G. L. HALL. 2 Sheets--Sheet 1.

Improvement in Machines for Punching Horseshoe Nail Blanks from Plate Metal

No. 125,045. Patented March 26, 1872

Fig. 1.

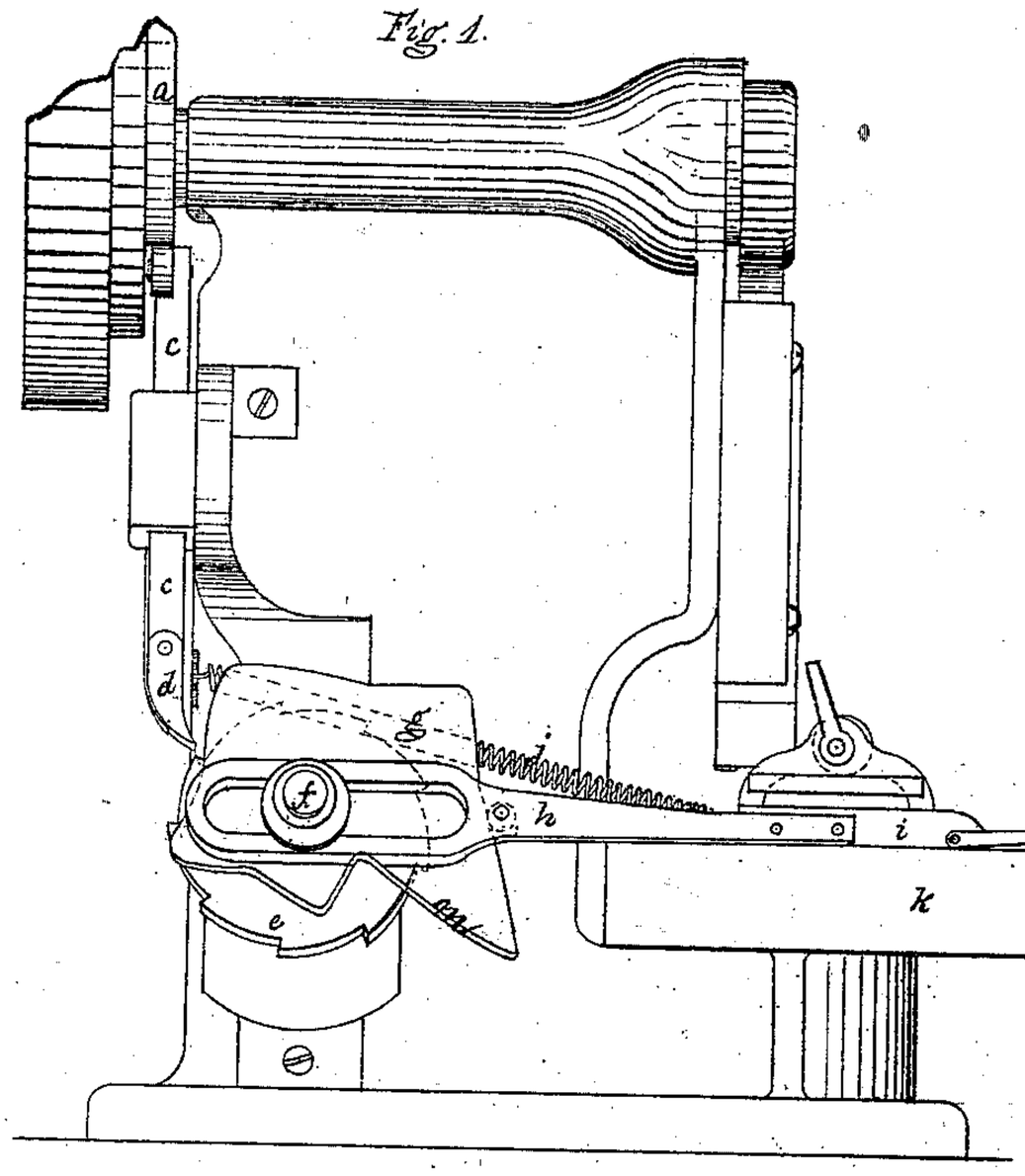


Fig. 2.

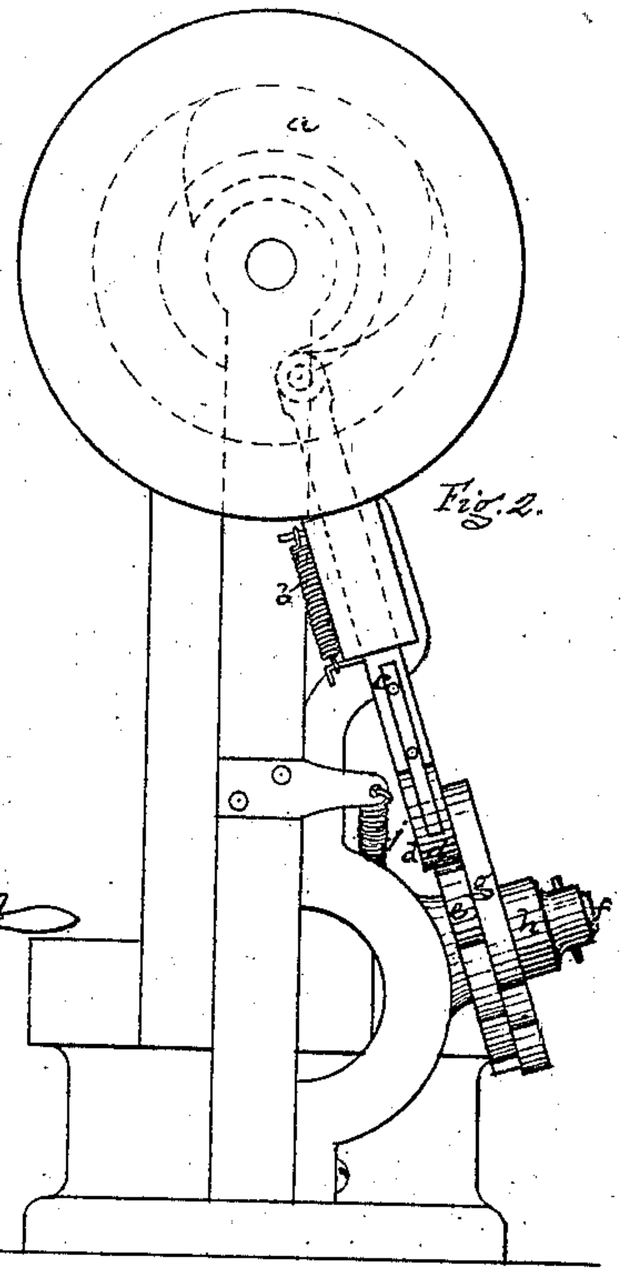


Fig. 3.

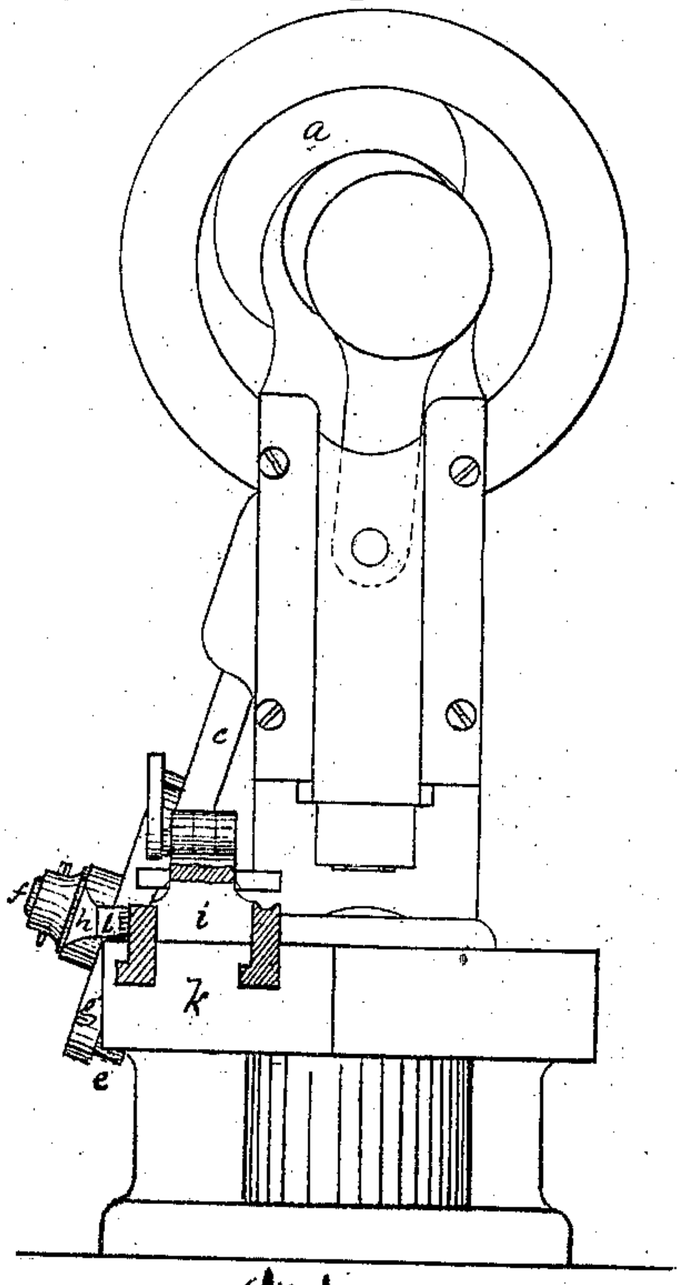
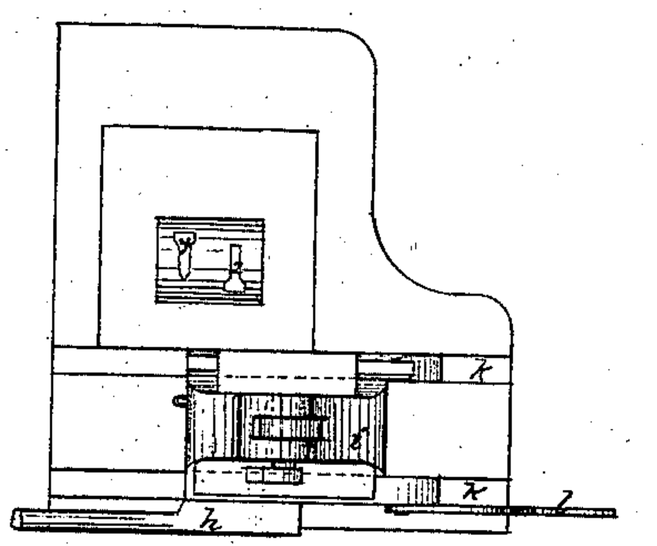


Fig. 4.



Witnesses { G. W. Gregory. Ed. Ballard.

Inventor. Geo L. Hall by his attys. Crosby & Gould

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2 Sheets--Sheet 2.

Improvement in Machines for Punching Horseshoe Nail Blanks from Plate Metal

No. 125,045.

Patented March 26, 1872

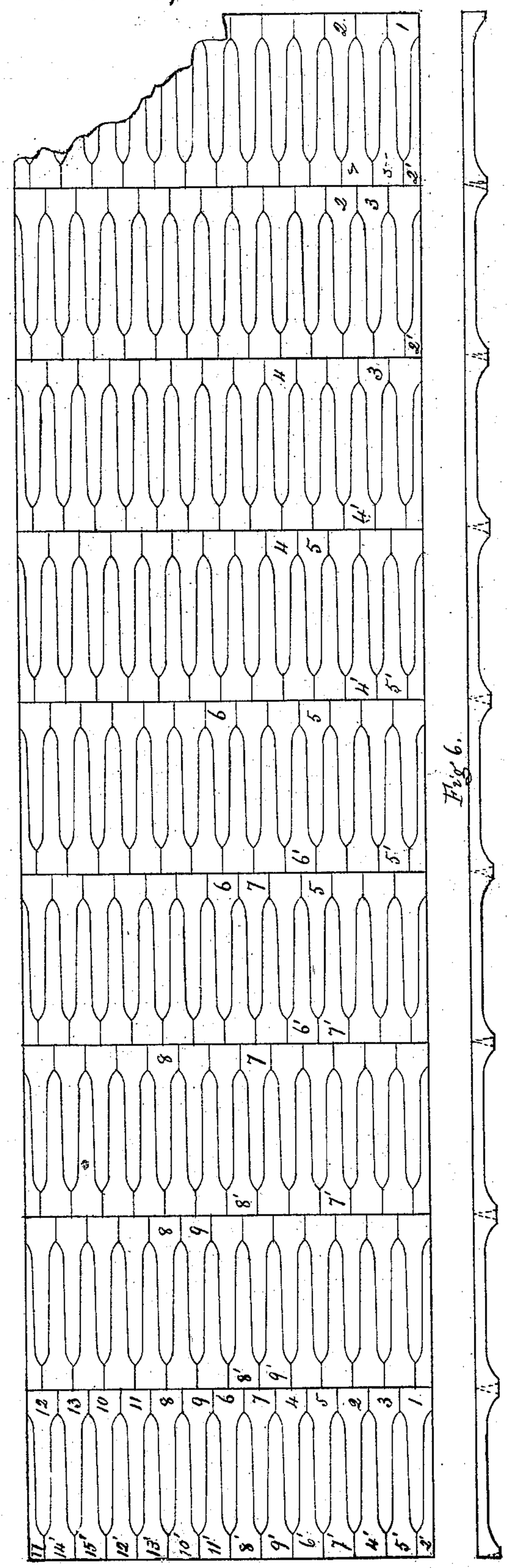

Fig. 6.

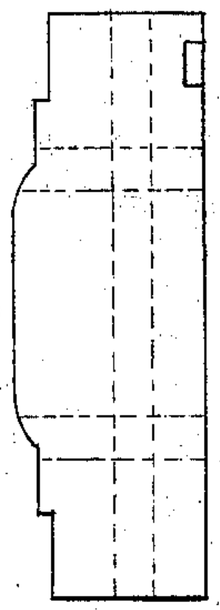

Fig. 9.

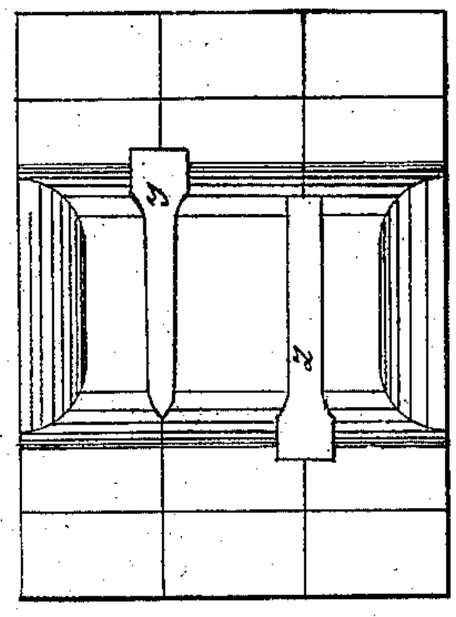

Fig. 7.

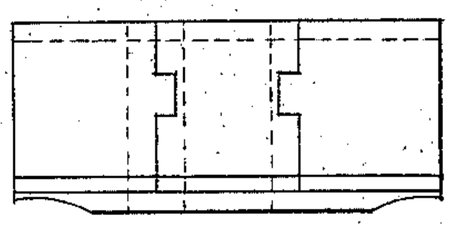

Fig. 8.

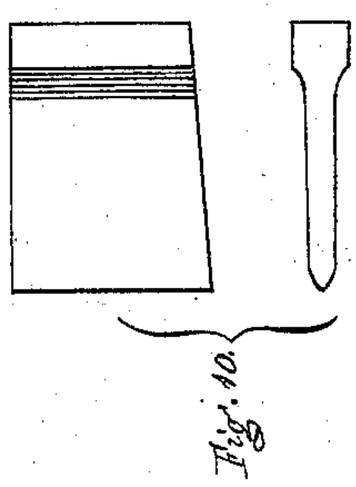

Fig. 10.

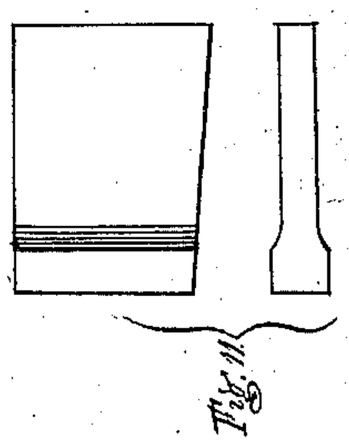

Fig. 11.

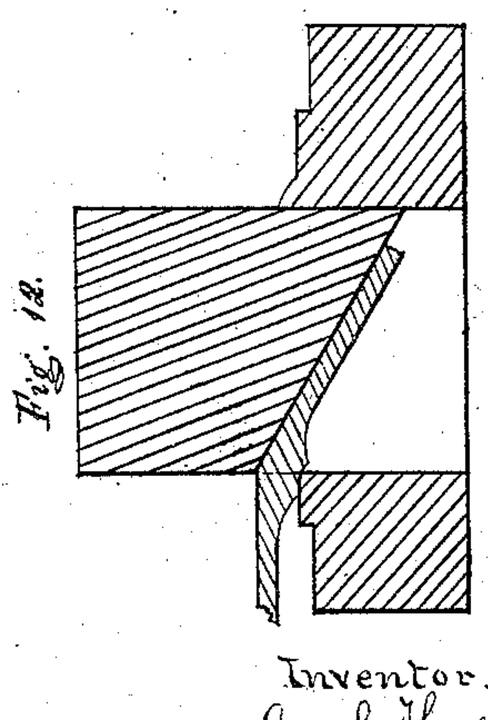

Fig. 12.

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Witnesses { H. W. Gregory
E. H. Gillan.

125,045

UNITED STATES PATENT OFFICE.

GEORGE L. HALL, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO GLOBE NAIL COMPANY, OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR PUNCHING HORSESHOE NAIL-BLANKS FROM PLATE METAL.

Specification forming part of Letters Patent No. 125,045, dated March 26, 1872.

To all whom it may concern:

Be it known that I, GEORGE L. HALL, of Boston, in the county of Suffolk and State of Massachusetts, have invented Improvements in the Mode of Punching Blanks for Nails and other articles from Plates of Rolled Metal; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

This invention will be described with special reference to its adaptation to punching blanks, from which horseshoe-nails are to be produced, from long strips of suitable metal, in such manner that substantially the only waste of material is made at the edges of the strips; but it will be understood that said invention is equally applicable to the production by punching of other articles besides nails or nail-blanks, when such articles are so shaped that the sides of the adjacent articles coincide in the material from which they are punched. The invention embraces a process which consists in the relation of the movement of the material to be punched with reference to the location of the punches; also, mechanism employed in the process.

On Sheet 1 is exhibited, in side and rear and front elevations, a punching-machine in common use, so far as the parts are concerned, by which the punches are moved toward and from the dies or bed, but showing, added thereunto, mechanism by which I present the metal to the action of the punches, in accordance with my process.

Figure 1 is said side elevation; Fig. 2 is the rear elevation; and Fig. 3 is the front elevation; while Fig. 4 is a partial plan, showing the die or bed and the moving clamp-carriage for holding the metal.

On the main shaft of the machine, by which the punch-plunger is worked, is a cam, *a*, which, in connection with the spring *b*, reciprocates slide *c*, as the shaft is rotated, the slide having at its end a pivot-jointed spring-pawl, *d*, which gives intermittent rotary motion to the ratchet *e* fitted on stud *f* secured to the frame of the machine. The ratchet *e* has fixed to it and intermittently rotates the cam *g*, the operative edges of which act against a roll or pin fixed to the connecting-rod *h*, one end of which is jointed to the slide *i*, the other end of the rod being slotted and guided on the projecting end of stud *f*. The spring *j* operates to keep the roll or pin in the connecting-rod *h* always against the operative edge-faces of cam *g*. Ways *k* are attached to the frame of the machine, suited to guide the slide *i*, and the upper part of the slide is provided with a cam which can be turned to force a plate down upon the iron introduced into the machine to be cut up by the punches. The slide *i* has a latch, *l*, pivoted to it, which latch catches over the end of ways *k* and holds the slide at the position given by the extreme action of cam *g* until such time as the operator raises the catch, when spring *j* draws the slide back to its opposite extreme position. The teeth of the ratchet *e* are equally spaced at first, and then the tooth on which the pawl operates, to give that motion to the cam by which the last advance movement of the carriage *i* is made is slightly shortened, and, of course, the next tooth to be acted upon by the pawl becomes longer, so that the pawl, having equal motions at each rotation of the shaft, and when acting on the short tooth having some lost motion, will fail on the next rotation to catch upon the point of the long tooth, the carriage *i* being held from retraction by the latch *l*. The face *m* of cam *g* is so shaped that the roll or pin in connecting-rod *h* acts, when retracted by spring *j*, to turn the cam, and consequently the ratchet, to such an extent as to cause the pawl to take on the end of the long tooth, and then the feeding movements of carriage *i* proceed automatically. But while the carriage *i* remains latched forward the pawl moves over the back of the long tooth in the ratchet without giving motion to the cam. At the inner edge of the slide is a groove, to receive one of the cross-ribs made on the metal to provide for the nail-heads, said groove thus serving as a guide in securing the metal properly in place for presentation to the punches.

The two punches are placed with their longitudinal centers parallel to each other, with the head and point-forming parts oppositely arranged, the longitudinal centers being apart a distance equal to twice and one half the width of the nail-heads, the dies corresponding to the location of the punches. The iron is so intro-

duced that the punch, working with the die-hole *y* in its first descent, cuts one nail or blank with its longitudinal center upon the strip a distance equal to half the width of the nail or blank-head, the punch operative with the die-hole *z* not acting on the metal. When the punches rise the cam *g* moves the slide and the strip clamped therein a distance equal to the distance apart of the centers of two blanks having adjacent heads, and then the second complete nail or blank is punched out by die *y* in the descent of the punch-plunger, and the punch operative with die *z* removes from the edge of the strip a half-blank or waste-piece. When the punches rise the slide moves back the distance apart of the centers of adjacent nail or blank-heads, and the punch over die *y* forms blank or nail 3, and then the operation continues across the width of the strip by forward movements of the metal equal to the distances apart of the centers of three adjacent nail-heads, alternated with backward movements equal to the distance apart of the centers of adjacent nail-heads. By reference to diagram, Fig. 5, this described process or order of operation is illustrated. The numbers 1, 2, 3, &c., represent the nails or blanks cut out at the leading die *y*, and the numbers 2′, 3′, 4′, &c., represent those cut at the following-die *z*.

In the described process, 1 is first punched; then the strip is fed forward two spaces, or a distance equal to the width of two nail-heads, and 2 and the half-blank 2′ are punched; then the strip is back-fed one space and 3 is punched; then the strip is fed three spaces and 4 and 4′ are punched. 5 and 5′ are punched after the next back-feed of one space, and 6 and 6′ after a forward feed of three spaces, and so on across the strip, until the punch working in the following-die *z* finishes by removal of a waste-piece in the form of a half-nail or blank, and during the time while the punch is working in the following-die *z*, punching the last three pieces which it severs from the strip, the punch working in the leading-die *y* moves through space not occupied by the metal strip, and consequently does not produce nails or blanks.

It will be observed that the leading-punch makes its cut on the series of nails or blanks denoted by 1, 3, 2, 5, &c., from the point of each of said nails or blanks along the entire length of the shank on both sides, and cuts the top end of each head, and sometimes both sides of the head, while the following-punch cuts only the top end of each nail or blank of the series denoted by 2′, 5′, 4′, 7′, &c., and sometimes the two parallel sides of the head, so that the severing of the heads of all of the nails or blanks along the line of the top ends of the heads is performed by the following-punch. While the following-punch does all of the severing of the blanks from the strip of iron at the top ends of the blanks, (except when punching the first series of blanks from a new strip of iron not squared on the end, in which case the leading punch severs from the strip the heads of the first entire series 1, 3, 2, 5, &c.,) the leading-punch in its operation along the line of junction of adjacent heads of two sets or series removes from the metal chips which are in section isosceles triangles.

It will be seen that the following-punch and its die *z* are not brought to the shape of the shank of the nail or blank to be produced, for the reasons, first, that the shanks of the nails or blanks are not cut by said punch and die, and second, to give room for a slight side-swerving or springing of the material.

In illustration of the second reason, suppose blanks 1, 2, and 3 to have been punched by the leading-punch, and the half blank 2′ by the following-punch, it will be seen that in the punching operation the shanks left to form blanks 4′ and 5′, may have been swerved slightly sidewise, and if the shank parts of the following punch and die should be made of the exact width of the shanks that are so swerved, the following-punch would shave one side of the severed shank. But as the shank parts of the following-die are made wider from the point toward the head than the shank of the swerved blank, provision is made to avoid such secondary and harmful cutting of the metal.

For reasons well known to every practical shoer of animals, it is desirable to have most prominent that portion of the head which is in line with the nail-point, and, as in many horseshoe-nails, a point or end edge is now made at one side or surface of such nail-shanks, it is desirable to have the corner formed by said side or surface of each nail and the top of the head, the most prominent part of the head, so as to receive and transmit hammer blows directly in line with the nail-point. I produce this desired formation of the nail-head by giving to the punches a peculiar form or arrangement, which consists in so making each punch that it will strike upon that part of the metal which is to form the nail-point in advance, and will bend or deflect the metal of the nail or nail-blank before the cut takes place that makes the top surface of the nail-head.

On Sheet 2 will be seen besides the diagram Fig. 5, already alluded to, Fig. 6, which is a side or edge view of the ribbed strip or bar of metal, from which nails or nail-blanks are punched, and it should be observed that, by preference, such bars or strips of metal are placed for the punching operation with the ribbed surface in contact with the die-bed, the punches coming into contact with the plain surface of the strips. Figs. 7, 8, and 9 are, respectively, a plan, an end view, and a side view of the die-bed, the die hole *z*, seen in the plan, being that with which works a punch of corresponding form, and which I have herein termed the following die and punch; and the die-hole *y* being that with which works the leading-punch of form corresponding to said die-hole. Fig. 10 shows the leading-punch in side elevation and in plan, and Fig. 11 shows similar views of the following-punch.

In Figs. 10 and 11, it will be seen that what may be termed the points of the punches are advanced beyond the heads, so as to operate sooner on the metal forming the points of the nails than they do on the metal forming the heads.

By this construction and arrangement of the parts, two objects are attained—first, the labor or strain of the cutting operation is not performed all at same instant, but begins at the point and follows toward and terminates at the head, thus easing the severity of the stress on the punches and dies. Second, the bending of the nail metal at the point, causes the dies and punches to cut the nail-head tops at an angle less than a right angle with the surface against which the punches come into contact, thus giving prominence to the nail-heads in line with their points.

Diagram, Fig. 12, illustrates this arrangement and method of operation of the punches, the amount of bevel or angle given to the operative faces of the punches being exaggerated beyond the amount given in practice, in order to show the operation clearly. Along the line where the heads of the nails or blanks are severed will be formed a waste-piece, triangular in cross-section, and of length equal to the with of the strip upon which the punching is performed.

In Fig. 6 the dotted lines there shown indicate the triangular waste-pieces made across the metal bar consequent upon the described beveling of the operative faces of the punches.

It will now be obvious that the leading feature of my invention is an improvement in the art of punching, which consists in giving to the material to be punched certain specific advance and retrograde movements in connection with leading and following punches and dies, set at certain distances from each other, which movements may be produced by various mechanical devices.

Of such devices I have exhibited the best, simplest, and most effective known to me, and in said devices and their combinations other parts of my invention consist, though the said improvement in the art may be carried into effect by different means for producing the forward and retrograde movement of the material to be punched with reference to the punches and dies, located as set forth. And still another part of my invention consists in an improvement in the art of punching by means of which the head-end of each nail or nail-blank is cut at an angle less than a right angle with the straight surface thereof.

This part of my invention may be more specifically stated, as consisting in the combination with die-holes of two punches made with operative faces beveled or inclined, as described, so that the advanced points of the dies will bend the punchings, and will cause the punches and dies to cut the heads of the nails or nail-blanks at angles of less than ninety degrees with the surfaces against which the punches operate.

I have specified that the distances of the centers of the punches and dies apart must be equal to the distance of twice and one-half the distance apart of adjacent nail-heads. This distance, however, may be increased by the addition thereunto of one or more units, considering the width of a nail-head as a unit; but the distance cannot be decreased, nor can the system described of forward and retrograde feeding of the material to be punched be changed. The objection to placing the punches further apart than the width of two and one-half nail-heads, is that in beginning and ending the punching on the edges of the strip, one of the punches will be longer inoperative than is necessary.

By inspection of diagram, Fig. 5, it will be seen that where a punch operates it works with a balanced cut—that is, it cuts always on equal opposite sides, and never on one side, as in shearing. It is this balanced operation of the punches that keeps the blank or nails from twisting as they are severed from the metal, and said balanced operation is attained by the described forward and back movements given to the stock relatively to punches and dies arranged with reference to each other, as described.

In cutting the metal bars or strips into nails or nail-blanks there remains in the holder, shown in the drawing before referred to, end pieces, which, if not further reduced by the punches into nail-blanks or nails, add considerably to the percentage of scrap-metal to be rewrought into other nail-bars. To reduce a very large portion of such ends into nail-blanks, I provide one of a set of punching-machines like the one described, with a carriage like that seen in cross-section at A, Sheet 1. In this carriage the clamping part is located nearer to the die-bed than is the case with the carriage seen in the other figures, and the movable platen is operated by a screw instead of by a cam. Part of the bed of this carriage under the platen is located on a level with the highest part of the die-bed, and is rounded like the die-bed to fit the ribbed formation of the bars or strips from which the nails or nail-blanks are punched, so that between the die-bed edge and the adjacent edge of the stock-clamp there is formed a groove or channel which receives one of the projections or ribs on the stock.

With either form of carriage the stock is released, pushed forward under the punches the distance between two adjacent ribs on the stock, and reclamped as often as the the punches complete their cutting action across the entire width of the bar.

In practical use the carriage shown at A is not found so convenient for holding and releasing the long bars as is the carriage shown in the other figures; but it is especially adapted for use with the ends of the bars, as before described.

I claim—

1. As an improvement in the method of cutting out nails or nail-blanks from rolled plates,

the use, with die-holes, of two punches with operative faces inclined in opposite directions, each from one extremity to the other, to give a shear cut and to produce beveled heads, and operated intermittingly and alternately—one to form the whole of the shanks, and also to bevel the heads of the series of nails or blanks made from one margin of the plate, and the other to separate and bevel the heads of the opposite series, substantially as set forth.

2. The combination of leading and following punches and dies, arranged in relation to one another, substantially as described, and mechanism to automatically present to them the metal to be operated on in the manner substantially as set forth.

3. In combination with the punches and dies, constructed and arranged as set forth, the slide or feed-carriage *i*, the latch *l*, or its equivalent, and mechanism to reciprocate said carriage in the manner substantially as described.

4. The combination of the ratchet-wheel *e* and cam *g*, when constructed as described, with a vibrating pawl and a feed-carriage, as set forth.

5. The punches *y* and *z* and their respective die-holes made in their point and shank, forming parts as described, and arranged relatively to each other, as set forth.

GEO. L. HALL.

Witnesses:
J. B. CROSBY,
FRANCIS GOULD.