W. E. ELLIS.

LAST.

APPLICATION FILED JUNE 30, 1902.

928,909.

Patented July 20, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

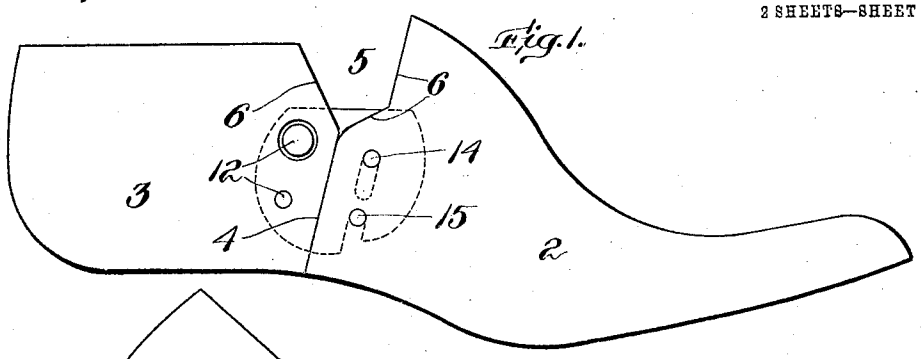

Fig. 2.

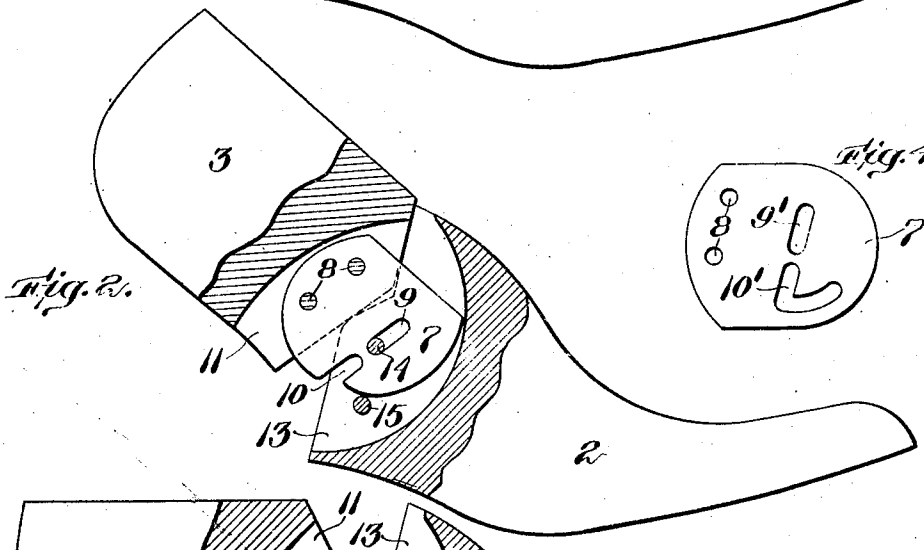

Fig. 4.

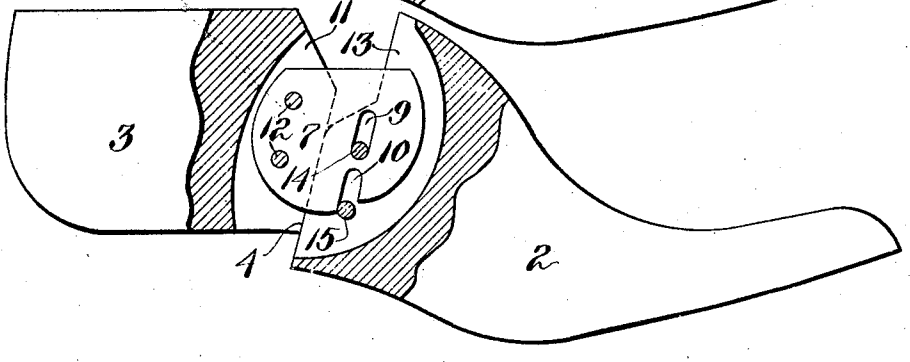

Fig. 3.

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2 SHEETS—SHEET 2.

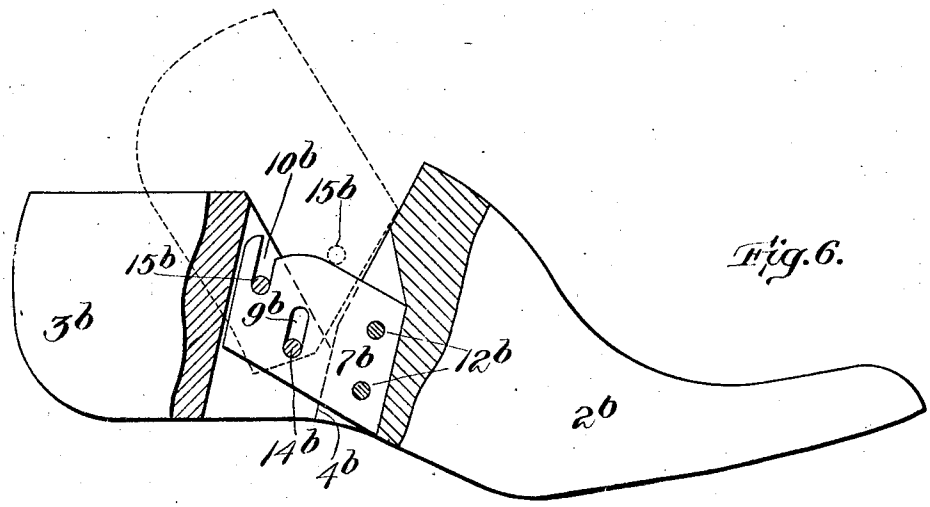

Fig. 6.

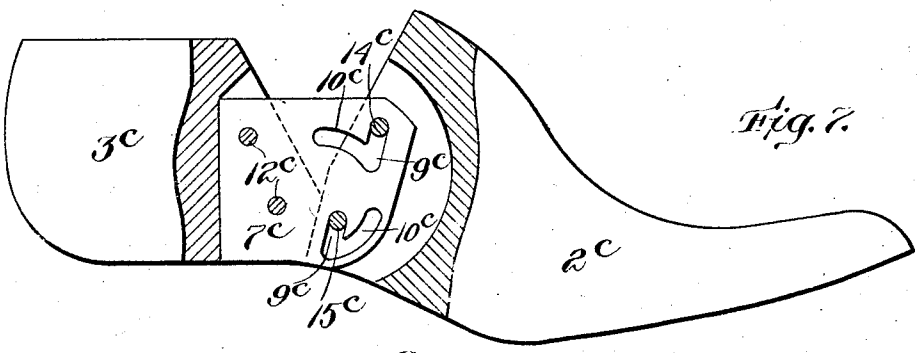

Fig. 7.

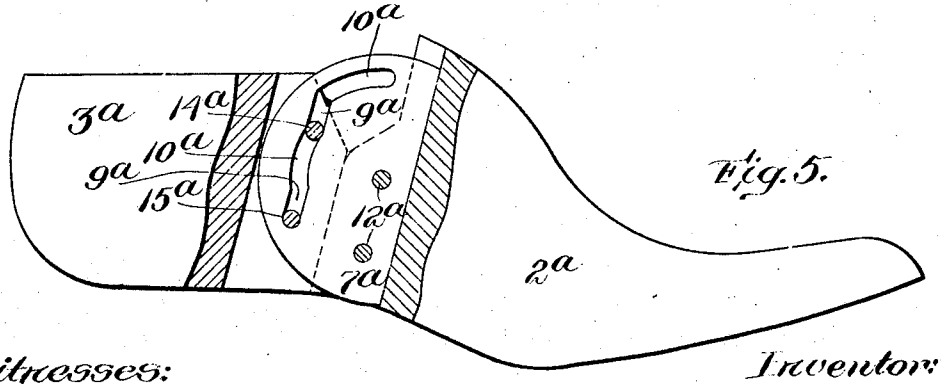

Fig. 5.

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UNITED STATES PATENT OFFICE.

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LAST.

No. 928,909. Specification of Letters Patent. Patented July 20, 1909.

Application filed June 30, 1902. Serial No. 113,690.

To all whom it may concern:

Be it known that I, WARREN EUGENE ELLIS, a citizen of the United States, and a resident of Haverhill, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Lasts, of which the following is a specification.

My invention is intended to provide an improved last of the collapsible type, which may be used as a first or lasting last as well as for the second lasting and subsequent operations performed on the shoe, and will possess other advantageous features hereinafter pointed out.

To this end my invention viewed in its more complete embodiment consists primarily in the provision of a transversely divided last the heel and toe portions of which are separated by certain peculiar lines of cut, substantially as hereinafter described, in combination with means for connecting said portions in such manner that when the last is fully extended, its parts are rigidly locked against being collapsed by any pressure applied to a shoe by the processes of manufacture, while in withdrawing the last from a shoe a limited initial movement of withdrawal unlocks the parts of the last and shortens the last as a whole, whereupon a pivotal movement of the heel portion of the last removes said portion from the shoe, leaving the toe portion free to be withdrawn in the usual manner. Conversely, when the last is inserted into a shoe my construction permits the toe portion of the last to be pushed into place and the heel portion to be then turned easily into the corresponding portion of the shoe, the final movement of insertion serving to extend the last and simultaneously lock the portions thereof in their extended position.

My invention also includes less complete embodiments as well as the connecting member as an article of manufacture, of simple and durable construction, for connecting the heel and toe portions of my last, whereby their operation is efficiently provided for.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 shows in side elevation a last embodying my preferred construction, the parts being shown in the extended position; Fig. 2 is a side view, partly in central, longitudinal section, showing the same last with its parts in the collapsed position; Fig. 3 is a view similar to Fig. 2, showing the parts of the last in an intermediate position; Fig. 4 is a detail view illustrating a modified form of connecting member suitable for use in the last shown in Figs. 1, 2 and 3; Figs. 5, 6 and 7 are views similar to Figs. 2 and 3, showing modified constructions, in the extended position.

The last shown in Figs. 1, 2 and 3 of the drawings comprises a main or toe portion 2 and a heel portion 3, said portions being separated by a transverse cut 4 slanting upwardly and forwardly from the bottom of the last and terminating about midway between the top and the bottom thereof, and also by a recess 5 bounded by diverging lines 6, 6, which extend upward to the top of the last, thus enabling the portions 2 and 3 to assume the position shown in Fig. 2. The portions 2 and 3 are so connected as to provide for a limited relative movement thereof in the direction of the slanting line 4, whereby said portions may be shifted from the position shown in Fig. 1 into the position shown in Fig. 3, and vice versa. The connections between said portions also provide for a pivotal movement of the portion 3 with respect to the portion 2, whereby said portions may be moved from the position shown in Fig. 3 into that shown in Fig. 2, and vice versa, the arrangement being such that when the parts of the last are in the extended position, shown in Fig. 1, they will be rigidly locked against pivotal movement. The means which I prefer to employ for connecting the portions 2 and 3 as above described, and to which one portion of my invention relates, consists of a metal plate 7 provided with holes 8 and with slots 9 and 10, both running in the same direction, said plate being cut away in front of the lower end of the slot 10, for a purpose hereinafter described. This plate 7 is immovably secured in a slot 11 formed vertically in the heel portion of the last, by means of pins 12 passing through the substance of the last and through the holes 8. The position of said plate is such that its front portion, which contains the slots 9 and 10, projects beyond the front end of the portion 3 and into a vertical slot 13 formed in the portion 2, in alinement with the slot 11. Pins 14 and 15 are inserted transversely into or through the toe portion 2 of the last and

pass respectively through the upper ends of the slots 9 and 10 in the plate 7, when the parts are in the position shown in Fig. 1. As thus constructed, when the parts of the last are in the extended position, the pins 14 and 15 are located respectively within the slots 9 and 10, and thus prevent any movement of the heel portion 3 with respect to the toe portion 2 except an upward sliding movement in the direction of the line of cut 4, but when the heel portion 3 has thus been slid upward sufficiently to bring the pin 15 below the lower end of the front wall of the slot 10, said heel portion becomes free to move into the position shown in Fig. 2 by turning on the pin 14 as a pivot. Thus, when my last is fully extended, its heel and toe portions are rigidly locked together, and can be unlocked only by sliding one of said portions along the slanting line 4. When in this condition my last is rigid and practically solid, and is well adapted for use as an original or lasting last. It is understood, of course, that during the processes of manufacture the last is inverted, and is supported on a spindle which enters its heel portion 3, so that the pressures applied to the last during said processes of manufacture are downward and hence are incapable of producing the sliding movement necessary to unlock the parts of the last. When it is desired to remove a shoe from the last, an upward pressure applied by the workman to the toe portion of the inverted last causes said portion to slide along the line of cut 4 and thus to unlock the portions 2 and 3. This movement also results in shortening the last before the heel portion 3 is withdrawn from the shoe, so that such withdrawal is easily performed without causing any substantial binding of the portion 3 against the surrounding parts of the shoe. When the last is inserted, the toe portion 2 is first pushed into place, the heel portion 3, turning on the pin 14 as an axis, is then easily inserted into the heel portion of the shoe, and the last is finally extended and locked by a sliding movement which brings the parts of the last into the position shown in Fig. 1.

In Fig. 4 I have shown a slightly modified connecting member 7', which differs from the member 7 in that said member 7' has its lower slot 10' wholly surrounded by the metal of the plate itself, the lower end of said slot 10' opening into a lateral extension or enlargement so shaped as to provide for the necessary movement of the plate 7' about the pin 14 as a center.

In Fig. 5 I have shown a modification in which the connecting member 7^a is rigidly secured to the toe portion 2^a of the last and moves in a slot formed in the heel portion 3^a. In this modification the slot through which the pins 14^a and 15^a pass consists of straight portions 9^a running in the same direction and parallel with the line of cut 4^a, and curved portions 10^a struck from the center about which the relative pivotal movement of the parts of the last is to occur. In the construction shown, this center coincides with the uppermost pin 12^a, and the lines of cut which separate the heel and toe portions of the last are the same as in the last shown in Figs. 1, 2 and 3.

In the constructions previously described the center about which the relative pivotal movements of the parts of the last occur is located within the toe portion thereof. In Fig. 6 I have shown another modification, in which said center is located in the heel portion of the last, the connecting member being rigidly secured to the toe portion as in the case of the modification shown in Fig. 5. In the last shown in Fig. 6 the recess which separates the toe portion 2^b from the heel portion 3^b has its bounding surfaces somewhat differently located, the upwardly and forwardly slanting surface at the front of the transverse line of cut 4^b being extended somewhat above the upper end of the corresponding surface on the heel portion 3^b, so that when said heel portion has been slid upward to unlock the parts of the last, the recess left between the portions 2^b and 3^b will be V-shaped. The connecting member used in this modification consists of a plate 7^b secured to the toe portion 2^b by pins 12^b in the manner previously described and provided with parallel slots 9^b and 10^b through which the pins 14^b and 15^b pass, but in this case said plate 7^b is cut away in front of the upper end of the slot 10^b in such manner as to provide for the desired pivotal movement of the heel portion about the pin 14^b as a center, after said heel portion has been slid upward into the intermediate position.

In Fig. 7 I have shown still another modification, in which the pivotal center is located in the line of cut which separates the heel and toe portions of the last, the connecting member being rigidly secured to said heel portion. In this modification the lines of cut which separate the toe and heel portions 2^c and 3^c are or may be the same as in the last shown in Fig. 6. The connecting member consists of a plate 7^c rigidly secured to the heel portion 3^c by means of pins 12^c and provided with parallel slots 9^c through which the pins 14^c and 15^c pass, said plate being so cut at the lower ends of said slots as to provide spaces 10^c which permit the desired relative pivotal movement of the portions 2^c and 3^c, in which movement the pins 14^c and 15^c are guided by the edges of the plate which define said spaces. The center of pivotal movement, in this construction, is located at the vertex of the angle formed by the flat front faces of the heel portion 3^c.

Viewed in its more complete embodiment and preferred construction, it will be seen

that the characteristic features of my last are the division of the last by lines of cut which produce conforming surfaces extending upward and forward for a limited distance from the bottom of the last and a recess with diverging walls at the upper end of the conforming surfaces, and the combination therewith of means connecting the two parts of the last and providing for a guided relative movement thereof along the conforming surfaces, or substantially so, during the initial movement of withdrawal and the final movement of insertion and for another relative movement of the two parts of the last on a short radius whereby the recess is closed after the initial movement of withdrawal and opened prior to the final movement of insertion. Thus in each of the constructions illustrated, the connecting member is so slotted as to provide straight guiding surfaces for the pins with respect to which said member moves, which surfaces are parallel with the slanting line of cut when the last is in its extended position, thereby providing for the relative sliding movement of the heel and toe portions of the last whereby said portions are shifted from the extended position of the last into what I have termed the intermediate position, and vice versa. These guiding surfaces are formed in each instance by the sides of the straight slots, the width of which slots is substantially equal to the diameter of the pins which slide in them. The connecting member is also preferably so formed in each case as to provide curved guiding surfaces for said pins, which surfaces form continuations or extensions of said straight guiding surfaces, the curved guiding surfaces being so shaped as to secure the desired relative movement between the portions of the last about a predetermined center. For example, in the last shown in Figs. 1, 2 and 3 the curved guiding surfaces are formed at the lower end of the slot 9 and by the edge of the plate 7 where it is cut away at the lower end of the slot 10, this location of said surfaces being such as to permit a relative pivotal movement about the pin 14 as a center. In the last shown in Fig. 5 the curved guiding surfaces are located at the edges of the slots 10^a, and are so shaped as to provide for a relative pivotal movement of the parts of the last about a point located in the toe portion thereof, namely, the center of the uppermost pin 12^a. In the last shown in Fig. 6 said curved guiding surfaces are located in front of the upper end of the slot 10^b and at the upper end of the slot 9^b, and in the last shown in Fig. 7 said surfaces are shown at 10^c.

The various modifications shown in the drawings are intended merely to represent typical examples of my construction, showing how the point about which the relative pivotal movement of the portions of the last occurs may be located either in the heel portion or in the toe portion of the last, or at the dividing line which separates them, and also illustrating the securing of the connecting member either to the heel portion or to the toe portion, and I have not attempted to show all possible modifications of my last, either in respect to the connecting member or in respect to the exact location and conformation of the lines of cut which divide the portions of the last, since other possible modifications of these features will readily occur to those skilled in the art. I consider those constructions in which the connecting member is rigidly secured to the heel portion of the last to be preferable to those in which said member is rigidly secured to the toe portion, since the heel portion of the last has to undergo heavy strains and pressures during the processes of manufacture of a shoe, and is stronger and more solid when the connecting member is rigidly pinned thereto than when said member plays in a slot formed therein. As between the constructions shown in Figs. 1 and 7, I prefer the former, for the reason that its connecting member is somewhat simpler of construction, and the recess which is formed in the upper portion of the last when in the extended position is not so deep as in the case of the last shown in Fig. 7, and hence in the former case a greater portion of the surface of the last is left smooth and continuous.

It will be noted that when my last is collapsed, the heel portion thereof is still located behind the toe portion and does not overlap or overhang the same to any substantial extent, and I consider this to be a valuable feature of my construction, for the reason that it facilitates the insertion or withdrawal of the last, and also permits the last to be used with shoes the uppers of which are temporarily secured by the fastening devices employed for that purpose, without making it necessary to remove or relax such fastening devices before inserting or withdrawing the last. I also consider the fact that the heel portion of my last is inserted and withdrawn by a pivotal movement after the last has been somewhat shortened, to be a valuable and important characteristic of my last, because in practice it has been found very difficult to insert the heel portion of a last, especially into an Oxford shoe, by a sliding movement alone or by a pivotal movement which also brings the last into its most extended position. I also consider the type of connecting member which I have shown and described, to be particularly well suited for its purpose, because it is strong and simple of construction, and provides for guiding the heel and toe portions of the last, during their relative sliding movement, in such manner that all

strains are supported by the metallic parts of the last, and the friction of the sliding movement is made much less than would be produced in case said heel and toe portions were in sliding contact at the slanting line of cut. However, I do not consider my invention to be limited to this particular type of connecting member, since other means may be employed for connecting the heel and toe portions of my last and providing for their operation in the manner above set forth.

I expressly disclaim the construction of the application Ser. No. 678,338, of W. E. Trufant, as he entered the field prior to me as to the generic features of the invention covering a divided last having a vertical plate fastened to the heel-part and provided with a slot and notch, the forepart of the last being provided with two transverse pins for coöperation with the said slot and notch to connect the heel-part with the forepart.

I claim as my invention:

1. A last comprising heel and toe portions divided by a transverse cut extending upward and forward for a limited distance from the bottom of the last, and by surfaces diverging from the upper end of said cut and providing a recess below the top of the last when the latter is in extended position, in combination with connecting means uniting said portions and providing for a relative guided movement thereof along said transverse cut and for an additional relative movement of said portions for closing or opening said recess.

2. A last comprising heel and toe portions divided by a transverse cut slanting upward and forward from the bottom of the last, and terminating below the top of the latter and by a recess the walls of which diverge upward from said cut, in combination with a plate secured to one of said portions and slotted to provide guiding surfaces running parallel with said cut, and pins secured to the other portion of the last and passing through said slots, said plate being also formed to provide curved continuations of said guiding surfaces, permitting a relative movement between said plate and pins about a predetermined center, substantially as described.

3. A last comprising heel and toe portions divided by a transverse cut slanting upward and forward from the bottom of the last, and by a recess the walls of which diverge upward from said cut, said portions being provided with alined vertical slots, in combination with a plate rigidly secured in the slot in said heel portion and extending forward into the slot in the toe portion, said plate being provided with slots running parallel with said cut, and pins passing through said slots and held in said toe portion, a space being provided at the lower end of the lower slot for permitting a pivotal movement of the plate about the pin located in the other slot.

4. As an article of manufacture, a connecting member for the heel and toe portions of a collapsible last, consisting of a plate adapted to be rigidly secured to one of said portions and to project into a slot formed in the other portion, said plate being slotted to receive two separated pins and to provide parallel guiding surfaces for each pin, and also formed to provide curved continuations of each of said guiding surfaces, thereby permitting a relative movement between said plate and pins about a predetermined center, substantially as described.

5. As an article of manufacture, a connecting member for the heel and toe portions of a collapsible last, consisting of a plate adapted to be rigidly secured to one of said portions and to project into a slot formed in the other portion, said plate being provided with straight, parallel slots, and cut away at one end of one of said slots, substantially as described.

6. As an article of manufacture, a connecting member for the heel and toe portions of a collapsible last, consisting of a plate provided with means adapting it to be rigidly secured to one of said portions and to project into a slot formed in the other portion, and a pin, said plate being provided with a parallel-sided pin-receiving slot having a slot-offset opening from one side and below the upper end thereof forming guiding surfaces for guiding a holding pin thereby permitting a combined sliding and pivotal movement between the plate and pin about a predetermined center.

7. A divided last comprising a fore part and a heel part separated along an oblique line of cut extending downwardly from the instep rearwardly toward the bottom of the heel, the upper forward end of the heel part being cut away at an angle thereto to form an intervening gap between said parts, and means connecting said parts constructed to permit the heel part to slide upwardly a short distance on the fore part and then turn forward thereon.

8. A last, comprising a forepart and a heelpart, separated by a transverse cut extending diagonally upward and forward for a limited distance from the bottom of the last for giving an extended horizontal overlap to the contacting surfaces fitting each other tightly when the last is extended, and by surfaces diverging from the upper end of said cut and providing a recess below the top of the last when the latter is in extended position, in combination with a central vertical hinge-plate rigidly connected to the heelpart and slidingly and pivotally connected to the forepart, said hinge and its

pivotal connection being constructed and arranged with relation to the secant surfaces of the adjacent ends of the forepart and heelpart to permit the heelpart to move upwardly, first bodily parallel to itself and then to separate said overlapping surfaces angularly from each other, swinging the upper diverging surface of the heelpart forward for closing said recess.

9. A last, comprising heel and toe portions, divided transversely, the rear end of said toe portion having a long plane contacting surface for receiving the adjacent surface of the heel portion and providing a longitudinally extended horizontal overlap to the contacting surfaces of said two portions, and above said contacting surface, diverging therefrom forwardly, obliquely, in combination with a vertical hinge-plate fast in said heel portion and projecting into the rear end of said toe portion, said plate being provided with substantially straight parallel slots, one below the other, fixed transverse pins extending through said toe portion to occupy said slots, said hinge-plate being cut away at the lower end of the lower slot for the passage therefrom of the contained pin to permit the heelpart to slide and then turn upon the forepart.

In testimony whereof, I have hereunto subscribed my name this twenty-eighth day of June, 1902.

WARREN EUGENE ELLIS.

Witnesses:

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E. D. CHADWICK.