No. 713,950. Patented Nov. 18, 1902.

J. B. BURRELL.

GRAFTING APPARATUS.

(Application filed Mar. 24, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

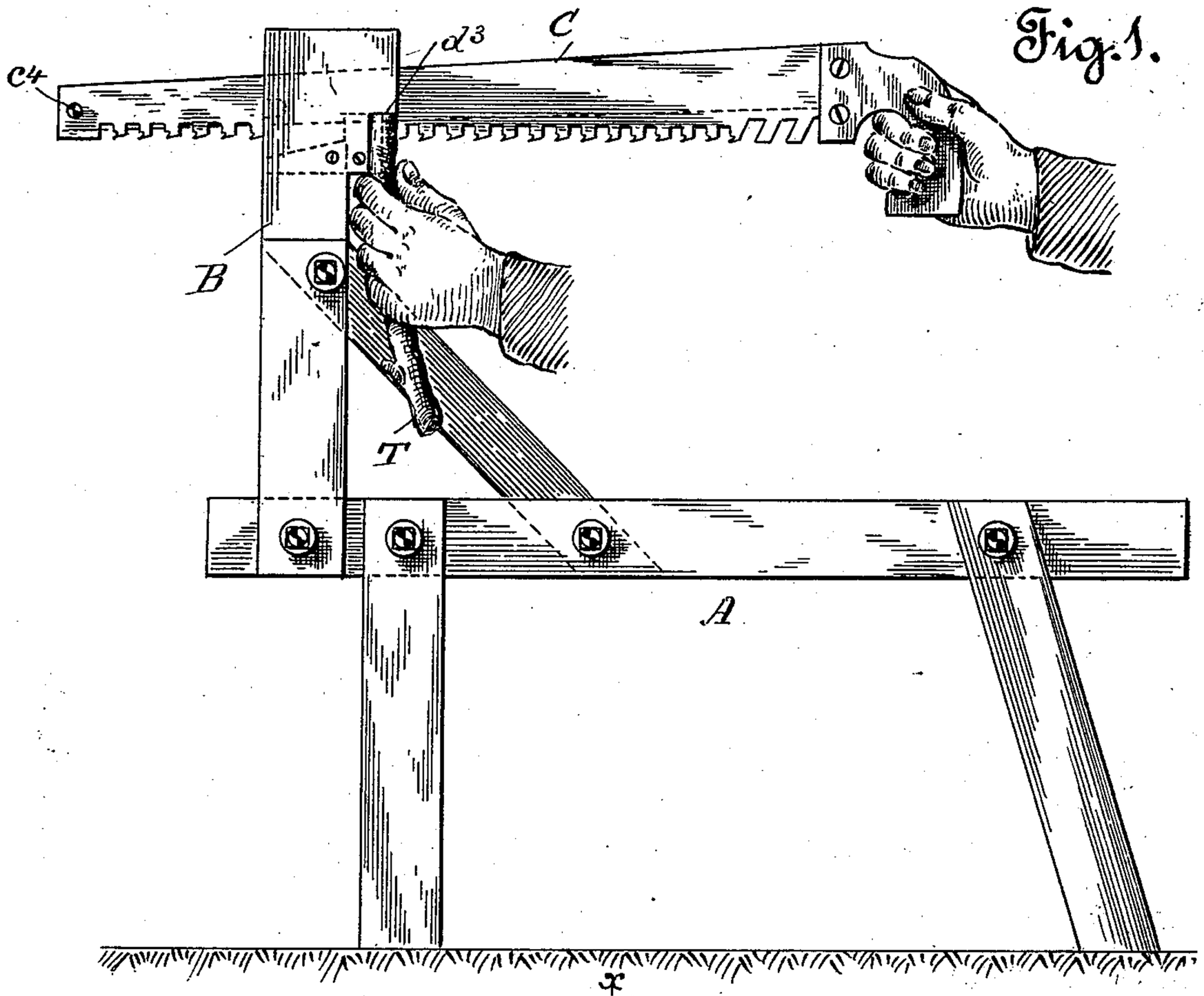


Fig. 4.

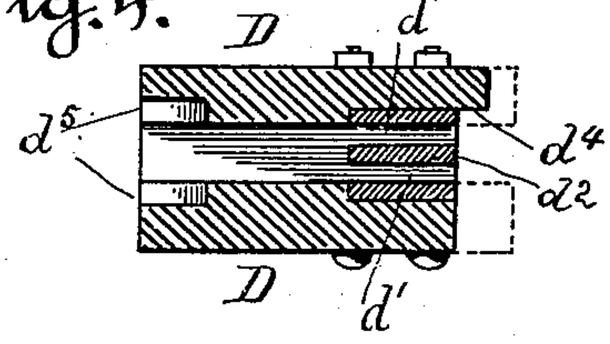


Fig. 2.

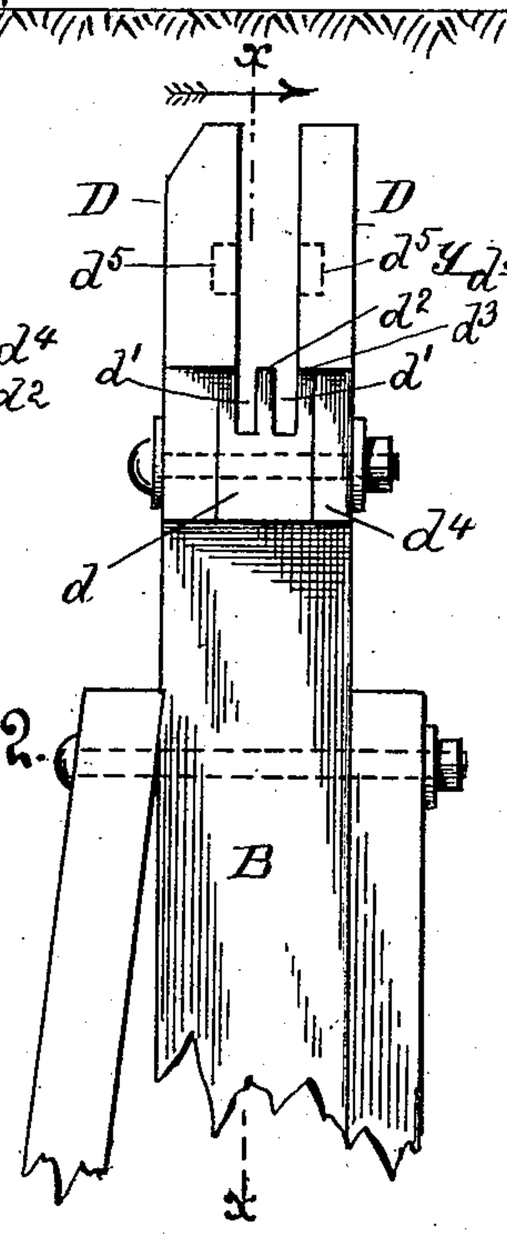
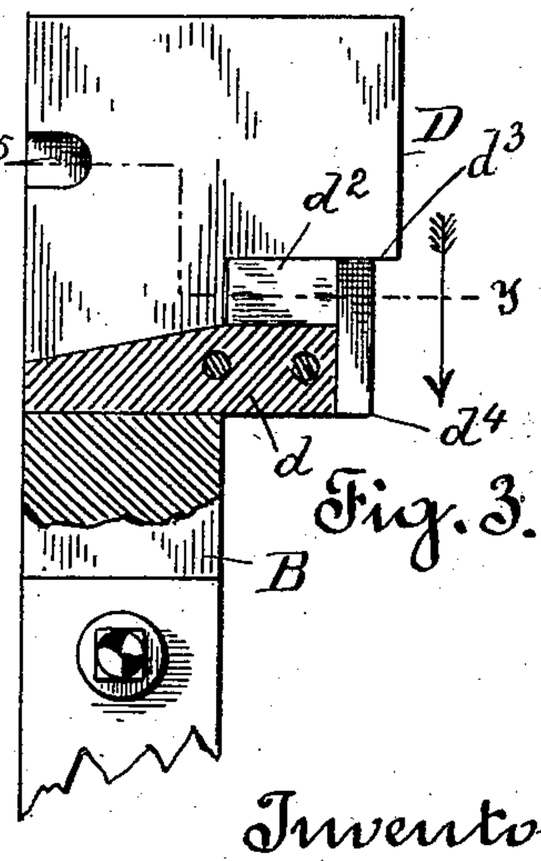


Fig. 3.



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No. 713,950. Patented Nov. 18, 1902.

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GRAFTING APPARATUS.

(Application filed Mar. 24, 1902.)

(No Model.) 2 Sheets—Sheet 2.

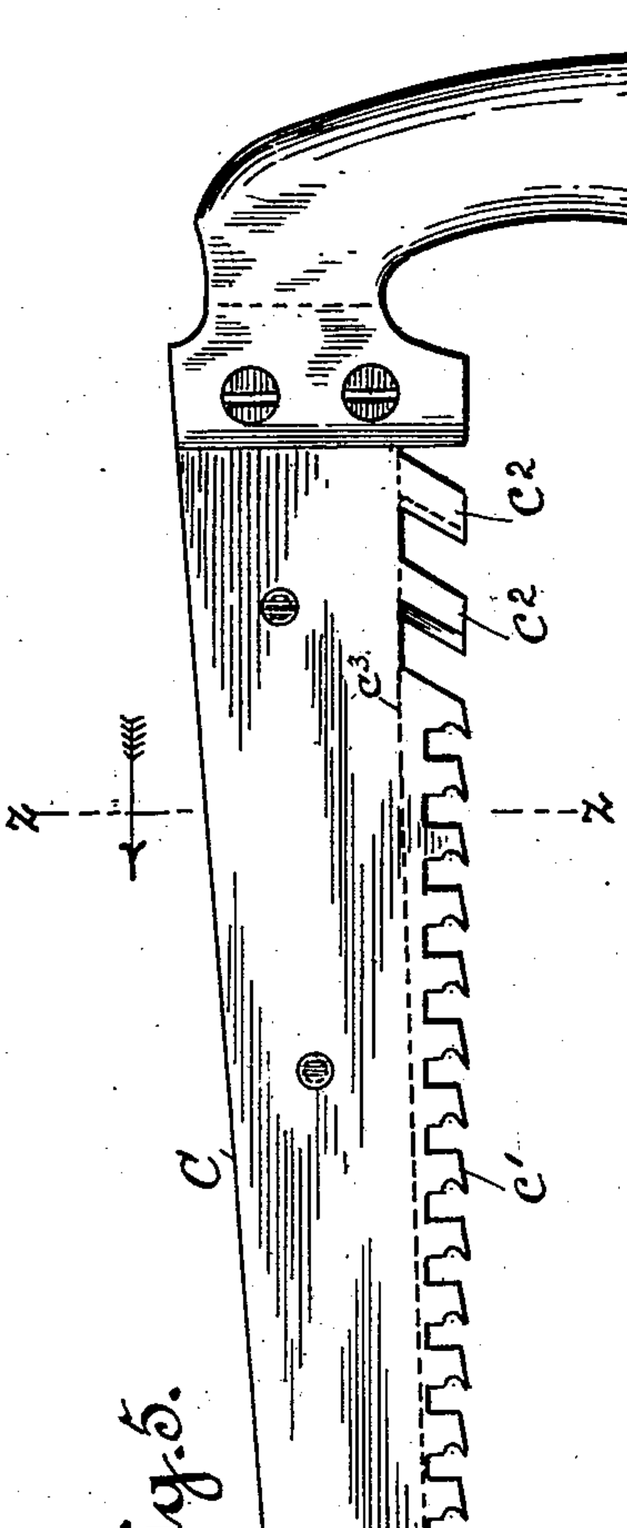

Fig. 5.

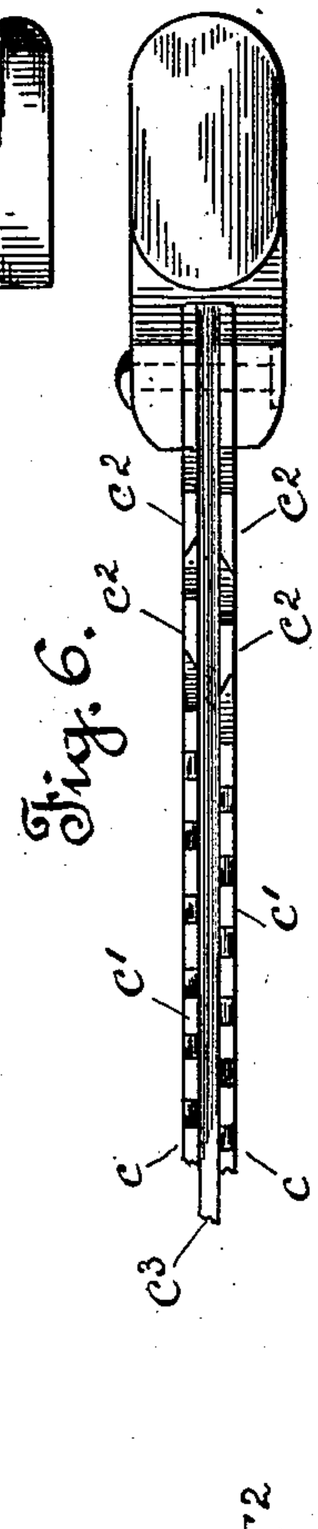

Fig. 6.

Fig. 7.

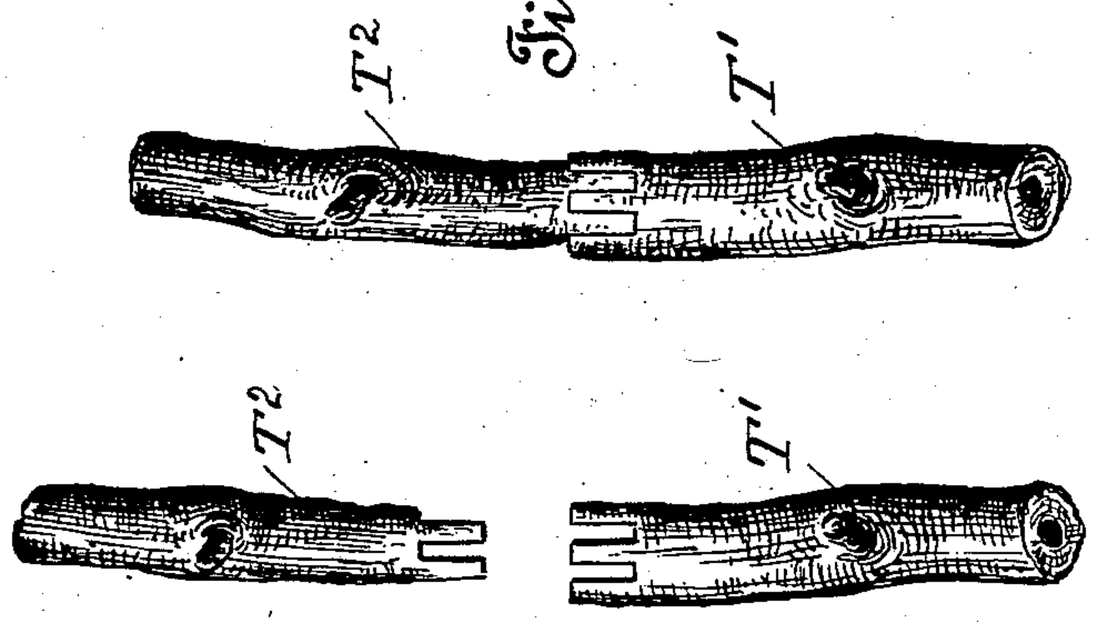

Fig. 9.

Fig. 8.

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UNITED STATES PATENT OFFICE.

JAMES BIRNEY BURRELL, OF WRIGHTS, CALIFORNIA.

GRAFTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 713,950, dated November 18, 1902.

Application filed March 24, 1902. Serial No. 99,571. (No model.)

To all whom it may concern:

Be it known that I, JAMES BIRNEY BURRELL, a citizen of the United States, residing at Wrights, Santa Clara county, State of California, have invented certain new and useful Improvements in Grafting Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of grafting tools, machines, or apparatus.

Successful grafting requires, in general terms, two main essentials—namely, extensive close contact of the cambium layers of stock and scion and a sufficiently strong and tight lock or joint to avoid displacement or separation. To attain these results in maximum degree and with speed and facility is the object of my invention.

My invention consists in the novel cutting-tool for forming the clefts and in the novel guide, with its several stops, for directing the cutting-tool with accuracy and for defining the position of the stock and scion with precision while subject to the operation of said tool, all as I shall hereinafter fully describe by reference to the accompanying drawings, in which—

Figure 1 is a side view of my apparatus, showing in a general way its manner of use. Fig. 2 is a front view of the tool-guide. Fig. 3 is a vertical section of same on line $x\ x$ of Fig. 2. Fig. 4 is a horizontal cross-section of same on line $y\ y$ of Fig. 3. Fig. 5 is a side view of the cutting-tool. In this figure, as well as in Fig. 1, I have for the sake of clearness not shown the "staggering" of the teeth. Fig. 6 is a bottom plan view of a portion of the cutting-tool, showing the teeth staggering. Fig. 7 is a cross-section of same on line $z\ z$ of Fig. 5. Fig. 8 is a view showing the clefts in stock and scion, the two being separated. Fig. 9 is a view of same, showing the graft lock or joint union completed.

Referring to Fig. 1, A is a frame of any suitable construction, preferably one upon which the operator sits straddled. From one end of this frame rises a standard B, the upper end of which carries the tool-guide, the details of which I shall presently describe and in which the cutting-tool operates. The twig, whether it be stock or scion and which is represented by T, is held in the position shown in said figure by one hand of the operator, while the other hand operates the cutting-tool. The guide for the cutting-tool will be seen by reference to Figs. 2, 3, and 4. It consists of two separated plates D, carried on the top of standard B and having located between them at their bases the guide-block d, the upper surface of which is provided with vertical slots d', which are equal in width and are bounded and separated by a tongue or tongues d^2 of a thickness substantially equal to or very slightly in excess of the width of the slots. The depth of the slots is approximately that of the cleft to be made in the twig, and said slots are exposed in the space separating the plates D, as is seen in Figs. 2 and 4. On one side and level with the top of the slots and tongues is a horizontal shoulder made in one of the plates D and forming a gage-stop d^3, Figs. 2 and 3, which, as shown in Fig. 1, is adapted to come in contact with the upper end of the twig T, whereby the position of said twig vertically is defined, so that its top is on a level with the top of the slots and tongues of the guide-block d. On the same side there is a vertical gage-stop d^4, Figs. 2 and 4, against which the side of the twig comes, thereby defining its lateral position. In the rear edges of the plates D, on their inner surfaces, are made recesses d^5, which form stops for the cutting-tool to prevent it from being drawn out of the guide, as I shall hereinafter describe. The construction of the cutting-tool will be seen by reference to Figs. 5, 6, and 7. It consists of a handled instrument of a general saw shape, comprising in its best form a plurality of parallel separated or spaced blades c. The space between the blades is clear and unobstructed, so that said blades will make and leave in the twig a plurality of distinct clefts separated by intervening tongues. I have here shown two of said blades, though more may be used, if desired. The lower or cutting edge of each of these blades is provided with suitable cutting-teeth c'. The best form of these teeth is that of planer heads or bits, whereby their action is more that of planing than of tearing like a saw. It is best to arrange the teeth of

one blade out of line with those of the other or staggering, as I have shown in Fig. 6, in order to better distribute the force or strain of cutting and to avoid the tearing of the twig, of which there would be a liability if the full force of the teeth of both blades were brought at the same time upon the same general portion of the twig. The teeth proper of the blades stop short of the handle, and between said teeth and handle are formed on the blades the cleft-smoothing knives c^2. The purpose of these knives is to smooth out both walls of each cleft made by the teeth c. In the cutting-tool here shown, which comprises the two blades, there are consequently four of these smoothing-knives, two on one blade and two on the other, and they are "staggered" like the teeth c'. The cutting edges of these smoothing-knives are beveled from opposite sides, as is shown in Figs. 5 and 6, so that they smooth the opposite walls of each cleft, and said knives are inclined downwardly and forwardly, as is seen in Fig. 5, whereby they cut from the bottom of the cleft upwardly to the top in the same manner that an operator would cut with his pocket-knife. There will be a slight set to these knives to enable them to get an appreciable shaving in their smoothing action.

The blades c of the cutting-tool are separated by a space which is at least equal to but preferably slightly in excess of the width of the thickness of the blades themselves or the width of the clefts which they cut. The separation is made by a suitable headpiece of a width slightly greater than the thickness of the blades, the intervening space being left unobstructed, and said separation is here shown as effected by an intervening plate c^3, Fig. 7, the blades and plate being riveted or otherwise secured together. This intervening plate c^3 is a cam-guide for the cutting-tool, and for this purpose, as will be seen in Fig. 5, its lower edge starts at the end of the tool flush with the lower edges of the teeth and thence slopes backwardly and upwardly on an inclined plane to the level of the upper ends of the smoothing-knives, thus leaving between the blades a space constantly increasing in depth from the forward end of the tool to the rear end. Upon the point of the tool C, Figs. 1 and 5, are opposite stop-studs c^4, which are adapted to come in contact with the stop-recesses d^5 of plates D, and thereby to limit the backward movement of the tool, preventing it from being drawn wholly out of the guide.

A description of the operation will now be understood. The operator sits upon the stand A, and while one hand grasps the cutting-tool C the other hand holds the twig T up to the gage-stops d^3 and d^4. The cutting-tool lies in the guide between the plates D, with the forward flush edge of the cam-plate c^3 lying upon the top of the tongue d^2 of the guide-block d, while the teeth of the tool lie in the plane of the upper ends of slots d' in said guide-block and upon the top of the twig. The cutting-tool is now pressed forward with a constant and steady movement. As the teeth c successively come in contact with the twig the tool itself descends, being allowed to do so by the inclined plane of the cam-plate c^3 traveling over the tongue d^2 of the guide-block d, and thus the teeth gradually descend into the twig and cut out the clefts therein to the depth defined by the slots d'. Finally the knives c^2 pass through the clefts and smooth out their walls from the bottom upwardly. The twig is then laid aside, the cutting-tool is drawn back to its stops c^4, a fresh twig is presented, and the operation is repeated.

The clefts made as thus described are shown in Fig. 8, wherein T' may represent the stock and T^2 the scion. The graft union or lock is shown in Fig. 9, in which it will be seen that by reason of the plurality of clefts there is obtained a most extensive contact of the cambium layers, and at the same time, by reason of the substantially equal or slightly excessive thicknesses of the tongues as compared with widths of the clefts, this contact is a close one, due to the spring of the material in fitting the tongues into the clefts, and a very tight lock is made, which will require no wrapping, tying, or protection of any character, either to hold the surfaces closely together or to prevent accidental displacement or separation.

It will readily be understood from the foregoing that as the clefts in both stock and scion are made by the same tool and the width of each cleft is therefore properly proportionate to the thickness of each tongue, whereby the lock must be a tight and close one, it is not essential that the cutting-tool be confined to two blades. Three or even more may be used to secure the same result. Nor is it essential that the clefts be confined in all cases within the circumference of the twig. One or more may be partial or imperfect ones on the circumference, but which will cut it away sufficiently to expose the cambium layer, thus doing away with any hand-cutting work. I am aware of the common form of cleft-grafting in which a single cleft is sawed in the stock and a central tongue is roughly whittled by hand from the scion; but such practice is inaccurate, resulting in a loose joint and limited contact. It is therefore an essential of my invention, as far as the best lock is concerned, that it be formed accurately and, preferably, by means for cutting a plurality of properly-proportioned clefts and tongues; but it will be understood that as far as the specific novel features of my apparatus are concerned, such as the smoothing-knives following the cleft-cutting teeth, and a suitable guide for the tool and gage stops for the twig, these features apply to a single-bladed tool as well as to one provided with a plurality of blades.

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

1. A grafting-tool composed of a number of parallel cutting-blades and separating head-pieces of width slightly greater than the thickness of the blades, the intervening space being left unobstructed.

2. A grafting-tool consisting of a blade having teeth to cut the cleft and a knife-tooth following said cleft-making teeth and adapted to smooth out the wall of said cleft, said knife-tooth being inclined from the top forwardly to the bottom, whereby its smoothing-cut is made from the bottom of the cleft outwardly.

3. A grafting-tool composed of a plurality of parallel-spaced blades having teeth to cut the cleft and a pair of knife-teeth on each blade following the cleft-making teeth, the members of each pair being oppositely beveled, and adapted to smooth out both walls of each cleft.

4. A grafting-tool composed of a plurality of parallel-spaced blades having teeth to cut the cleft and a pair of knife-teeth on each blade following the cleft-making teeth, the members of each pair being oppositely beveled, and adapted to smooth out both walls of each cleft, the cutting-teeth and the knife-teeth of one blade being set "staggering" with relation to those of the other blade.

5. A grafting-tool composed of a plurality of parallel-spaced blades having teeth to cut the cleft and a pair of knife-teeth on each blade following the cleft-making teeth, the members of each pair being oppositely beveled, and adapted to smooth out both walls of each cleft, said knife-teeth being inclined from the top forwardly to the bottom whereby their smoothing-cuts are made from the bottom of each cleft outwardly.

6. A grafting-tool composed of a plurality of parallel-spaced blades having teeth to cut the cleft, said blades being separated by spaces proportioned in width as described to the width of the clefts made by the blades, and a pair of knife-teeth on each blade following the cleft-making teeth, the members of each pair being oppositely beveled, and adapted to smooth out both walls of each cleft.

7. In a grafting apparatus the combination of a cleft-cutting blade and a cam-guide for changing the plane of the blade-stroke from the beginning to the end, to deepen the cleft.

8. In a grafting apparatus, the combination of a cleft-cutting blade, a slotted guide and an inclined plane for causing the blade to descend in the slotted guide during the progress of its stroke.

9. In a grafting apparatus, the combination of a cleft-cutting blade, a slotted guide and a plane on the blade, inclining backward and upward from its forward end.

10. In a grafting apparatus the combination of a cleft-cutting tool composed of a plurality of parallel-spaced blades, a plate between and separating said blades and having a lower edge inclined backwardly and upwardly from the forward end of the blades, and a fixed guide-block provided with a plurality of spaced slots adapted to receive the descending blades of the cutting-tool, as the inclined plate of said tool rides on the tongue between said slots.

11. In a grafting apparatus, the combination of a cleft-cutting blade, having secured to it an inclined plane rising from its forward end, a fixed slotted guide-block, adapted to receive the descending blade as its inclined plane travels on top of said block, and suitable gage-stops adjacent to said block for defining the position of the twig to be cleft.

12. In a grafting apparatus, the combination of a cleft-cutting tool composed of a plurality of parallel-spaced blades, a plate between and separating said blades and having a lower edge inclined backwardly and upwardly from the forward end of the blades, a fixed guide-block provided with a plurality of spaced slots adapted to receive the descending blades of the cutting-tool, as the inclined plate of said tool rides on the tongue between said slots and suitable horizontal and vertical stops adjacent to said guide-block for defining the vertical and lateral position of the twig to be cleft.

13. A grafting apparatus consisting of a frame having vertical spaced guide-plates, a guide-block between the bases of said plates and provided with a plurality of vertical spaced slots, a cutting-tool composed of a plurality of parallel-spaced blades, a plate between said blades inclining from the forward end upwardly and backwardly, said tool being fitted to reciprocate between the guide-plates, with its inclined plate traveling on the guide-block whereby the blades of the tool descend into the slots of the block, horizontal and vertical gage-stops at one side of the guide-block for defining the vertical and lateral position of the twig to be cleft, stops in the back of the spaced guide-plates, and studs on the cutting-tool end adapted to engage said stops to limit the return stroke of the tool.

In witness whereof I have hereunto set my hand.

JAMES BIRNEY BURRELL.

Witnesses:
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H. H. MOSER.