No. 671,451. Patented Apr. 9, 1901.

C. PROUTY.

ART OF MANUFACTURING SAWS.

(Application filed Mar. 19, 1898.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

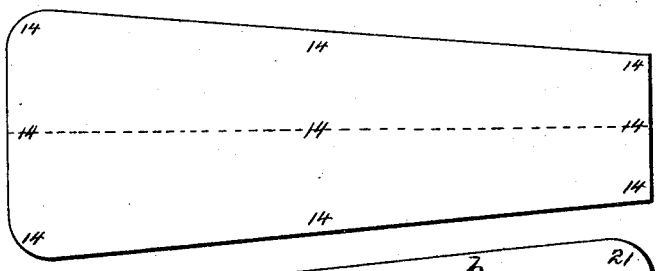


Fig. 2.

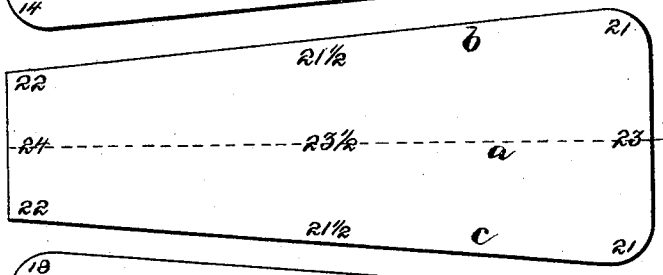


Fig. 3.

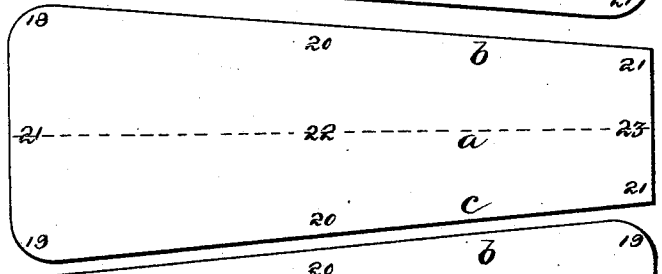


Fig. 4.

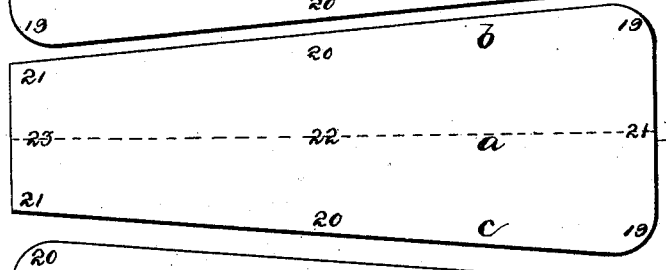


Fig. 5.

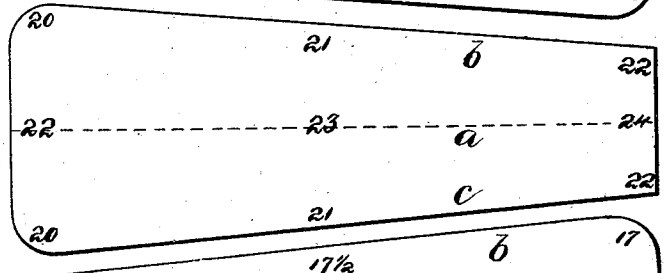
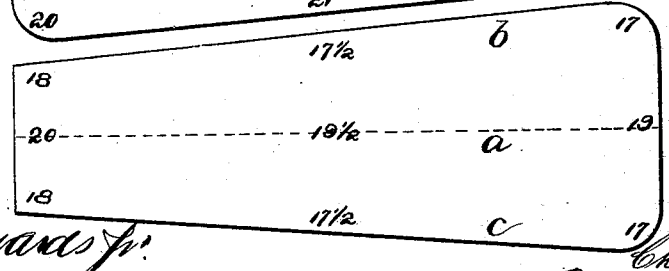


Fig. 6.



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No. 671,451. Patented Apr. 9, 1901.

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Fig. 7.

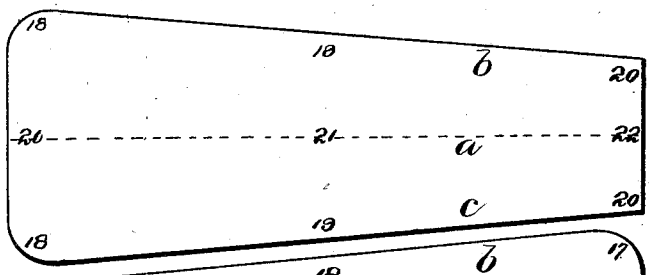

Fig. 8.

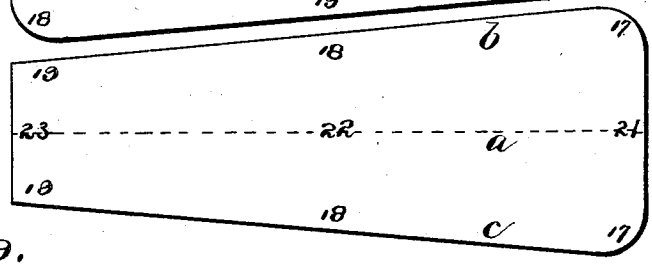

Fig. 9.

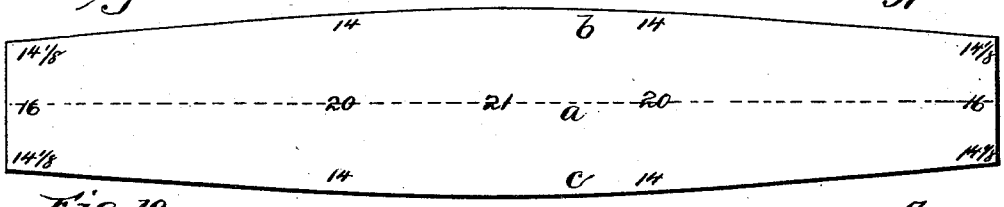

Fig. 10.

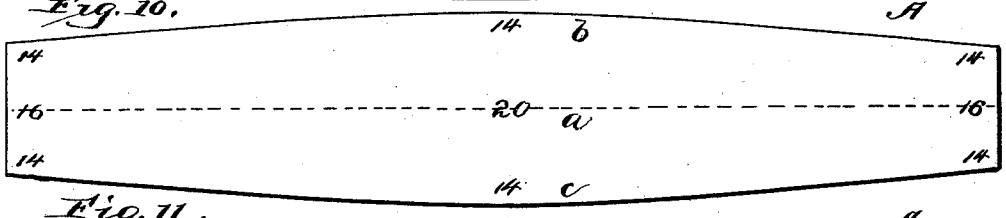

Fig. 11.

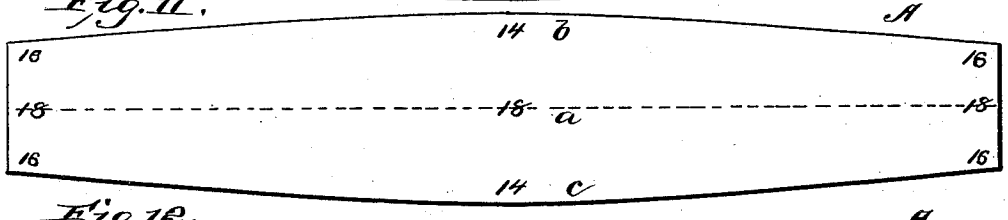

Fig. 12.

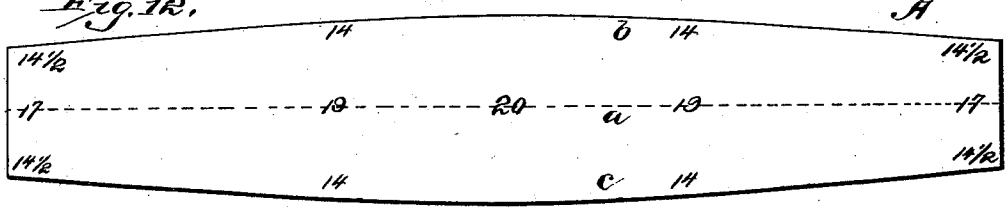

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Fig. 13.

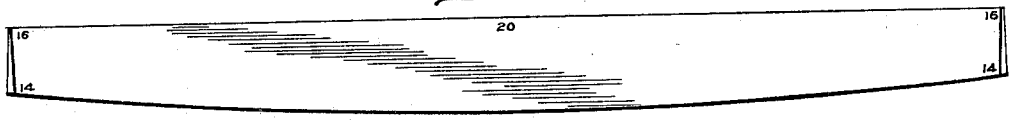
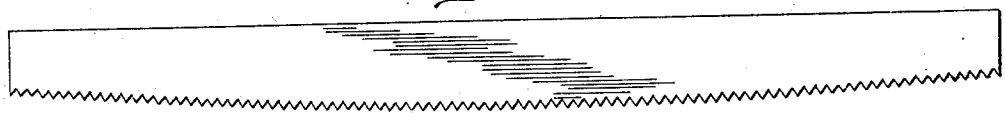


Fig. 14.



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No. 671,451. Patented Apr. 9, 1901.

C. PROUTY.

ART OF MANUFACTURING SAWS.

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Fig. 15.

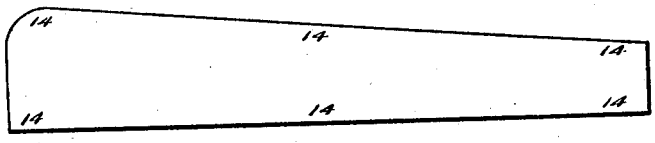


Fig. 16.

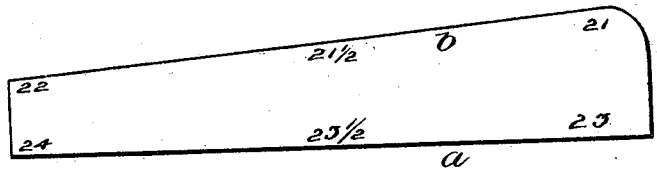


Fig. 17.

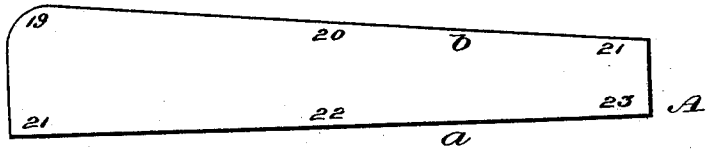


Fig. 18.

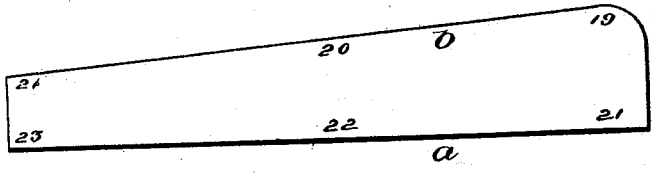


Fig. 19.

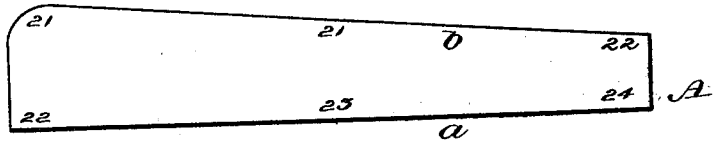
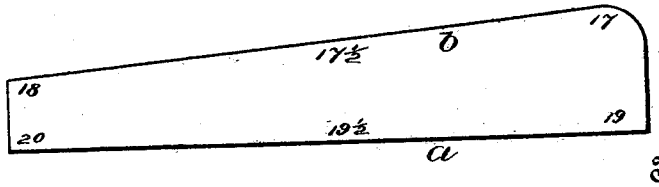


Fig. 20.



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No. 671,451. Patented Apr. 9, 1901.

C. PROUTY.

ART OF MANUFACTURING SAWS.

(Application filed Mar. 19, 1898.)

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Fig. 21.

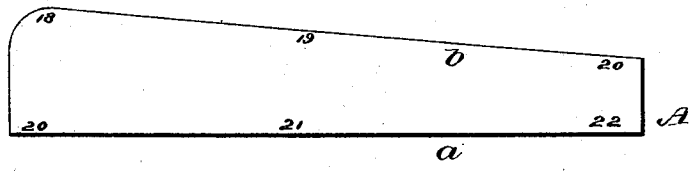


Fig. 22.

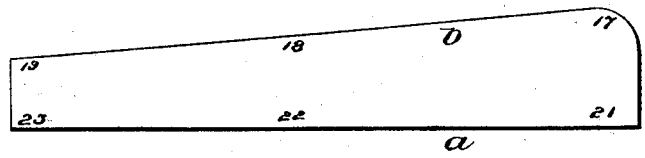


Fig. 23.

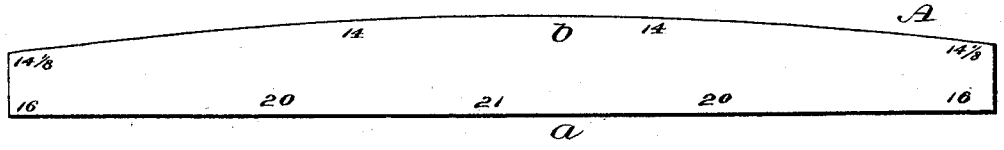


Fig. 24.

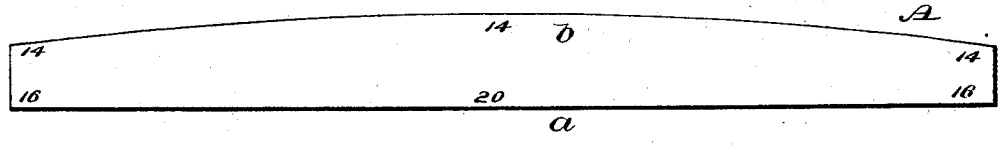


Fig. 25.

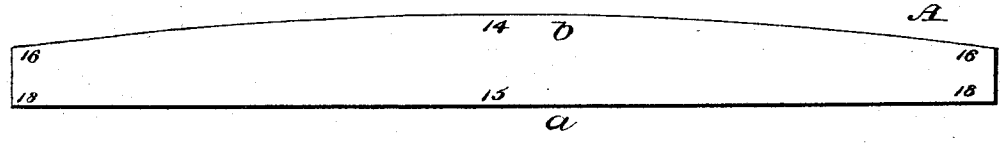
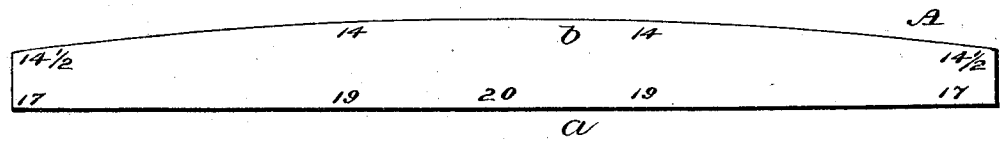


Fig. 26.



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UNITED STATES PATENT OFFICE.

CHESTER PROUTY, OF RIDGWAY, PENNSYLVANIA.

ART OF MANUFACTURING SAWS.

SPECIFICATION forming part of Letters Patent No. 671,451, dated April 9, 1901.

Original application filed March 3, 1896, Serial No. 581,658. Divided and this application filed March 19, 1898. Serial No. 674,519. (No model.)

To all whom it may concern:

Be it known that I, CHESTER PROUTY, a citizen of the United States, residing at Ridgway, in the county of Elk and State of Pennsylvania, have invented certain new and useful Improvements in the Art of Manufacturing Saws; 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.

This invention relates to new and useful improvements in saws for use by hand as distinguished from rotary and power-driven saws, and it is a division of a prior application filed by me on the 3d day of March, 1896, Serial No. 581,658.

Prior to my invention it was customary in the manufacture of crosscut, hand, one-man, and other kinds of saws to first roll the steel to a finish through common rolls to a common or uniform gage throughout the length and width of the sheet-steel, to subsequently shear the uniform thickness of steel to the required shape and size, then to cut the teeth on one edge of the blank so produced, and finally to temper the steel and finish the blank, as graphically represented by Figure 1 of the accompanying drawings, designated as "old blank." Now if it were desired to produce a saw with different thicknesses or gages along its front working edge or at its back neutral edge or along both its working and neutral edges it is the universal custom to grind the saw-blade in order to secure the requisite variation in the gages or thicknesses of the blade lengthwise and transversely thereof. Such a method of grinding the saw-blade to secure the requisite taper is known in the trade as the "Simond's process," which contemplates the presentation of the saw-blade to a running stone or stones and subjecting the blade to the action of the grindstones at variable points, so as to produce the requisite taper lengthwise of the blade. Such a process necessarily results in the grinding off or removal by mechanical abrasion of sufficient quantity of steel at different points as to reduce the steel blade to the desired gage; but among other objections the grinding process results in unevenness or irregularities on the respective faces of the blade, the grinding operation resulting in many cases in the removal of enough steel as to amount to one-half of the weight of an unfinished blade to secure a single finished article.

It is frequently necessary in the art to produce crosscut-saws which shall be twenty-one gage on the back edge and fourteen-gage on the front working edge; also, to produce other relative graduations in the blades of one-man saws, tapered handsaws, and other kinds of saws for use in sawing timber. Under the old and common process of grinding saws having such graduations in the relative thickness or gage of the front and back edges it requires double the weight of metal in a finished saw for the production of a blank of the necessary gage preparatory to the grinding operation, because the metal must be ground and thinned down to the required thinness along different parts of the blade, and such grinding operation also involves considerable wear on the grinding-stone. In the course of my experience in the art I have observed that it requires on some occasions from eight to sixteen pounds of grindstone to grind off one pound of steel from a long crosscut-saw blade, and in many cases it is necessary to grind off five pounds of steel from a blade to produce a finished blade. Of course the expense of grinding a blade varies according to the quality of the steel of which the blade is made and the quality of the stone employed in the operation, and when the stone and steel are once ground the materials are both lost, besides entailing the expense of a great deal of labor and the tear and friction on heavy machinery.

One of the most serious objections encountered in grinding saw-blades to the required gage is the liability of pressing the saw too hard against the grindstone, which results in heating and "burning" of the steel, consequent drawing out of the temper, and rendering the saw too soft and pliable, so that it bends in the hands of the operator when engaged in cutting timber, which objection is noticeable particularly in long crosscut-saws from five to seven feet in length. On the other hand, the water running on the grindstone and poured on a saw while in its

overheated condition due to the grinding or abrasive action of the stone on the blade the saw will become case-hardened, thus causing it to break or fracture easily at the thin part thereof. It is well known that the operation of grinding steel does not tend to refine or benefit the quality of the steel; but, on the contrary, the tendency is to lessen the durability and strength of the article. When saws are pressed unusually hard against the stone, the blades are generally overheated and are hardened at that particular place whenever water comes in contact therewith. In the event that the blade should become case-hardened the remaining part of the unduly-heated section of the blade would be too soft if the water does not come in contact therewith. Frequently the grindstones contain hard spots or areas that reduce or wear away much slower than the balance of the stone, and these hardened stone areas tend to injure the saw, because they protrude beyond the remainder of the stone-surface. Hence at each revolution of the stone the hardened areas thereof press with greater force against the blade and produce concave places therein or unduly heat the same, thus subjecting the blade to conditions which either render them too soft or too hard. Many attempts have been made to overcome these difficulties, principally by rolling the blades singly; but to my knowledge the single-rolling operations have always been failures owing to the tendency of the steel to "ruffle" or become irregularly formed on the thin edge of the blade and to unduly curve toward the thick edge or become bulged *en masse* on the working edge.

Briefly summarized, the grinding of the saw-blade is objectionable because of the expense in time, labor, and material consumed, the production of irregularly-faced blades or the inequalities in or loss of the temper and the consequent softening of the blade or the case-hardening and consequent tendency to fracture of the blade, while, on the other hand, the rolling of single blades results in the production of steel blanks in which the steel is "ruffled" on the thin edge and unduly massed and curved on the thick working edge.

The object of my invention is to construct saw-blades which are of graduated thicknesses and gage in several portions of the working and neutral edges thereof and to provide saw-blades in which the faces are true and accurate on both sides, the quality of the steel is fine and tough, and in which the saws are free from "burns" and hardened or soft spots or sections in the structure of the blade.

My improvement consists in providing a saw which is preferably produced by rolling the metal in either a cold or heated condition of double or duplex blank, in which the metal is of different gages lengthwise along its median and side edges and is also of double-tapered form in cross-section, with its thinnest portion along the median line of the blank and its thickest portion of the respective sides or edges thereof, subsequently cutting or severing the blank along its median line into two equal halves or sections, each producing a saw-blank which is thinnest on one edge, thickest on the opposite edge, and of varying gage or thickness longitudinally along its thick and thin edges, with both lateral faces true and accurate, and then cutting the teeth in one edge, and subsequently finishing the blade for the attachment of the handle or handles.

It will be understood that, if desired, I may produce at one or more rolling operations an embryonic blank capable of severance along the median line into two equal halves or sections each of the proper contour, taper, and gage for manufacture into perfect saw-blades without subjecting them to a grinding operation, with the consequent evil effects hereinbefore described.

My improvement consists in providing blades or blanks which have the sides or faces thereof of exactly corresponding contour or shape. The rolling process refines the steel and makes it tougher and more dense and compact, so that it will better stand the rough usage in actual service, and when the steel blanks are produced thinner on the back edge than on the front edge the steel along the thinnest edge will be refined and toughened in proportion to the variation in the gage, thus producing saws which are the best adapted to the requirements of the service.

The accompanying drawings illustrate my improvement and some of the many different kinds of saw-blades which may be produced.

Fig. 1 represents diagrammatically the old style of rolled blade with uniform gage preparatory to the grinding operation for reducing the gage at the front and back edges. Figs. 2 to 8, inclusive, show blanks of different graduations in the gage thereof suitable for manufacturing handsaws. Figs. 9 to 12, inclusive, are similar views of crosscut-saw blanks, which, it will be understood, vary in length from three to twelve feet. Fig. 13 is a view of one of the blade-blanks produced or obtained by severing the blank shown in Fig. 10 along its median longitudinal line. Fig. 14 is a view of the saw-blade after the teeth have been formed therein. Figs. 15 to 26, inclusive, show single blanks formed by cutting the blanks illustrated in Figs. 1 to 12 along the longitudinal center thereof.

It will be borne in mind that the blade shown in Fig. 1 is the common style of steel blank rolled by an ordinary rolling-mill to a uniform gage through its length and width, as indicated by the gage-numerals 14; that it is a single blank for a single saw, and that the blank was prepared with the sole end in view of being ground to the required thickness at its front and back edges, all as hereinbefore described.

According to my invention I prepare an

embryonic blank or steel sheet of peculiar form—that is to say, the blank A is rolled with its thinnest portion along the median line *a* and with its thickest portions along the respective edges *b c* of the blank. Now in the rolling operation to produce a double or duplex embryo blank A the steel is given the variations in the gage both longitudinally and transversely of the blank, without, however, producing in any wise ruffling or buckling of the steel fibers or particles, because the double-tapered cross-sectional form of the blank overcomes any tendency to the malformation or improper assemblage and disposition of the steel fibers, and herein lies one of the important and advantageous features of my improvement in the art of manufacturing saw-blades. Subsequent to the rolling of the longitudinally-tapered blank of double-wedge-shaped form in cross-section the blank is severed longitudinally along the thinnest portion or the median line, (indicated at *a*,) thus producing two equal halves or sections, each having the required gage along both its thick and thin edges or the proper longitudinal and transverse taper produced therein as an integral part of the blade consequent upon the rolling operation. The blades are now further treated by punching the teeth in the thickened working edges thereof, and each blade is finally finished in the ordinary manner well known to those skilled in the art for the attachment of the handle or handles, &c.

As exemplifying some of the styles of saw-blades which may be produced by my invention I have illustrated various types thereof. For example, Figs. 2 to 8 represent various styles of handsaw-blanks. More specifically, Fig. 2 shows a blank which along its median line tapers from twenty-three to twenty-three and one-half to twenty-four gage, while at the side edges the blank is respectively twenty-one, twenty-one and one-half, and twenty-two gage. Fig. 3 shows the gage to be twenty-one, twenty-two, and twenty-three along the median line and nineteen, twenty, and twenty-one at each side edge. Fig. 4 shows the blank to be twenty-one, twenty-two, and twenty-three gage at the thin median line and nineteen, twenty, and twenty-one at each side edge. Fig. 5 shows the blank with a gage of twenty-two, twenty-three, and twenty-four along the median line and twenty, twenty-one, and twenty-two at each side edge. Fig. 6 is a blank with the gage twenty, nineteen and one-half, and nineteen at the median line, while at each edge the gage is eighteen, seventeen and one-half, and seventeen. Fig. 7 shows the gage to be twenty, twenty-one, and twenty-two at the middle and eighteen, nineteen, and twenty at the edges, and Fig. 8 shows the gage twenty-one, twenty-two, and twenty-three at the middle, while at the edges it is nineteen, eighteen, and seventeen.

In the long crosscut-saw blanks shown by Figs. 9 to 12, inclusive, different conditions prevail, in that the gage along each edge and the median line is graduated from the ends toward the center. In Fig. 9 the gage-numerals indicate that the gage along the middle varies from sixteen at the ends to twenty and twenty-one at the center, while on each edge the gage is fourteen and one-eighth at the ends and fourteen near the middle. The blank shown by Fig. 10 has at the median line the gages sixteen, twenty, and sixteen, and at the edges the gage is uniform at fourteen. Fig. 11 indicates that the gage is uniform at eighteen along the median line, while at each edge the gage varies from sixteen to fourteen, as shown, and in Fig. 12 the blank is shown with a gage along the center which varies from seventeen to nineteen and twenty; but at the edge the gage is fourteen and one-half to fourteen at the points shown. It is thus apparent that I produce rolled blanks of double-tapered form in cross-section with varying gages or thicknesses longitudinally along the median and both sides of the blanks, and it is evident that the gages or thicknesses may vary to meet the different conditions demanded by the trade.

My improvement enables me to produce rapidly and economically saw-blades of the required taper and gage which are free from the objections heretofore encountered in the art and due to the grinding of the blade to the required gage or to the rolling of a single blank, and my improved saw-blades also have both lateral faces true and accurate and they are free from the blemishes which from a practical standpoint are so objectionable to ordinary saw-blades.

Many attempts have heretofore been made to roll cross-sectionally-tapered steel blanks for saws and other cutlery articles; but such attempts, to my knowledge, have all been failures, for the reason that it has not been practical to roll a cross-sectionally-tapered plate to the form required of metal for service in the art. One attempt at producing such rolling of the plate has been the employment of cylindrical rolls set with their axes inclined in diverse planes; but this is wholly impracticable, for the reason that the work as it passes through the rolls will curve around to one side and become deflected edgewise, resulting in the production of steel wholly unfit for the purposes of manufacture into saws or other articles. It has been wholly impracticable to provide means for guiding the blank and keeping it in true relation to the rods and feeding in a straight line therethrough. These objections are overcome by my invention, the vital feature of which is the rolling of a steel plate of double-tapered form in cross-section. This rolling operation and this form of the blank or plate solves the problem connected with the economical and rapid production of a high grade of saws free from defects long recognized in the trade. In the rolling of the blank or plate by crowned rolls the

metal is displaced or forced along its median line uniformly in opposite directions, and thus while the blank is made thinner along its median portion and thicker at both side edges the displacement of the metal is uniform in both directions and at right angles to the longitudinal axis of the blank or plate. Such rolling of the double-tapered plate is effected by crowned rolls, which are balanced to act uniformly in the displacement of the metallic particles, and hence it is possible to feed the blank in a straight line through the mill. After such a blank as that shown in Fig. 10, for instance, has been produced it is cut along the longitudinal median line to provide two blade-blanks, one of which is shown in Fig. 13. The blank shown in Fig. 13 is then finished, as hereinbefore described, by cutting the teeth in the thicker edge thereof, and Fig. 14 illustrates the blank after the performance of this step.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A saw-blank of tapering cross-sectional contour and having different gages or thicknesses along its thick and thin edges, said blank produced by rolling a plate which is doubly tapered in cross-section and subsequently divided along its thin median line, substantially as described.

2. A cross-sectionally-tapered saw-blank which is also tapered longitudinally, producing different gages or thicknesses at its respective thin and thickened edges, said blank produced from a rolled plate which has its molecules displaced in opposite directions from a thin median portion and is subsequently divided along said median portion, substantially as described.

3. A saw-blank, produced by rolling, which is tapered transversely and is thicker at points adjacent to its ends than at intermediate points in its length, substantially as set forth.

4. A saw-blank tapered transversely and thicker at points adjacent to its ends than at intermediate points in its length, the surfaces thereof hardened by rolling, substantially as described.

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

CHESTER PROUTY.

Witnesses:
M. Z. ELLIOTT,
A. M. ENT.