No. 840,334. PATENTED JAN. 1, 1907.

J. W. HYATT.

PROCESS OF MAKING SHOES FOR PNEUMATIC TIRES.

APPLICATION FILED AUG. 19, 1905.

2 SHEETS—SHEET 1.

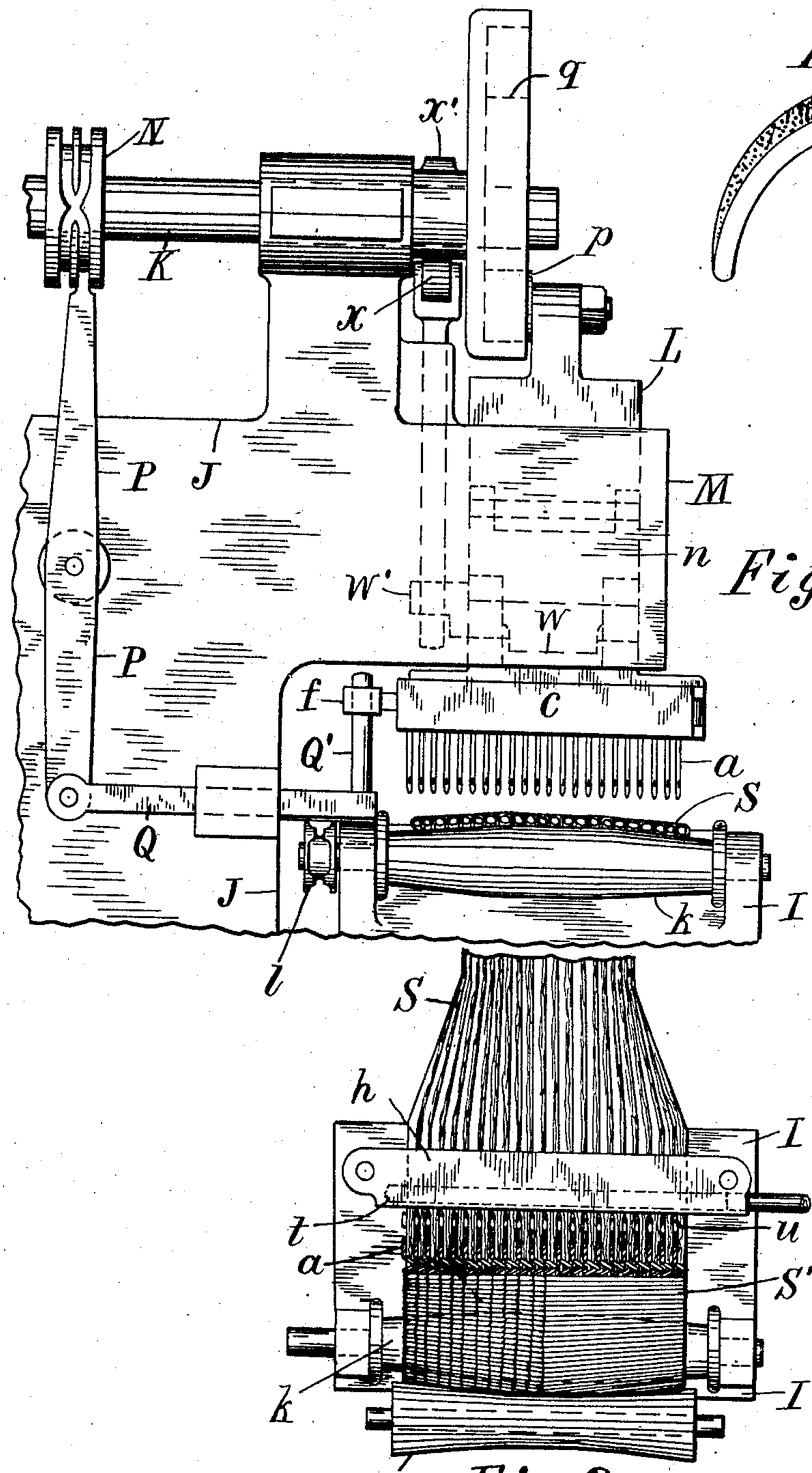

Fig. 1.

Fig. 3.

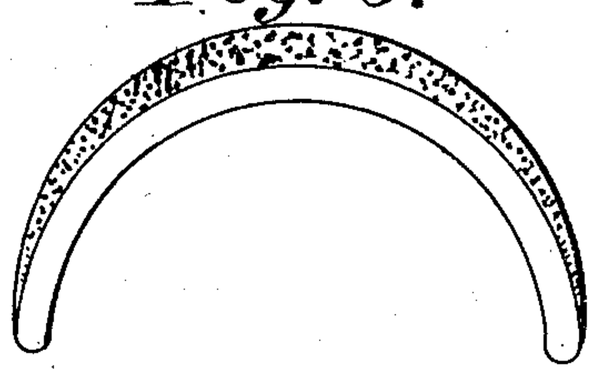

Fig. 2.

Attest:
L. Lee.
E. H. Crane

Inventor.
John W. Hyatt,
per Thomas S. Crane, Atty.

No. 840,334. PATENTED JAN. 1, 1907.

J. W. HYATT.

PROCESS OF MAKING SHOES FOR PNEUMATIC TIRES.

APPLICATION FILED AUG. 19, 1905.

2 SHEETS—SHEET 2.

Fig. 4.

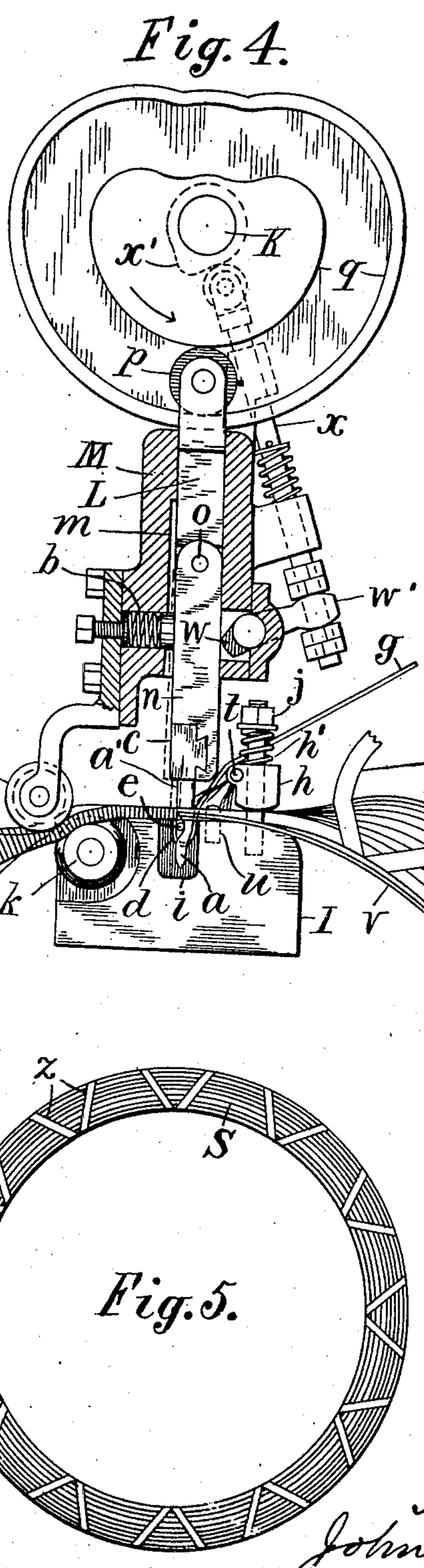

Fig. 6.

Fig. 7.

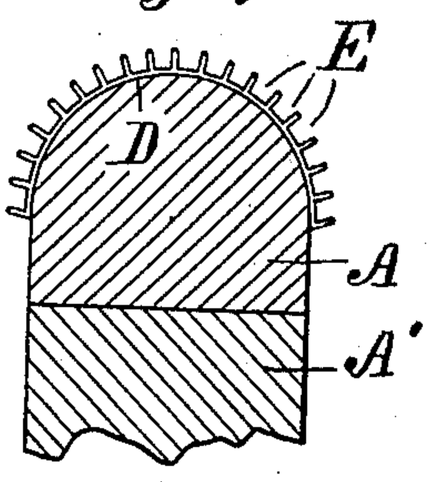

Fig. 5.

Attest:
L. Lee
Ethel M. Crane

Inventor
John W. Hyatt,
per Thomas L. Crane, Atty.

UNITED STATES PATENT OFFICE.

JOHN WESLEY HYATT, OF NEWARK, NEW JERSEY

PROCESS OF MAKING SHOES FOR PNEUMATIC TIRES.

No. 840,334. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed August 19, 1905. Serial No. 274,939.

To all whom it may concern:

Be it known that I, JOHN WESLEY HYATT, a citizen of the United States, residing at 141 Commerce street, Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Processes of Making Shoes for Pneumatic Tires, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to the making of an endless trough-shaped shoe or cover for pneumatic tires, the shoe having a warp of continuous circular strands connected by a transverse filling. Such filling consists of a woof woven into the warp or of sewed zigzag stitches, such as are shown in my Patent No. 711,898, granted October 21, 1902, for sewed warp fabric.

In the present invention the coils or circular strands in such a trough-shaped shoe are first wound into the required trough shape, the coils at the edges of the trough being necessarily of much smaller diameter than those at the middle, and on account of the difference in the diameter peculiar means is required in applying the filling to connect the strands.

In the present invention the trough is flattened upon a transverse line, and the coils are connected upon such line by a sewing or weaving operation which inserts the filling. Endless wire rings may be connected to the marginal warp-coils by the filling during the application of the filling. The middle portion of the warp is during the application of the filling fed forward faster than the edges in the same proportion that the diameter of the shoe at the middle exceeds the diameter at the edges.

A strong filling is formed by a gang or row of needles operated simultaneously in a so-called "zigzag-sewing machine," such as is described in my Patent No. 708,480, granted September 2, 1902, and to facilitate the supporting and feeding of the warp-coils when applying the filling the cord to make the warp is preferably saturated with an adhesive composition of character suited to stiffen the warp-coils and to cement their adjacent edges together. Such saturated cord is readily coiled upon a former of suitable shape and when sufficiently hardened or stiffened forms a unitary structure which is readily handled and supported during the sewing operation. To sew the warp coils or strands with zigzag stitches, the strands are separated progressively by a comb upon a line across the flattened portion during the sewing operation, the cementing material being preferably softened by a jet of steam along such line during the progress of the sewing, which permits all of the strands or coils to remain cemented together until just before they are sewed, and thus cause the shoe to feed forward as a unit until the strands are thus separated and immediately joined by the zigzag stitches.

The invention will be understood by reference to the annexed drawings, in which—

Figure 1 is an elevation of part of a zigzag-sewing machine with the flattened shoe beneath the needles. Fig. 2 is a plan of the sewing-machine table with the tension and feeding devices, with part of the stitches omitted on the sewed warp. Fig. 3 is a cross-section of a tire-shoe drawn upon a scale twice as great as Figs. 1 and 2. Fig. 4 is a vertical section of the sewing-machine fixtures upon the same scale as Fig. 1. Fig. 5 is a side elevation of the warp in readiness for sewing; and Fig. 6 is a diagram, partly in section, showing the means for winding the saturated warp. Figs. 5 and 6 are drawn upon a scale one-half as great as Fig. 4. Fig. 7 is a cross-section upon the same scale as Fig. 4 of one edge of the warp-former with the warp-guide thereon.

Referring to Fig. 6, A designates the warp-former, and B the vessel containing the melted composition for saturating the warp-strand C, which may be made of a single twisted cord, or, as shown in the figure, of a group of small cords C′, which are more readily saturated by the composition.

Metallic guides with an elastic base D, having prongs to form exterior notches E, are shown upon the exterior of the former A in Figs. 6 and 7, and the warp coils or strands wound in the notches in Fig. 6, the guides serving to hold the strands in position with their adjacent sides in contact between the guides until the strands have hardened by the cooling of the composition, which also operates to cement the edges of the strands together and form a unitary warp.

A composition like printers' ink-rollers is easily softened by heat and rapidly chills upon cooling, and the cord or cords may be readily saturated with such heated composition by drawing it beneath a roll F in the vessel B and then through a die G upon the edge of the vessel to remove the surplus composition.

The cord for the strands, whether twisted or grouped, may form all the coils continuously and spirally by winding it successively in the adjacent notches E of the guides upon the "former," and the ends of the cord are in practice extended one past the other for about twelve inches, and the sewing commenced intermediate to these ends. The coils forming the left-hand half of a warp S are shown upon the former in Fig. 6, the remaining half of the coils upon the front side of the former being broken away to show the guides having the notches E. The former is in practice made with a center portion (A′ in Fig. 7) which can be drawn out and with marginal sections which collapse when the center is taken away, which permits the former to be entirely withdrawn from the warp when sufficiently stiffened. When the former is removed from the trough of the warp, the flexible base of each guide (which is preferably made of sheet metal) can be bent inwardly to retract the prongs which form the notches E, and the guides are thus removed from the warp, leaving all of the strands adherent to one another excepting the short openings *e′*, formed by the prongs. With a suitable composition the warp is now held securely in trough shape until the filling can be applied to connect the strands, when the composition may be dissolved or removed from the warp by boiling in water The warp when removed from the former exhibits the appearance shown in Fig. 5, with the strands cemented together by a composition that is sufficiently flexible to permit the flattening of the shoe for a certain portion upon the sewing-machine table, as shown in Figs. 2 and 4. Fig. 2 shows at S the normal width of the warp and at S′ the width produced by flattening the same.

In Figs. 1, 2, and 4 I designates the sewing-machine table, and J the standard carrying the driving-shaft K. The needle-bar is made in two sections, with the upper section L fitted to a guide M and reciprocated by a roll *p* and a cam *q* upon the shaft K. The guide is formed in the lower part at one side with a recess *m*, and the lower portion *n* of the needle-bar in such recess is hinged to the upper portion by a joint and pin *o* and pressed normally toward one side of the guide by a spring *b*. A row of needles *a* is fixed to a carrier *c*, which is movable across the bottom of the needle-bar and reciprocated by a cam N, lever P, and link Q. (Shown in Fig. 4.) The link carries a stud Q′, fitted within an eye *f* upon the end of the carrier *c*, and is thus enabled to reciprocate the carrier as the needle-bar moves up and down. The needles in their descent pass, as shown in Fig. 4, into a groove *i* in the bed I, and the loops *d* of the sewing-threads *g* are engaged by a looper *e*, which connects all of the stitching-loops upon a lock-thread, as fully set forth in my Patent No. 708,480. A presser or tension bar *h* is shown extended across the flattened portion of the warp at one side of the table I and pressed downwardly by springs *h′*, which are adjusted by nuts *j* to vary the pressure and tension and provided with the passage *t* for supplying steam-jets. At the opposite edge of the table a spindle-shaped feed-roll *k* is mounted and is rotated uniformly during the sewing operation by a driving-wheel *l*. The roll has a convex surface, as shown in Fig. 1, which gives it a greater diameter at the middle than at the ends and is so proportioned as to feed the middle of the flattened warp at a greater speed than the edges and in the same ratio as the center of the warp exceeds in diameter the edges.

An elastic pressure-roll *r* of concave face is provided, as shown in Figs. 2 and 4, to press the warp upon the convex feed-roll *k*, and the warp is thus advanced under the tension produced by the pressure of the bar *h* at a suitable speed to space the rows of zigzag stitches which are formed by the needles *a*.

In Fig. 4 an endless coil of wire *v* (formed by welding or soldering the ends of the wire) is shown adjacent to the right-hand side of the trough-shaped warp and embraced in and by the stitches at the margin of the sewed warp at the left-hand side of the table I.

A row of comb-teeth *u* is shown in Fig. 2, extended across the table close to the row of needles to separate the warp-strands, and thus facilitate the penetration of the needles between the same and spacing and determining the exact width of the fabric. To assist in the separation of the strands and in the passage of the needles between the same, a jet of steam is shown in Fig. 4, projected from the passage *t* upon the needles and upon the warp adjacent to the comb.

By using an adhesive composition which is readily softened by heat and moisture for stiffening and cementing the warp-strands the compostion is readily softened by a jet of steam, and the needles are thus enabled to operate freely, although the strands are held firmly cemented together during their passage beneath the tension-bar *h* and are thus compelled to feed forward in proportion to their distance from the center of the trough-shaped warp. The effect of thus feeding the strands is to dispose the transverse rows of stitches a little farther apart at the middle than at the edges of the warp, as shown in Fig. 2, the stitches forming a filling which serves the same purpose as a woven filling in uniting the warp-strands and producing a strong and firmly-united fabric. The transverse rows of stitches may by this means be commenced at any transverse line upon the warp which is flattened down upon

the table I, the comb-teeth *u* being placed through the openings *e'* left by the prongs of the guides E, which were used to space the warp-strands upon the former, and the rows of stitches extended entirely around the warp, leaving only the opening left when withdrawing the needles from the last row of stitches. Such opening is readily closed by making several of the rows at each side of the opening with a little finer feed, so that they crowd together when the needles are finally withdrawn.

It is immaterial what means be employed to apply a filling to the warp-strands to connect the same together, as the value of the product depends chiefly upon the endless form of the warp-strands, which gives each one the same strength throughout its entire circuit, and thus fits the shoe to resist the expansive force of the pneumatic shoe by which it is distended.

The invention embraces the winding of the warp into trough shape and flattening the same transversely during the insertion of the transverse filling, which greatly facilitates the manufacture of the trough-shaped shoe, whether or not the strands be cemented together by a soluble composition. I have made a specific claim to the trough-shaped warp having its strands or coils cemented together at their edges by an adhesive composition, as such a warp is the direct product of the process when the latter includes the use of an adhesive composition.

To compact the filling and crowd the successive rows of transverse stitches close together, a dog *w* is provided upon the guide M of the needle-bar to crowd the lower hinged portion of the needle-bar forward while the needles are between the warp-strands, as indicated by dotted lines *a'* in Fig. 4, which moves the needles toward the roll *r* and the portion already stitched and crowds the last row of stitching firmly against those previously made. Fig. 2 shows the last row before pressing the same forward. The dog *w* is mounted upon a rock-shaft having an arm *w'*, which is oscillated by a rod *x* and a cam *x'* upon the driving-shaft K. The tooth of the cam *x'* gives the dog and hinged portion of the needle-bar only a brief impulse, and the needle-bar is then restored to its normal position by the spring *b*, (shown in Fig. 4,) which backs off the needles and leaves the needles free to rise from the warp clear of the last row of stitches. This construction moves the row of needles forcibly against the previously-formed row of stitches while the needles are between the strands and then removes the needles from such row to retract them freely from the spaces between the strands. The lateral connection of the strands may be made still more positive before sewing by laying a tape or tapes transversely upon the exterior of the warp while the composition is soft enough to secure the adhesion of the tape, which is then held in position by the hardening of the composition.

A single tape *z* may be used by laying it in a zigzag path back and forth across the outer side of the trough-shaped warp, as shown in Figs. 4, 5, and 6, and such tape can be readily peeled off the warp as it approaches the presser *h* to be flattened upon the sewing-machine table.

It is obvious that a circular warp cannot be readily held in trough shape during a sewing or weaving operation nor readily operated upon unless flattened and fed forward in the manner described above, and these operations are greatly facilitated by saturating the warp-strands with a substance that will stiffen and cement them together, while leaving a warp sufficiently flexible to be progressively flattened as it passes over the sewing-machine table and the strands separated just previous to the insertion of the filling.

Such a process of making the trough-shaped shoe permits the use of very cheap labor in winding the warp in the required form and the use of automatic machinery for applying the filling thereto, and thus avoids the use of expensive hand-labor in a very great degree.

Having thus set forth the nature of the invention, what is claimed herein is—

1. The process of making an endless trough-shaped shoe for pneumatic tires, which consists in first winding a warp into circular trough-shape with its opening upon the inner side, second, flattening such trough upon a transverse line, and third, connecting the coils of the warp by a transverse filling.

2. The process of making an endless trough-shaped shoe for pneumatic tires, which consists in first winding a warp into circular trough shape with its opening upon the inner side, second, supporting endless rings of rigid material, as wire, at opposite edges of the trough, third, flattening such trough transversely into line with the periphery of such rings, and fourth, connecting such rings and the warp-coils by a transverse filling.

3. The process of making an endless trough-shaped shoe for pneumatic tires, which consists in first winding a single continuous strand spirally into a trough-shaped circular warp, second, flattening such trough upon a transverse line, and third, connecting the coils of the warp by a transverse filling.

4. The process of making an endless trough-shaped shoe for pneumatic tires, which consists in first winding a single continuous cord spirally into a trough-shaped circular warp, second, flattening such trough upon a transverse line, third, separating longitudinally the cords of such warp transversely into a series of parallel groups, and fourth, connecting the cords by a transverse filling.

5. The process of making an endless trough-

shaped shoe for pneumatic tires, which consists in first moistening the circular strands with an adhesive cement or composition, second, winding the warp into circular trough shape with its opening upon the inner side, third, flattening such trough upon a transverse line, fourth, separating the strands of such warp progressively upon a line across the flattened portion, and fifth, connecting such separated strands progressively by a transverse filling.

6. The process of making an endless trough-shaped shoe for pneumatic tires, which consists in first winding the strands of the warp into circular trough shape and cementing the strands together, second, flattening such trough upon a transverse line, third, separating the strands of the warp upon a line across the flattened portion, fourth, carrying stitching-threads between the strands thus separated and connecting the stitches beneath the strands by a lock-thread.

7. The process of making an endless trough-shaped shoe for pneumatic tires, which consists in first saturating the warp-strands with a soluble composition adapted to stiffen and cement together the strands, second, winding the saturated warp into circular trough shape with its opening upon the inner side, third, flattening such trough upon a transverse line, fourth, softening the cementing material upon such transverse line, and fifth, progressively connecting the coils of the warp by a filling upon such transverse line.

8. The process of making an endless trough-shaped shoe for pneumatic tires, which consists in first saturating the warp-strands with a soluble composition adapted to stiffen and cement together the strands, second, winding the saturated warp into circular trough shape with its opening upon the inner side, third, flattening such trough upon a transverse line, fourth, separating the strands of the warp into a series of parallel groups progressively, fifth, projecting steam against the warp along such transverse line to soften the cementing material, and sixth, connecting the strands progressively by a filling upon such transverse line.

9. The process of making an endless trough-shaped shoe for pneumatic tires, which consists in first saturating the warp-strands with a soluble composition adapted to stiffen and cement together the strands, second, winding the saturated strand spirally into a trough-shaped circular warp, third, flattening such trough upon a transverse line, fourth, softening the cementing material upon such transverse line, and separating the strands on such line, fifth, supporting endless wire rings at the margin of the softened portion, and sixth, progressively connecting such ring and the warp-strands by a permanent filling upon such transverse line.

10. The process of making a tire-shoe with endless warp, which consists first in passing the cord for the strands through a soluble composition and through a die to remove the excess of the composition, second, winding the cord continuously and spirally in a series of strands into a trough-shaped circular warp, with the strands coherent at their edges, third, flattening such trough upon a transverse line, and fourth, connecting the strands progressively by a permanent transverse filling.

11. The process of making a tire-shoe with endless warp, which consists first in passing the cords for the strands through a soluble composition and through a die to remove the excess of the composition, second, winding the cord continuously and spirally in a series of strands into a trough-shaped circular warp, with the strands coherent at their edges, third, flattening such trough upon a transverse line, fourth, projecting steam upon the flattened warp on such transverse line to soften the composition, and fifth, progressively connecting the strands by a permanent filling where thus softened.

12. The process of making a tire-shoe with endless warp and transverse filling of zigzag stitches, which consists first in passing the cord for the strands through a soluble composition, second, winding the cord continuously and spirally, in a series of strands, into a trough-shaped circular warp with the strands coherent at their edges, third, flattening such trough on a transverse line and supporting the flattened portion below a transverse row of stitching-needles, fourth, projecting steam upon such needles and upon the flattened warp to soften the composition, fifth, separating the warp-strands in line with the stitching positions of the needles, and sixth, extending zigzag stitches back and forth across the warp-strands, and connecting the loops of such stitches beneath the strands.

13. The process of making a tire-shoe with endless warp, which consists in first saturating the cord for the warp-strands with a soluble composition, second, forming such cord, in a series of adjacent circular strands, into a trough-shaped circular warp with the edges of the strands coherent, third, attaching a tape in a zigzag path across the outer side of the trough-shaped warp, fourth, flattening such trough upon a transverse line, and fifth, connecting the strands by a permanent filling upon such transverse line.

14. The process of making a tire-shoe with endless warp, which consists in first forming strands into a trough-shaped circular warp and cementing them together by a soluble composition, second, connecting such strands progressively by a transverse filling, and third, washing the cementing material out of the fabric.

15. The process of making a tire-shoe with

endless warp, which consists in first forming strands into a trough-shaped circular warp and cementing them together, second, flattening such trough upon a transverse line and forming a stitched filling across the warp upon such transverse line, and third, feeding the warp forward with a greater speed at the middle than at the edges of the flattened portion, whereby the transverse rows of filling are spaced in accordance with the trough shape of the shoe.

16. The process of making a tire-shoe with endless warp, which consists in first forming strands into a trough-shaped circular warp and cementing them together, second, flattening such trough upon a transverse line and forming a stitched filling across the warp upon such transverse line, and third, feeding the warp forward with a greater speed at the middle than at the edges of the flattened portion and holding back the warp with suitable tension for applying the transverse filling.

17. The process of making a tire-shoe with endless warp and transverse filling of zigzag stitches, which consists in first forming strands into a trough-shaped circular warp, second, flattening such trough on a transverse line and supporting the flattened portion below a transverse row of stitching-needles, third, feeding the warp continuously forward with a greater speed at the middle than at the edges of the flattened portion, and fourth, moving the row of needles forcibly against the previously-formed row of stitches, while the needles are between the strands, and then removing the needles from such row to retract them freely from the strands.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN WESLEY HYATT.

Witnesses:
L. LEE,
THOMAS S. CRANE.