(No Model.) 2 Sheets—Sheet 1.

# C. D. ROGERS.

## DIE FOR SLOTTING SCREW HEADS.

No. 452,064. Patented May 12, 1891.

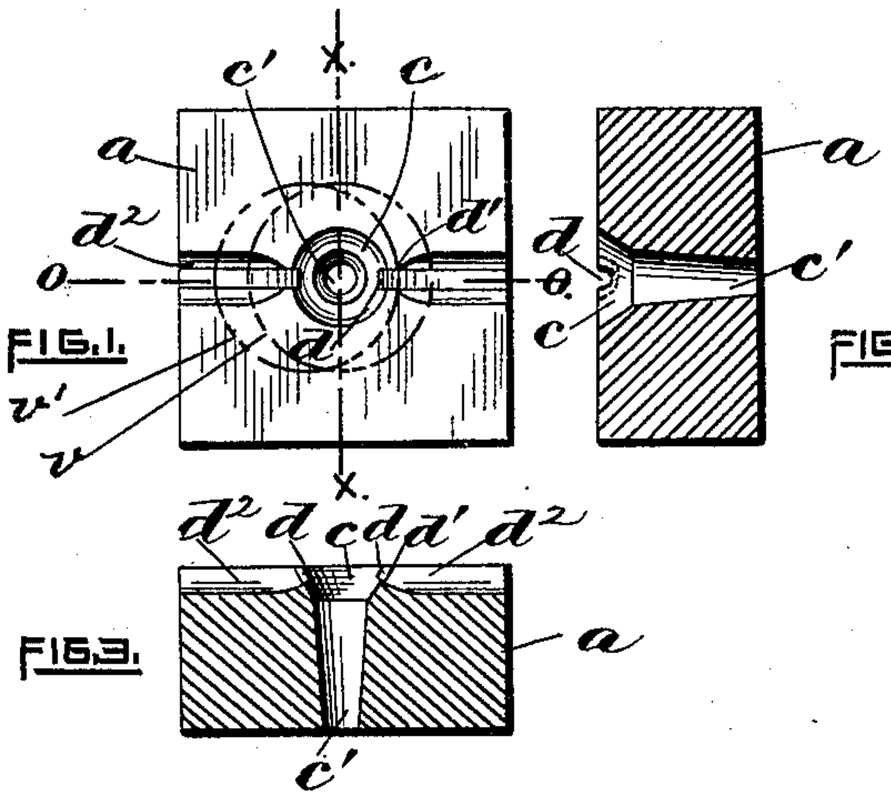


FIG. 1.

FIG. 2.

FIG. 3.

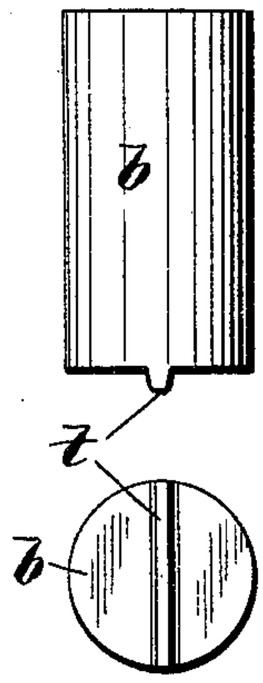


FIG. 4.

FIG. 5.

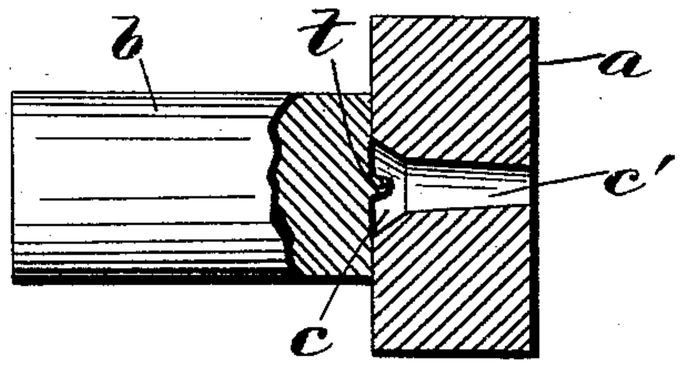


FIG. 6.

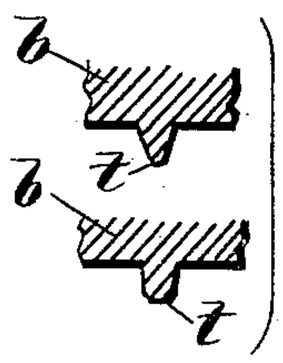


FIG. 7.

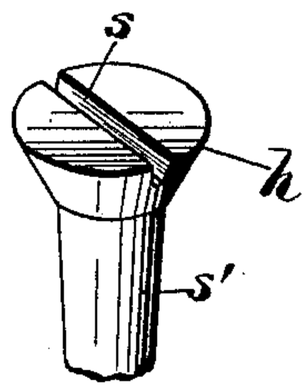


FIG. 8.

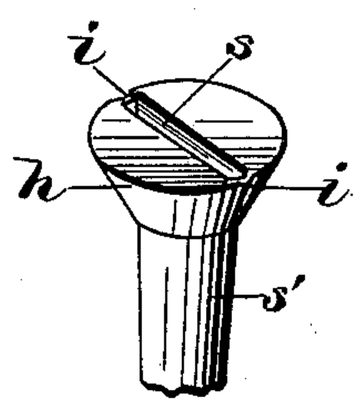


FIG. 9.

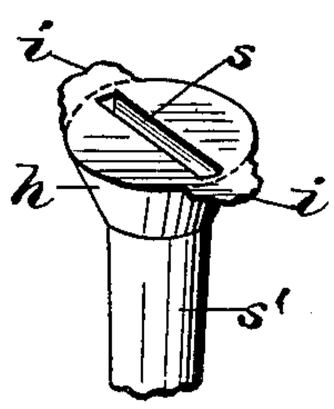


FIG. 10.

WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

# C. D. ROGERS.

## DIE FOR SLOTTING SCREW HEADS.

No. 452,064. Patented May 12, 1891.

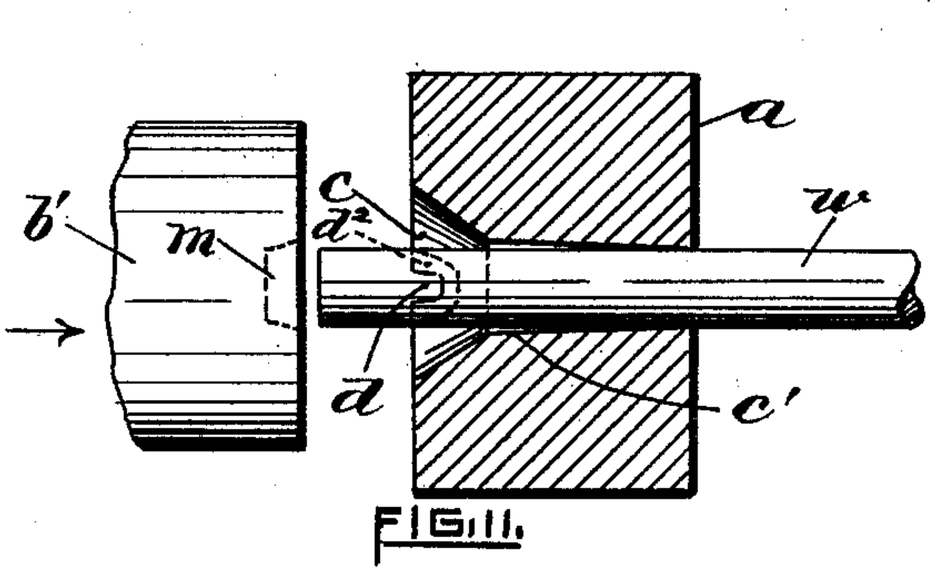


FIG. 11.

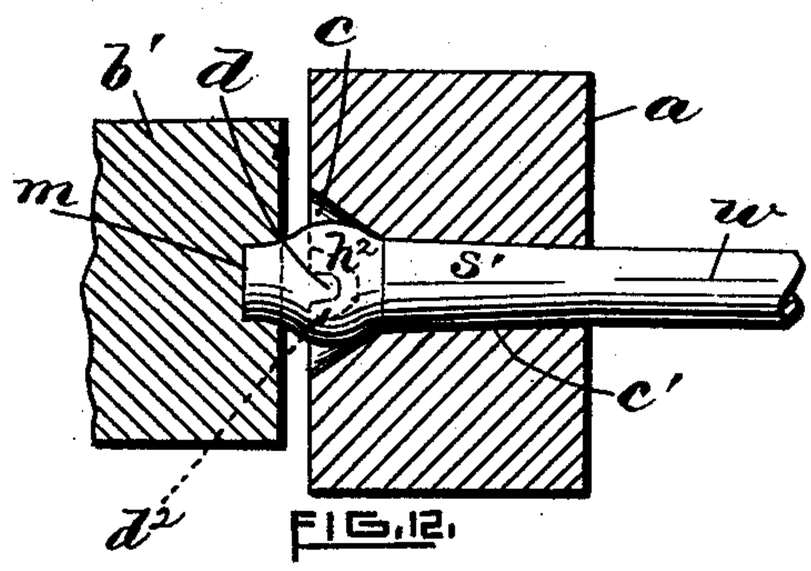


FIG. 12.

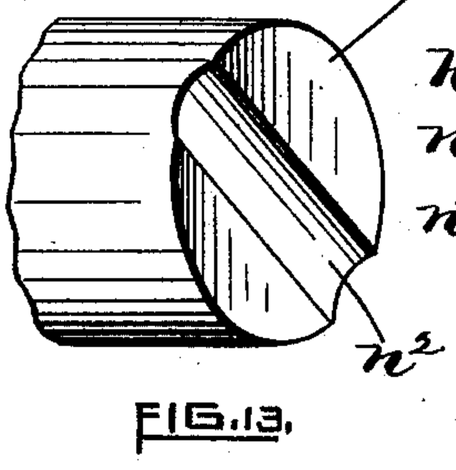


FIG. 13.

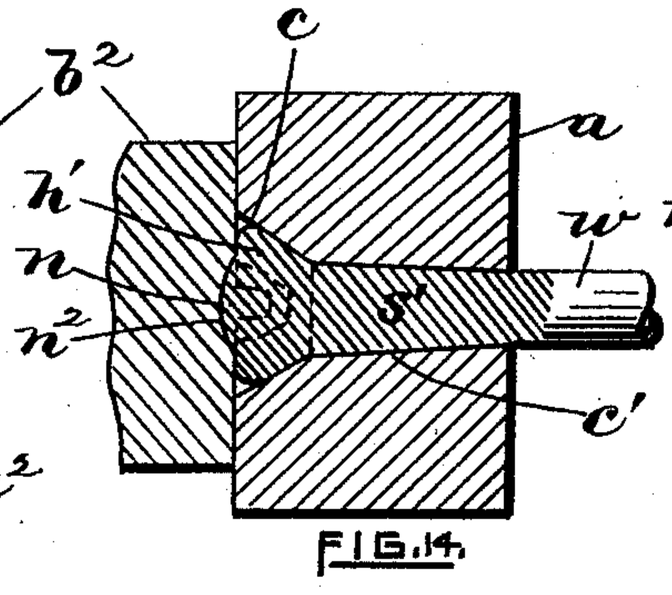


FIG. 14.

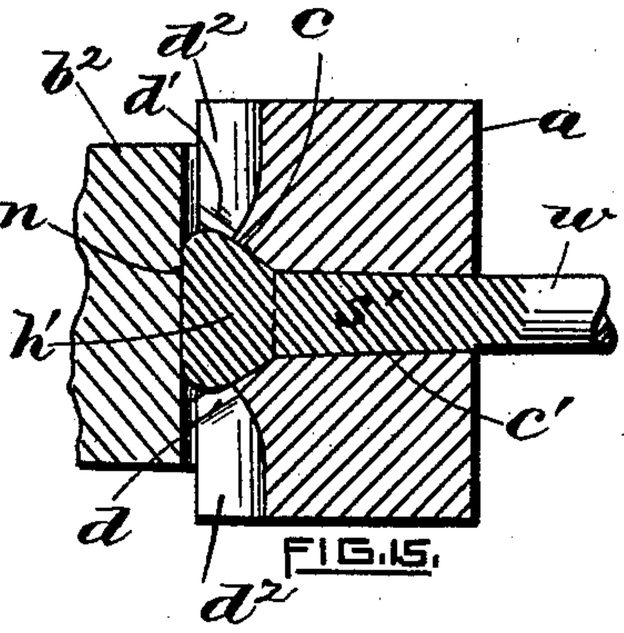


FIG. 15.

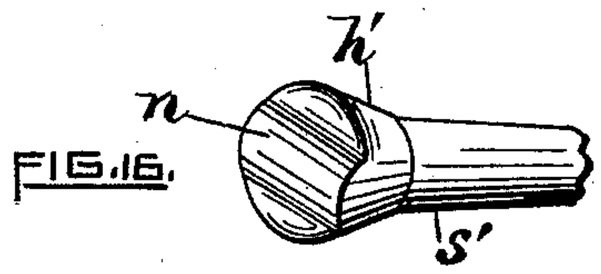


FIG. 16.

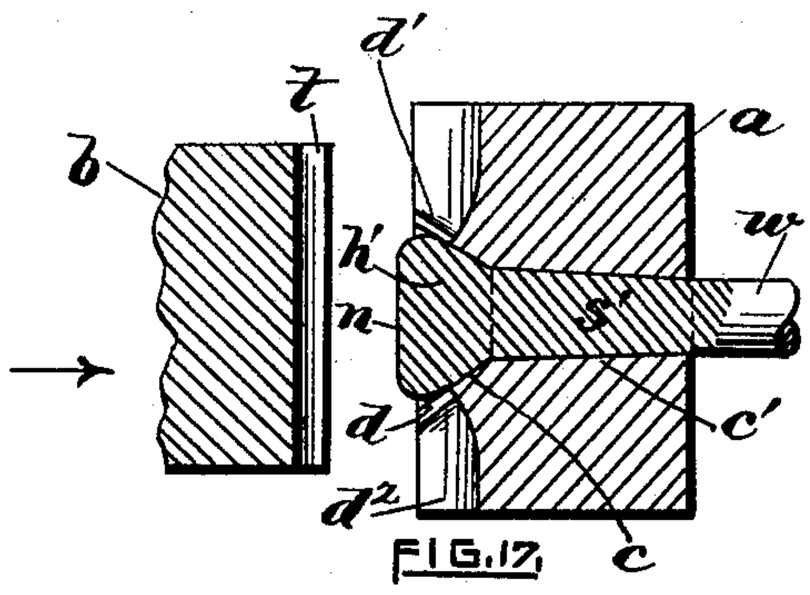


FIG. 17.

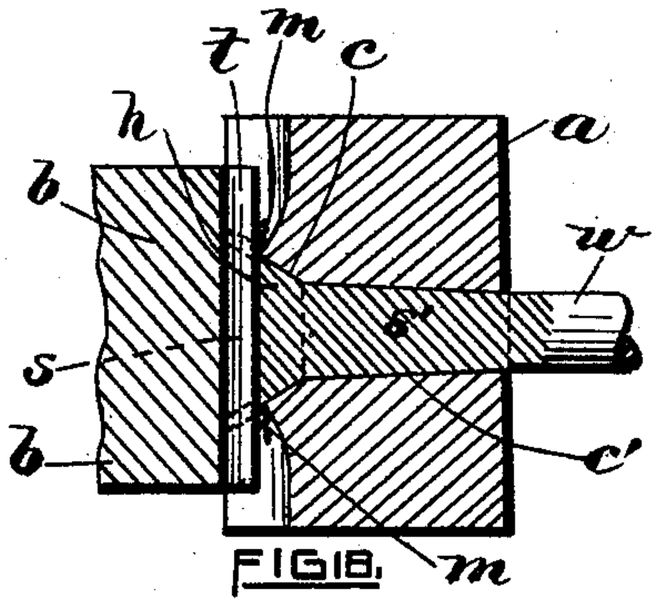


FIG. 18.

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# UNITED STATES PATENT OFFICE.

CHARLES D. ROGERS, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE AMERICAN SCREW COMPANY, OF SAME PLACE.

## DIE FOR SLOTTING SCREW-HEADS.

SPECIFICATION forming part of Letters Patent No. 452,064, dated May 12, 1891.

Application filed December 3, 1890. Serial No. 373,433. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES D. ROGERS, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Dies for Slotting Screw-Heads; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

In the manufacture of wood-screws and drive-screws, but more especially screws produced by the swaging or rolling process, it is the usual practice to form the slot for the screw-driver by swaging simultaneously with the upsetting of the metal to form the face of the head. An example of swaging dies for forming finished heads of screws, including the slot, is shown and described in a patent of the United States granted to me September 4, 1888, No. 389,167. In that patent, however, the screw-driver nick or slot does not extend entirely across the face of the head of the screw.

In all former attempts to produce screws having swaged heads provided with open-swaged slots—that is, slots extending entirely across the head—such attempts have resulted almost invariably in the production of screws having imperfect heads. Sometimes the defect is due to a fin of metal at the ends of the slots; sometimes there is a lack of metal to fill the die so as to make a complete head; sometimes there is an excess of metal, in which case the surplus stock spreads out laterally between the face of the die and the hammer and forms a fin, which must subsequently be removed. In such former arrangements adapted to swage the slot entirely across the head of the screw the die-cavity was made true and smooth, the inclined sides thereof having an unbroken surface, the face of the finishing-hammer being provided with a tongue having the exact size and shape or counterpart of the slot to be produced; or, in other words, the length of the tongue at its intersection with the face of the hammer was just equal to the diameter of the mouth of the die-cavity, the ends of the tongue having the same angle or inclination as the sides of the die. When thus made, it is a very difficult matter to so adjust the parts that the tongue will find the exact center of the die in swaging the slot; and in any event there is an amount of metal to be disposed of at the ends of the tongue which produces an excessive strain upon the mechanism in causing the metal to flow in advance of the moving tongue.

To produce a swaged open slot—that is, extending entirely across the head of the screw-blank or screw—and at the same time one devoid of the objections or defects before referred to is the object of my present invention. To that end I provide the face of the die with two or more lateral channels, which extend into the die-cavity, the size and form of each channel where it enters the inclined sides of the die being substantially the counterpart transversely of the slot to be produced, and the face of the finishing heading hammer is provided with a tongue adapted to enter the said channels. The sides of the channels are cut away or enlarged so as to produce in conjunction with the tongue a shearing action upon the metal filling the die. By this method any surplus metal flowing from the die through the channels by the force of the advancing tongue during the heading operation is cut or sheared off and falls to waste, the slotted head thus produced being free from fins or other defects usually present in swaged screw-heads having open slots.

Another advantage resulting from my improvement is that the hammer may be easily and quickly adjusted to the die. This is due to the fact that I preferably make the tongue considerably longer than the diameter of the die-cavity. Therefore the slots can be as accurately produced in the screw-head as though the centers of the hammer and die were always in actual alignment.

In carrying out my present invention I usually employ a series of three hammers somewhat in the manner described in my patent before referred to—that is, the first hammer to act upon the stock or metal upsets, and centralizes it in the grooved die; the next

or second hammer has its face provided with a curved portion so shaped that in operation the hammer disposes the metal alike on each side of the line where the slot is to be formed or as determined by the position of the grooves in the die, and the last or finishing hammer has a tongue extending across its face which is impressed into the metal, thereby causing the latter to flow laterally and upward to fill the die, any surplus metal at the same time flowing outward through the die-channels, the final movement of the tongue completely severing or shearing such surplus stock from the now-finished head resting on the die.

Another advantage of my invention lies in the facility it gives for the production of screws having the bottom of the slots curved instead of angular transversely, as usually made. This is done in order to render the heads stronger, because otherwise screws when made of steel or "homogeneous metal," as it is called, when the slots are made by cutting, are very liable to fracture at the angle of the slot when being subjected to the strain or pressure produced by the screw-driver. This property or characteristic of steel—*i. e.*, its homogeneity—has been made the subject of careful investigation and experiment during the past two or three years, and recent experience has also confirmed the result of such investigation in proving that a bar or piece of this metal is very sensitive to a tearing action, if only a means of starting the tear exists, a sharp angular groove or cut made in the piece, or a scratch even in some instances, being sufficient to form the initial point of the tear, the further tearing action or complete fracture being produced by a sudden strain or pressure, or by the jarring or vibration from hammering, &c. In such instances the strain or pressure is concentrated at or along the angular groove or sharp line formed in the piece of stock. Now, in order to prevent such tearing action at the cut or grooved points just referred to, it is found that the metal can be made perfectly reliable by simply forming in the metal, in lieu of such angular cuts, cuts or grooves having a curved form transversely. By this latter method the strain or pressure is distributed because there is no sharp groove or angle at which the pressure can be concentrated and produce a fracture. I can easily give this form to the bottom of the slot of a screw-head by simply rounding the end or face of the tongue which forms the slot.

In the appended two sheets of drawings illustrating my improvement, Figure 1, Sheet 1, represents a face or plan view of the die. Figs. 2 and 3 are transverse sectional views taken on lines *x x* and *o o*, respectively, of Fig. 1. Fig. 4 is a side elevation of the slotting-hammer. Fig. 5 is an end view of it. Fig. 6 is a sectional view showing the relation of the hammer and die as in use. Fig. 7 represents sectionally-enlarged modified forms of the slot-forming tongue of the hammer. Fig. 8 shows, enlarged, a perspective view of the upper portion of a screw-blank having a swaged open slot. Figs. 9 and 10 are similar views showing forms of imperfectly-slotted heads as commonly produced when swaging-hammers are used. Fig. 11, Sheet 2, shows, enlarged, a transverse section of my improved die having a piece of wire resting therein preparatory to being acted upon by the first heading-hammer. Fig. 12 is a similar view showing the hammer advanced to its limit, its action being to upset the metal and form a preliminary head centrally on the end of the wire. Fig. 13 is a perspective view of the lower or working face of the second hammer. Fig. 14 is a sectional view showing the initial head transformed by the second hammer into a roughly-shaped head, the end thereof having a lateral projection arranged in relation to the slot to be produced, the die-section corresponding to Fig. 2. Fig. 15 is a similar sectional view of the parts represented in Fig. 14, the line of cut, however, being taken at right angles therewith or corresponding to Fig. 3. Fig. 16 is a perspective view of the blank sectionally represented in the two preceding figures. Fig. 17 is a sectional view showing the die and blank resting therein, as in Fig. 15, and also showing the third or slotting hammer advancing to produce the slot, and Fig. 18 shows the same at the end of the operation, the tongue of the hammer having been forced into the metal of the head, thereby swaging the slot and at the same time shearing or squeezing off any surplus metal forced into the die-channels, the headed blank when removed from the die being substantially as represented in Fig. 8.

My invention involves a new method of forging slots in screw-heads with open ends and the employment of a die and hammer constructed and arranged as described below.

In the drawings, *w* indicates a piece of wire resting in the die *a*, Fig. 11, a centrally-recessed heading-hammer $b'$, the first to operate upon the wire, being in the act of upsetting the metal to form the preliminary head $h^2$, the latter being shown by Fig. 12, and at the same time upsetting the metal in the die portion $c'$ to form the taper shank $s'$. The next heading-hammer $b^2$ to act upon the metal—that is, the preliminary head—has its face provided with a curved depression $n^2$, Fig. 13, which acts to dispose the metal across the head, substantially as shown at *n* in Fig. 16. At the same time the metal is still further compressed into the die-cavity *c*, thus forming the approximate head $h'$. (See Figs. 14 and 15.) The final operation impresses the tongue *t* of the last or third hammer *b* into and longitudinally of the slightly-raised projection *n* of the head $h'$.

The face of the die *a* (see Figs. 1, 2, 3, &c.) is provided with a cavity *c*, having inclined sides, the cavity being the counterpart of the screw-head to be produced. A groove *d* is

formed in opposite sides of the die-cavity, the form and size of the groove transversely being substantially the same as the slot produced by the action of the tongue *t* of the hammer *b*. Immediately to the rear of the slot opening or channel *d*, where it enters the die-cavity *c*, the channel is enlarged laterally, as at $d^2$, to form, in conjunction with the tongue *t*, cutting or shearing edges *d'*. In fact, the vertical or nearly vertical sides of the grooves at their intersection with the walls of the die-cavity may be employed for the purpose. The tongue *t*, projecting from the face of the slotting-hammer *b*, may have any suitable form transversely, the channels *d* of the die obviously having the same form. In any event, however, I prefer for reasons hereinbefore stated to remove the lower sharp edges of the tongue, so as to produce fillets in the nicks or slots *s* at the intersection of the bottom and vertical sides. Figs. 4 and 7 represent different forms of the tongue. Another novel feature of the tongue is that I make it longer than the diameter of the cavity *c*, or, say, equal to the diameter of the hammer itself.

In Fig. 1 the dotted circle *v* indicates that the center of the hammer and die are coincident. The other circle *v'* indicates that the said centers are not in alignment, although the tongue of the hammer is still capable of forming a complete slot. By again referring to Fig. 17 it will be seen that the die *a* contains in its cavity *c* the partly-completed screw-head. Now upon advancing the hammer *b* the tongue *t* engages the raised portion *n* of the head *h'*, Fig. 16, &c., to form the slot, the continued movement of the hammer forcing the tongue into the metal to its full depth, being also the depth of the die-channels *d*, and at the same time forcing out and shearing or squeezing off at the points *d'* any surplus metal, as *m*, Fig. 18, and completing the operation. Upon removing the headed blank from the die the head *h* will be found to have a practically perfect slot *s* therein extending entirely across its face, substantially as represented by Fig. 8.

I claim as my invention—

1. A die for forging slotted screw-heads, having in the surface surrounding the cavity in which the screw-heads are to be formed slots or channels extending from such cavity in line with the slots to be formed in the screw-heads to receive the ends of a slot-forming tongue on the face of a heading-hammer and permit the escape of surplus metal displaced by the tongue in forming the slot.

2. A die for forming slotted screw-heads, having in the surface surrounding the cavity in which screw-heads are to be formed slots or channels extending from such cavity in line with the slot to be formed in a screw-head, in combination with a heading-hammer having across its face a tongue to form the slot in the screw-head and to enter the slots in the die in line therewith to remove from the screw-head surplus metal displaced in forging the slot.

3. The method herein described for forging slots across the heads of screws and open at the ends by forcing into the metal of a screw-head in the cavity of a die and into slots or channels formed in the surface surrounding such cavity and extending therefrom in line with the slots to be formed in the screw-heads a tongue formed on the face of a heading-hammer the counterpart in cross-section of the slot to be produced in the screw-head.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES D. ROGERS.

Witnesses:

CHARLES HANNIGAN,

GEO. H. REMINGTON.