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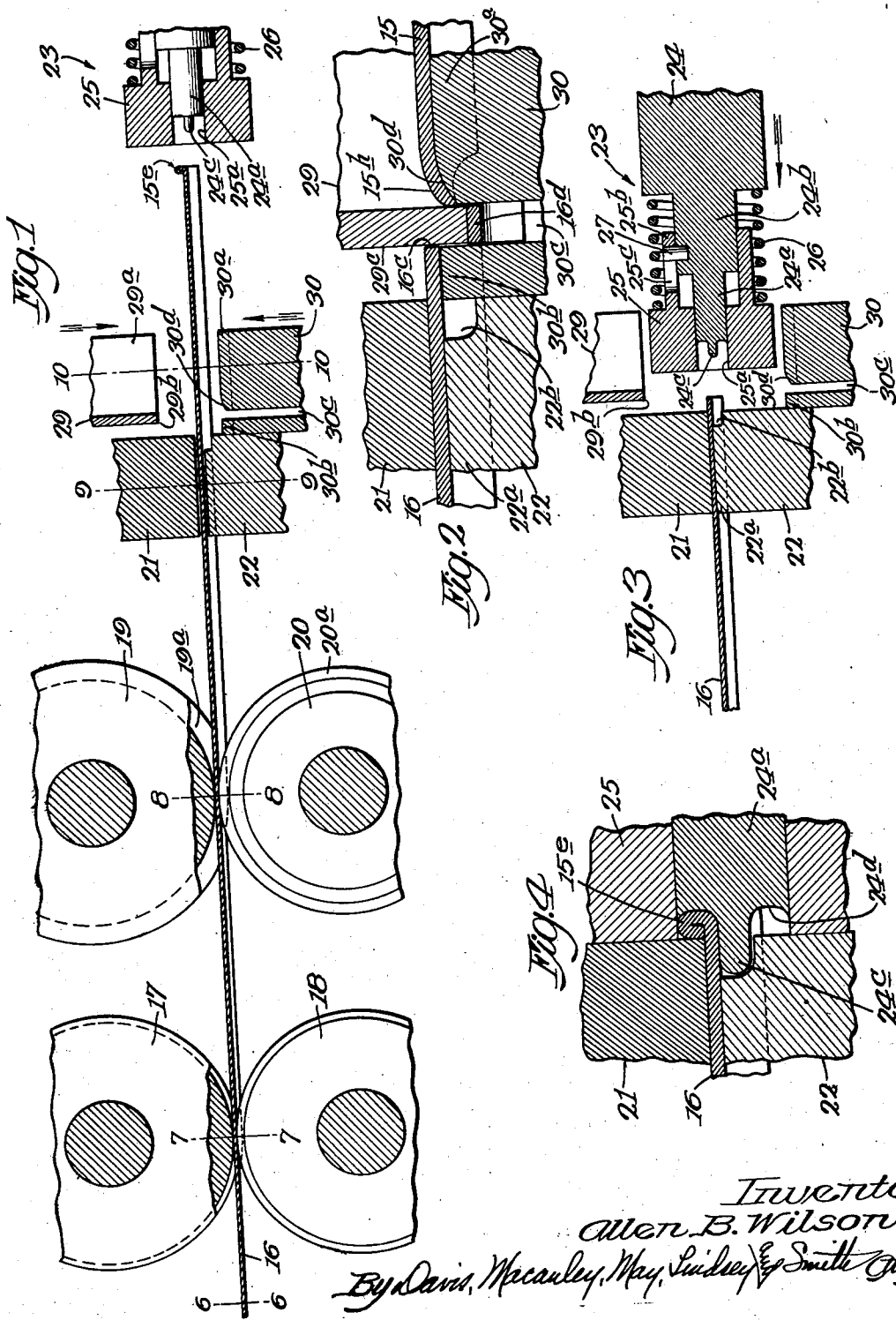
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2,070,766

SHEET METAL NAIL AND METHOD OF FORMING SAME

Filed Nov. 11, 1935

2 Sheets-Sheet 1



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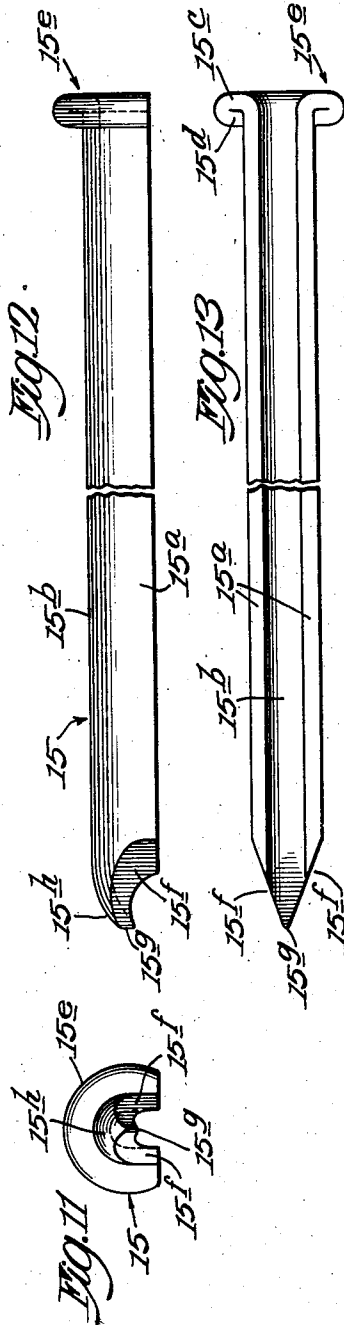
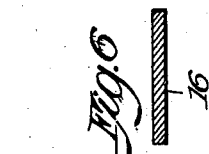
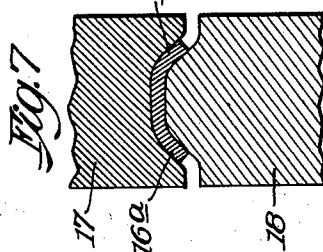
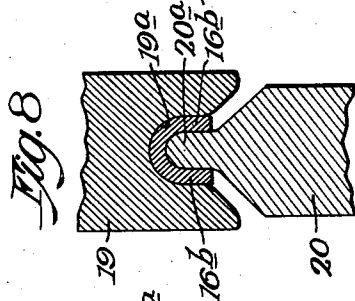
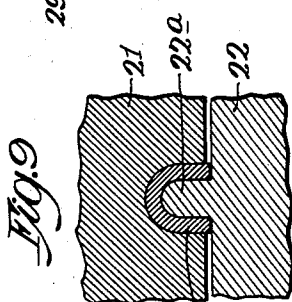
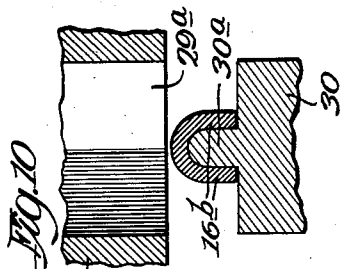
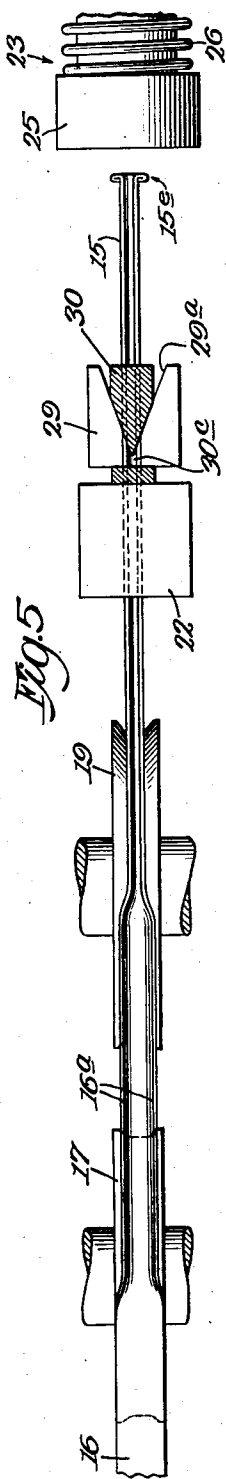
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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SHEET METAL NAIL AND METHOD OF FORMING SAME

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15 Claims. (Cl. 10—34)

This invention relates to sheet metal nails and its purpose is to provide an improved nail formed by an improved method from a strip of sheet metal and adapted to be used for all of the purposes for which ordinary wire nails are ordinarily employed. Heretofore, many efforts have been made to form nails from sheet metal but these attempts have not met with success, due largely to the inability to form a nail which could be driven into wood or the like without bending or to form one having an adequate head which would withstand successive blows of a hammer or the like, and which could be withdrawn after being driven, without substantial deformation. These difficulties have been overcome in the present invention by providing an improved nail formed of a strip of sheet metal and comprising an improved construction of the head and the point of the nail which permit it to be driven without bending and to be withdrawn when desired. A further feature of the invention is the provision of a sheet metal nail of U-shaped cross-section having an enlarged head and a point which is located on or near the longitudinal axis of the nail so that when the nail is driven it retains its original shape and does not deflect laterally. A further object of the invention is to provide an improved method of forming sheet metal nails according to which an elongated metal strip is caused to assume a U-shaped cross-section and then cut off into successive sections which are operated upon by dies or the like to form a head at one end of each section and a point at the other end, the point being deflected toward the longitudinal axis of the nail. Still another object of the invention is to provide a sheet metal nail comprising an improved head having a plurality of layers of metal extending transversely to the body of the nail. Other objects relate to various features of construction and arrangement and to details of the improved method which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings, in which one embodiment of the improved nail and one example of the improved method of forming it are illustrated. In the drawings,

Fig. 1 shows a longitudinal section through a strip of metal and one form of apparatus which may be employed in operating upon the strip to form a sheet metal nail embodying the present invention;

Fig. 2 is an enlarged vertical section showing the relative positions of the parts after the shear-

ing dies of the apparatus illustrated in Fig. 1 have been operated to cut off one nail-forming section from the elongated strip shown in Fig. 1;

Fig. 3 is an enlargement of the portion of the apparatus illustrated at the right of Fig. 1, showing the relative positions of the parts preliminary to the formation of a head upon one of the nail sections;

Fig. 4 is a section similar to that of Fig. 3, but on an enlarged scale, showing the relative positions of the parts after the dies have been operated to form the nail head;

Fig. 5 shows a bottom plan view of the apparatus illustrated in Fig. 1, with the lower rolls removed;

Fig. 6 shows a cross-section through the sheet metal strip from which the nails are formed, the section being taken on the line 6—6 of Fig. 1;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 1, showing portions of the first stage rolls which impart an initial transverse bend to the metal strip;

Fig. 8 is an enlarged section taken on the line 8—8 of Fig. 1, showing the effect upon the metal strip of the second stage rolls which impart to the strip a U-shaped cross-section;

Fig. 9 is an enlarged section taken on the line 9—9 of Fig. 1, showing the action of the clamps which hold the U-shaped strip while a section thereof is being cut off to form a nail;

Fig. 10 is a sectional view taken on the line 10—10 of Fig. 1, showing on an enlarged scale the shearing dies which operate to cut off a nail section from the source of supply and to impart the desired pointed end structure to the section;

Fig. 11 shows an end view of the completed nail;

Fig. 12 shows a side view of the completed nail; and

Fig. 13 shows a bottom plan view of the completed nail.

Before describing the method and apparatus which are employed in forming the improved nail, reference may be had to Figs. 11, 12, and 13, which show the completed nail 15. This nail is of U-shaped cross-section, comprising side walls 15^a connected by a curved back wall or top wall 15^b. At one end of the nail, the material of these walls is turned outwardly as shown at 15^c and then reversely bent as shown at 15^d to form a head designated generally by the numeral 15^e. At the other end of the nail, the side walls are sheared off as shown at 15^f to form a point 15^g. This point may be located in substantial alignment or coincidence with the longitudinal

axis of the nail by having the back or top wall of the nail curved or bent downwardly as shown at 15^b. The extent to which the point is deflected inwardly toward the axis of the nail will depend upon the size of the nail, the material of which it is formed and the use to which it is to be put; the deflection should be sufficient to overcome the tendency of the nail to bend in the direction of the closed side of the channel and will ordinarily locate the point at or near the longitudinal axis of the nail as determined by the center of mass of the cross-section of the nail.

The nail 15 is preferably formed from an elongated strip of sheet steel 16 or the like which has parallel edges and which is of sufficient width to permit the formation of the completed nail therefrom. This strip 16 is run through a pair of rolls 17 and 18, shown in Figs. 1 and 7, which have their peripheral surfaces so formed that they turn the side edges of the strip 16 downwardly as shown at 16^a and give it a shallow U-shaped cross-section as it passes between them. The strip then passes between two other rolls 19 and 20, shown in Figs. 1 and 8, which bend the side portions of the strip downwardly to a further extent due to the action of the U-shaped groove 19^a in the upper roll and the corresponding annular projection 20^a on the lower roll. The strip 16 thus acquires parallel side walls 16^b which correspond in shape and spaced relation to the side walls 15^a of the completed nail.

The strip 16 having the U-shaped cross-section imparted thereto by the rolls 19 and 20 is then in readiness to be cut up into sections for the formation of nails 15. The rolls 17, 18, 19, and 20 are power driven and their motion is intermittently arrested so that while the strip 16 is stationary, it may be gripped by a pair of clamping devices 21 and 22 which have their operating surfaces formed substantially like the peripheral surfaces of the rolls 19 and 20 so that the upper member 21 embraces the outside of the strip while the lower gripping member 22 has a projection 22^a which extends up into the groove of the strip. These gripping devices 21 and 22 may be moved toward each other by any suitable operating mechanism and be caused to grip the end portion of the U-shaped strip 16, leaving a predetermined part of the strip projecting beyond the faces of the gripping members, as shown in Fig. 3. A head-forming device 23 is then brought into action to form on the end of the strip one of the heads 15^c of the completed nail. This head-forming device comprises a plunger 24 which is adapted to be reciprocated horizontally in alignment with the axis of the strip 16 and which has slidably mounted thereon a chuck or sleeve 25. This sleeve has a circular aperture 25^a formed therein and this aperture is slidably engaged by the reduced end portion 24^a of the plunger. The sleeve 25 has a part 25^b of reduced diameter which is slidably mounted upon the intermediate portion 24^b of the plunger and a coil spring 26 surrounds the parts 24^b and 25^b and extends between the annular shoulders on the body portions of the members 24 and 25 so that it normally tends to separate them to the extent shown in Fig. 3. The relative movement of the members 24 and 25 and the extent of their separation are limited by a pin 27 which is mounted in the intermediate portion 24^b of the member 24 and which engages a slot 28^a formed in the member

25. When the members 24 and 25 are thus separated to the maximum extent under the influence of the spring 26, the bore 25^a of the member 25 is partially occupied by the portion 24^a of the plunger, leaving a cavity which is partially occupied by a central projection 24^c which is formed on the end of the plunger. The end surface of the portion 24^a of the plunger is in the form of an annular groove of curved cross-section as shown at 24^d, conforming to the desired curvature of the portion 15^c of the nail head.

With the parts in the relative positions shown in Fig. 3, the head-forming device 23 is then moved bodily toward the left until the chuck or sleeve 25 engages the end faces of the clamping devices 21 and 22 at which time the extremity of the U-shaped strip 16 will project into the cavity of the member 25. Further movement of the plunger 24, with the member 25 held stationary by the clamping devices, with a resulting compression of the spring 26, will cause the projection 24^c to enter the groove of the strip 16 until the extremity of this strip engages the annular end face 24^d of the plunger. This curved end face then causes the metal of the end of the strip to be turned outwardly and this outward movement of the metal continues until it engages the wall of the bore 25^a. By this time, the relative movement of the part 24^a of the plunger with respect to the body 25 of the chuck or sleeve will have proceeded to a point where further continued relative movement will cause the edge of the out-turned part of the metal strip to engage the faces of the clamping members 21 and 22 so that the metal will then be turned inwardly and will continue to move inwardly until its edge engages the body portion of the U-shaped strip. During this time, the projection 24^c of the plunger will enter the notch 22^b which is formed in the lower clamping member 22 and when the plunger 24 has reached the limit of its movement, the parts will be in the relative positions shown in Fig. 4 and the double flanged head 15^c will have been formed on the end of the strip. The head-forming device 23 is then withdrawn, the clamping devices 21 and 22 are released from the strip and the strip is again advanced by the intermittent rotation of the rolls a distance substantially equal to the length of the finished nail.

Having formed the head on the end of the elongated strip and having advanced the strip through the gripping devices 21 and 22, these gripping devices are again brought into position to hold the strip and the projecting portion of the strip is then cut off adjacent to the gripping devices by the action of cutting or shearing dies 29 and 30 which are shown particularly in Figs. 1, 2, and 10. The upper die 29 has V-shaped cutting edges 29^a which diverge at an angle corresponding to the divergence of the edges 15^c at the point of the finished nail and this upper die also has a transverse cutting edge 29^b which extends at right angles to the axis of the strip so that after the die has operated, the body portion of the strip is left with a blunt end which is adapted for the formation of a head upon the next succeeding nail. The lower cutting or shearing die 30 has a projection 30^a which is adapted to enter the groove in the under side of the strip beneath the upper die 29 and thereby support the strip during the action of the upper die. The lower die 30 also has another projection 30^b which also enters the groove of the strip and supports the part of this strip which lies between the 75

clamping member 21 and the end face 29^c of the upper die, as shown in Fig. 2. The lower die 30 is further provided with a slot 30^c which extends downwardly through the body of the die between the parts 30^a and 30^b and which is adapted to be entered by the V-shaped upper die 29 when the latter moves downwardly to its extreme position. The upper edge of the projection 30^a is curved downwardly as shown at 30^d adjacent to the slot 30^c with the result that when the upper die 29 is moved downwardly to engage the strip, after the lower die 30 has been moved upwardly to engage and support the strip on its under side, the strip 16 is sheared off transversely by the cutting edge 29^b as shown at 16^c and at the same time the inclined cutting edges 29^a of the upper die shear off the side walls of the end portion of the strip to form diverging surfaces which become the surfaces 15^f of the point of the finished nail. As this shearing action takes place, the top or back wall of the extremity of the U-shaped member is deflected downwardly against the curved surface 30^d of the lower die, as shown in Fig. 2, to form the point 15^g of the completed nail and to cause this point to occupy a position on or near the longitudinal axis of the nail, as explained above. This shearing operation removes a section 16^d of the strip and leaves the completed nail 15. The cutting dies 29 and 30 are then withdrawn and the parts are then in readiness for moving the head-forming device 23 into position to form a head on the body portion of the strip which is then held between the clamping devices 21 and 22, as shown in Fig. 3. In this way, the heads and the points are formed alternately and nails may be quickly formed in succession from the elongated metal strip which has a step by step motion through the apparatus.

Instead of imparting an exact U-shaped cross-section to the strip as it passes through the rolls of the apparatus, it may be caused to assume a V-shaped cross-section or other substantially equivalent shape, but some form of concave cross-section approximating the U-shaped or its equivalent is desirable because of the greater surface of the nail which is exposed to frictional engagement with the wood into which it is driven, as compared with the surface area of wire nails or the like. When the improved nail is driven, the wood enters the groove of the nail in addition to contacting the outer surface thereof so that the total area of contact between the wood and the nail is relatively large and the resistance to withdrawing the nail is correspondingly great. The double flanged head permits the nail to be driven or withdrawn without deformation of the head or other parts of the nail and the V-shaped point having its extremity deflected inwardly toward the longitudinal axis of the nail permits the nail to be driven without bending in any direction. Although various proportions may be successfully employed in practice, it has been found, for example, that if the sheared edges 15^f of the completed nail make an angle of substantially 17 degrees with the axis of the nail, with the back wall of the nail bent downwardly as shown at 15^h for a distance from the end of the nail equal to from one and one-half to two times the thickness of the nail, very efficient results are obtained.

Although one form of the improved nail has been shown by way of illustration in connection with the description of one method of forming it, it will be understood that the improved nail may

be constructed in various forms and that the method may be practiced in various ways coming within the scope of the appended claims.

I claim:

1. A sheet metal nail of angular cross-section having a point deflected inwardly toward the longitudinal axis of the nail to a sufficient extent to prevent bending of the nail when it is driven.
2. A sheet metal nail of U-shaped cross-section having a point located approximately on the longitudinal axis of the nail.
3. A sheet metal nail of angular cross-section having a flanged head comprising a plurality of layers of metal extending transversely to the longitudinal axis of the nail.
4. A nail comprising a channel-shaped strip of sheet metal having the metal at its end bent outwardly and reversed upon itself transversely to the longitudinal axis of the nail to form a head.
5. A nail comprising a channel-shaped strip of sheet metal having the metal at one end bent outwardly to form a head and having the sides of the channel at the other end cut away along oblique lines to form a point, said point being inclined inwardly toward the longitudinal axis of the nail to a sufficient extent to prevent bending of the nail when it is driven.
6. A sheet metal nail of channel cross-section having the sides of the channel at one end of the nail cut away along converging surfaces to form a point, the back of the channel being deflected to locate said point near the longitudinal axis of the nail.
7. A sheet metal nail of channel shape having its walls bent outwardly transversely to the longitudinal axis of the nail at one end to form a multiple layered head and having said walls sharpened and deflected at the other end to form a point located inwardly from the outer face of the nail to a sufficient extent to prevent bending of the nail when it is driven.
8. A sheet metal nail of channel shape having its walls bent outwardly and then reversely bent at one end to form a multiple layered head and having its walls cut away along convergent surfaces at the other end to form a point, said point being deflected to a position substantially on the longitudinal axis of the nail.
9. The method of forming a nail which consists in rolling the edges of an elongated flat strip of sheet metal to form a channel-shaped member, bending the walls of said channel transversely at one end of said member to form a head, and cutting said walls along oblique lines at the other end of said member to form a point.
10. The method of forming a nail which consists in rolling the edges of an elongated flat strip of sheet metal to form a channel-shaped member, bending the walls of said channel transversely at one end of said member to form a head, cutting said walls along oblique lines at the other end of said member to form a point, and deflecting said point toward the longitudinal axis of the nail.
11. The method of forming a nail which consists in rolling the edges of an elongated flat strip of sheet metal to form a channel-shaped member, bending the walls of said channel transversely at one end of said member to form a multi-layered head, and cutting the walls of the other end of said member to form a point.
12. The method of forming a nail which consists in rolling the edges of an elongated flat strip of sheet metal to form a channel-shaped member, bending the walls of said channel transversely at one end of said member to form a multi-layered

head, and cutting and bending said walls at the other end of said member to form a point located inwardly toward the longitudinal axis of the nail.

13. The method of forming a nail which consists in bending the lateral portions of an elongated flat strip of sheet metal to form a channel, holding said channel and bending the ends of its walls transversely to form a head, then advancing said channel longitudinally, again holding said channel, and then shearing off said channel to form a pointed end on the head-carrying portion thereof.

14. The method of forming a nail which consists in bending the lateral portions of an elongated flat strip of sheet metal to form a channel, holding said channel and bending the ends of its walls transversely to form a head, then ad-

vancing said channel longitudinally, again holding said channel, and then shearing off said channel to form a pointed end on the head-carrying portion thereof and to form a transverse end on the remaining portion.

15. The method of forming a nail which consists in bending the lateral portions of an elongated flat strip of sheet metal to form a channel, holding said channel and bending the ends of its walls transversely to form a head, then advancing said channel longitudinally, again holding said channel, and then shearing off said channel along oblique surfaces and bending the end of the cut-off portion inwardly toward the longitudinal axis of the nail.

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