(No Model.) 2 Sheets—Sheet 1.

D. E. KEMPSTER.

HORSESHOE NAIL AND BLANK THEREFOR.

No. 417,490. Patented Dec. 17, 1889.

Fig. 1.

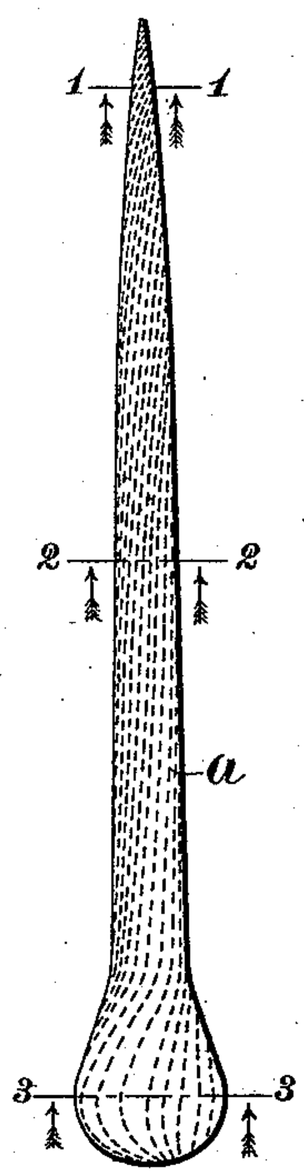

Fig. 6.

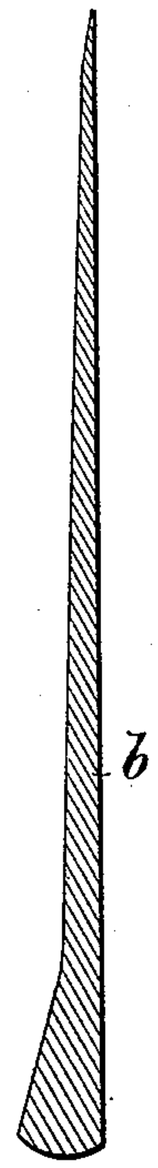

Fig. 5.

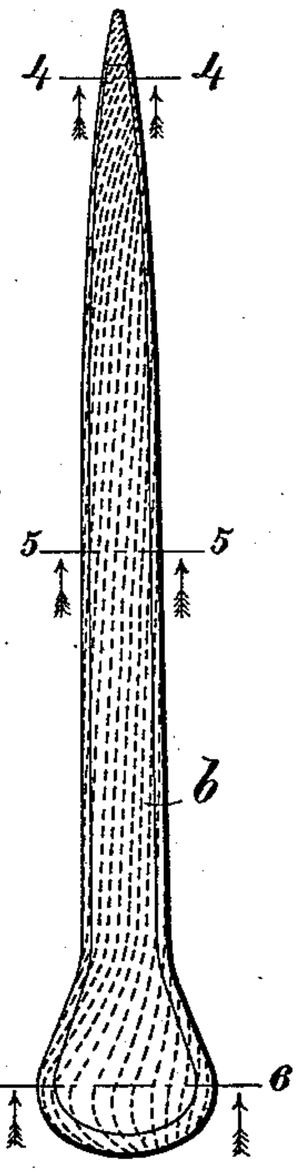

Fig. 10.

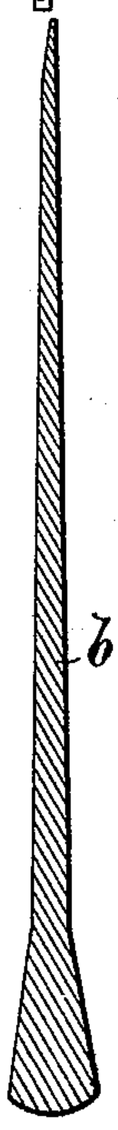

Fig. 2.

Fig. 7.

Fig. 12.

Fig. 3.

Fig. 8.

Fig. 11.

Fig. 4.

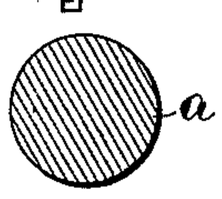

Fig. 9.

Witnesses

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(No Model.) 2 Sheets—Sheet 2.

D. E. KEMPSTER.

HORSESHOE NAIL AND BLANK THEREFOR.

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Fig 13.

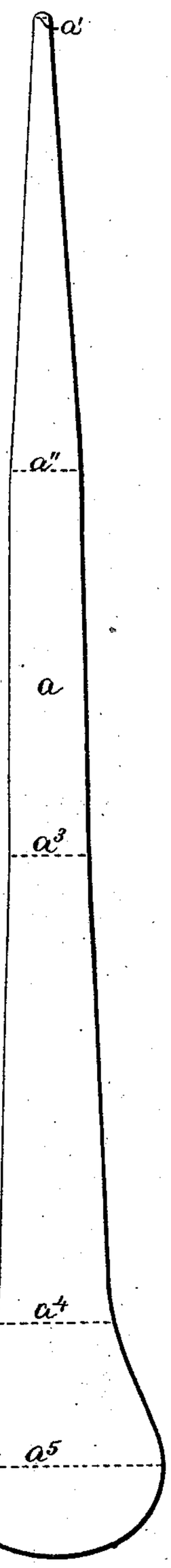


Fig 14

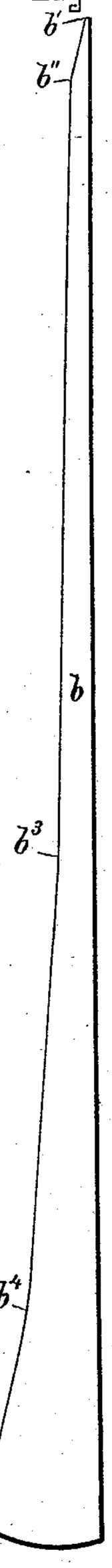
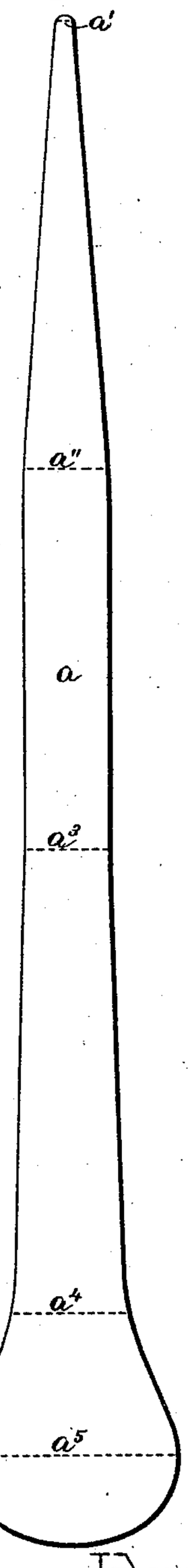


Fig 16

Fig 15.



Witnesses
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UNITED STATES PATENT OFFICE.

DANIEL E. KEMPSTER, OF BOSTON, MASSACHUSETTS.

HORSESHOE-NAIL AND BLANK THEREFOR.

SPECIFICATION forming part of Letters Patent No. 417,490, dated December 17, 1889.

Application filed April 23, 1888. Serial No. 271,534. (No model.)

To all whom it may concern:

Be it known that I, DANIEL E. KEMPSTER, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Horseshoe-Nails and Nail-Blanks therefor; and I do 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 the letters of reference marked thereon, which form a part of this specification.

My invention relates to nails for fastening the shoes upon the feet of animals, and especially to that class of such nails as are completely forged from hot metal and require no subsequent cutting or shearing at their points in their manufacture. The nails manufactured and used for this purpose may be considered in two classes—viz., those which are completely forged hot and those which are formed cold. I need not herein describe the state of the art with regard to the manufacture of either class; but, that all may fully understand their nature and thereby more readily see and appreciate the merits of my invention, I will briefly point out the good and bad qualities existing in both classes of said nails as furnished to the user at the present time prior to the introduction of my improved nails.

The advantages of hot-forged nails are: They are tougher, stronger, clinch better, and are less liable to sliver or split at their points when being driven into the hoof than nails made by the cold process. The disadvantages of hot-forged nails are: They are not uniform in size or shape, and, owing to the methods of their manufacture, are inclined to have the middle portion or point half of their blades or shanks bulged or swelled out broader than in the neck under the head. This is a very great objection, as such nails make the holes so large in the hoof that they do not fill said holes tightly when completely driven in where they belong, and consequently the shoe is loose. Said nails are also very soft and ductile, and therefore stretch and allow the shoe to work and wear loose and soon require refitting. The driving qualities of the hot-forged nails are also very inferior, as, owing to the removal of the oxide or scale from the nails, their surfaces are left rough and granulated and not smoothly finished, as when rolled or compressed cold, and therefore when driving said nails (especially in a hard hoof) the nails, being soft, are very liable to bend and crinkle up, and thereby require considerable extra time in their use, and to avoid this objection some manufacturers of hot-forged nails now compress or hammer the point half of the nails when cold, thereby tempering and stiffening them and improving their driving qualities. This cold compression or hammering given said nails does not add to the wearing qualities of their heads and necks, which come within the crease and holes in the shoe, and which should be thoroughly compressed and condensed, so as to be hard at that part, to withstand the wear and tendency of the shoe to shear them off under the action of the severe pounding of said shoes upon the earth or pavement while upon the animal's feet.

The advantages of animal-shoe nails made by the cold process are: They are uniform in size and of symmetrical shape, being usually sheared or compressed, tapering from head to point, so that when completely driven in where they belong they fill the holes in the shoe and hoof tightly, and thereby firmly secure the shoe from working loose. The metal throughout the entire nail being condensed and hardened, they are not so liable to wear off or to stretch out and allow the shoe to work loose upon the hoof. The driving qualities of these nails are very superior, as their surfaces are smoothly finished, and they are stiff and not liable to bend or crinkle up when driven into the hardest hoof. The disadvantages of these cold-made nails are: They are very brittle, and therefore liable to break off short when being clinched, and, furthermore, the use of these nails is always attended with more or less danger of injuring if not permanently disabling the animal shod thereby, as from the very nature of the cold-process manufacture, laminations are engendered in the metal, and such nails, although apparently sound as far as any external appear-

ance can denote, are liable to split or sliver in their use; but, owing to the advantage of their driving qualities and their uniformity, which gives a greater number of nails to the pound, and also to the fact that they can be manufactured and sold cheaper than hot-forged nails, they are used to a great extent throughout the country, and valuable animals are continually being ruined thereby.

In the best kinds of animal shoe nails heretofore manufactured the grain or fiber of the metal runs lengthwise of the nail, and therefore any operation upon the slender blade or point of the nail while cold, either by rolling or hammering, which compresses the cold metal alternately, first upon two opposite sides and then upon two opposite edges, or vice versa, (either for the purpose of stiffening and pointing the hot-forged nails or as a part of the cold-process manufacture,) necessarily fractures the minute crystals composing the structure of the nail, as the alternate lateral displacement of its fibrous texture under this treatment at once destroys the tenacity and cohesiveness of the fibers and particles of metal and produces laminations which develop into slivers and split points when being driven into the hoof, and especially if said hoof is a hard one. This disability exists to a greater degree in nails which have their points clipped or sheared, as the fibers of the metal are in that case cut diagonally across; but the defect mentioned is also inherent, although to a less extent, in hot-forged nails having their blades and beveled points cold-hammered in the manner before described.

My invention has for its object to provide improved animal-shoe nails having superior qualities and combining therein all those advantages found in both classes of nails referred to hereinbefore, and at the same time possessing none of their disadvantages; and I accomplish this object by a novel process of manufacture, as fully set forth and illustrated in my separate application for Letters Patent filed by me in the United States Patent Office March 15, 1889, and bearing Serial No. 303,408, and therefore I will not in this application minutely describe the process or method and appliances for carrying it out in the manufacture of my improved nails; but for a more complete and thorough understanding thereof I would refer to my other and companion application alluded to above as containing a full description of said matters.

My invention consists in an animal-shoe-nail blank rolled forging, formed circular in cross-sectional area by cross-rolling the metal blank.

My invention further consists in an animal-shoe-nail blank circular in cross-sectional area and having a series or plural number of longitudinally-tapering portions within its length.

My invention further consists in an animal-shoe nail having the fibers of its metal running spirally, especially at its point.

My invention further consists in an animal-shoe nail hot-rolled forged into circular cross-sectional area, then cold-pressed or flattened upon two sides, and then bevel-pointed by cold hammering the metal point upon four sides.

My invention further consists in other peculiarities of construction, all of which I will now fully describe in detail, and point out the special features thereof in the claims at the end of this specification.

Figure 1 is a side view of a nail-blank made in accordance with my invention. Figs. 2, 3, and 4 are cross-sections of said nail-blank on the cross-lines 1, 2, and 3, respectively, in Fig. 1. Fig. 5 is a face view of my improved nail, showing its face form and the degree of taper given its side edges. Fig. 6 is an edge view of said nail shown in central longitudinal section. Figs. 7, 8, and 9 are cross-sections of said nail on the cross-lines 4, 5, and 6, respectively, in Fig. 5. Fig. 10 is an edge view (shown in central longitudinal section) of a nail having its head taper on both its face and back or centrally edgewise. Figs. 11 and 12 are cross-sections of other forms of nail blades or shanks, to be more fully described hereinafter. Fig. 13 is an enlarged view of the nail shown in Fig. 1. Fig. 14 is an enlarged view of the nail shown in Fig. 6. Figs. 15 and 16 are similar views showing another form having straight and also different degrees of tapering portions within its length, as will be more fully described and explained hereinafter.

a represents the nail-blank rolled forging, formed circular in cross-sectional area by rotating or cross-rolling a metal blank between adjacent and converging die-faces, one or both of said dies having movement in the well-known manner of making rolled forgings. The said dies have longitudinally-arranged working-grooves sunk within their faces, and the surfaces of said grooves are shaped in cross-section the converse of the longitudinal configuration of one-half (more or less) of the round nail-blank *a*. Said round nail-blank *a* is formed with a series or plural number of longitudinally-tapering portions within its length, and the metal of said different tapering portions may be distributed throughout the nail-blank, as required, to predetermine the desired shape of the flattened and finished nail, as will be hereinafter described.

To clearly illustrate my invention, I have presented Figs. 13, 14, 15, and 16 as greatly-enlarged views of the round nail-blank *a* and the flattened and pointed nail *b* when tapered and shaped in the most preferred forms.

Fig. 13 represents an exaggerated view of the nail-blank *a*, showing plainly the different tapering portions within its length, which consist of four distinct portions having different degrees of taper, as shown, from *a'* to *a''*,

from a'' to a^3, from a^3 to a^4, from a^4 to a^5, and from a^5 rounded over to form the top of the head.

Fig. 15 represents another form of tapering round nail-blank having a tapering portion from a' to a'', a straight portion from a'' to a^3, a tapering portion from a^3 to a^4, a tapering portion from a^4 to a^5, and from a^5 rounded over to form the top of the head.

The round nail-blanks are designed to be of such longitudinal taper or shape that when flattened and finished the head is the proper taper or shape to drive closely into the crease of the shoe and fill the tapering nail-holes therein, and the blade or shank of the nail is largest in cross-section in the neck under the head and of the proper taper and shape to drive easily and fill the holes in the hoof tightly when they are completely driven in and clinched.

The round nail-blanks are preferably hot-forged, and the fibers of the metal composing their structure are preferably twisted or caused to run spirally, especially at their points. This is accomplished by the action of the forging-dies in the following manner: When reducing or forming the metal nail-blank by compressing and rotating it between adjacent die-faces in the usual manner of making rolled forgings, owing to the dies being shaped on their faces to form a nail-blank having a tapering blade or shank, and said die-faces being milled or scored to prevent their slipping past the metal blank without revolving it, the tendency of said dies when cross-rolling said nail-blank is to cause its smaller diameters to revolve faster than its larger, and consequently the fibers of its metal are spun and twisted as it is variably reduced in diameter and extended in length, somewhat as shown in dotted lines in Fig. 1, the degree of pitch or twist given the fibers depending upon the degree of taper given the blank and to whether the dies have slipped past any portion of said blank without revolving it, as the twisting of the metal may be nearly, if not entirely, obviated by lessening the friction of the dies upon the metal blank by dispensing with the milled or scored die-surfaces and making them smooth, so as to slip past the metal blank without revolving any portion of it faster than the approximate speed of its largest diameter. The spiral twist given the hot metal while being rolled down and condensed into form thoroughly welds the fibers of metal together, similar to a twisted gun-barrel, giving great strength and effectually precluding the possibility of any seams or imperfections which may have existed in the nail-rod from entering and remaining in the finished nail and thereby causing it to split when being driven, and, furthermore, the twisted fibers admit of compressing or hammering the nails when cold to flatten or stiffen them, and also to bevel their points without any danger of rupturing or injuring the metal composing the nails. This liability has heretofore compelled the manufacturers of animal-shoe nails, at great expense, to use only the finest grades of imported iron; but with my invention I produce good and serviceable nails from moderate-priced brands of domestic iron and at comparatively a great deal lower cost of manufacture.

b represents the complete or finished nail, having a beveled point, a flattened face and back, and curved or rounded edges. The top of the head I prefer to make, as shown, of convex or spheroidal shape, as I find that an imperfectly-delivered blow from the flat face of a shoeing-hammer upon the convex surface of the head of the nail does not so easily tend to glance off, and thus bend or throw the nail out of line, as is the case when the top of the head is flat, or when rounded as to width and flat or slanting as to thickness, or when in the shape of a frustum of a cone or pyramid, all of which forms have prominent corners liable to receive the blow of the hammer if the nail is not struck fairly, and thereby cause it to be thrown out of its proper position. The top of the nail-heads may, however, be of any desired shape.

The nail *b* is formed by flattening the round nail-blank *a* upon two sides, when cold, by subjecting it to pressure between dies having their faces so shaped and gaged as to impart the desired thickness, taper, and curvature or "set" edgewise of the nail. This cold stamping or compression of the soft hot-forged nail-blank produces a smooth and stiff nail having a hardened face and back with a ductile central portion running through it where the metal has not been thoroughly condensed by the pressure which flattened and hardened the shell of the face and back. The cold flattening or compression given the hot-forged nails smoothly finishes and hardens the face and back surfaces of said nails, thereby insuring their perfect driving and wearing qualities, and the softer central portion or core left within them also insures their perfect strength and toughness, as required for clinching and holding the shoe; and, furthermore, by the rolled-forging process of making the nails I am able to form them uniform in size and shape, as by this method a very fine adjustment is obtainable, and said nails need not vary in any of their dimensions.

After the flattening process the nail is beveled on its point, and, although impossible to clearly illustrate in the drawings, the metal composing said point is condensed to its greatest extent to give it great strength, density, and hardness, as is particularly essential in the point of the nail. I accomplish this condensation of the point of the nail not by alternately acting upon opposite sides and edges of said nail in the usual manner, which cause alternate lateral displacement of the fibers thereof, the fatal effect of which I have already pointed out, but by simultaneously acting upon all four sides, or rather

the two sides and two edges of the point, by compressing it between dies which are so shaped upon their working-faces and arranged with relation to each other as to converge to a common center and close upon the point of the nail simultaneously upon all sides, thereby evenly compressing and condensing the metal and imparting thereto a solid, dense, and hardened beveled point, as is required in a perfect or ideal animal-shoe nail.

Fig. 14 represents an enlarged view of the nail shown in Fig. 6, the exaggerated size of the finished nail *b* showing plainly therein the different tapering portions edgewise within its length, which consist of four distinct portions having different degrees of taper, as shown, from b' to b'', from b'' to b^3, from b^3 to b^4, from b^4 to b^5, and from b^5 rounded over to form the top of the head.

Fig. 16 represents another form or style of shaping the finished nail *b* edgewise, and consists in a tapering portion from b' to b'', a straight portion from b'' to b^3, a tapering portion from b^3 to b^4, a tapering portion from b^4 to b^5, and from b^5 rounded over to form the top of the head.

I have shown in Figs. 14 and 16 two of the most common and desirable ways of tapering the nails edgewise; but it should be understood that said nails may be differently shaped if so preferred, and in any case the face form or tapering shape of the side edges of the flattened nails, as in Fig. 5, may be predetermined by simply distributing the metal properly within the round nail-blanks—as, for instance, when it is desirable to produce a finished nail having the proper tapering face form, as in Fig. 5, and its blade or shank tapering edgewise, as shown in Figs. 6 or 14, it is accomplished by forming the round nail-blank with the series of tapering portions, substantially as shown in Fig. 13, the metal forming said blank being of varying tapers longitudinally, thus properly distributing the metal therein, so that when flattened and finished the nail necessarily assumes the form shown in Figs. 5 and 6 or 14, as before stated.

If the nail is to be flattened partly straight and partly tapering edgewise, as shown in Fig. 16, then the round nail-blank should be formed partly straight and partly tapering, substantially as shown in Fig. 15. This distribution of the metal throughout the round nail-blank is absolutely necessary to insure the face form of the flattened nail assuming the desired symmetrical or tapering shape, substantially as shown in Fig. 5, without the liability of said nails, when being flattened, bulging or swelling out broader across the middle portion or point half of the blade or shank, which would then necessitate the usual and additional operation of either side swaging or clipping the side edges of the nails to bring them to a proper finished shape suitable for driving.

Now, therefore, it must be clearly understood that I produce animal-shoe nails having their blades or shanks largest in cross-sectional area in the neck under the head and tapering smaller toward the point, substantially as above described, without swaging the side edges of said blades or shanks or removing any superfluous metal therefrom, but by simply giving the round nail-blank the necessary longitudinal configuration by properly distributing the metal therein, so that when said nail-blank is flattened to the proper thickness and taper edgewise of the finished nail it will also necessarily cause said nail-blank to assume the proper tapering or desired face form of a finished nail, thus making strong and durable nails, with their fibers uncut and intact from head to point.

The nail shown in Fig. 10 has its head taper on both its face and back or centrally edgewise instead of only on the face side, as is usual, and would be preferred for certain kinds of shoes having correspondingly-formed creases and nail-holes.

In Figs. 11 and 12 are shown in cross-section other forms of finished nail blades or shanks, which are designed to displace or disfigure the hoof less in passing through the same, or when holding the shoe thereon, than the nails in ordinary use for this purpose, and they are especially preferred for race-horses and fancy shoeing.

It is obvious that I may somewhat modify and change the contour of some parts of the nail without departing from the essential features and spirit of my invention, which primarily consists in rolled-forged animal-shoe nails, regardless of the preferred forms described herein, as said nails may be formed with straight blade or shank portions and be flattened either when hot or cold, and they may then be pointed and beveled by swaging or clipping in any of the well-known ways now practiced.

I have shown in the drawings the finished nail as being straight edgewise, it being somewhat easier to so illustrate it; but it should be understood that in practice the nails when being compressed and flattened are also given the usual and necessary curvature or set, as required in this class of nails, to insure their driving properly, as is well known by those familiar with the art of shoeing horses and other animals.

I would have it understood that the term "rolled forged" or "rolled forging," as used by me in this application, refers particularly to the process or method of forging metal into circular cross-sectional area by cross-rolling it, substantially as hereinbefore described.

Having thus fully described the nature and construction of my invention, I wish to secure by Letters Patent, and claim—

1. As a new and improved article of manufacture, an animal-shoe nail having an even

exterior and its fibers twisted or running spirally, for the purpose set forth.

2. As a new and improved article of manufacture, a rolled-forged animal-shoe nail having rounded edges, a blade or shank largest in cross-sectional area in the neck under the head, a condensed and hardened face and back, a ductile central portion between said face and back, and a solid, dense, hardened, uncut, beveled point, all substantially as herein specified, and for the purpose set forth.

3. A rolled-forged animal-shoe nail having a head, a beveled point, and an intermediate blade or shank of greater breadth than thickness having curved or rounded edges and largest in cross-section in the neck under the head, substantially as set forth.

4. An animal-shoe nail having the top of its head of convex or spheroidal shape, substantially as herein shown, and for the purpose set forth.

5. An animal-shoe nail cross-rolled to form and the metal condensed and toughened, as set forth, having a flat face and back of greater breadth than thickness throughout, with curved or rounded side edges between said face and back and tapering in both breadth and thickness, substantially as described.

6. An animal-shoe nail having a head portion projecting laterally from its face and two side edges and flush with its back, a tapering blade or shank portion of greater breadth than thickness having curved or rounded side edges and largest in cross-section in the neck under the head, and a tapering point portion beveled on its face, all substantially as described.

7. A rolled-forged animal-shoe-nail blank circular in cross-section and the metal condensed and toughened, substantially as herein specified, for the purpose set forth.

8. The animal-shoe-nail blank *a*, circular in cross-sectional area, and having a series or plurality of tapers, substantially as herein specified, whereby the metal is so arranged and distributed throughout the round nail-blank that when said blank is flattened to the desired thickness and taper edgewise of the finished nail *b* it will also cause it to assume the proper face form without side-swaging or clipping the side edges of the nail, substantially as herein described.

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

DANIEL E. KEMPSTER.

Witnesses:
HENRY CHADBOURN,
HERBERT L. CHAPIN.