same and a web-like projection extending axially of the hammer and transversely of said working surface, said projection being adapted to be pressed into the blank to form a transverse slot therein and having substantially at its midpoint an axially extending enlargement for reinforcing the projection against breakage.

2. In apparatus of the character described, a hammer having a die recess adapted to form a head on a screw blank and a projection extending axially of the hammer part-way into said recess and transversely thereof for forming a transverse slot in the screw head being formed, said projection having its lateral edges joined to the wall of said recess and also having substantially at its midpoint an axially extending tapered enlargement for reinforcing the projection against breakage.

3. In apparatus of the character described, a screw-forming hammer having a tapered punch projection extending axially from a working face thereof and web-like portions connected with said projection and extending laterally in opposite directions therefrom, said tapered projection and web-like portions being of substantially the same depth but the punch being thicker in cross-section than said web-like portions.

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