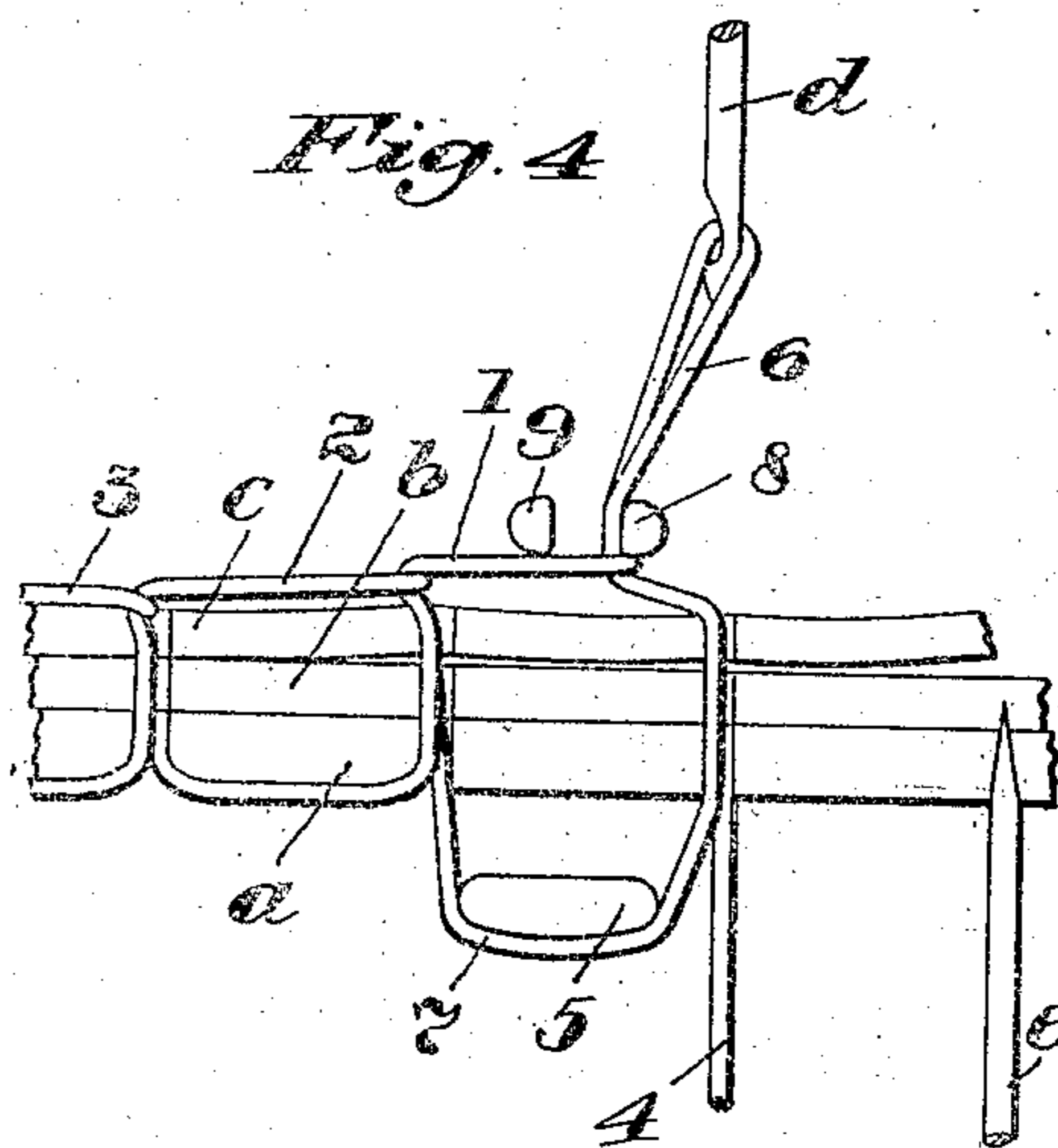
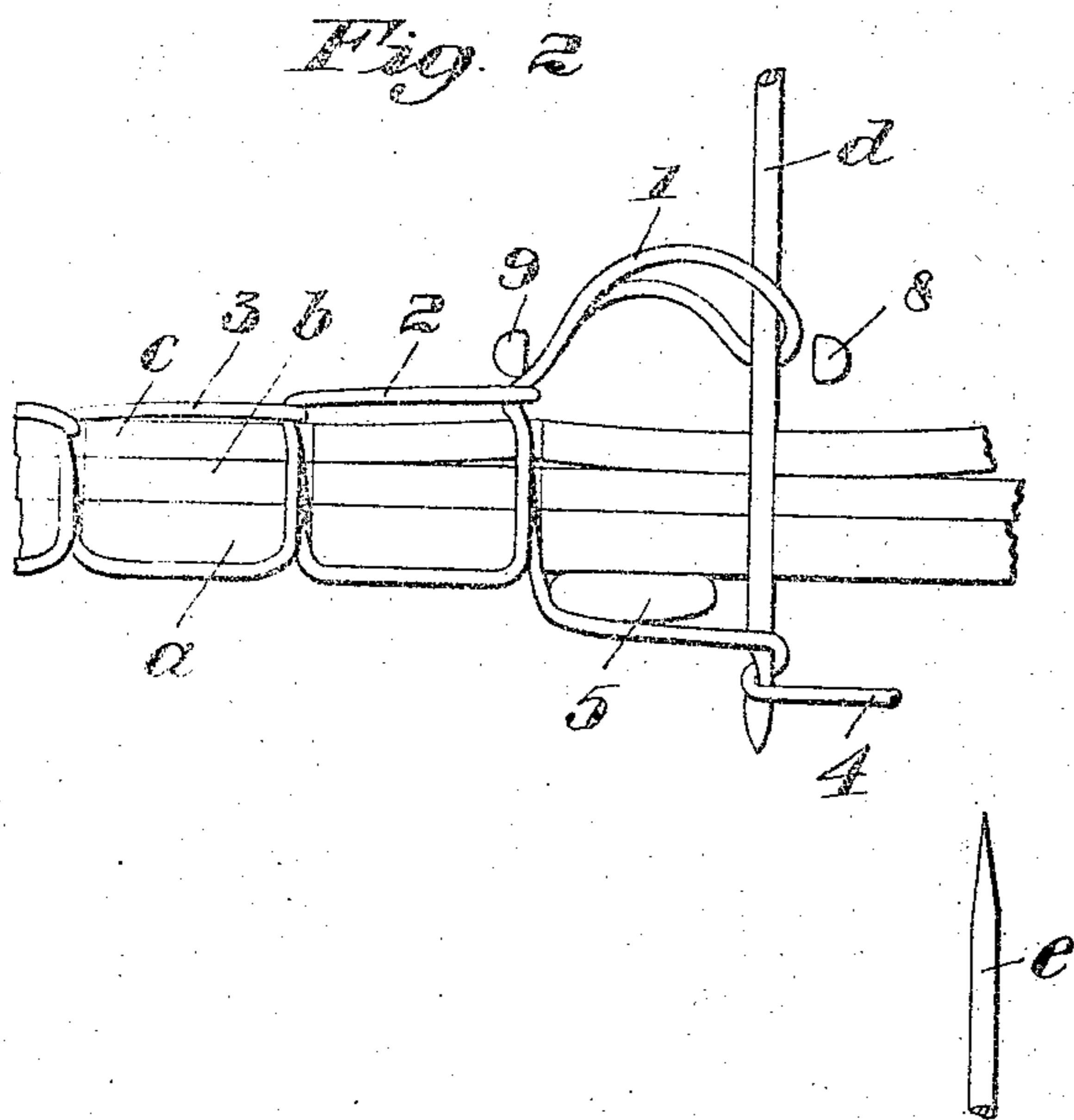
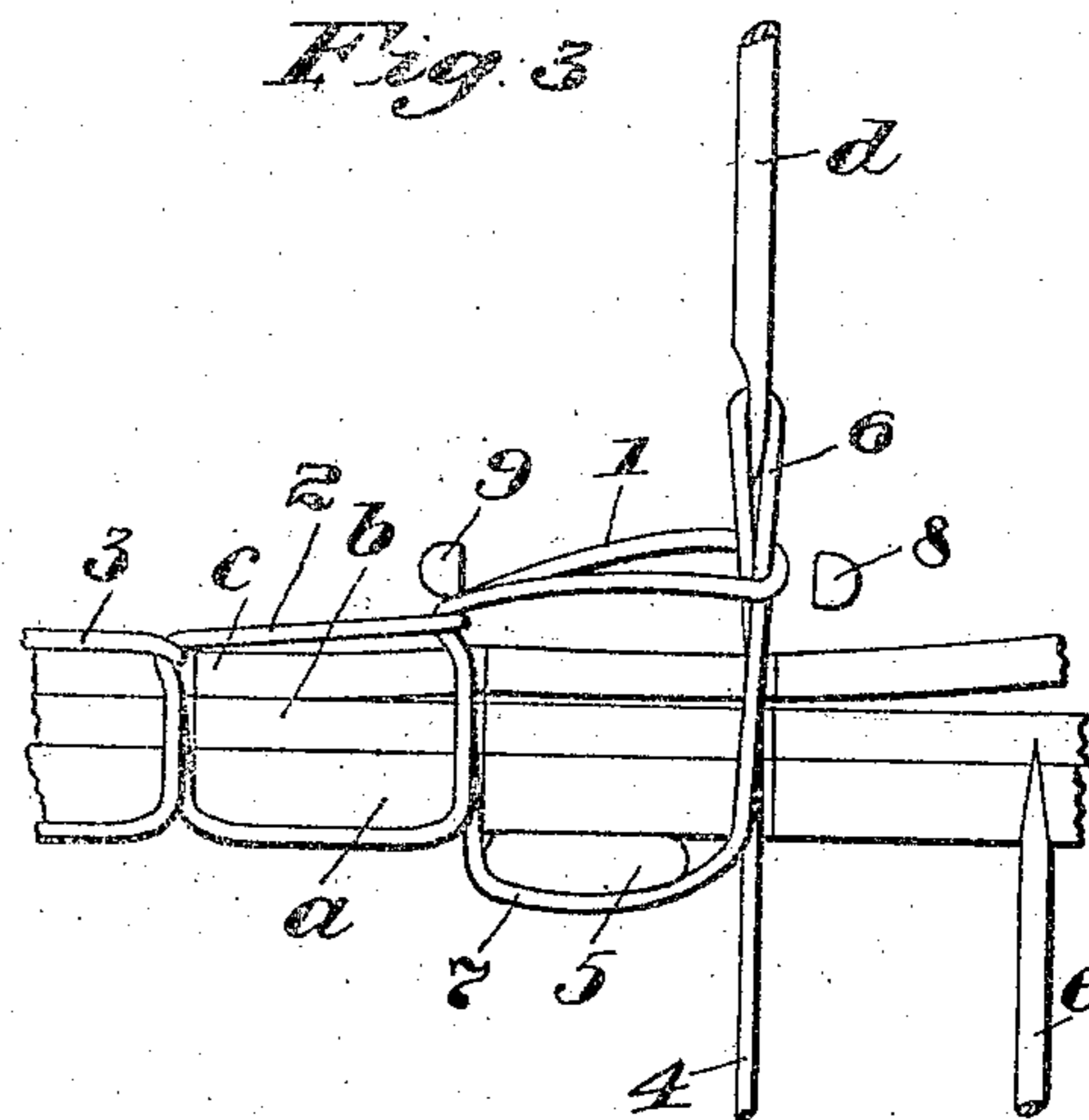
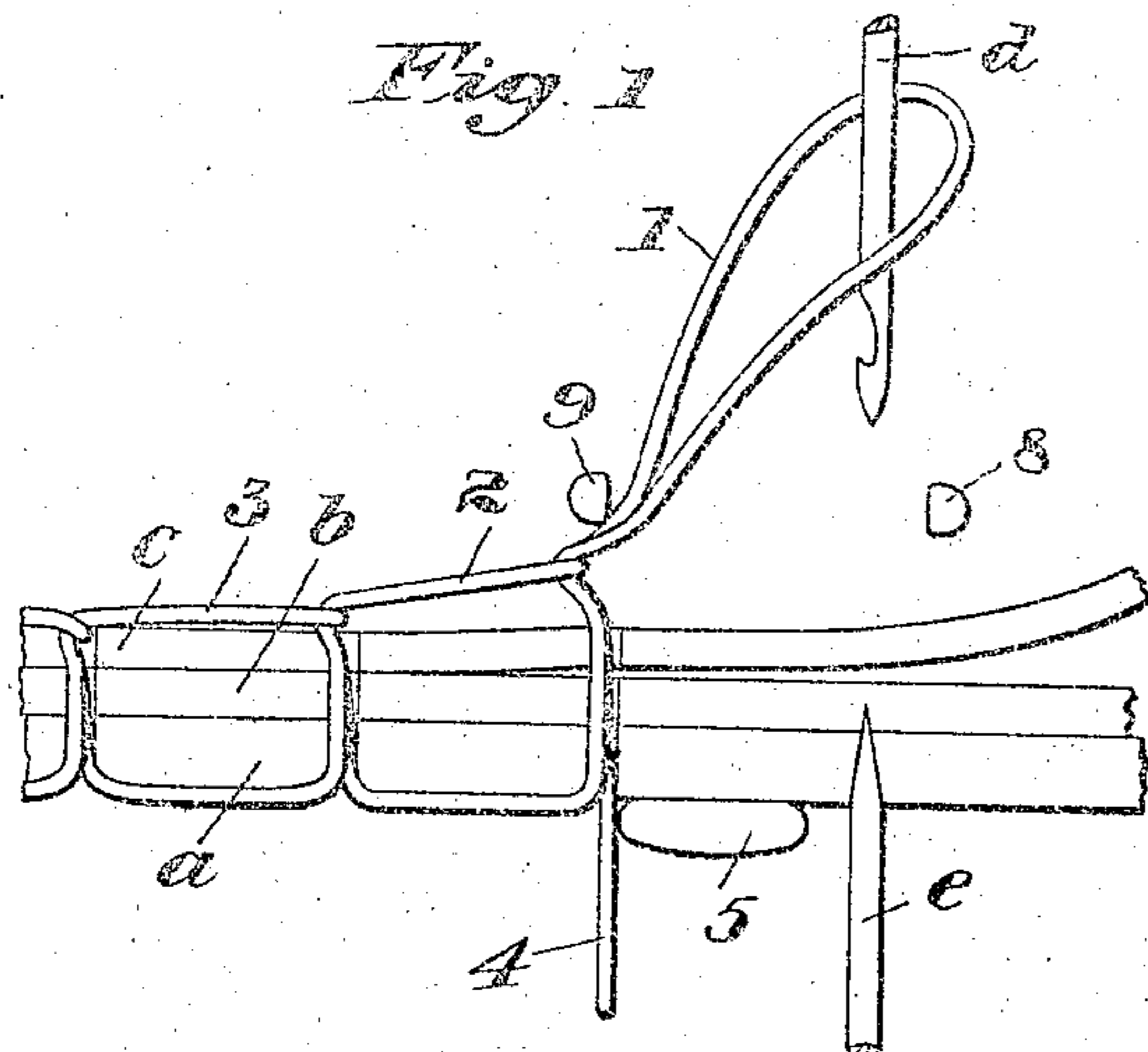


T. G. PLANT.  
METHOD OF FORMING CHAIN STITCHES.  
APPLICATION FILED AUG. 3, 1906.

945,045.

Patented Jan. 4, 1910.  
2 SHEETS—SHEET 1.



Witnesses:  
Horace A. Crossman  
Adolph C. Kaiser.

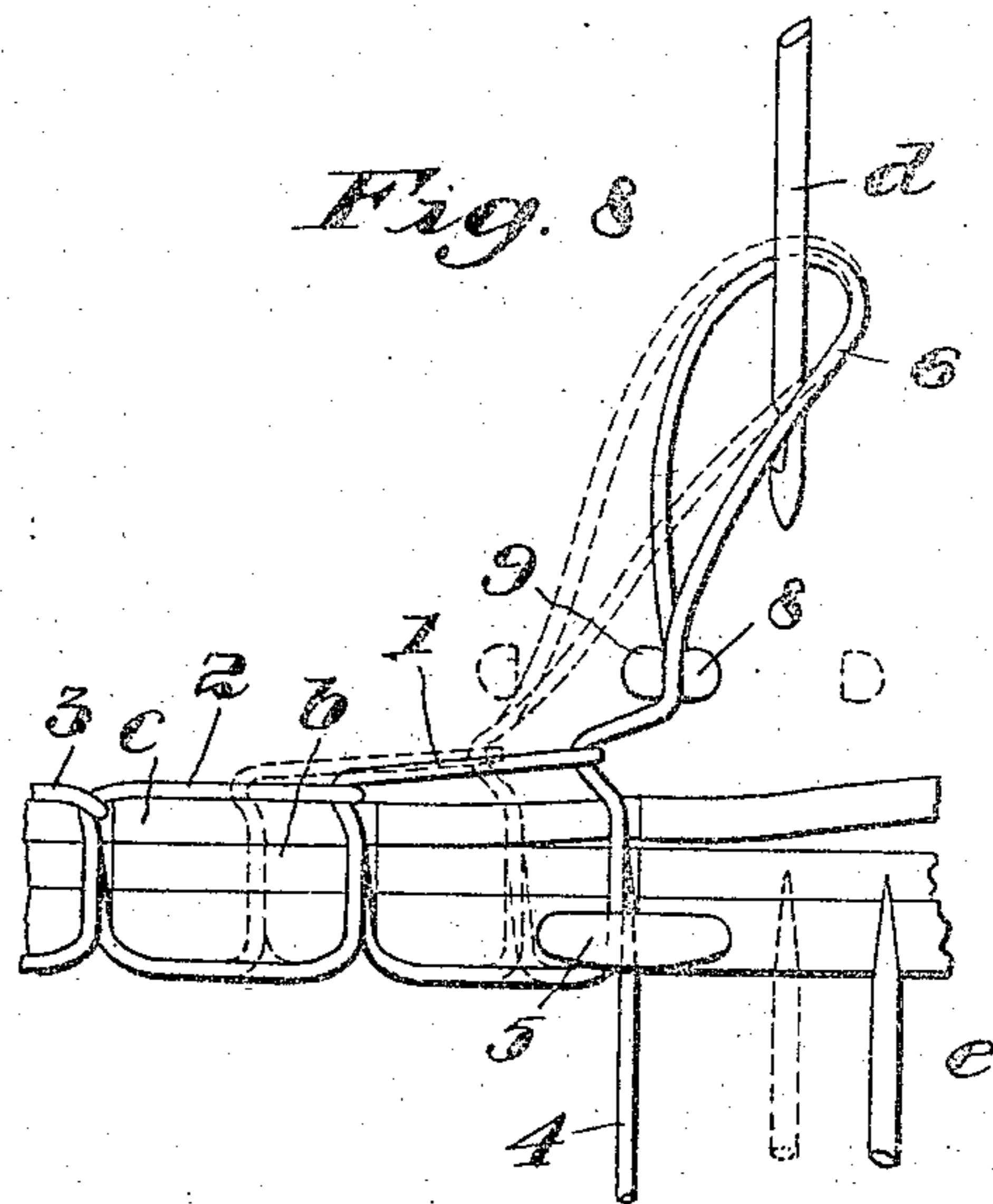
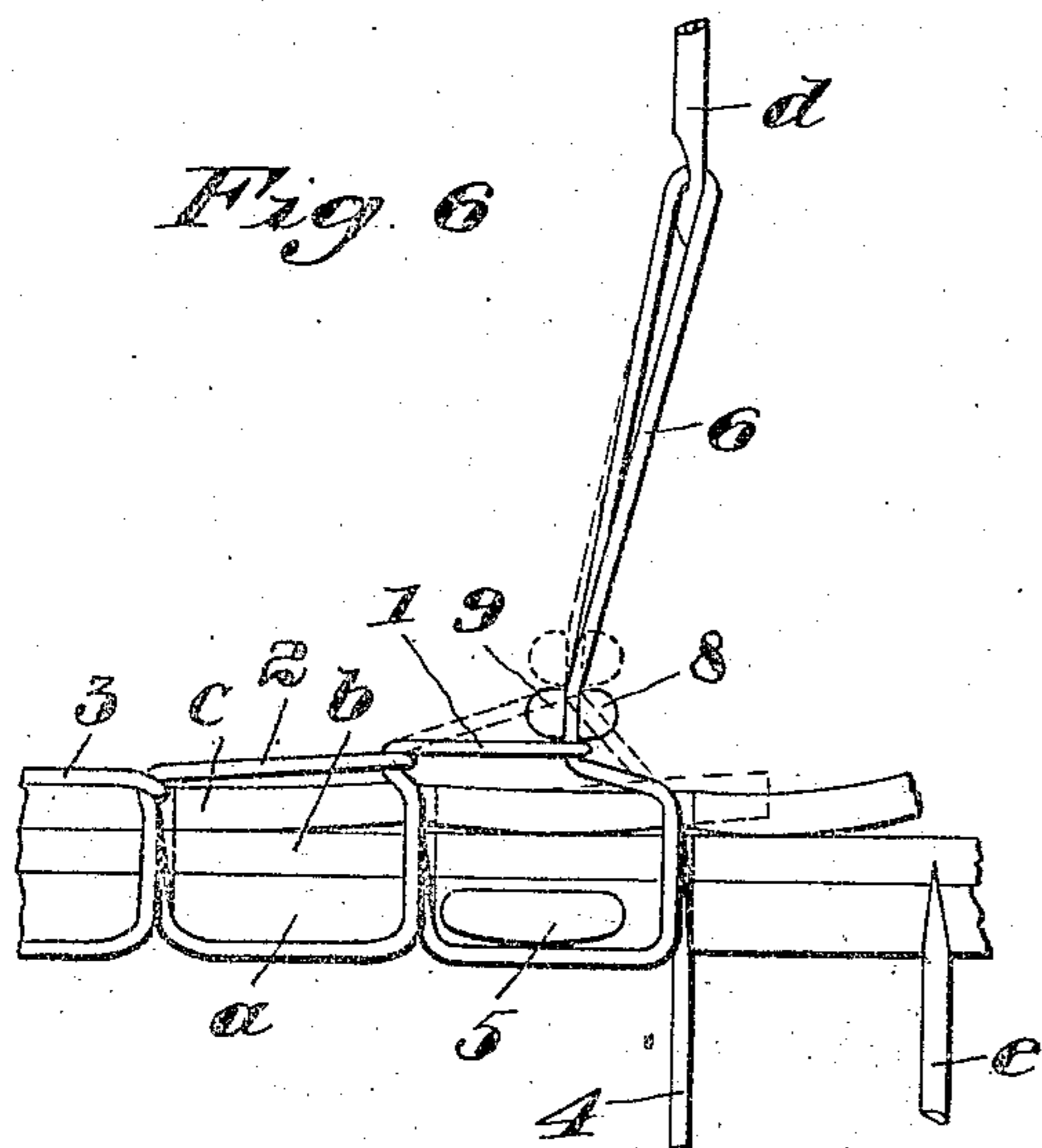
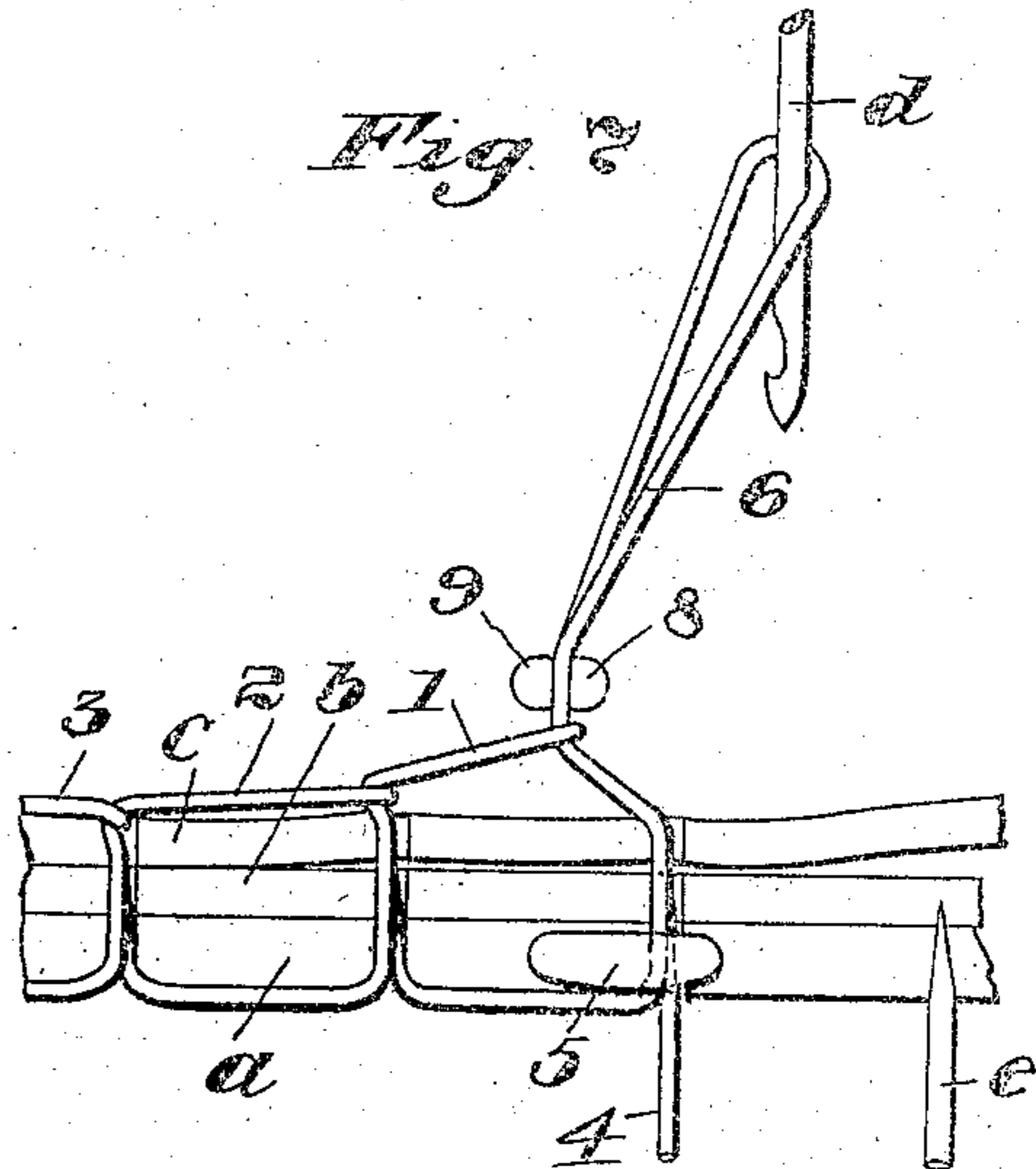
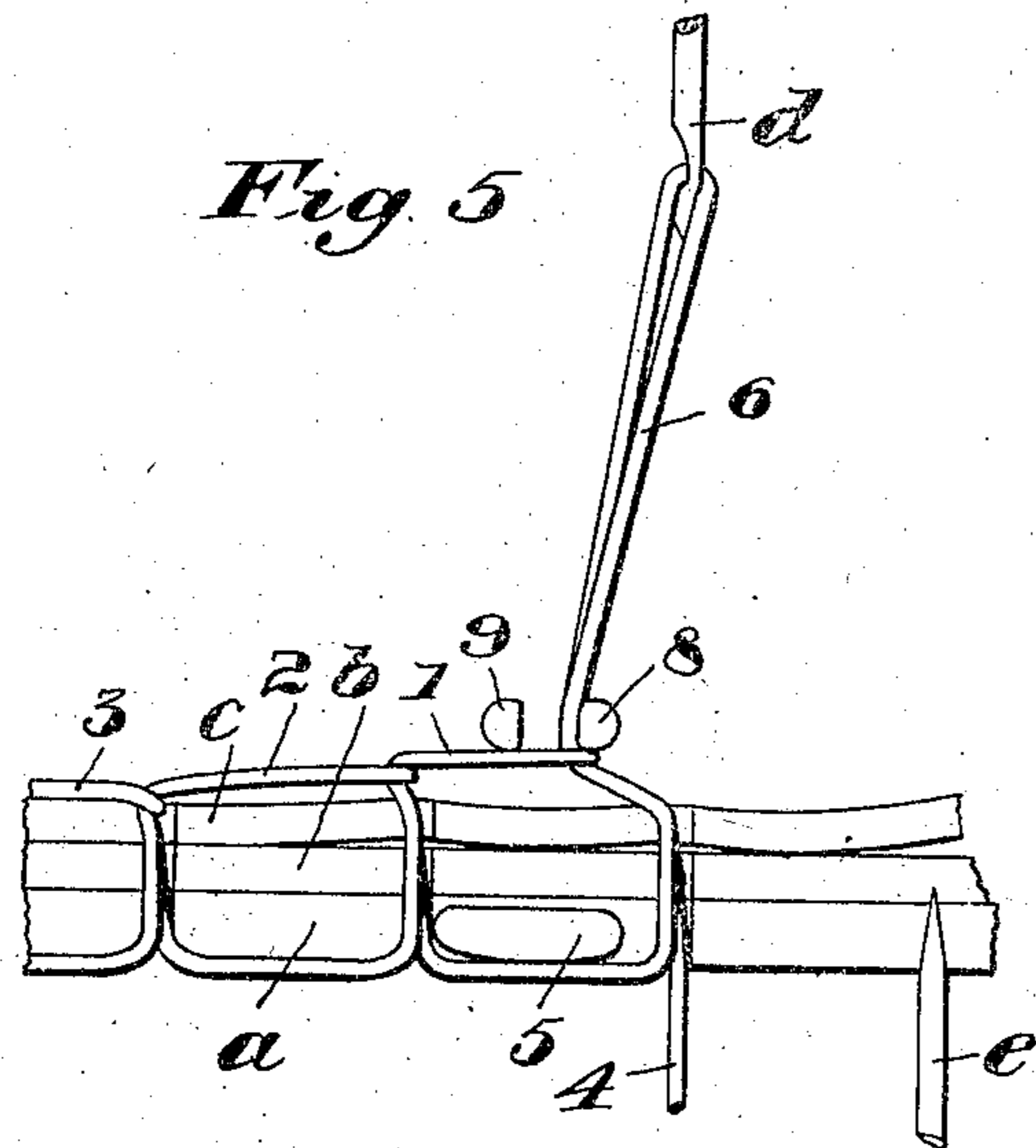
Inventor:  
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2 SHEETS—SHEET 2.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

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JERSEY.

METHOD OF FORMING CHAIN-STITCHES.

945,045.

Specification of Letters Patent.

Patented Jan. 4, 1910.

Application filed August 3, 1906. Serial No. 329,009.

*To all whom it may concern:*

Be it known that I, THOMAS G. PLANT, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Methods of Forming Chain-Stitches, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention aims to provide a novel method of forming and setting what is known as a chain stitch for uniting substances or materials.

While my invention is applicable to stitches formed with any thread and for uniting any materials or substances it is particularly useful in connection with waxed thread commonly used in uniting several plies or layers of leather or other materials employed in the manufacture of boots and shoes, more especially in the formation of what is known as the "inseam" for uniting the insole, upper and its linings of a turn shoe or the insole, upper, linings and welt of a welted boot or shoe. This "inseam" may be and formerly almost universally, was formed by hand with the aid of such common instrumentalities as a needle, awl and the like, although more recently generally formed with the aid of a machine known as a "welter" or "inseaming" machine. My present invention, however, is capable of being practiced either by hand or by machine.

Because of the special applicability of my novel method to the welting or inseaming of boots and shoes, I will disclose my invention as it may be practiced in that art and will point out the advantages as apparent therein but without limiting my invention either to the advantages particularly mentioned or to the particular use referred to.

Prior to my invention, in the welting of boots and shoes the method of forming chain stitches, particularly by the aid of a machine first generally attempted, was what has come to be commonly known as the "Dancel" method, wherein a needle was inserted through the last loop of the chain and through the work or materials, at the point desired for the next stitch, and received in its barb at the opposite side of the work a loop or bight of thread which was then

drawn back through the loop last previously formed, the new loop being drawn backward by the needle to tighten the last stitch formed by drawing the last preceding loop tightly against the new loop reaching from the work to the needle, this tightening of the last preceding stitch serving to finally tighten and set the second preceding stitch. This method was objected to because in tightening and setting the preceding stitches wholly by the needle the thread was caused to reeve or travel around and through the work and around and in the barb of the needle under the full tension or pull required for setting the stitches and this reeving or thread travel extended back through one or more of the stitches previously formed and caused a serious and sometimes ruinous cutting of the work over which the thread traveled and of the thread where it reeved in the barb of the needle.

In the making of a welt shoe the insole is formed to present a marginal shoulder located slightly in from the edge of the sole and following the outline thereof and within this marginal shoulder the insole, if of leather, is channeled by cutting a diagonal slit therein from the surface of the sole toward the edge thereof. This sole is tacked or otherwise secured upon the bottom of a wood last and the upper with its linings are assembled over and about said last and are stretched or lasted into shape about the same. The upper and its linings together with the welt strip are now drawn inward closely to and secured against said shoulder by the inseam, the stitches of which extend from the outside of the welt through the welt, the upper and its linings and that portion of the insole which lies between the shoulder and the bottom of the channel, the looped side of the stitch usually lying against the welt and the single thread side of the stitch usually lying in the bottom of the channel. That portion of the insole lying between the marginal shoulder and the bottom of the channel which is the portion of the insole through which the inseam stitches extend and which is relied upon to hold the said stitches to the sole, is known in the art as the "between substance." This "between substance" is the softest and most spongy part of the insole because the

stronger, outer or flesh side of the insole is cut through in the formation of the channel. Furthermore, in the commercial manufacture of boots and shoes, manufacturers employ as low a grade of insole as is possible not only to reduce the cost of manufacture but to make the shoe more flexible, since a soft, loose grained stock is most suitable for welt insoles if they can be secured without cutting through the "between substance." The principal objection to the Dancel method of forming chain stitches was that the extensive reeving or travel of the thread around this between substance and in the bottom of the channel due to the setting of the stitches by the needle caused the between substance to be frequently cut through, thereby ruining the insole. To obviate these objections, what is known as the "Briggs" method was devised, the same being shown and described in Letters Patent of the United States to Henry Briggs, No. 461,793, dated October 20, 1891, to which reference may be had. The principal characteristic of this Briggs method, as commonly regarded in the art, is that the stitch instead of being tightened and set under the backward pull of the needle, causing the thread in the tightening action to travel forward through the several stitches and around the between substance and in the needle barb, is tightened or set while the needle is in the work at the point desired for the next stitch, the tightening and setting pull being upon the supply end of thread at the opposite side of the work from the needle and being directly away from and perpendicular to the line of the work. In other words, after the needle has been inserted through the last previous loop and the work the thread leading from the thread supply to the last previous loop is pulled perpendicularly to the work to draw the loop that is around the needle against the material, thereby setting the preceding stitch, after which the supply end of the thread is carried around the needle to form another loop, which is drawn backward by the needle through the work and through the loop previously tightened about the needle. Before the new loop is cast about the needle a sufficient length of thread is measured off to furnish one leg or strand of the new loop that is to be drawn through the work and the last previous loop, without any reeving in the barb of the needle.

The Briggs method has gone into extensive use and has proven of considerable commercial value, but it has objections which I have sought by my invention to overcome. In the Briggs method the last previous loop when tightened by the take-up or pull at the supply side is tightened about the needle itself, which is of greater diameter than the two strands of thread ultimately to take its

place, so that a looseness is left in said last previous loop which is not taken out by the stitch setting pull but by the subsequent needle pull, with all the objections attending the same, principal of which is the objectionable reeving and cutting referred to. In the Briggs method the stitches are tightened and set by pulling upon a single strand of thread, which passes through the preceding loop to and around the needle and back to and through the same preceding loop and around the between substance and the tightening can only be effected by a general progressive travel of said single thread about said between substance and through one or more of the succeeding loops. Thus, each loop in being tightened by another loop passed through it, is subjected to the frictional travel and cutting action of two strands of thread traveling in opposite directions making it necessary to draw against a much tighter tension for tightening and setting the stitches than the between substance when of soft and loose grained leather can resist. This tends to cut through the between substance when not reinforced with cloth and also weakens the loops at the engaging or interlocking joints. In the Briggs method, furthermore, the tightening pull is transverse or perpendicular to the line of the stitches and the work, and while the chain of loops at the loop side of the stitch is thereby drawn gradually forward toward the needle, as is the case in the tightening of any chain stitch whether by the needle or otherwise, it is accomplished only by the objectionable opposite and cutting travel of the strands of the various loops as above referred to.

My invention aims to overcome these and other objections to the Briggs and Dancel methods, as will be more particularly pointed out and referred to, and to enable my invention to be understood I will describe the same in connection with the best embodiment thereof now known to me, without, however, limiting my said invention to the particular embodiment disclosed, for my invention, as will be apparent from the following disclosure, presents many advantages, and is capable of being variously embodied.

In the drawings the various figures, numbered respectively 1 to 8, inclusive, illustrate various steps in the formation of a chain stitch in accordance with my invention, these steps having been arbitrarily selected for the purpose of this disclosure.

In many, and probably all, instances the progression of the stitch formation is substantially continuous and is not marked necessarily by well defined steps or stages to which the stitch formation progresses before proceeding to the next. It is desirable, however, for the sake of clearness, to select various arbitrary positions or formations in

order to make clear the method to be disclosed.

Referring to Figure 1, the between substance is indicated at *a*, the upper and linings at *b* and the welt at *c*, although so far as my invention is concerned and as hereinbefore stated any other materials or substances, whether connected with shoe manufacture or not, might as well be selected for illustrative purposes, since my invention is not limited to boot and shoe manufacture. It is to be borne in mind that the between substance is required to serve as a base to withstand the entire pull required to draw the upper and linings which are under tension, and the welt, closely and compactly against the marginal shoulder on the insole, since the essential of a welt shoe is a tight and close in-seam. To accomplish this the between substance must not yield more than slightly to compress under the stitch tightening stress. Nevertheless the between substance which is required to withstand all this, is usually of a spongy and grainy nature and during stitch tightening is subjected to the cutting action of a single thread which is drawn lengthwise along its channel, under high stitch setting tension calculated to cause said thread to cut into or through said between substance. The welt on the other hand stands away from the shoulder and is free to yield and move toward it; furthermore it is acted upon by the double strands of the en-chained loops, hence the welt will withstand any thread tension or tightening action that it is possible to bring to bear upon it. Obviously therefore, that method of forming the in-seam stitches is the best which best protects the between substance. The usual needle is indicated at *d*, the same being preferably used whether my method is practiced by hand or by machine, it being in effect merely one form of instrument by means of which the operative is enabled to reach through from one to the opposite side of the work for the purpose of drawing through the loops required in the formation of a chain stitch.

Assuming the line of stitches to be in process of formation, the last previous loop is marked 1, it being here shown as lying loosely about the needle by means of which it was drawn backward, the needle and work having been moved relatively to lay said loop forward in the direction of stitch progression, so that the needle without being removed from said loop may be reinserted in the work at the point desired for the next stitch. As herein used, the term "work" refers to the materials or substances in or upon which the stitch is formed and which are to be confined thereby, it being convenient as an abbreviated term for the general purposes of description. The needle is now advanced toward and to penetrate the work

at the point desired for the next stitch, a passage preferably having been in whole or in part provided for it through the work by previous insertion of a usual awl *e* from the opposite side of the work, said awl being withdrawn in advance of the entering needle.

The needle is advanced through the work to the position for example indicated in Fig. 2, and a supply end 4 of thread running from any suitable source of supply, for example the usual spool or cop, is carried to and, preferably one and one half times about the barbed end of the needle to provide the latter with a bight of thread to be drawn backward through the work in the form of a new loop. Before the supply thread 4 is carried to and about the needle, as just stated, I prefer to place next the adjacent side of the work an instrument 5 to facilitate manipulation of the thread 4 at a subsequent period in the formation of the stitch, although said instrument 5 is not essential. Like the needle and awl, it is a convenient instrumentality to facilitate the carrying out of the method of stitch formation.

Having received its bight of thread as in Fig. 2, the needle is withdrawn or retracted through the work and through the said last preceding loop 1, see Fig. 3, drawing the new loop now marked 6 also through the work and through the said last preceding loop 1, the said loop 1 giving up of its slackness to furnish sufficient thread for one leg of the new loop as the latter is drawn backward by the needle. This, of course, causes a reeving of the thread around the work and through the holes therein but this reeving is not detrimental because not under tension or against any resistance. The reeving that is objectionable and that has been hereinbefore referred to is the reeving under tension or resistance such as involved in the final tightening and setting of the stitches, because when under this heavy resistance it tends to cut into the work and tends also to fray and cut the thread where it plays in the barb of the needle. It is in this sense that reeving is hereinafter referred to, that which is not objectionable and not under tension being referred to merely as thread travel.

After having pulled the new loop or "needle loop" as it will be hereinafter designated through the work and through the last preceding loop, as in Fig. 3, the single strand of thread 7 extending about the instrument 5 from the last previous loop to the needle loop in the channel or the between substance side of the work, is drawn away from the work,—see Fig. 4,—conveniently by means of said instrument 5, thereby further to contract or shorten said last preceding loop 1, to cause the latter to deflect or draw the needle loop 6 to one side, in the direction of the

preceding stitches and forming what may for convenience be termed a "toggle" in said needle loop. The travel of the thread due to this deflection of the needle loop is again unobjectionable.

In the further formation of the stitch the single strand 7 of thread passing about the instrument 5 is now released, either by releasing the strand if held in the fingers, or by removing or retracting said instrument 5 wholly or to a position indicated in Fig. 5, and the slack thread 7 thus left by removal of the said instrument 5 is drawn through by the further retraction of the needle to the position shown in Fig. 5, until the thread 7 meets a resistance by contact with the work. In the preferred embodiment of my invention the retraction of the needle ceases substantially at the moment of contact of the single strand 7 with the work.

The needle loop is now engaged or seized, preferably immediately above the last preceding loop, as in Fig. 6; in other words is seized as close to the work at the needle side thereof as is conveniently practicable, the seizure being between the fingers of the operative or between two instruments, of which the instrument 8 may be one and a cooperating instrument indicated at 9, another, or they may be cooperating members of a single instrument, as a pair of pincers or pliers, and said needle loop is first preferably lifted or drawn back away from the work, as indicated in dotted lines, Fig. 6, and then and whether or not first drawn back, said loop is carried bodily along the surface of the work in the direction of stitch progression, and away from the previously formed stitches sufficiently to tighten said last preceding loop 1 and the second preceding loop 2 about and upon the work and to set the third preceding loop 3, and any previous loops that may require setting, to their final condition of work compression and set, as indicated in Fig. 8.

When the method is practiced upon a machine, which for the greatest commercial economy would be the case, the needle instead of being moved forward along the work would be moved to enter and recede from the work in an unvarying line and the work would be fed to and past it. In such case the work feed would preferably occur, in part at least during the carrying over of the seized loop.

Having set the stitch, the needle loop is released and the seizing members, if employed, are restored to their normal positions as in dotted lines Fig. 8 and full lines Fig. 1, the process being repeated in the formation of a further stitch, as required. The remaining thread for each new stitch will be given up by the source during the manipulation of the thread in the stitch formation and before the thread is put under tension.

When practiced in a machine, the feed of the work may conveniently be had through the instrumentality of the awl, which, as is common in machines for this purpose, is caused to penetrate the work from the side opposite the needle practically simultaneously with the retraction of the needle but at the point in the work at which the next stitch is to be formed, and the work is then fed to the left, past the needle by means of the awl, which does not leave the work until after the needle has again entered it for the new stitch.

The method as here disclosed may be conveniently practiced by hand and by the aid of the usual instrumentalities employed by a hand workman, or conveniently used by him, and it may also be practiced by a machine properly organized and equipped and of the well-known curve needle type, now commonly used in boot and shoe manufacture. A machine for this type and which is capable of practicing this method is disclosed in application for United States Patent, Ser. No. 335,903, filed Sept. 24, 1906, pending concurrently herewith. It will be observed in the formation of stitches by my improved method, as here illustrated, that when the seized needle loop is drawn bodily away from the work, as in dotted lines, Fig. 6, which herein is the first movement toward tightening the stitch, there is no resultant travel or reeving of the single thread 7 along the spongy between substance or in the bottom of the channel.

In the forward movement of the seized loop to the right, or in the direction of the closed end of the preceding loop to tighten and set the stitches, there is no substantial movement of the single thread 7 of the last formed stitch in or along the spongy between substance; the thread movement being wholly in and between the needle loop 6, the last preceding loop 1 and the second preceding loop 2. It will be noticed, however, that in each of these cases the two strands of the inclosed loop which is the loop drawn upon to draw the embracing loop along in a forward direction, that is, the two strands of the loop 6 acting in the last preceding loop 1, and the two strands of the last preceding loop 1 acting in the second preceding loop 2, all move in the same direction and to the right, so that there is no seesawing action of the two strands of the drawing loop in the embracing loop which they are seeking to draw along, as in the Briggs and Dancel methods and which is so detrimental to the thread of the engaging loops. The carrying forward of the enchained loops at the needle side of the work, whereby the stitches are tightened and set is accomplished by my invention without substantial travel or reeving of the single thread at the opposite side of the work, which is of obvious

advantage and, so far as I am aware is new with my invention. By accomplishing this without reeving of the thread and without pulling upon the thread at any point in a direction substantially different from that in which the tightening action is to take place, the strain upon the thread is not only reduced in itself but is received upon the plural strands working together, rather than upon single strands as heretofore and, because it is applied and directly received at the welt side of the work, acts more effectively to draw the latter into position to form a tight seam than has been possible in prior methods of chain stitch formation.

When a pull is exerted upon the needle loop or upon the single thread leading from the source of thread supply the pull can be no greater than the resistance opposed to the reeving of the thread through the needle barb or from the thread source, which in a machine is usually the tension applied to the thread leading from the source of supply. It is obvious, therefore, that my improved method permits a much more compact seam to be obtained with a given thread tension than is possible by pulling upon a single thread; and this tightening action is much more effective on the looped or doubled thread side of the work or materials than upon the single strand or opposite side, which is in boot and shoe work usually next the spongy between substance. Consequently, my improved method makes it possible to obtain a more compact seam with materials of a given resistance or quality and thread of a given strength or equally satisfactory results with materials of lower quality and thread of less strength. In the carrying forward of the loops the resistance is brought principally upon the preceding loops enchaind therewith and the welt material lying adjacent thereto, rather than upon the single strands of thread at the opposite side of the seam and upon the spongy between substance thereat.

While for the best results I prefer to follow the method as above disclosed, nevertheless advantageous results may be had without utilizing all the steps disclosed.

It will be observed that the contracting of the last preceding loop is not upon or substantially to and about the needle but to and about the needle loop extending between the needle and the work, as in Dancel, and contradistinguished from the Briggs method, and it will likewise be observed that this contraction of the last preceding loop is accomplished not by a pull upon the thread leading from the source, as in Briggs and with the attendant disadvantages heretofore pointed out, but by a pull upon the thread in a fully formed but not yet tightened or set stitch.

Thus it will be seen that my invention as

here disclosed comprehends a number of advantages and novel features which, when combined or used collectively, present a method which may be practiced with the greatest advantage and security both to the work and to the thread but which when availed of in part, that is, without the use or combination of all the features, presents singly and collectively features of advantage which render my method superior to known previous methods.

Having disclosed my invention as practiced in a method involving what I consider to be the most approved manner of practicing it, I have set forth in the appended claims the various features of novelty and invention comprehended thereby and which may with advantage be availed of and practiced singly or collectively as the particular work and judgment of the operative may dictate.

What I claim is:—

1. That improvement in the art of forming chain stitch seams consisting in drawing a loop of thread through the work, drawing a second or needle loop through the work and also through the first-named loop, toggling or deflecting both limbs of said second or needle loop by drawing on the thread from the side of the work opposite the enchaind loops to shorten said first-named loop, and then engaging said second loop and carrying the engaged thread in the direction of the closed end of the first-named loop, or in the direction of stitch progression.
2. The method of forming chain stitches which consists in drawing a loop of thread through the work, drawing a second loop of the same thread through the work and through the first formed loop in advance of the point where the first formed loop passes through the work, drawing the limbs of the first formed loop back through the work, and then clamping both limbs of the second loop and deflecting or toggling both limbs of the second loop in the direction of the stitch formation while so clamped to draw the bight of the first formed loop forwardly.
3. The improved method of forming a seam of chain stitches, which consists in drawing a loop of thread through the work, drawing a second loop of thread through the work and through the first named loop in advance of the point where the first loop passes through the work, drawing back the first formed loop to shorten the same and deflect the second loop backwardly, and then engaging both limbs of the second formed loop between its end and the work and drawing thereupon in the direction of the seam.
4. That improvement in the art of forming chain stitch seams which consists in passing a loop of thread through the work, passing a second loop also through the work and through said first-named loop producing

a deflection or toggle in the thread of said second loop, and drawing upon the thread at the single thread side of the seam to draw back the first loop as permitted by the deflection in said second loop, and then drawing on both limbs of the second loop to set the stitch.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

THOMAS G. PLANT.

Witnesses:

FREDERICK L. EMERY,  
ROBERT H. KAMMLER.