Aug. 26, 1930. A. E. LARD 1,774,385

METALLIC TUBE OR SHAFT

Original Filed July 17 1928

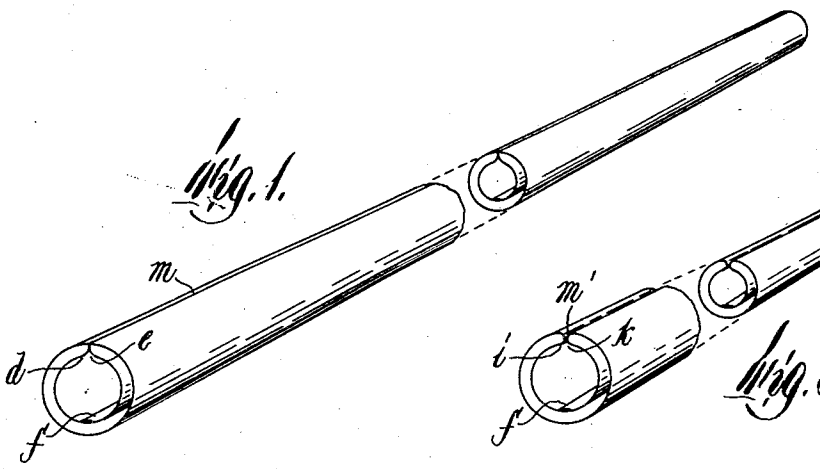


Fig. 1.

Fig. 3.

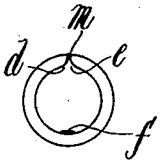


Fig. 2.

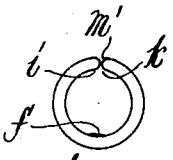


Fig. 4.



Fig. 5.

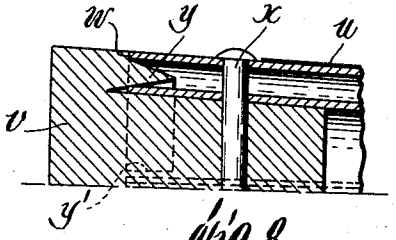


Fig. 8.

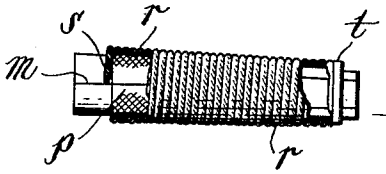


Fig. 6.

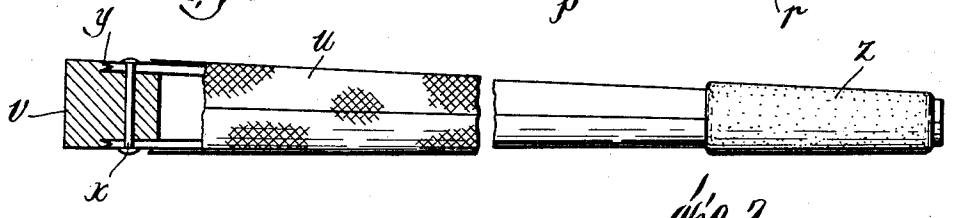


Fig. 7.

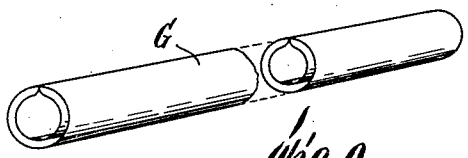


Fig. 9.

Inventor:
Allan E. Lard,
by Mauro & Lucas,
Attys.

Patented Aug. 26, 1930 1,774,385

UNITED STATES PATENT OFFICE

ALLAN E. LARD, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE METALLIC SHAFT COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE

METALLIC TUBE OR SHAFT

Original application filed July 17, 1928, Serial No. 293,419. Divided and this application filed October 9, 1929. Serial No. 398,381.

This invention relates to improvements in metallic tubes, shafts, or shapes and process of producing the same. The metallic shaft or tube is claimed herein; the process is claimed in application Serial No. 293,419, filed July 17, 1928, of which the present application is a division.

One object of the invention is the production of such tubes, shafts, or shapes having the desired torsion. Another object is so to form a metallic tube that said formation will duplicate a fine hickory golf shaft in torsion, weight, flexibility and balance. Another object is so to form and process the metallic golf shaft that same will be a practical, commercial, inexpensive article. Still other objects will be apparent from the detailed description and accompanying drawings.

The torsioning metallic construction of this invention is designed for use in golf club shafts and for other uses in tubular constructions where the shock-absorbing, stress-relieving characteristics of torsion are desired, or/and where the resilient spring action of torsion is desired.

It is a known fact that a thin walled tubular seamless golf shaft having approximately the same weight, flexibility and balance as a hickory golf shaft, and such as heretofore on the market, has practically no torsion as compared with the torsion of a hickory shaft. The degree of torsion inherent in hickory is one of the fundamental requisites of a golf shaft; hence metallic golf shafts lacking said degree of torsion are fundamentally defective.

In the drawing, wherein the invention is illustrated in connection with a shaft for golf clubs,—

Fig. 1 is a perspective view of a tapered shaft shown with its larger end forward;

Fig. 2 illustrates the golf shaft of Fig. 1 in end elevation viewed from its larger end;

Fig. 3 is a perspective view of a somewhat modified construction of tapered shaft shown with its larger end forward;

Fig. 4 illustrates the golf shaft of Fig. 3 in end elevation viewed from its larger end;

Fig. 5 is an end view from the smaller end of the metallic tube or golf shaft illustrating the application of a fabric covering;

Fig. 6 is a detail view of the smaller end of the metallic tube showing it covered with fabric and then wound about with cord;

Fig. 7 illustrates the tapered metallic tube as finished to constitute a commercial golf shaft;

Fig. 8 is a larger scale detail longitudinal sectional view through one-half of the left-hand end of the finished shaft of Fig. 7; and

Fig. 9 is a perspective view of a non-tapered straight shaft of this invention.

Starting with a blank consisting of a strip of sheet metal gradually diminishing in width towards one end, said strip being of high carbon sheet steel, about .011″ thick and 43″ long, and following the process set forth in the aforesaid application of which this is a division, there will be produced a metallic tube or shaft such as illustrated in Figs. 1 and 2, wherein the two longitudinal edges of said blank are secured together by a brazed or welded joint *f* extending longitudinally of the shaft along the inside or inner wall of the two walls thereof, and wherein there are two approximately angular edges *d* and *e* neatly abutting in a manner to form a seam, such as illustrated at *m*, extending longitudinally of the shaft at its outer surface. But in commercial practice it has been found preferable, by suitable slight modification of the aforesaid process, to produce the form of seam illustrated at *m′* in Figs. 3 and 4 and constituted by opposing or contiguous but slightly separated rounded edges, such as *i* and *k*.

The preferred outside dimensions of a 43″ driver shaft produced in the manner aforesaid are approximately .625″ at the large end and .338″ at the small end.

In the aforesaid process of formation, the thin steel walls of the shaft are spaced a uniform distance apart by the interposition of a spacer or separator, of suitable material, preferably lead, the thickness of which determines said spacing and thereby also determines the degree of torsion in the finished tube or golf shaft. The thinner the lead

spacer, that is, the less the space between the thin steel walls, the greater the degree of torsion that will be developed under a given stress and a given diameter of shaft. In the production of the model 43″ driver shaft, used as a basis for the specification of the application of which this is a division, the lead filler was approximately 0.70″ thick, and said shaft, tried in actual play, is an unqualified success.

It will be noted that the shaft comprises two tubes, or shapes, or walls, of annular cross-section, one within the other, the inner joined to and suspended or supported from the outer; and that the seam *m* or *m'* extending longitudinally of the shaft is constituted by opposing or contiguous edges which may abut as in Figs. 1 and 2, or be separated as in Figs. 3 and 4. In other words, the opposing edges are not fastened together and hence may be said to constitute an "open" seam, the edges of which are free for slight movement relatively to each other when the shaft is subjected to torsional stress or strain. Said open seam may be concealed, if desired, by inserting any suitable material between said opposing edges and then buffing said material flush with the metal, the filling material being anchored by means of the pressure of the walls of the seam thereon.

By this invention there is thus produced a tubular metal golf shaft of circular cross-section, which possesses the torsion, weight, flexibility and balance of a fine hickory golf shaft; and this has been confirmed by actual demonstration in comparison with shafts of hickory. By the use of steel somewhat thinner than is used in the ordinary steel golf shafts, it is possible, by this invention and by reason of the two walls, to obtain greater strength without increasing the weight.

Instead of starting the process with a blank of high carbon steel, low carbon steel carburized to a high carbon content may be used. In that event it is preferable to weld the joint *f*. Instead of welding or brazing, the joint *f* may be formed by riveting. And, instead of starting with a blank of sheet metal or steel, proper lengths of cold drawn seamless tubing, drawn or swaged to the desired taper and drawn, swaged or "stropped" to the desired thickness of walls, may be used and processed to the form shown in the drawing. Duralumin or similar alloy metal may be used, in the form of a seamless tapered tube, the wall thereof being thicker than that of steel but gauged to weigh the same. The thicker wall of course has less torsion, but this may be offset by correspondingly decreasing the space between the two walls and the desired torsion thus obtained. Molybdenum steel tubing may be used.

Having produced the metal shaft, it is desirable to make certain additional provisions for its use as a golf club shaft. To prepare its small end to be glued in the socket of a wooden head, the preferred procedure is as follows: Acetone (or similar elastic cement having the characteristics of bonding and shrinking the material to the shaft) is applied over a section of said small end of the shaft about 3″ in length and a fabric covering or sleeve *p*, Fig. 6 is then slipped over said section. Said sleeve *p* is larger (about ⅛″ larger in diameter) than the shaft, thus providing an excess of fabric for a purpose stated below. Wedges (not shown) are now forced into the open seam of the shaft just beyond each end of the fibrous sleeve *p*, thus slightly spreading said seam. The excess of fabric in the sleeve *p* is now forced down into the slightly spread seam, as shown at *q* in Fig. 5, thereby drawing the fabric to a tight fit around the shaft. The two wedges are now withdrawn allowing the spread seam to spring back to a tightly closed condition in which it securely grips and anchors the fabric between its edges.

The end of a string *r*, of cotton, or other suitable fiber, is now forced into the seam at *s*, in Fig. 6, thereby anchoring said end of the string. Acetone is now applied over the fabric sleeve *p* and to the string *r* and the string then wound spirally down to within a short distance of the extreme end of the shaft, where the string is laced through a transverse hole in the shaft and wedged in place by a peg *t* driven into said hole—all as shown in Fig. 6. Cement is then applied over the string winding and the end of the shaft thus wound is dipped into fine sawdust. After this cement and sawdust covering has been allowed to set and dry, the end of the shaft is "chucked", the same as with hickory shafts, thus producing an evenly finished wooden surface *z*, Fig. 6, which duplicates the gluing surface at the end of a hickory shaft. Anchoring the fabric sleeve *p* between the opposing edges of the seam serves, in conjunction with the cement and winding to prevent said sleeve from slipping or becoming loose under the stress of the impact with the ball, or through the action of atmospheric changes in the wooden neck of the head of the club.

To prepare the large end of the metal shaft to receive the usual grip of leather or leather-like material, the preferred procedure is as follows: A fabric sleeve *u* is applied to about 11″ in length of said large end of the shaft, as shown in Fig. 7; and forced into the seam *m* of the shaft and anchored therein, all by the same procedure as hereinbefore described with reference to fabric sleeve *p* at the small end of the shaft. No string winding or sawdust covering is employed at the large end of the shaft, the anchoring of the fabric sleeve between the grip of the opposing edges of the seam, in conjunction with the acetone, being sufficient to prevent any rotation or movement of the fabric sleeve relative to

the metal shaft under the customary stress of play. The fabric *u*, unlike the steel surface to which it is applied, furnishes a gluing surface for the usual listing and leather grip.

A wooden extension plug *v*, Figs. 7 and 8, is now applied to the large end of the metal shaft and extends about ½″ beyond it. The inner end or stem of the plug is of reduced diameter and fits closely within the inner metal wall of the shaft. The outer and projecting end or head of the plug is of larger diameter such as to be approximately flush with the outer surface of the outer wall of the shaft. Around the plug, at the offset between the head and stem thereof, there is a shoulder *w* (see Fig. 8) at approximate right angles to the axis of the plug. Around the plug inside said shoulder there is a wedge-shaped collar *y*. After the plug *v* is driven into the end of the metal shaft until the shoulder *w* abuts the end of the outer wall of the shaft, a headed pin *x* is inserted through holes in both walls of the tube and the plug, and the pin then riveted, all as shown in Figs. 7 and 8. By this arrangement the walls of the metal shaft are held in spaced relation against any relative movement. The collar *y* on the plug is notched at *y′* (see one half of the notch shown in dotted line in Fig. 8) to receive the walls at the seam of the metal shaft. The headed pin or rivet *x* of Figs. 7 and 8 may be omitted and the edges of the notch *y′* utilized to lock the walls of the seam together, the stem of the plug making a driving fit within the metal shaft.

The drawing is intended to show the proportional dimensions for an average shaft for the "woods", the driver, brassie and spoon, and it will be understood that shafts for the "irons" will be shorter and somewhat larger in diameter.

The metal shaft of this invention, instead of being tapered. as has been described with relation to Figs. 1 to 8, may be non-tapered, that is to say, it may be in the form of a straight shaft of approximately uniform diameter or cross-section, such as the shaft G shown in Fig. 9, which may be produced from a blank of sheet steel of uniform width throughout by the process described in said application of which this is a division. The longitudinal edges of the blank are secured together by a brazed joint, similar to that shown at *f* in the other figures of the drawing; and the shaft G has two approximately angular edges, similar to edges *d* and *e* of Figs. 1 and 2, forming an open seam similar to seam *m* in said figures and extending longitudinally of the shaft at its outer surface. But preferably said open seam may be similar to that shown at *m′* in Figs. 3 and 4, formed by rounded opposing edges such as shown at *i* and *k* in said figures. The ends of the non-tapering shaft may be prepared to receive a grip and a head, respectively, in any suitable way, for example, in the manner hereinbefore described and illustrated in Figs. 5 to 8 inclusive in reference to a tapered shaft.

The outer wall of both the tapered shaft of Figs. 1 to 8 inclusive and the non-tapered shaft of Fig. 9 may be reinforced where it leaves the neck of the head by inserting strips of hickory or spring metal, convex in cross-section, between the two walls of the shaft, said strips making a tight fit and yielding under action where the shaft leaves the neck.

It is to be understood that the metal tube or shaft claimed herein as a new article of manufacture is not limited to one produced by the particular process illustrated, described and claimed in the application of which this is a division.

In some of the claims the expression "open seam" is used as designating the seam extending longitudinally of the shaft formed by the abutting or closely contiguous edges of the folded blank, which edges are free for movement relatively to each other, and examples of which seam are shown at *m* in Figs. 1 and 7, where the opposing or contiguous edges neatly abut together, and at *m′* in Figs. 3 and 4, where the opposing or contiguous edges are slightly separated.

Experience in the commercial manufacture of golf shafts embodying the invention herein set forth, and claimed has disclosed that, while in a shaft produced by the process now employed in such manufacture, the outer and inner tubular walls are uniformly equidistant for the greater portion of the length of a tapered shaft of standard dimensions, nevertheless, for a comparatively short distance along the shaft, beginning at the small end thereof (where the exterior diameter is approximately .338 of an inch), the spacing of the walls is somewhat irregular, the probable reason for this being the presence of the thickness of metal at the joint *f* and the resistance offered thereby to bending and shaping such as to give uniformly equidistant spacing at the small end of the shaft.

Therefore, such of the appended claims as included the phrases "walls substantially uniformly spaced apart one within the other", or having "walls of substantially the same shape in cross section", or having "a hollow wall of substantially uniform thickness", and phrases of similar purport, are to be understood as applying to a tube or shaft having the specified structural characteristics throughout a substantial part of its length, as well as to a tube or shaft having said structural characteristics throughout the entire length thereof.

Experienced golfers are familiar with the torsion action of a golf club shaft, and how it functions when the ball is struck. The torsion in a hickory shaft can be seen and felt by

turning the head of the club with one hand while holding the leather grip of the club tightly grasped in the other hand; a good hickory shaft twists even when comparatively little force is applied and untwists or rebounds the instant the twisting force is released. It is well known to master golfers that this torsioning, this instantaneous twisting and untwisting, when the head impacts with the ball, is the very feature that cushions the shot by absorbing the jar of impact, and contributes to a long, straight ball. This is known to be the reason why the world famous golfers have continued heretofore to use the old hickory shaft—to secure the torsion attainable only in hickory prior to this invention.

On the other hand, hickory has sundry imperfections and disadvantages. It is well known that hickory shafts are prone to warping, which renders them undesirable for their intended use. Moreover, hard, straight hickory shafts are now very scarce, and according to Government statistics the supply of high grade hickory timber, suitable for the manufacture of golf shafts, is nearing its end.

Again it is found that nearly all present day hickory shafts, as they come from the machines whereby they are turned to circular cross-section, are crooked; and in order to straighten them such force is applied as tends to break down the fibers, which greatly shortens the life and also impairs the driving power of the shafts. Likewise the twisting and flexing action due to repeated impacts with the ball and with the ground also tend to injure or weaken the fibers, thus causing gradual deterioration with corresponding loss of distance and direction.

Furthermore, hickory shafts are highly sensitive to changes of temperature and humidity; the effect of rainy weather and hot weather being to increase their flexibility and degree of torsion, and vice versa.

For the foregoing reasons a hickory golf shaft lacks constancy (or dependable uniformity of condition and action); and because of its variability and its susceptibility to even the ordinary changes of weather and other conditions, it is often the major contributing cause of unsteadiness or irregularity in the play of the user. Many "off days", that are commonly attributed to the golfers themselves, are in fact "off days" for their hickory shafted clubs.

As the result of experience derived from the actual commercial manufacture of golf club shafts embodying the herein described invention, and from the use thereof in actual play and under careful observation, it has been conclusively demonstrated that said shafts, having the herein described torsion seam, which is a distinguishing characteristic of the present invention, possess all of the desirable features of the hickory shaft, but none of its undesirable characteristics. In particular, the torsion of hickory, as imparted to a steel shaft by the herein described invention, gives these outstanding advantages over steel shafts heretofore on the market: (1) It absorbs the jar of impact, thus cushioning the "feel" of the shot; (2) it counteracts the turning of the wrists at the moment of impact, thus producing better direction; (3) it snaps the ball away on the rebound and thus contributes to a longer shot.

What is claimed is:

1. As a new article of manufacture, a metal tube or shaft susceptible of torsioning and having a seam extending longitudinally thereof formed by opposing edges which are free for slight movement relative to each other in said torsioning, said tube or shaft being constituted by two tubular walls of thin metal substantially uniformly spaced apart one within the other, and said walls being continuous with each other at both edges of said longitudinal seam.

2. As a new article of manufacture, a metal tube or shaft capable of torsioning and having a seam extending longitudinally thereof formed by contiguous edges which are free for slight movement relative to each other in said torsioning, said tube or shaft being constituted by two tubular walls of thin metal of substantially the same shape in cross section and substantially uniformly spaced apart one within the other, and said walls being integrally continuous with each other at both edges of said longitudinal seam.

3. As a new article of manufacture, a metal tube or shaft capable of torsioning and of substantially uniform dimensions from end to end and having a seam extending longitudinally thereof formed by opposing edges which are free for slight movement relative to each other in said torsioning, said tube or shaft being constituted by two tubular walls of thin metal one within the other and continuous with each other at both edges of said longitudinal seam.

4. As a new article of manufacture, a metal tube or shaft capable of torsioning and having a seam extending longitudinally thereof formed by opposing angular edges which closely abut flush with the outer surface of the tube or shaft and which are free for slight movement relative to each other in said torsioning, said tube or shaft being constituted by two tubular walls of thin metal of substantially the same shape in cross section and substantially uniformly spaced apart one within the other and said walls being integrally continuous with each other at both edges of said longitudinal seam.

5. As a new article of manufacture, a metal tube or shaft capable of torsioning and constiuted by two tubular walls of thin metal one within the other and continuous with each other at both sides of a seam extending lon-

gitudinally of the tube or shaft, the whole being substantially ◎-shaped in cross section.

6. A metal tube or shaft composed of two metallic shapes of substantially the same form in cross section and one surrounding the other and having an open seam formed of two opposing edges, said seam being common to both shapes and extending lengthwise of the shaft and said shapes being connected together along both sides of said seam.

7. A tube or shaft of uniform diameter composed of two metallic shapes one surrounding the other and having an open seam formed of two opposing edges, said seam being common to both shapes and extending lengthwise thereof and said shapes being connected together along both sides of said seam.

8. A metal tube or shaft composed of a plurality of shapes of substantially the same form in cross section and one surrounding another and having an open seam common to all of the shapes and said shapes being connected together along both sides of said seam.

9. A shaft for golf clubs comprising a metallic tube having an open seam extending longitudinally thereof and a hollow wall of substantially uniform thickness.

10. A shaft for golf clubs comprising a tapered metallic tube having a longitudinally extending open seam and a hollow wall of substantially uniform thickness.

11. A shaft for golf clubs comprising a metallic tube having an open seam and constituted by inner and outer walls uniformly spaced from each other and integrally connected at said seam.

12. A shaft for golf clubs comprising a hollow-walled metallic structure of substantially uniform thickness formed into tubular shape with its longitudinal edges contiguous.

13. A golf shaft having two tubular metallic walls of similar outline in cross section spaced apart one within the other and continuous one with the other at both sides of an open joint or seam extending longitudinally of the shaft.

14. A hollow tubular shaft annular in cross-section made of a single sheet of metal folded upon itself to form two tubes one within the other and separated by a space of approximately uniform thickness, said shaft having a seam extending lengthwise thereof constituted by contiguous edges that are free for slight movement relatively to each other when the shaft is subjected to torsional stress

15. The combination with a metal tube or shaft having a longitudinally extending seam formed by opposing edges of the wall of the tube or shaft, of a covering of flexible material, such as fabric, surrounding a portion of said tube or shaft and having part thereof projecting into said seam and tightly gripped between its said opposing edges.

16. The construction defined in claim 15, with the addition of a covering applied over said flexible material.

17. The construction defined in claim 16, with the addition of a winding of string applied about said covering of flexible material.

18. The combination with a metal tube or shaft having a longitudinally extending seam formed by opposing edges of the wall of the tube or shaft, of a string wound over a portion of the tube or shaft and anchored at one end by being gripped between said edges of the seam.

19. The combination with a metal tube or shaft, of a string wound about a portion of the tube and having one end thereof extending into an opening in the tube and secured therein by a peg.

20. The combination with a metal tube or shaft constituted by two tubular walls spaced apart one within the other, of a plug fitting within the inner tubular wall at one end of the tube or shaft, and means on the plug fitting between the ends of the inner and outer walls and holding them in spaced relationship to each other.

21. The construction defined in claim 20 with the addition of a pin extending entirely through both walls of the shaft at both sides thereof and through the portion of the plug fitting within the inner wall of the shaft.

In testimony whereof I have signed this specification.

ALLAN E. LARD.

CERTIFICATE OF CORRECTION.

Patent No. 1,774,385. Granted August 26, 1930, to

ALLAN E. LARD.

It is hereby certified that error appears in the above numbered patent requiring correction as follows: Page 4, lines 126 to 130, and page 5, lines 1 and 2, comprising claim 5, should appear as follows instead of as given in the patent:

5. As a new article of manufacture, a metal tube or shaft capable of torsioning and constituted by two tubular walls of thin metal one within the other and continuous with each other at both sides of a seam extending longitudinally of the tube or shaft, the whole being substantially ◎-shaped in cross section.

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of May, A. D. 1931.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.