

C. M. HIGGINS.
PEGS FOR BOOTS AND SHOES.

No. 172,435.

Patented Jan. 18, 1876.

Fig. 1.

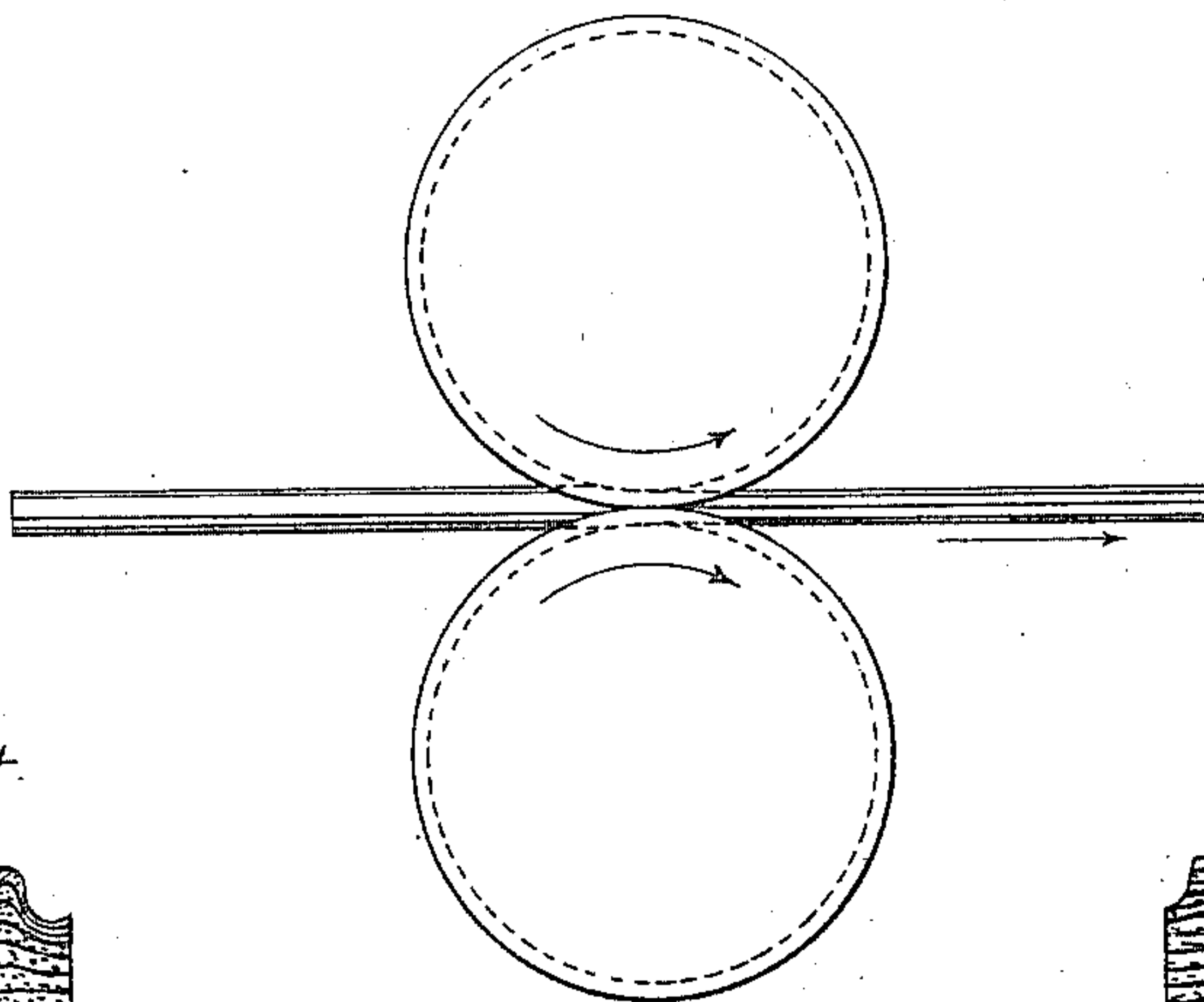
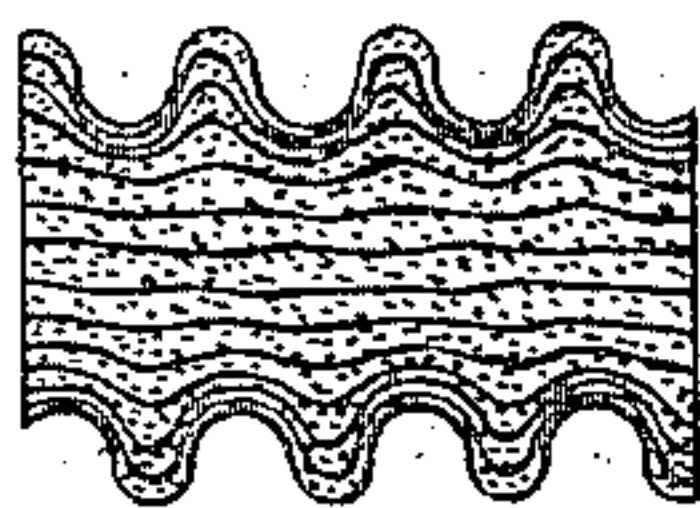
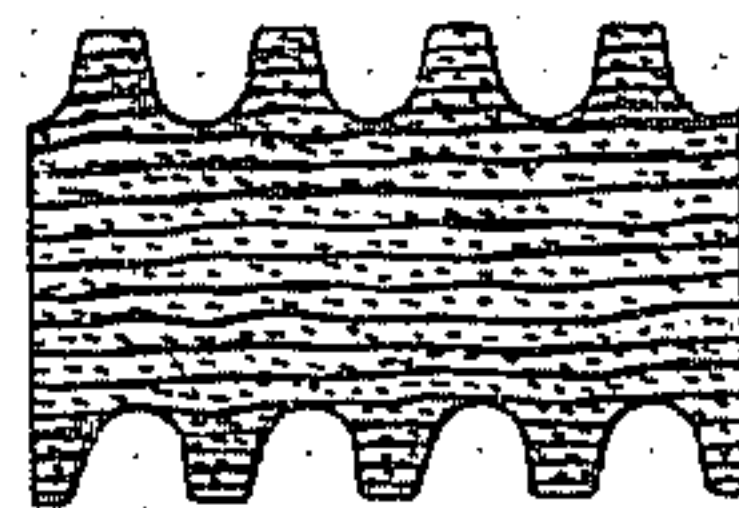


Fig. 4.



Compressed.

Fig. 5.



Cut.

Fig. 2.

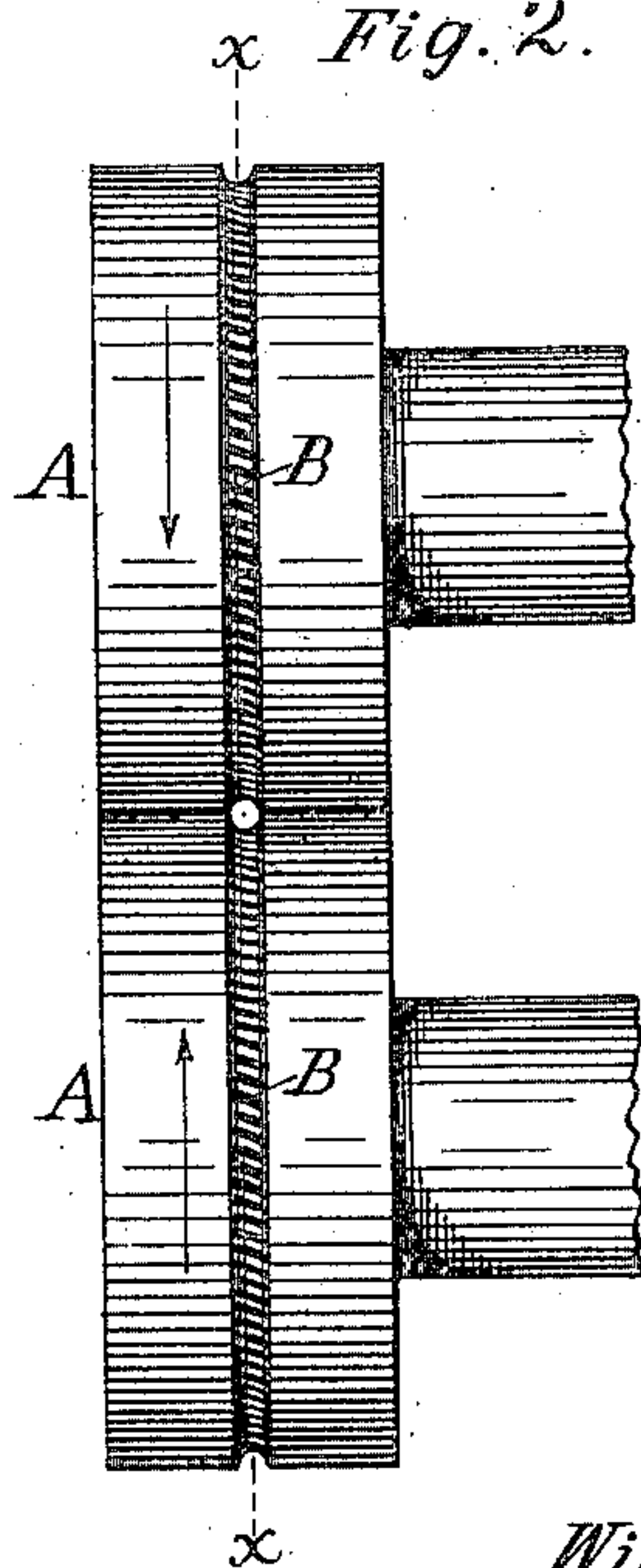
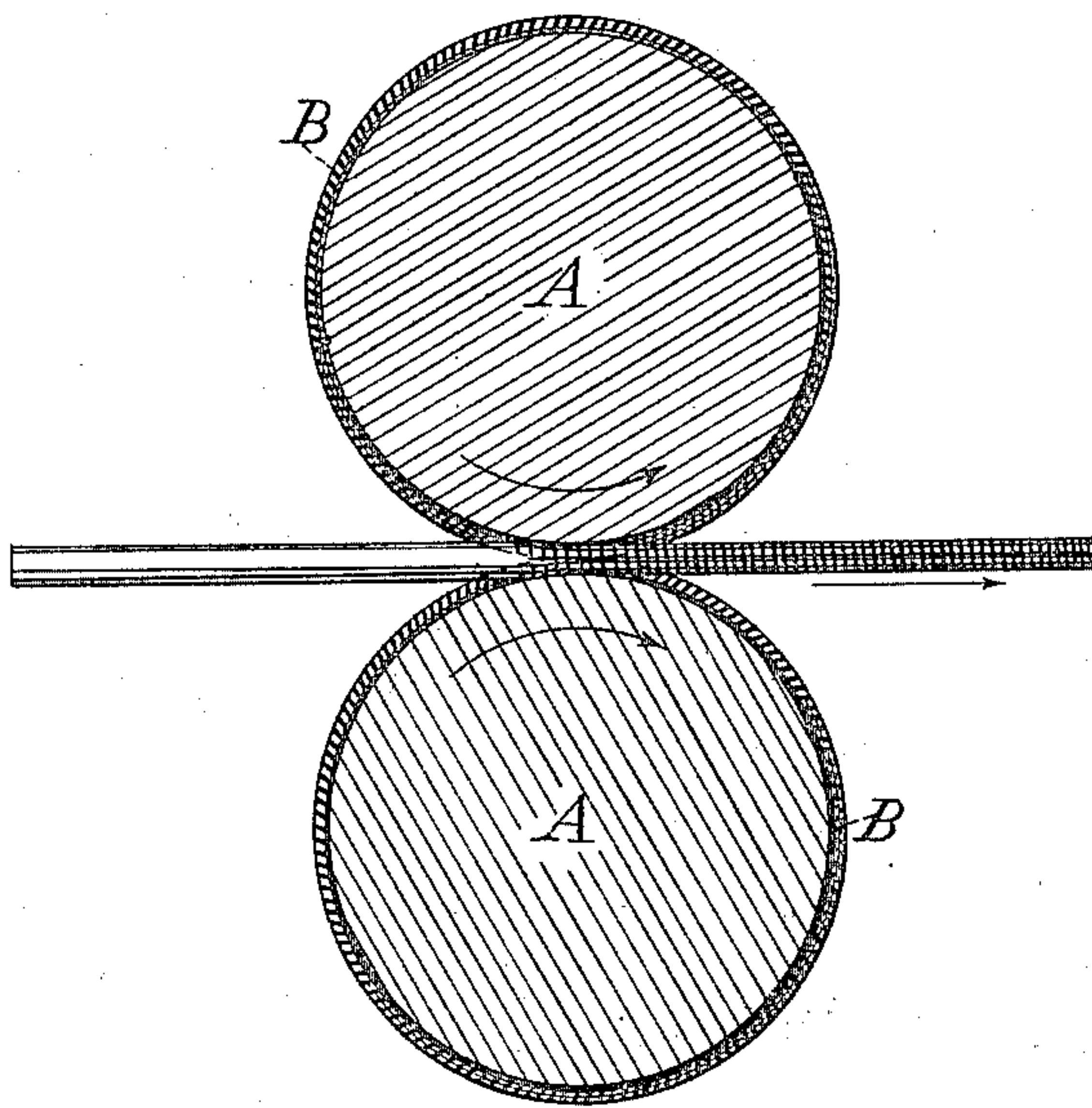


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE

CHARLES M. HIGGINS, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN PEGS FOR BOOTS AND SHOES.

Specification forming part of Letters Patent No. **172,435**, dated January 18, 1876; application filed November 29, 1875.

To all whom it may concern:

Be it known that I, CHARLES M. HIGGINS, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in the Manufacture of Screw-Peg Cord for the Fastening of Leather-Work, of which the following is a specification:

Previous to my invention there had been proposed, as a fastening for shoe-soles and other leather-work, a screw made of what was termed "petrified hide"—that is, rawhide treated by a process which was supposed to petrify it, and thus render it sufficiently hard to enable a practical screw-thread to be cut on a long string of the material.

The design is to furnish this finished screw-cord in coils or spools to the consumer, who is supposed to employ special machines for its insertion—such, for instance, as that patented to me November 2, 1875. Hence, as a long interval may intervene between the time of the manufacture of this cord and of its actual use, it must be capable of resisting the deteriorating influences that may thus be brought to bear upon it, such as that of the atmosphere and of handling.

It is the object of my invention to produce an improved screw-fastening which shall be fully adapted for the intended purpose, free from the defects pertaining to that mentioned, and possessing the opposite qualities in a high degree. To this end my invention is distinguished by the following features: First, that leather is employed as the base of the cord; second, the leather, or its equivalent, in strips or cords, is saturated with a cementing size; and, third, is treated to compression by passage between grooved rotating rollers; and, fourth, by the mode as hereinafter described of compressing or impressing thereupon a continuous screw-thread.

It should be understood that the ideal combination of properties which I aim to produce in this improved fastening is that, while possessing great strength, it must be quite flexible and possess a hardness, or rather softness, of texture little different from the leather to be fastened, else no advantage is obtained over a metallic screw, so that when the screws are inserted in the shoe-sole their wear will be uniform therewith and their flexibility will

allow them to bend readily with the sole, and thus practically render the shoe-sole homogeneous. Now, in addition to these properties of softness and flexibility, the screw-cord must, as a practical necessity, possess also the property of torsional stiffness in a high degree to resist the severe torsional strain that necessarily occurs during its insertion. Now, in this has been one of the chief problems, to combine in the same article these apparently incompatible properties, but which, however, finds its practical solution in my invention. It is accomplished, in the first place, by the employment of leather as the base of the cord, thus securing at the first step a material identical with that to be fastened, possessing superior flexibility, perfectly insoluble, and entirely unaffected by atmospheric moisture, as well as having great firmness or strength, and withal of great comparative softness, and possessing the valuable property of being swelled, though not weakened, by wetting; but it is chiefly accomplished by the combined operations of sizing and compression. These operations are auxiliary to each other, and, though they can be used separately, yet are mutually necessary to produce a good result, for were sizing alone employed to obtain the necessary torsional stiffness it would have to be used to such an extent as would seriously impair the softness and lateral flexibility of the cord; while, on the other hand, were compression alone resorted to, such a degree would be required as would generally destroy the tenacity of the leather and render it brittle, as well as totally impair its swelling power when wet; but by the judicious combination of the two, in the manner and proportion hereafter described, such a degree of torsional stiffness is obtained that the greatest length of the cord that will ever be exposed at one time to the strain (about one inch and a half) cannot, according to actual tests, be twisted more than one-eighth of a revolution under the greatest strain it will ever be subjected to, a degree which is remarkable, considering that it possesses, at the same time, a softness of texture and a lateral flexibility little different from normal leather, and indeed no different from what that becomes under the influence of continued wear.

The operation of sizing is a highly-impor-

tant one, and is not used merely as a stiffening, that function, as auxiliary to compression, being the most dispensable of its effects; but its chief function is rather as a binding-cement, to hold together the fibers of the leather, and to impart to the leather the property of plasticity, so that when the leather cord is compressed or impressed, and a screw-thread formed or impressed on it, it will retain with positive permanency whatever form is given to it, completely unaffected by rough handling or by the influence of the atmosphere; and here again has been another of the chief problems whose solution has been left to my invention.

Though the employment of leather is one of the features that distinguish my improved screw-fastening, and furnishes those properties which so peculiarly fit it for the ends in view, yet the mode of manufacture herein described is not entirely confined to leather, but is applicable to some other materials, and among these to rawhide; but I do not favor the use of this, which is ill adapted, partly owing to its inferior flexibility when treated; and its solubility when wet, together with the greater labor and unpleasantness which would attend its manufacture.

In practicing my invention I proceed, therefore, as follows: A good or fair quality of leather should be first selected for the purpose, preferably, of oak or union tanning and of a firm texture. It is not essential that the leather used be fully finished or dressed; but the crude—of course, fully tanned—leather before the final operations are performed on it, may be used to good advantage, and with a saving of expense. Or a suitable quality of the leather known in the trade as "unfinished split," an incidental product in the manufacture of some thin dressed leathers, and obtainable at a moderate cost, may be used. And here it may be remarked that the employment of leather secures also a decided economic advantage, in that, as above indicated, an incidental product, obtainable at a small cost, can be made use of, and in which the wastage is trifling. The sides of leather having been selected, if thick or unsplit, should, by aid of splitting-machine, be reduced to uniform thickness, though this is not absolutely necessary; but in all cases a thin layer should be cut from the flesh side to remove the loose flabby portion, leaving the firm tenacious leather to form the body of the cord. The leather should then be divided into pieces or sheets of suitable size, preferably of a round or oval form, but in all cases having an outline free from angles or concavities. These sheets are then to be cut, by means of special machine, into long narrow strips, the cutting being continued spirally, so as to form of a single sheet one long continuous strip or cord of square section. This square strip should next be rounded by drawing it through a tubular cutter revolving at high speed. After the leather strip is nicely rounded, which op-

eration is necessary for a good result and cannot well be dispensed with, it is next saturated with the cement or sizing. No special kind of sizing is essential; but for leather I favor a soluble sizing, and much prefer glue, owing to its toughness.

For rawhide or other partially-soluble base an insoluble sizing may be used, such as shellac, paraffine, or a mixture of oil and rosin, &c.; or precisely the same process may be used, with good effect, as is described for leather. For the leather, the glue-sizing should be made about one-third or one-half thinner than is used for ordinary adhesive purposes, and should be placed, say, in a long trough, and kept heated to about 100° Fahrenheit, or just enough to maintain it sufficiently liquid to become readily absorbed by the leather. The rounded strip may be steeped in or drawn slowly through this trough, during which the size will become absorbed, and, when sufficiently charged, it is withdrawn, being drained or lightly wiped as it emerges to free it from superfluous size. It should then be placed on gratings or racks exposed to currents of air to dry, which will generally take from two to three hours, according to the condition of the air; but, of course, its drying may be forced by artificial means, if desired. The cord should not be allowed to dry fully; but when in that particular condition between absolute dryness and actual wetness it should be submitted to the compression operation by rolling between grooved rollers, as represented in Fig. 1. In this operation the leather cord becomes compressed to the required size and density, which operation strengthens and stiffens the cord, and renders its form regular and its surface smooth. The degree of compression is very important, for, as before remarked, if compressed much it loses all tenacity and becomes brittle, and if not enough it will not have the requisite stiffness. The degree of compression that I have found best is from one-fifth to one-sixth, so that the original rounded strip should have a diameter about one-sixth greater than the finished product.

After the rolling and compressing operation the cord, when fully dried, may have a screw-thread cut upon it by any suitable means. I, however, much prefer to impress or compress the screw-thread upon it, for the important reasons hereinafter named, and employ the mode represented in Figs. 2 and 3, the former view being a front elevation, and the latter a cross-section on line *x x*.

A A represent a pair of hardened-steel rollers, which are capable of continuous rotation, and are geared together, so that they rotate in exact unison. Around the periphery of each of these rollers is cut a semicircular groove, B, each groove being arranged in exact conjunction with the other. The grooves or groove is tapped over its whole extent with a screw-thread, as represented, of the desired pitch, twenty-seven threads to the inch being preferable. The rollers should have a diame-

ter of from four to six inches. Anything less would have the effect of causing the screw-threads to be reduced in thickness where the rollers join, and they should be so geared that the backlash shall be reduced to a minimum, so that the threads on each roller shall always match with each other. It will now be obvious that if the rollers are rotated and the cord presented to the screw-groove it will be drawn through between them, and an accurate continuous screw-thread will be impressed upon it. This operation should be performed while the sized cord is in that slightly moist condition before mentioned—between actual dryness and wetness. In this state the cord is in a peculiarly plastic and impressible condition, taking an impression almost as readily as wax or lead, and retaining it with as much permanency. The elasticity of the leather appears, in this state, to be dormant, while the cementing power of the size is most active, so that when the leather is then compressed it fails to expand, until, being exposed during wear to the direct action of water, the size becomes dissolved, and thus releases the elasticity of the leather, which then tends to swell to its original volume, and thus becomes tightly wedged in its socket.

It will hence be perceived that by the use of a soluble sizing that valuable property of leather—possessed by few, if any other, materials—of being swelled, though not weakened, by wet, is preserved, and which, it should be remembered, would be destroyed were a great degree of compression used.

When the cord is screw-threaded by this mode the preliminary plain rolling, although sometimes desirable, will not be generally necessary, but the sized cord may be submitted directly to the screw-threading rolls, and thus perform the compressing and screw-threading operations at once. When the entire length of cord has passed through the screw-rolls it is then allowed to fully dry, which generally takes about half an hour, and after this—although not absolutely necessary—it is passed through a screw die or nut revolving at high speed, which removes the slight seam or burr left by the rollers, and also frees the threads from any slight irregularities that may exist. It is then wound on large spools of about twenty yards capacity, and this completes the operation, and the cord is ready for the market.

It will be perceived that by this mode of screw-threading any continuous length of cord may be threaded with great ease and rapidity. Not the least advantage of the mode is, that the cord is threaded without being subjected to the slightest torsional strain, as in those modes which act by revolution around the cord, and thus have a disintegrating tendency—and to form a compressed screw-thread would be impracticable—while by this mode the tendency is to strengthen or compact the cord. Again, as the motion given to the cord

is a simple continuous longitudinal, without any tendency to twist, it renders the management of this operation a much simpler matter than it otherwise would be. Moreover, a compressed screw-thread, such as produced by this mode, is one altogether better fitted for the purpose, inasmuch as far greater permanency and strength are secured thereby. This will be rendered evident by considering the texture of the compressed screw, as represented in section in Fig. 4, where it will be observed that the fiber is preserved continuous throughout, and, instead of being broken or removed, is compacted with a powerful reinforcing effect just where greatest strength is necessary—*i. e.*, at the lower side of the thread. The screw prepared by this mode, in fact, possesses almost the strength and permanency of metal, combined with the flexibility and other valuable properties of leather, and the roughest handling it is ever liable to receive from the time of its manufacture till it is finally inserted in the work is not sufficient to mar or injure it to any material extent. On the contrary, when the texture of the uncompressed cut screw is considered, as represented in Fig. 5, it will be evident that it cannot possess the strength of the former, for the fiber's continuity is here destroyed, and a less amount of fiber is exposed to strain, leaving the threads liable to be easily broken or injured by severe strain or rough handling. Of course, the permanency and strength of the cut screw can be greatly increased by the preliminary use of the sizing and compressing operations herein described; but I strongly recommend the compressed screw, and, in my opinion, the cut can never be made to equal it.

What I claim as my invention is as follows:

1. As an improved fastening for leather-work, a screw-peg cord, composed of leather sized and compressed, and provided with a continuous screw-thread, substantially as herein set forth.
2. A process for the manufacture of screw-peg cord, combining the operations in the order stated of cutting leather or its equivalent into separate continuous cords of a rounded form, impregnating the same with a cementing size, and rounding and slightly compressing the same by passage between grooved rotating rollers, providing a continuous screw-thread adapted to unite leather-work, substantially as herein described.
3. As an improved fastening for leather-work, a cord of leather having a continuous screw-thread of fine pitch compressed thereupon, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CHAS. M. HIGGINS.

Witnesses:

E. R. LE COUNT,
MARGARET HIGGINS.