N. P. PETERSEN.

HARDENING OF THIN STEEL SHEETS.

APPLICATION FILED NOV. 24, 1920.

1,431,680. Patented Oct. 10, 1922.

2 SHEETS—SHEET 1.

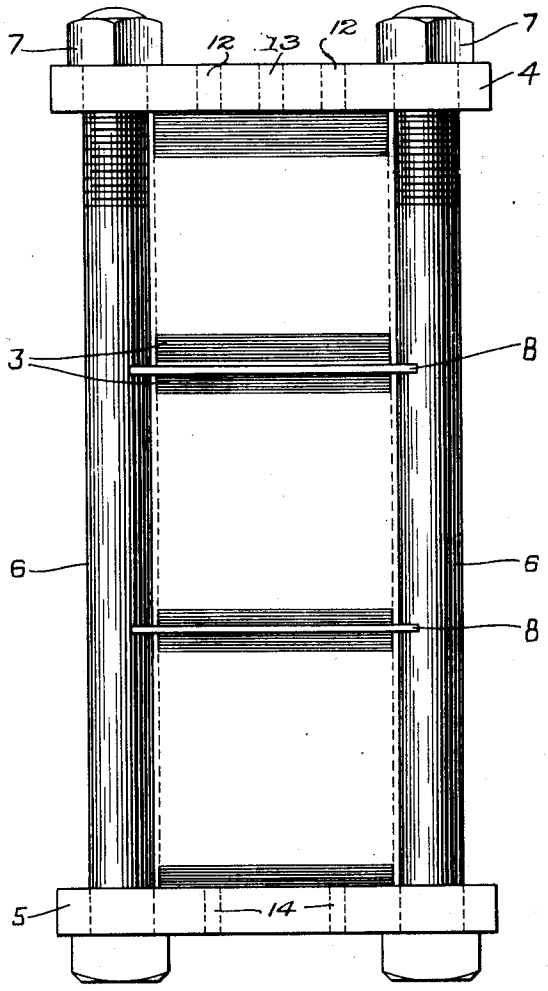


FIG. 1.

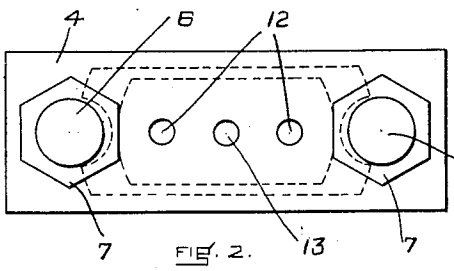


FIG. 2.

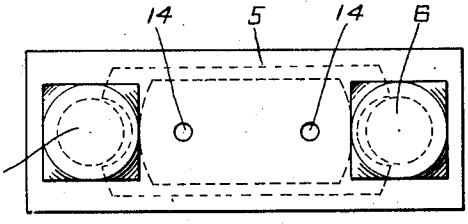


FIG. 3.

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2 SHEETS—SHEET 2.

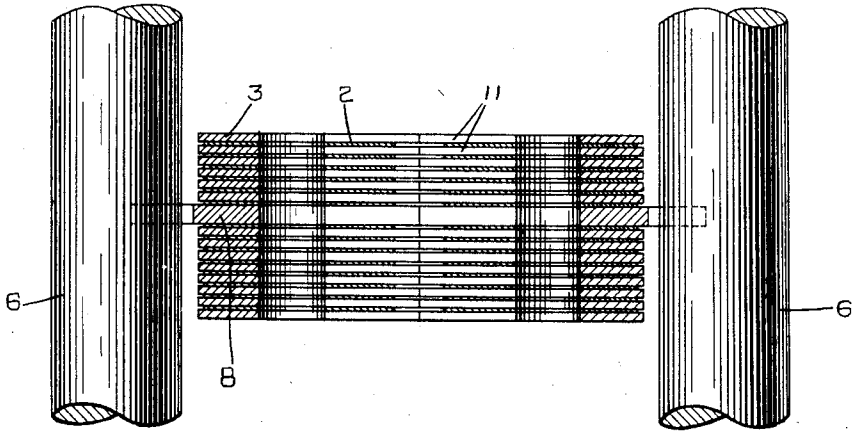


FIG. 4.

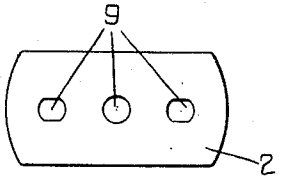


FIG. 5.

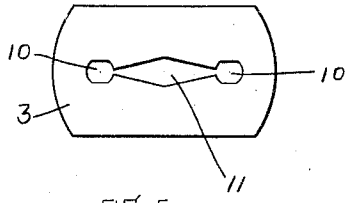


FIG. 6.

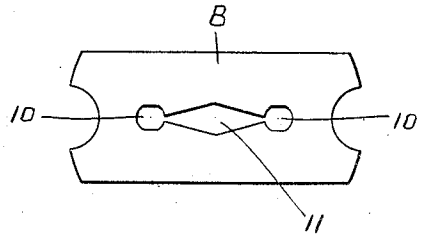


FIG. 7.

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Patented Oct. 10, 1922. 1,431,680

UNITED STATES PATENT OFFICE.

NEIL P. PETERSEN, OF MONTREAL, QUEBEC, CANADA, ASSIGNOR TO GILLETTE SAFETY RAZOR COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF DELAWARE.

HARDENING OF THIN STEEL SHEETS.

Application filed November 24, 1920. Serial No. 426,285.

To all whom it may concern:

Be it known that I, NEIL P. PETERSEN, a citizen of the United States, residing at Montreal, Province of Quebec, Dominion of Canada, have invented certain new and useful Improvements in the Hardening of Thin Steel Sheets, of which the following is a specification.

My invention relates to the art of hardening thin steel sheets of limited area, and is an improvement on the method described in U. S. Letters Patent No. 812,442, granted Feb. 13, 1906, on the application of W. E. Nickerson, as applied to the hardening of perforated blanks such as are used in making safety razor blades. In practicing the method above referred to, the steel blanks are interleaved with sheets of copper or other metal of relatively high heat conductivity as compared with steel, confining the interleaved blanks and sheets in a stack, heating the stack and then chilling it, the chilling action being made quickly effective throughout the entire extent of the blanks by reason of the rapid conduction of their heat outward to the exterior of the stack through the interleaved copper sheets. According to the present invention the same procedure is followed except that the stack is so constituted that there is provided within it one or more open spaces to which the chilling medium has access through one or both ends of the stack and in which the blade blanks are exposed to a limited extent, so that when the heated stack is subjected to the action of the chilling medium the heat is abstracted from the blade blanks not only by conduction outward through the copper sheets but also by conduction inward through the same sheets and by direct contact of the chilling medium with the internally exposed portions of the blanks. In this way the chilling action is rendered more rapid and effective throughout the area of each blank and all internal strains which, if present, might cause the chilled blanks to warp are entirely eliminated.

In the accompanying drawing illustrating my invention as applied to the hardening of blade blanks of the character above referred to,

Figure 1 is a side elevation of a frame suitable for holding the stack of interleaved blade blanks and heat-conducting sheets during the heating and chilling operations, showing a portion of the stack in place in the frame;

Figure 2 is a top view of the frame;

Figure 3 is a bottom view of the frame;

Figure 4 is a side view on a larger scale of a portion of the frame and stack, showing the latter in section lengthwise of the blade blanks at their centers;

Figure 5 is a plan view of one of the blade blanks;

Figure 6 is a plan view of one of the sheets which are interleaved with the blade blanks to form the stack; and

Figure 7 is a plan view of a slightly different sheet hereinafter described.

In the drawing the blade blanks to be hardened and the sheets which are interleaved with them are indicated by the numerals 2 and 3 respectively, and the frame in which the stack of interleaved blanks and sheets is held during the heating and chilling operations is shown as consisting of two cross-bars 4 and 5 separably connected by a pair of headed bolts 6 which pass through perforations in the ends of the cross bars and are provided with nuts 7 whereby the cross bars can be caused to clamp the stack between them and maintain a suitable pressure thereon. When the stack is in place in the frame the blanks 2 and sheets 3 extend longitudinally between the bolts 6, leaving both sides of the stack exposed, and in order to prevent lateral displacement of the stack at any point there may be included in it a few relatively thick and stiff sheets 8 of greater length than the sheets 3 and having at each end an inwardly extending recess adapted to receive the adjacent bolt 6, as shown in dotted lines in Figures 2 and 3. These sheets 8 as well as the sheets 3 are preferably made of copper, in which case the sheets 8 will serve as the heat-extracting sheets for the adjacent blade blanks, and both the sheets 3 and the sheets 8 should be somewhat wider than the blanks 2 as explained in the Letters Patent above referred to.

The particular blade blank illustrated has three perforations 9 in line with one another, of which one perforation is located at the center of the blank and the others are located between the central perforation and the ends of the blank, and the sheets 3 and 8 used with such blanks are each provided with two perforations 10 in position to register respec-

tively with the end perforations in the blank 2 and are cut away at their centers, as at 11, to a sufficient extent to expose a limited portion of the adjacent blanks 2 when interleaved therewith. One of the cross bars of the frame, as for example the cross bar 4, is also provided with three perforations, of which the two perforations 12 are located in position to register respectively with the aligned perforations 10 in the sheets 3 and 8 and the end perforations in the blade blanks 2, and the perforation 13 is located in position to register with the central perforations in the blade blanks.

In assembling the parts above referred to the stack may be conveniently formed by placing the blanks 2 and the sheets 3 and 8 in the proper order on a pair of slender rods (not shown) temporarily inserted in the perforations 12 in the cross bar 4, whereby they are held in position to enter the end perforations in the blanks and sheets. After the stack has been formed the other parts of the frame are assembled around the stack, which is thereupon clamped between the cross bars by means of the nuts 7, the rods used in stacking the blanks and sheets being then withdrawn through the perforations 12. In the stack thus constituted there will evidently be three internal open spaces, one formed within the central portion of the stack by the collective openings 11 in the sheets 3 and 8 and the central perforations in the blade blanks, and the others formed respectively by the end perforations in the blade blanks and the corresponding perforations 10 in the sheets 3 and 8, and all of these internal spaces will be in communication with the exterior of the stack through the perforations 12 and 13 in the cross bar 4. In consequence, when the stack after having been heated is subjected to the action of the chilling medium the latter enters the interior of the stack and abstracts the heat from the blade blanks by direct contact with the exposed central portions thereof as well as by conduction through the copper sheets both inwardly and outwardly, as and with the results above stated.

The central openings 11 in the sheets 3 and 8 are shown as extending into the end perforations in the same sheets, and hence the open spaces within a stack containing such sheets will be in communication with one another laterally. In such case it is unnecessary to provide the cross bar 4 with all three of the perforations shown at 12 and 13, since the chilling medium entering through any one of them will have access to all three of the open spaces within the stack, but the provision of more than one such perforation is advisable in order to prevent too much delay in the action of the chilling medium within said open spaces, and to the same end the cross bar 5 may be provided with one or more perforations through which the chilling medium can enter the interior of the stack. Two such perforations are shown at 14, and by varying the size and number of these perforations and the perforations 12 and 13 the action of the chilling medium may be controlled to a considerable extent, according to the desired hardness of the blade blanks when chilled. The size, shape and location of the openings 11 may also be varied and it is not essential that these openings shall extend into the adjacent perforations, if such are employed, so long as each open space provided within the stack is connected with the exterior of the stack by a passage through which the chilling medium can enter. The heating and chilling of the stack may be accomplished in the manner described in the Letters Patent above referred to, or in any other suitable manner.

I claim:

1. An improvement in the method of hardening perforated articles of thin sheet steel by heating and subsequently chilling a stack in which such articles are interleaved with sheets of high heat conductivity as compared with steel, characterized by the employment of sheets each having an internal opening of such contour as to provide, in connection with the perforations in said articles, an open space within the stack to which the chilling medium has access and in which limited portions of the faces of the articles are exposed to direct contact with said medium.

2. A method as set forth in claim 1 and adapted for use with articles having more than one perforation, characterized by the employment of sheets of such formation that the stack contains open spaces in lateral communication with each other.

3. A heat-conducting sheet for use in practising the method set forth in claim 1, having an internal opening of greater area than the corresponding perforations in the articles to be hardened.

4. A heat-conducting sheet as described in claim 3, having its internal opening centrally located between perforations adapted to overlie similarly spaced perforations in the articles to be hardened.

5. A heat-conducting sheet as described in claims 3 and 4, in which the internal opening extends into the perforations at its ends.

Signed at Boston, Massachusetts, this seventeenth day of November, 1920.

NEIL P. PETERSEN.