L. HARDY.

MANUFACTURE OF CUTTER-STOCK.

No. 171,127. Patented Dec. 14, 1875.

Fig. 1.

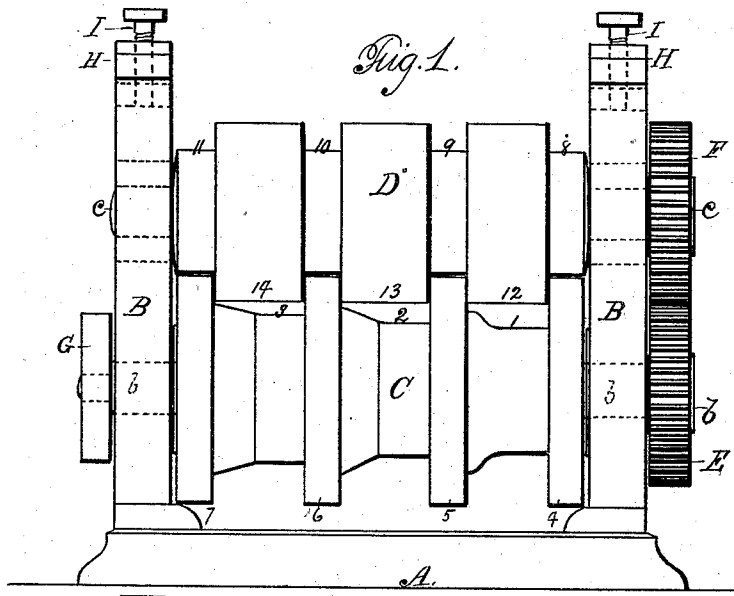


Fig. 2.

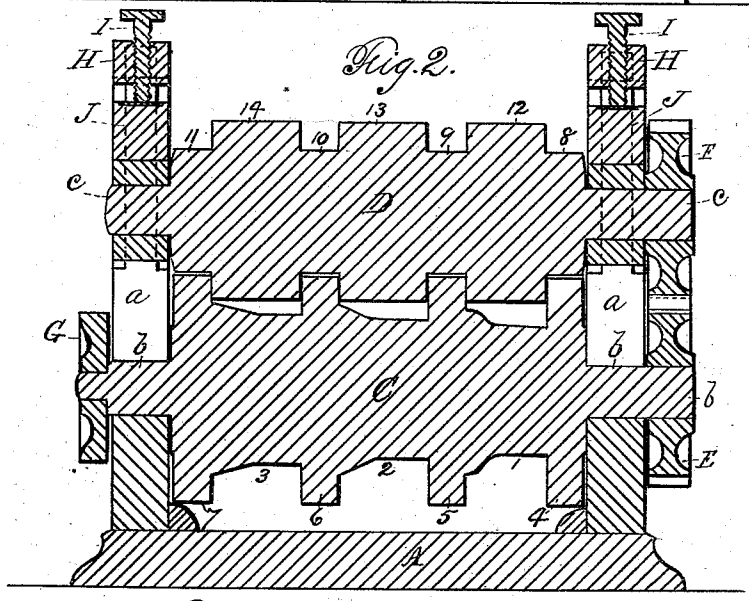


Fig. 3.

Fig. 4.

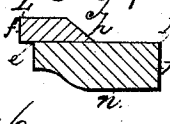


Fig. 5.

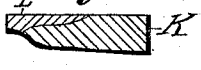
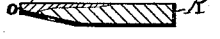


Fig. 6.

Fig. 7.



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IMPROVEMENT IN THE MANUFACTURE OF CUTTER-STOCK.

Specification forming part of Letters Patent No. **171,127**, dated December 14, 1875; application filed November 27, 1875.

To all whom it may concern:

Be it known that I, LEVI HARDY, of the city and county of Worcester, and Commonwealth of Massachusetts, have invented certain new and useful Improvements in the Mode or Process of Manufacturing Combined Iron and Steel Die-Cutter and Knife Stock; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings forming a part of this specification, and in which—

Figure 1 represents a front view of one of the machines employed in the said mode or process. Fig. 2 represents a longitudinal vertical central section of the machine shown in Fig. 1; and Figs. 3, 4, 5, 6, and 7 represent, upon an enlarged scale, cross-sections of the material and finished stock at different stages in the mode or process of manufacture.

To enable those skilled in the art to which my invention belongs to make and use the same, I will proceed to describe it more in detail.

In the drawings, A represents the base, and B B the slotted end pieces, of the frame of the machine. Within the slots *a a* in the end pieces B B are arranged the journals *b b* and *c c* of the rolls C and D. The roll C is provided with grooves 1, 2, and 3, and projections 4, 5, 6, and 7, while roll D is provided with grooves or recesses 8, 9, 10, and 11, and projections 12, 13, and 14, projections 4, 5, 6, and 7 of roll C fitting into recesses or grooves 8, 9, 10, and 11 of roll D, while projections 12, 13, and 14 fit into recesses or grooves 1, 2, and 3 of roll C.

It will be observed that the outer surfaces of the projections 12, 13, and 14 form circles of equal diameter; consequently they are in the same horizontal plane at all times when they come opposite the center of roll C, while the forms of the inner surfaces of the grooves or recesses 1, 2, and 3, into which said projections enter, are irregular and cam-shaped, as fully shown in Figs. 1 and 2. Upon the ends of the axles *b* and *c* of rolls C and D are secured cog-gears E and F, which mesh into each other, so that when power is applied to pulley G, fast on the journal of roll C, a positive and uniform motion will be imparted to both rolls. Upon the tops of the slotted standards B B are fastened cap-pieces H H, through which are passed screw-bolts I I, the lower ends of said screw-bolts bearing or pressing against the tops of the sliding journal-boxes J J upon the journals C C of roll D, whereby roll D can be adjusted so as to leave a greater or less distance between the outer surfaces of the projections 12, 13, and 14 and the inner surfaces of the grooves or recesses 1, 2, and 3 when the machine is in operation, as and for the purposes hereafter explained.

The bar of iron K, to which the steel is to be welded by a rolling operation, is first rolled, so that a cross-section of the same will be represented by Fig. 3 of the drawings, said bar having one of its corners *d* rolled in, as indicated in Fig. 3 of the drawings. The next stage of the process consists in placing a bar of steel, L, longitudinally upon the edge *e* of bar K, one edge, *f*, of the steel bar projecting over the edge of the iron bar, as fully shown in Fig. 4. The inner upper corner of the bar of steel is rolled down, so as to form a bevel, *h*, before it is placed upon the bar of iron, and Fig. 4 represents a cross-section of both the bars of iron and steel in the relative positions in which they are first run through the machine after the bars K and L of iron and steel have been placed or piled in the relative positions shown in Fig. 4. One end of such pile is run into the furnace and heated sufficiently to enable the ends to be welded together by a few blows. Both bars are then run into a furnace of sufficient capacity to receive and heat their entire lengths, and the bars are allowed to remain in such furnace until they are brought to a red heat at least, after which they are removed from the furnace, and borax is applied on and into the joints between the bars. The bars are then returned to the furnace and raised to a welding heat, after which the bars are withdrawn and placed between a pair of clamping-jaws, by means of which the bars are firmly clamped together, thereby causing the iron and steel surfaces to adhere to each other. The pile is then run into the furnace again and raised to a welding heat, after which the pile is removed from the furnace and run endwise between projection 12

on roll D and the cam-surface 1 on roll C, the lower side *n* of the bar of iron being down or upon the under side, while the steel bar is upon the upper side. After the bars have passed once through the machine the steel and iron are welded together and caused to assume the relative positions and form shown in Fig. 5. The bar is then passed back and run through between the surfaces 2 and 13 of the machine, when a cross-section of the welded bar at this stage of the process is represented by Fig. 6. The bar is then passed back and run through between the surfaces 3 and 14 of the rolls C and D, when a cross-section of the bar will show the relative positions of the iron and steel, as indicated by Fig. 7, and if it be desired the bar can be passed back and run through between the surfaces 3 and 14 again, the operator turning down the adjusting-bolt I a little on the left-hand end of the machine, to cause the steel edge *o* to be rolled somewhat thinner, and to give the bar a smoother and more finished appearance than it had after passing for the first time between said surfaces 3 and 14. When this is done, however, adjusting-bolt I should be turned back to its former position before the next is run through. In practice I prefer to have an iron or metallic table in front of the machine of sufficient length to enable the operator, when he receives the bar back over the top roll D from the attendant on the back side of the machine, to strike the bar lengthwise on said table, for the purpose of straightening it, and also for the purpose of relieving it from scales, the table being covered with water.

It will be observed that the iron is rolled or forced back from under the outer edge of the steel, while the steel itself is rolled down and spread out upon the plane side of the bar, whereby great economy in the use of steel can be practiced, while at the same time obtaining a proper backing of iron and sufficient steel to produce a good cutting-edge when it is ground off to the usual bevel.

It will be understood that Figs. 3, 4, 5, 6, and 7 are drawn to an enlarged scale from Figs. 1 and 2, for the purpose of illustrating the relative positions of the iron and steel during different stages of the operation. It will also be understood that the forming-rolls C and D may be made so as to roll different sizes of stock, as occasion may require.

Having described my improved mode or process of manufacturing my combined iron and steel die-cutter and knife stock, what I claim therein as new and of my invention, and desire to secure by Letters Patent, is—

1. The mode or process of forming or producing a combined iron and steel bar (shown in Fig. 7) from iron and steel bars of the form shown in Figs. 3 and 4, by the mode or process shown and described.

2. The combination, with the rolls C, provided with projections 4, 5, 6, and 7, and peculiarly-formed recesses 1, 2, and 3, of roll D, provided with projections 12, 13, and 14, and recesses 8, 9, 10, and 11, substantially as and for the purposes set forth.

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